The Age Gap in Mortgage Access*

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Abstract

This paper uses data on millions of single-family mortgage applications to study the relationship between applicant age and application outcomes. Conditional on a rich set of observable characteristics, mortgage refinance applications submitted by older borrowers are associated with higher rejection probabilities. Collateral quality appears to contribute. Mortgages held by older borrowers carry higher coupon rates and origination fees. Overall, the results suggest that older individuals systematically face higher barriers to mortgage access and, relative to race and ethnicity, age appears to be a comparably important correlate of mortgage application outcomes. Potential explanations are discussed.

Keywords: Aging, Mortgage, Housing, Inequality, Credit Access

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1 Introduction

Conditional on observable credit risk characteristics, do older individuals face higher barriers to credit access? If so, why? As birth rates continue to fall and Baby Boomers reach retirement age, these questions are worth answering because aging is an increasingly pressing demographic issue for the United States. From a policy perspective, as the US population ages and the natural human lifespan increases, it is important to understand how aging affects an individual's ability to access credit because many individuals do and will spend a larger portion of their lives as senior citizens.

In the academic literature, the relationship between age and access to credit has received little attention mainly due to data limitations. This paper uses the 2018 to 2021 vintages of the anonymized confidential Home Mortgage Disclosure Act (CHMDA) data, a representative data set of the US mortgage market, to study the relationship between age and mortgage access.[1] The mortgage market is one of the largest retail credit markets in the United States and, therefore, serves as a valuable laboratory to study this empirical relationship. In the same spirit as the seminal work by Munnell et al. (1996), which uses, at the time, the state-of-the-art data set on mortgage application outcomes to study the relationship between applicants' race and mortgage access, this paper's main objective is to carefully estimate the conditional correlation between applicant age and two mortgage application outcomes: rejection probability and coupon rate.

The main empirical analyses focus on single-borrower 30-year rate-and-term refinance fixed rate mortgage applications. As described in greater detail below, I choose to focus on rate-and-term refinance mortgage applications because the statistical biases that are driven by unobservable differences between applicants who belong to different age groups are likely to be less severe among refinance mortgage applications than among home purchase mortgage applications. For completeness, in the Online Appendix, I provide results for home purchase and two-borrowers mortgage applications.

This paper is divided into two parts. The first part investigates the empirical relationship between applicant age and mortgage application rejection probability. Following several prominent papers in the literature (Munnell et al., 1996; Bayer et al., 2014; Bhutta and Hizmo, 2021), I run linear probability regressions where a mortgage application rejection indicator variable is regressed on age group indicator

[1] See Chapter V-9.1 of the FDIC Consumer Compliance Examination Manual. `https://www.fdic.gov/resources/supervision-and-examinations/consumer-compliance-examination-manual/documents/5/v-9-1.pdf`.

variables and a rich set of control variables that may be relevant to the underwriters' decision to extend credit. The age groups are 18 to 24, 25 to 29, 30 to 39, 40 to 49, 50 to 59, 60 to 69, and 70 or older. The first set of regressions reveals that, starting from the 25-to-29 age group, there is a monotonically increasing relationship between applicant age and probability of rejection. The economic magnitude is large. For example, applications associated with individuals who belong to the three oldest age groups are 1%, 2%, and 4.5%, respectively, more likely to be rejected than applications associated with individuals who are in the 18-to-24 age group. These estimates represent large increases relative to the sample's unconditional rejection probability of 15%.

This core result is surprising because older individuals are generally in better financial conditions.[2] This baseline pattern cannot be explained by the way in which borrowers select lenders because the results are qualitatively and quantitatively similar when the regressions are estimated with lender by time fixed effects. Furthermore, the positive relationship also holds across demographic groups and loan types. Auxiliary analyses show that similar patterns also show up among refinance mortgage applications that have two borrowers. For home purchase mortgage applications, rejection probability also increases with age, but the increase is not monotonic.

Since the literature on mortgage access has largely focused on the role of race and ethnicity (Ladd, 1998), it is worth comparing the size of the age coefficients to that of the coefficients on race and ethnicity variables. In line with estimates from the literature Bhutta et al. (2021), the regression results show that applications associated with a Black or Hispanic applicant are 1-2%, more likely to be rejected than applications associated with white applicants. Compared to the aforementioned point estimates on the age group indicator variables, it is clear that an individual's age is a comparably important correlate of mortgage application outcomes. In addition, omitting either set of demographic indicator variables (age vs. race and ethnicity) from the regression does not meaningfully change the coefficients on the remaining set. This exercise yields two insights. First, previous estimates of on unequal mortgage access across racial and ethnic groups should remain robust, even though the researchers were unable to control for applicant age. Second, the sets of mechanisms that drive the age and race results are likely to be different and orthogonal from each other.

[2]Data from the SCF show that average annual income and average net worth tend to increase with age. Data from American Express show that average FICO scores increase monotonically with age: from 662 for individuals in their 20s to 749 for individuals who are older than 59 years old, `https://www.americanexpress.com/en-us/credit-cards/credit-intel/credit-score-by-age-state/`.

Exploiting the large number of observations, I estimate the conditional correlation between age and rejection probability using *individual* age values and find several interesting observations. First, rejection probability increases relatively smoothly with age, i.e., the baseline positive correlation between applicant age and rejection probability does not occur only at certain points (e.g., decade cutoffs) on the age spectrum. Second, increases in the probability of rejection accelerate in old age. These patterns are interesting for several reasons. First, the patterns suggest that the potential mechanisms that drive this relationship evolves smoothly with age, which is a feature that lends more support to some potential mechanisms than others. Second, the pattern suggests that, empirically, it appears that lenders do not seem to use underwriting systems that relatively benefit individuals who are 62 years or older, which, under Regulation B, is a requirement for certain types of credit underwriting systems.

To shed some light on why underwriters are more likely to reject applications associated with older individuals, I regress indicator variables that equal one if the application was rejected for a certain reason on the same age group variables. I find that there is a monotonically increasing relationship between applicant age and the probability that his or her application is rejected because of "insufficient collateral." Generally, mortgage applications are rejected because of insufficient collateral when the appraised value of the property is too low, relative to the requested loan amount.[3] The same qualitative pattern holds for home purchase and two-borrowers mortgage applications, which suggests that, with respect to age, collateral quality is an important determining factor of mortgage application rejection.

Age, as it relates to mortgage application outcomes, can be conceptualized in at least two ways. First, age does not contain any economically important information about risk because the documented correlation is driven by unobservable credit risk (e.g., financial distress) that just so happens to be correlated with age in this particular sample of mortgage applicants. On the other hand, age itself contains important information about risk (e.g., age-related mortality risk) or directly determines rejection probability (e.g., age discrimination).

The first section of the paper concludes with a discussion of potential mechanisms, which includes, but are not limited to, omitted variable bias, age-related mortality risk, unintended consequence from

[3]For rate-and-term mortgage refinance applications, lenders typically require the borrower to have at least 20% equity left on the property. Therefore, if the property value dropped substantially between the time that the first mortgage was originated and the time that the refinance application was submitted, or the loan amount has grown relative to the property value due to certain features of the original mortgage (e.g., negative amortization), then the application could be denied for "insufficient collateral."

demographic-blind underwriting systems (Fuster et al., 2022), and age discrimination. Age-related mortality risk is an appealing potential mechanism for several reasons. First, when a borrower dies, the mortgage is either paid off early via an estate sale or goes into default. Therefore, conceptually, age-related mortality risk is highly correlated with default and prepayment risk, and, hence, should be priced by lenders. Second, much like the rejection probability results, probability of death increases smoothly with age, accelerates in old age, and, in old age, is lower for females than for males. In addition, the insufficient collateral result could support both the omitted variable bias and the mortality risk explanations. For the former, inability to maintain one's property, due to financial distress, may contribute (Campbell et al., 2011). For the latter, all else equal, lenders may require older applicants to put up more collateral to secure against higher age-related mortality risk.

The second part of the paper studies the conditional correlation between borrower age and coupon rate. Using the same approach as in the first section, among the main sample of single-borrower refinance mortgages, I find that there is a monotonically increasing relationship between borrower age and points-adjusted coupon rate that ranges from 1 to 8 basis points (bps). The same qualitative result holds when I include lender by year-quarter fixed effects, which suggests that the result cannot be entirely explained by sorting behavior across lenders; that is, it is not the case that older borrowers are more likely to accept mortgage offers from more expensive lenders. The qualitative relationship holds for across demographic groups and for conforming and non-conforming mortgages. The same pattern also holds among home purchase and two-borrowers mortgages.

Taking advantage of the large number of observations, I explore the relationship between borrower age and coupon rate using individual age values. I find that, for both home purchase and refinance mortgages, points-adjusted coupon rate increases smoothly with age, much like the rejection probability results. The similarity suggests that the same set of mechanisms may be driving both sets of results.

Bartlett et al. (2022) find that mortgages held by Black and Hispanic borrowers carry approximately 9 bps higher coupon rates than mortgages held by white borrowers. Using this estimate as the benchmark, the age effect that I document is comparable in size. Much like the rejection regression result, omitting either set of demographic variables does not meaningfully change the coefficients on the remaining variable set.

The coupon rate results discussed thus far are likely to suffer from omitted variable bias. To address this concern, I use the loan-level pricing adjustment (LLPA) grid identification strategy (Bartlett et al., 2022). The identification strategy rests on the assumption that, if mortgages were originated to be sold to Fannie Mae and Freddie Mac, the government-sponsored enterprises (GSEs), then the originators' loan pricing decisions should only depend on the fee structure that is given by the LLPA grid. Any excess differences in coupon rate across age groups can be attributed to factors unrelated to unobservable credit risk. Using this identification strategy, I still find a monotonically increasing relationship between borrower age and coupon rate from the 30-to-39 age group onward. The economic magnitude of the coefficients are similar to the baseline results. The same pattern holds among home purchase and two-borrowers mortgages. Overall, this set of analyses suggests that the positive relationship between borrower age and points-adjusted coupon rate is unlikely to be driven by unobservable credit risk.

The second section concludes with a discussion of potential mechanisms. The baseline coupon rate result can be driven by omitted variable bias that stems from unobservable credit risk, which can be merely correlated with age (e.g., financial distress and low collateral quality) or be directly related to age (e.g., age-related mortality risk). Risk-based explanations of both flavors are supported by the finding that there is a positive relationship between borrower age and the probability that the mortgage is sold to Fannie Mae or Freddie Mac. If the identifying assumption behind the LLPA grid regressions holds, then the respective regression results cannot be explained by unobservable credit risk. The remaining potential explanations, among others, include differences in shopping behavior across, differences in menu offerings (Zhang and Willen, 2021), and taste-based age discrimination. Lastly, I find that the conditional correlation between borrower age and gross origination fee is positive. This result lends some support to the shopping behavior explanation as closing cost is another dimension in which borrowers and lenders could bargain over.

Overall, the results presented in this paper suggest that older individuals face higher barriers to mortgage access in the form of higher rejection probabilities and coupon rates. Since the findings in this paper broach the subject of fair lending, there are several important caveats to consider. First, the results presented in this paper are conditional correlations between age and mortgage application outcomes, which cannot be used to make statements about whether lenders are *actually* using age to make lending decisions. A rigorous fair lending analysis of individual lenders' activities would be required to make such

statements and is beyond the scope of this paper. Second, it follows that the results also cannot be used to make definitive statements about whether the lenders included in this study are behaving legally or illegally with respect to fair lending laws. Lastly, this paper does not aim to make a normative statement about whether older individuals *should* have easier access to credit. The paper's main goal is to present systematic empirical relationships between age and mortgage outcomes without making any welfare or normative statement.

This paper contributes to the literature on aging and credit access in several ways. First, using a large data set of mortgage applications that contains applicant age and a rich set of observable characteristics, this paper is the first to systematically document stylized facts about the empirical relationship between aging and mortgage access. I find that older applicants for mortgage refinance systematically face higher rejection probabilities, after controlling for many relevant credit quality variables. Furthermore, for both home purchase and refinance mortgages, mortgages held by older borrowers carry higher points-adjusted coupon rates. The same results hold under the LLPA grid identification strategy (Bartlett et al., 2022), which addresses concerns regarding unobservable credit risk. The current paper's contribution pushes the literature forward because prior works generally studied small samples of applications and loans and did not find systematic relationships between age and credit access (Black et al., 1978; Dunson and Reed, 1991; Epley and Liano, 1999; Dietrich, 2005). In turn, this paper also contributes to the larger literature on the disparity in mortgage access across subgroups of the population (Ladd, 1998) by showing that age is an economically important correlate of such outcomes. As a practical matter to researchers in this field, when possible, borrower age should be included as a control variable in mortgage application outcome regressions.

The second contribution that this paper makes to the literature on aging and credit access is the empirical evidence that the aforementioned stylized facts, especially on rejection probabilities, appear to be consistent with, among others, the idea that lenders consider age-related mortality risk, which is tightly associated with prepayment, default, and recovery risks. I show that the positive correlation between age and rejection probability, increases smoothly with age, accelerates in old age, and is larger for older and male applicants. These findings are consistent with the way in which the probability of death within one year behaves. Taken together, this set of results suggests that, by nature, the age effect may manifest in many credit markets because mortality risk is priced.

Bayer et al. (2014) used a fairly large sample of mortgages from metropolitan areas to study whether minority borrowers were more likely to receive high-cost mortgages. Although age was not the focus of the paper, borrower age appeared as an explanatory variable in the regressions, and the results showed that older borrowers face higher coupon rate spreads. The current paper improves our understanding of the relationship between aging and credit access beyond the findings in Bayer et al. (2014) by showing that older individuals systematically face higher barriers to mortgage access via both higher rejection rates and higher coupon rates. I also use the LLPA grid identification strategy to address concerns related to unobservable credit risk. Other complementary works include Mayer and Moulton (2020), which studied the usage pattern of reverse mortgages and home equity among older homeowners, and Dobbie et al. (2021), which find that age discrimination causes older borrowers to face higher loan application rejection rates in the market for short-term consumer loans.

Perhaps most closely related to this paper is the work by Kaul and Zhu (2021), which uses the public version of the HMDA data set to study rejection probabilities among older Americans for equity extraction products such as cash-out refinance, home equity lines of credit, and home equity conversion mortgages. The authors find that, unconditionally, rejection probabilities tend to rise with age and high debt-to-income ratio seems to be an important contributor. The current paper differs from Kaul and Zhu (2021) in several important aspects. First, the current paper focuses on simple refinance and home purchase mortgages, which, for older Americans, make up a larger proportion of their total demand for mortgage products between 2018 and 2021 than the products that Kaul and Zhu (2021) study.[4] Second, the current paper studies the conditional correlation between age and mortgage application outcomes and takes the problem of unobservable credit risk seriously by using the LLPA grid identification strategy. Lastly, this paper thoroughly studies the conditional correlation between borrower age, coupon rate, and origination fee, which Kaul and Zhu (2021) did not. The finding that older borrowers appear to pay higher origination fees contributes to the growing literature on mortgage closing costs, which finds that Black and Hispanic borrowers tend to pay higher closing costs (Mota et al., 2023).

The remainder of the paper is organized as follows. Section 2 discusses relevant parts of the US fair lending laws. Section 3 describes the data set and samples that are used in the analyses. Section 4 outlines the regression specifications that I use to estimate the aforementioned conditional correlations. Section 5 presents the rejection study results and discusses potential explanations. Section 6 presents the

[4]See online appendix Table B1 for summary statistics on mortgage product market share by age group.

coupon rate study results and discusses potential explanations. Section 7 discusses important caveats that the reader should keep in mind when thinking about the empirical results, and Section 8 concludes.

2 Borrower Age Under Regulation B

Regulation B implements the Equal Credit Opportunity Act (ECOA), which aims to "promote the availability of credit to all creditworthy applicants without regard to race, color, religion, national origin, sex, marital status, or age ... The regulation prohibits creditor practices that discriminate on the basis of any of these factors."[5] However, the law does not prohibit lenders from using age as part of a credit scoring system.

Under Regulation B, credit scoring systems can be classified as one of two types: a judgmental system or an empirically derived credit scoring system. If using a judgmental credit scoring system, the "creditor may not decide whether to extend credit or set the terms and conditions of credit based on age or information related exclusively to age."[6] However, "[a]ge or age-related information may be considered only in evaluating other 'pertinent elements of creditworthiness' that are drawn from the particular facts and circumstances concerning the applicant."[7] The Official Staff Comment for §1002.6(b)(2)-3 gives several, but not exhaustive, examples. First, "[a] creditor may consider the applicant's occupation and length of time to retirement to ascertain whether the applicant's income (including retirement income) will support the extension of credit to its maturity." Second, "[a] creditor may consider the adequacy of any security offered when the term of the credit extension exceeds the life expectancy of the applicant and the cost of realizing on the collateral could exceed the applicant's equity." Lastly, "[a] creditor may consider the applicant's age to assess the significance of length of employment (a young applicant may have just entered the job market) or length of time at an address (an elderly applicant may recently have retired and moved from a long-term residence)."

In a similar vein, an empirically derived credit scoring system is also permitted to consider age to determine a pertinent element of creditworthiness. Section §1002.11(b)(1)(iv) of Regulation B states that the federal regulation preempts state law that "[p]rohibits asking about or considering age in an

[5]Regulation B Section §1002.1.
[6]Official Staff Comment for Section §1002.6(b)(2)-3.
[7]Official Staff Comment for Section §1002.6(b)(2)-3.

empirically derived, demonstrably and statistically sound, credit scoring system to determine a pertinent element of creditworthiness, or to favor an elderly applicant."[8] The main takeaway from this discussion is that there *may* be systematic correlations between applicant age and mortgage application outcomes because, under certain circumstances, lenders *may* consider an applicant's age in connection with a relevant credit risk factor when making lending decisions.

3 Data

3.1 Data Sources and Sample Description

This paper uses mortgage application data from the anonymized CHMDA data set that spans 2018 to 2021. Crucially, the new data vintages contain applicant and co-applicant age in years and a richer set of applicant, property, and loan characteristic variables, which is helpful in controlling for observable characteristics that may matter for lending decisions. More details on the control variables are presented in the next section and Appendix A.

This paper uses a sample of 30-year fixed rate simple refinance mortgage applications associated with one borrower to produce the core results.[9] The focus on single-borrower mortgage application is motivated by the fact that, for mortgage applications that have two borrowers, it is unclear which borrower age should be the economically meaningful one.

The focus on refinance applications is motivated by the fact that the main empirical methodology that the paper employs is an careful estimation of the conditional correlation between applicant age and mortgage application outcomes. As such, omitted variable bias is a major concern. In this respect, home purchase loan applications are problematic because I cannot observe whether, at the time of application, the borrower was a homeowner or not. Homeownership status is potentially important for lending decisions because homeowners are likely to have lower credit risk than renters. Data from the Survey

[8] A lender may make lending decisions based on a system that combines an empirically derived system and a judgmental system. Per the Official Staff Comment for 1002.6(b)(2)-5, "[d]oing so will not negate the classification of the credit scoring component of the combined system as 'demonstrably and statistically sound.' While age could be used in the credit scoring portion, however, in the judgmental portion, age may not be considered directly. It may be used only for the purpose of determining a pertinent element of creditworthiness."

[9] Simple refinance refers to rate-and-term refinance as opposed to cash-out refinance. Refer to Appendix Section A.1 for more details on how the CHMDA data set defines the two types of refinances.

of Consumer Finances (SCF) show that the median single homeowner's net worth is, in 2016 USD, approximately $150,000 and his annual income is approximately $37,500. On the other hand, the median renter's net worth is approximately $3,800 and his annual income is approximately $22,500. In addition, homeowners are more likely to have longer credit histories because they hold at least one mortgage and are likely to differ from renters in difficult-to-observe characteristics such as financial sophistication, which may indirectly affect lending-decision-relevant variables. For example, Vestman (2019) found that homeowners are more than twice as likely to participate in the stock market than renters, which might imply that they are able to accumulate wealth at a faster rate.

Another source of unobservable risk that is more likely to affect home purchase mortgage applications than refinance applications is migration probability, which likely varies systematically across age groups. To lenders, migration probability is a form of prepayment risk (Quigley and Weinberg, 1977; Myers et al., 1997; South and Crowder, 1998; Clapp et al., 2006). The concern that prepayment risk from migration will bias the conditional correlation between age and mortgage application outcomes is likely to be attenuated in the refinance sample because a refinance, which comes with fixed costs, becomes profitable if the homeowner manages to remain within the home for a sufficiently long period of time.

At the surface, it may appear odd to use refinance and home purchase mortgages to explore the relationship between age and credit access because of the long-term nature of the product. I contend that this is a valuable exercise for several reasons. First, as shown in Online Appendix Table B1, refinance and home purchase mortgages appear to make up a substantial part of older Americans' demand for mortgage products, even in comparison to more seemingly age-appropriate products such as home equity line of credit, reverse mortgage, and cash-out refinance. This paper is agnostic about whether it is appropriate for older Americans to take out refinance and home purchase mortgages, but takes the demand that appears in the data as revealed preferences. Second, older Americans may have bequest motives and, due to relative differences in financial conditions between them and their offspring, it may make more sense for the older generation to take out home purchase or refinance mortgages with the goal to leave the property to their children. Regulatory revisions after the Global Financial Crisis have made it easier for older Americans to pass on mortgaged properties to their heirs.[10] Hence, the mortgage products that I study may be quite valuable for generational wealth accumulation.

[10]See `https://www.consumerfinance.gov/about-us/newsroom/cfpb-clarifies-mortgage-lending-rules-to-assist-surviving-family-members/`.

The main sample includes first-lien refinance applications for conforming, non-conforming, VA, and FHA mortgages that contain no special features such as interest-only payment, balloon payment, prepayment penalty, and negative amortization features. All applications are backed by primary residence properties that contain one housing unit. The filters allow me to estimate the conditional correlation of interest with less concern regarding how loan features such as balloon payment or interest-only payment should interact with observable borrower characteristics (e.g., credit score and income) when they enter the regression equation. Since applications for mortgages that contain uncommon features make up a relatively small part of the overall mortgage market, the empirical results presented below still captures the representative experience of older mortgage applicants.

The final sample contains approximately 4.2 million refinance applications. For robustness and completeness, in the Online Appendix, I also present results for two-borrowers refinance, single-borrower home purchase, and two-borrowers home purchase mortgage applications that survive the same filters. The top panel of Table 1 presents summary statistics on applicant and application characteristics for the main refinance sample. The bottom panel presents summary statistics on the additional information that is available for the subset of applications that reached the loan origination stage. Analogous summary statistics for the supplementary samples are presented in Online Appendix Section B.2.

3.2 Summary Statistics by Age Group

Since this is the first paper to use a representative data set to study the relationship between age and mortgage access, it is worth summarizing the unconditional relationships between applicant age, applicant characteristics, and application characteristics . This section presents summary statistics on applicant and application characteristics on the main sample of refinance applications. The goal of this exercise is to give some evidence that the observable characteristics of the sample of mortgage applicants that I study, with respect to age, behaves as one would reasonably expect. The top panel of Table 2 presents average characteristics by age group. Using associated borrower ages, applications are sorted into the following age groups: 18 to 24, 25 to 29, 30 to 39, 40 to 49, 50 to 59, 60 to 69, and 70+.

First, the proportion of the sample increases with age and peaks in the 30 to 39 age group and begins to decline. Older individuals make up a non-trivial proportion of the refinance application sample.

By application count, applicants who are 50 years or older make up approximately 40% of the sample. Interestingly, the unconditional rejection probability appears to increase with age with the exception that it falls between the first and second age groups. Annual income, as expected, increases with age and peaks in the 40 to 49 age group. The distribution of average annual income across age groups is slightly different from that of the population of single homeowners. Data from the SCF show that average annual income, in 2016 USD, across the age groups are $33,000, $55,000, $59,000, $71,000, $76,000, $52,000, and $40,000, respectively. Comparing the two sets of numbers, after adjusting for inflation, reveals that single homeowners in the sample tend to earn more than single homeowners in the SCF, which makes sense because the sample of study is composed of refinance applicants who are, anecdotally, more financially sophisticated than first-time home buyers.

Average credit scores, although not monotonically, tend to increase with age, which agrees with conventional wisdom; that is, older individuals should have higher credit scores than younger individuals because older individuals have longer credit histories. Data from American Express show that average FICO score increases monotonically with age: from 662 for individuals in their 20s to 749 for individuals who are older than 59 years old.[11]

Average debt-to-income (DTI) ratios vary little across age groups. The small variation seems to follow the variation in income across age groups, which implies that DTI should be highest for the youngest and oldest age groups. Average cumulative loan-to-value (CLTV) ratios decrease monotonically with age, which suggests that older applicants tend to take out smaller loans, relative to the collateral value. The pattern possibly aligns with the notion that individuals try to delever and downsize, as indicated by average loan amounts, as they get closer to retirement.

A unique feature of the post-2017 CHMDA data set is the information on automated underwriting system (AUS) recommendation. For many applications in the sample, I observe a recommendation by up to four different automatic underwriting systems, which could be one of the following: insufficient information to make a recommendation, approve, or deny. AUS recommendations are useful because the AUS "observes" more information than the econometrician, and so the AUS's recommendation is a measure of credit quality that captures more credit risk information beyond what the other variables in the CHMDA data set provide.[12] In addition, the AUS variable in CHMDA also provides information on

[11] See `https://www.americanexpress.com/en-us/credit-cards/credit-intel/credit-score-by-age-state/`.

[12] See Bhutta et al. (2021) for additional details on AUS information in CHMDA. See Fannie Mae's Single Family Selling

whether the mortgage application is eligible to be sold to Fannie Mae and Freddie Mac.

I define the variable AUS Approved as an indicator variable that equals one if the application was approved by at least one AUS and zero otherwise. The univariate tabulation shows that the AUS recommends approval less often for older applicants than for younger ones, which suggests older applicants have a higher credit risk than younger ones or that older applicants are less likely to have sufficient information for the AUS to give a recommendation.[13] The trend in AUS approval tends to agree with the rejection probability pattern, which may seem surprising because the descriptive statistics above suggest that older applicants have higher credit scores, take out smaller loans, and request less leverage.

Turning to the subsample of refinance mortgages that were originated, the bottom panel of Table 2 present average coupon rate, points-adjusted coupon rate, and net points purchased by age group. Average coupon rate appears to decrease with age. Points-adjusted coupon rate adjusts the raw coupon rate by adding back the amount of net mortgage points that the borrower purchased. Net points purchased is the difference between the number of mortgage points that the borrower purchased and the amount of lender credits that the borrower received. CHMDA reports points purchased and lender credits in dollars, which can be converted into percentage of loan amount and, conventionally, one percent of loan amount is equivalent to one point. Following Bartlett et al. (2022), I equate one point to 25 bps of coupon rate. After adjusting for points and lender credit, I still find that coupon rate seems to decrease with age. Interestingly, older borrowers tend to buy more mortgage points, as shown by the net points purchased row, expressed as basis points of loan amount. This pattern runs against the intuition that borrowers should purchase more points if they expect to stay in the home for longer Brueckner (1994). However, this pattern can also reflect older homeowner's bequest motives through the aforementioned post-GFC rule change.[14] Similar summary statistics for the supplementary samples are presented in Appendix B.2.

Guide for more information on information that the AUS observes, `https://singlefamily.fanniemae.com/media/31886/display`.

[13] Insufficient information is also a helpful status to consider because mortgage applications do get rejected when certain information is missing or cannot be verified.

[14] The net points purchased is not driven by variation in lender credits across age groups because such variation is small and lender credits appear to be negatively correlated with borrower age.

4 Empirical Methodology

The goal of this paper is to study the empirical relationship between applicant age and several mortgage application outcomes: rejection probability, coupon rate, and GSE sale probability. To this end, I use two regression-based approaches.

4.1 Baseline Regression Specification

Since the relationship between applicant age and rejection probability may not be linear, one way to estimate the conditional correlation between age and the outcome variable of interest is to run the following ordinary least squares (OLS) regression:

$$Y_i = \alpha + \sum_{j}^{J} \beta_j \times \mathbb{1}(Age\,Group\,j)_i + \gamma' \mathbf{x_i} + YearMonth \times Tract\,FE + \epsilon_i. \tag{1}$$

Following prominent papers in the mortgage access literature (Munnell et al., 1996; Bayer et al., 2014; Bhutta and Hizmo, 2021; Bartlett et al., 2022), I use OLS regressions for ease of interpretation. This regression specification conditions on observable characteristics that lenders may use to make lending decisions. i indexes loan applications. Y is the placeholder for the outcome variables that I study. The first outcome variable is *Rejected*, which is an indicator variable that equals one hundred if the application gets rejected and zero otherwise. The reference group includes applications that were approved but the applicant refused to take the offer. The second outcome variable is *Coupon Rate*, which is the points-adjusted coupon rate of the mortgage, reported in basis points. The third outcome variable is *GSE Sale*, which equals one hundred if the mortgage was sold to Fannie Mae or Freddie Mac and zero otherwise.[15] The reference group contains mortgages that were held on balance sheet, sold to a private securitization pool, or sold to other entities (e.g., banks and insurance companies). Whereas private securitization and other entities may consider borrower age as a source of risk when purchasing and pricing mortgages, Fannie

[15] All GSE securitization results are quantitatively and qualitatively similar when I exclude mortgages that were originated in the last three months of the year. This robustness check eliminates the concern that, with respect to loan sale, the CHMDA data only captures sale of mortgages that were originated and sold in the same calendar year. Therefore, mortgages that were originated near the end of the year are mechanically less likely to be sold.

Mae and Freddie Mac do not.[16] The GSE sale analysis is limited to conventional conforming mortgages.[17] The final outcome variable is gross origination fee, defined as the sum of origination charges and lender credits, expressed as basis points of loan amount.[18]

The explanatory variable of interest is applicant/borrower age, which is defined in several ways. For the case where the application has one borrower, I sort applications into the following age groups, indexed by j: 18 to 24, 25 to 29, 30 to 39, 40 to 49, 50 to 59, 60 to 69, 70 or older, and missing age. Applicant age enters into the equation as a set of indicator variables where the applicant's age determines which age group indicator variable equals one. Applications associated with individuals in the first age group are used as the reference group. This form of borrower age is appealing because it allows for nonlinearity. Depending on the purpose of the regression, I also run regressions where borrower age enters as individual age value indicator variables and as a single age value variable. For the case where the application has two borrowers, the age group variables are defined base on the minimum, maximum, or average age between the two borrowers.

$\gamma'\mathbf{x_i}$ is a vector of applicant and loan characteristics. The variables include sex, race, ethnicity, credit score, income, LTV ratio, DTI ratio, loan types and AUS approval. Additional details of these variables are provided in Appendix A.2. I include year-month by census tract fixed effects to difference out time-varying local macroeconomic effects and property location effects.[19] In some specifications, I include lender by year-quarter fixed effects to account for differences in each lender's time-varying business opportunities. Standard errors are clustered at the lender level because underwriting methods are assumed to be constant within lender. Following Bhutta and Hizmo (2021), mortgages that the AUS deemed to be ineligible or mortgages that have loan amounts larger than their respective conforming mortgage limits are tagged as non-conforming mortgages.

The regression specification outlined above allows me to study the conditional correlation between applicant's age and mortgage application outcomes among individuals who applied for a mortgage under very similar observable circumstances. Although I am able to control for a large set of observable

[16] See Appendix Figures A2 and A3.

[17] Mortgages that could have been or were sold to Ginnie Mae and Farmer Mac are excluded.

[18] Lender credits help borrower close the transaction. However, borrowers do pay for lender credits in the form of higher interest rates. In other words, lender credit is equivalent to buying negative mortgage points and, hence, can be considered as part of the total origination cost (Bhutta and Hizmo, 2021).

[19] I use action (e.g., approval/rejection decision) month to construct the year-month fixed effects for all rejection regressions. Application months are used for all coupon rate regressions because rates are locked based on the date of application. Alternative choices do not materially affect the results.

characteristics, the β_j coefficients do not admit a causal interpretation because of several reasons. First, the estimates likely suffer from omitted variable bias because I do not observe many important variables that are likely to be correlated with age and mortgage application outcomes (e.g., mobility risk and many more).

Furthermore, selection bias potentially a big issue. First, not every homeowner chooses to apply for a rate-and-term mortgage refinance loan. Second, lenders may discourage unqualified applicants from applying before they could submit an application and appear in the CHMDA data set. Lastly, the relatively younger (18 to 29) and relatively older (60+) applicants in the sample are likely to be very dissimilar to the median individual in their respective age groups. For example, the very young are likely to have uncommonly low credit risk because most young people do not have sufficient resources and credit history to apply for a mortgage. On the flip side, older individuals are likely to have uncommonly high credit risk because, anecdotally, most would-be retirees and retirees prefer to not carry debt into retirement, and so this particular group of older individuals may be in financial distress, which I cannot observe.

Therefore, the sample of applications that I use to estimate the regressions is not a random sample, and the selection mechanisms may be correlated with the relative differences in credit quality and, hence, mortgage application outcomes across age groups. Overall, due to the limitations outlined above, the estimation results from variants of equation 1 should be interpreted as a set of carefully estimated conditional correlations.[20]

4.2 LLPA Grid Regression Specification

The main empirical results presented by Bartlett et al. (2022) are conditional correlations between borrower's race and ethnicity and mortgage coupon rate that stem from sources beyond pricing adjustments for conforming mortgages that were sold to the GSEs. The argument is that, for mortgages that were sold to Fannie Mae or Freddie Mac, the sole determinant of the coupon rates is where the loans land in the LLPA grid, which determines the fee that originators have to pay the GSEs. Econometrically,

[20]Since, in the context of loan approval, it is difficult to randomly assign demographics (e.g., race and ethnicity) (Bertrand and Mullainathan, 2004) to estimate the causal effect that certain demographics have on lending decisions, it is common practice for researchers to estimate conditional correlations using the richest data sets available (Bayer et al., 2014; Bhutta et al., 2020; Bhutta and Hizmo, 2021; Bhutta et al., 2021).

this argument translates to, if the econometrician includes LLPA grid fixed effects in the regression that estimates the relationship between coupon rate and borrower's demographics, then any differences in coupon rates across demographic groups can be attributed to factors unrelated to relevant credit risk, observed and unobserved.[21] Potential factors include differences in shopping behavior and taste-based discrimination.

Following the same logic, I can use the OLS regression specification shown below to estimate the relationship between borrower age and points-adjusted coupon rate that is free from concerns of unobservable credit quality:

$$Coupon\,Rate_i = \alpha + \sum_{j}^{J} \delta_j \times \mathbb{1}(Age\,Group\,j)_i + \gamma' \mathbf{x_i} + YearMonth \times LLPA\,Grid \times GSE\,FE + \epsilon_i. \quad (2)$$

Following Bartlett et al. (2022), this regression equation is estimated using a sample of originated home purchase and refinance mortgages from CHMDA that were sold to either Fannie Mae or Freddie Mac. The outcome variable $Coupon_Rate$ is the points-adjusted coupon rate, defined above. $\gamma' \mathbf{x_i}$ is a vector of demographic controls. I include month by LLPA grid by GSE (Fannie Mae or Freddie Mac) fixed effects because I pool mortgages that were sold to the two GSEs. I use Fannie Mae's LLPA grid, presented in Appendix Figure A2, to define the LLPA grid fixed effects. As shown in Appendix Figures A2 and A3, Fannie Mae's fee schedule is finer, i.e., has more cells, than Freddie Mac's and, hence, makes the Fannie Mae LLPA grid fixed effects more stringent than the alternative. The interaction with GSE fixed effects is meant to absorb differences in fee amounts across the two purchasers.[22] In some specifications, I include lender fixed effects to address the concern that differences in coupon rate across age groups could arise from differences in overhead cost of issuance across lenders. Lastly, as discussed in Bartlett et al. (2022), repayment and put-back risk is not a material concern in the post-2008 sample.

If the identifying assumption holds, then δ_j is the estimate of the relationship between borrower

[21] See Bartlett et al. (2020) and Bartlett et al. (2022) for a detailed discussion of the legal framework that justifies the interpretation of LLPA grid fixed effects regressions. The GSEs' price adjustment tables that are used to construct the LLPA grid fixed effects can be found in Appendix Figures A2 and A3.

[22] All results are quantitatively and qualitatively similar when I use Freddie Mac's fee grid to define the LLPA grid fixed effects or when I run the regression separately for mortgages sold to Fannie Mae and mortgages sold to Freddie Mac, while using the respective fee schedules to define the LLPA grid fixed effects.

age and points-adjusted coupon rate that is in excess of unobservable credit risk. If the stated identifying assumption does not hold, then the results from the LLPA grid regression would suffer from the same drawbacks that are listed in Section 4.1. One way that the identifying assumption could fail is that, the sale probabilities of the mortgages in the sample are not always equal to one. In this case, the lender may use its own underwriting model to determine the mortgage's coupon rate and this model can use information that captures unobservable credit risk beyond the LLPA grid.

5 Rejection Study Results

5.1 Age and Rejection Probability

Table 3 presents the rejection regression results for the main single-borrower refinance mortgage application sample. Column 1 presents the regression result from a specification where, along with the age group variables, I include the full set of control variables. There are several notable patterns. First, relative to the 25-to-29 age group, there is a clear monotonically increasing relationship between applicant age and probability of rejection. The reference group, 18 to 24, has a slightly elevated rejection probability relative to the 25-to-29 age group. This result is surprising because, in the United States, credit score and wealth are positively correlated with age and, hence, ex-ante, we may expect that older applicants are less likely to be rejected.[23] Second, the economic magnitudes are large when compared to the unconditional probability of rejection of 15%. For example, the coefficients for the three oldest age groups indicate a 8% to 30% relative increase in rejection probability. The tract by year-month fixed effects eliminate the possibility that the age effect is driven by neighborhood-level characteristics such as average resident age, which implies that the individual's age is driving the result.

Column 2 presents regression results where I include lender by year-quarter fixed effects, and I find that, although the coefficients are smaller, the qualitative pattern is largely robust, which means that the core empirical pattern is not entirely driven by differences in lender matching across age groups; that is,

[23] In 2019, average FICO scores for people in age groups 20 to 29, 30 to 39, 40 to 49, 50 to 59, and 60 or older are 662, 673, 684, 706, and 749, respectively. Data are gathered from `https://www.americanexpress.com/en-us/credit-cards/credit-intel/credit-score-by-age-state/`. The SCF shows that the average net worth of people in the same age groups are, in thousands of 2016 USD, $137, $280, $593, $995, and $960, respectively, `https://sda.berkeley.edu/sdaweb/analysis/?dataset=scfcomb`.

older individuals are not selecting to apply for mortgages with more stringent lenders. Online Appendix Table B9 presents regression results for the sample where I exclude applications from the year 2020. The results are qualitatively and quantitatively similar to those presented in Table 3, which suggests that the main results are not driven by the COVID-19 pandemic.

The CHMDA data set provides applicant age in years, which allows me to study the correlation between age and rejection probability at each age value. I do so by running the regression specification that includes lender by year-quarter fixed effects with age value indicator variables instead of age group indicator variables. The resulting age coefficients and their respective 95% confidence intervals are plotted in Figure 1. There are two notable patterns. First, generally, rejection probabilities appear to increase relatively smoothly with age. Second, the increase appears to accelerate when the applicant is older than seventy years old.

The first observation is surprising for several reasons. First, the baseline results presented in Table 3 may suggest that the relationship between age and rejection probability looks more like a step function where rejection probabilities jump at the turn of each decade. Such pattern would be in line with potential mechanisms such as age discrimination where a one year increase in age is more salient at certain age values than others. However, the relatively smooth increase in rejection probabilities suggest that age may be a proxy for a certain set of credit risk that increases gradually with age. Second, the pattern in Figure 1 suggests that, for refinance mortgage applications, lenders do not appear to adopt underwriting schemes that are bounded by the part of Regulation B that mandates lenders to favor applicants who are 62 years or older over those who are younger.[24] Lastly, retirement age or the age at which individuals can begin to collect social security benefits (62 to 67) does not appear to trigger any noticeable jump (up or down) in rejection probability.[25]

Since the literature on the disparity in mortgage application outcomes (Ladd, 1998) largely focuses on race and ethnicity, it is worth comparing the coefficients on the age variables with those on the race and ethnicity variables. Across the two specifications, the coefficients on the three oldest age groups are generally larger than the coefficients on Black and Hispanic. This result suggests that, relative to race

[24]The Official Staff Comment for §1002.6(b)(2)-2 states that "age may be taken directly into account in a credit scoring system that is 'demonstrably and statistically sound,' as defined in §1002.2(p), with one limitation: Applicants age 62 years or older must be treated at least as favorably as applicants who are under age 62. If age is scored by assigning points to an applicant's age category, elderly applicants must receive the same or a greater number of points as the most favored class of non-elderly applicants."

[25]`https://www.ssa.gov/benefits/retirement/planner/agereduction.html`.

and ethnicity, applicant age is an equally important correlate of mortgage approval decision.[26]

Regression results shown in columns 3 and 4 of Table 3 explore whether, as in prior works in the literature, omitting age from this type of lending decision regression significantly affect the coefficients on race and sex indicator variables. In column 3, I omit age variables from the regression and, in column 4, I omit sex, race, and ethnicity variables from the regression. Comparing results in columns 2 through 4 reveals that such omissions do not significantly affect the coefficients on the included variables. This set of results implies that, if the statistical significance of the age, race, and ethnicity indicator variables is driven by unobservable credit quality, then the types of such credit quality that drive the age and the race results are likely to be orthogonal to each other.

Table 4 presents the regression result for each major demographic group in the single-borrower refinance application sample. The qualitative pattern appears to hold within each group. Table 5 presents the regression result for each loan type: conforming, non-conforming, and government guaranteed (e.g., VA and FHA) mortgage applications. The qualitative pattern appears to hold across loan types.

Online appendix Table B10 presents the rejection regression results for single-borrower home purchase mortgage applications. The correlation between applicant age and rejection probability is generally positive, but the increase in rejection probability is not monotonic. As discussed in Section 3, the non-monotonic pattern in the home purchase sample may be driven by unobservable factors such as differences in mobility risk or homeownership status across age groups. Online appendix Table B11 shows that the respective patterns hold in the two-borrowers refinance and home purchase mortgage application samples. The fact that similar patterns show up in the two-borrowers sample is not surprising because, within a mortgage application, the difference between applicant age and co-applicant age is very small, as shown in Online Appendix Table B8.

The key takeaways from this section are the following. First, for refinance mortgage applications, age appears to be positively correlated with rejection probability. The general conclusion holds for home purchase mortgage applications, but the increase in rejection probability is not monotonic. Second, relative to race and ethnicity, age appears to be a comparably important correlate in mortgage rejection regressions. Overall, in the application phase of the mortgage obtainment process, older applicants appear to face higher barriers to access via higher rejection probabilities.

[26]The size of the race and ethnicity coefficients are comparable to those estimated by recent works (Bhutta et al., 2021).

5.2 Age and Rejection Reasons

In CHMDA, for each rejected application, the underwriter provides at least one explanation for the decision. This section explores the conditional correlation between applicant age and the stated reasons for rejection. To do so, I use the main sample of refinance applications to estimate variants of regression equation 1, where the dependent variable is an indicator variable that equals one for a certain rejection reason. For example, the first (coded as reason 1) reason for rejection in the CHMDA data set is high DTI ratio. Therefore, the analogous outcome variable is an indicator variable that equals one hundred if the application is rejected because its DTI ratio is too high.

Table 6 presents the regression results.[27] The rejection reason that seems to qualitatively match the baseline correlation between applicant age and application rejection probability is "insufficient collateral," shown in column 4.[28] A rate-and-term refinance application can be rejected for insufficient collateral because the homeowner does not have enough equity on his or her property to take out the desired loan amount. This scenario could occur if the homeowner's estimate of his property value was too optimistic or if the property had experienced a substantial price decline since the time the original mortgage was originated.

The insufficient collateral result is consistent with the conjecture that older homeowners are less able to maintain the quality of their homes (Campbell et al., 2011). Therefore, the value of their collateral may have dropped substantially between the time when they first bought the property and the time when they applied for refinancing. Other reasons for significant collateral value declines include selecting into houses that are more likely to experience functional obsolescence and buying houses at the wrong place and at the wrong time. Insufficient collateral could also result if the loan amount has grown relative to the property value. This event could occur if the original mortgage has a negative amortization feature or the borrower is attempting to consolidate multiple mortgages into one.[29]

[27] Values in the Average Outcome row do not add up to 15% because a single application could be rejected for multiple reasons.

[28] The regression results shown in column 9, "Other", also appear to match the baseline rejection probability pattern. However, the coefficients are small and the reason for rejection is a catch-all term for reasons other than the ones listed in columns 1 through 8, which makes the economic interpretation difficult.

[29] A borrower who wishes to refinance a mortgage that has a negative amortization feature may be more likely to be rejected for insufficient collateral because, during the life of the first mortgage, the principal amount that needs to be refinanced has grown relative to the value of the property. And so, even if the property did not experience a large decline in value, its current collateral value may be insufficient to back the new loan. I do not observe information on the original mortgage and, therefore, cannot quantify the importance of this mechanism. Per Appendix A.1, it is possible that some lenders in the sample mistakenly classify a refinance mortgage that consolidates multiple existing mortgages into one as a

Online appendix Tables B12, B13, and B14 show that the positive correlation between applicant age and the probability of being rejected for insufficient collateral is also present in the single-borrower home purchase and the two-borrowers mortgage application samples. Overall, the takeaway from this section is that insufficient collateral appears to be an important driver of the relationship between applicant age and probability of rejection.

5.3 Potential Explanations

In this section, I provide a non-exhaustive list of possible explanations that could produce the empirical patterns presented above, but not to suggest that any one of the explanations discussed below is more plausible, causal, or quantitatively more important than the others. The reader should interpret the empirical results as being driven by any combination of the listed explanations and those that are not listed in this section. The potential explanations discussed below fall into two categories. First, age is *causally* affecting mortgage application outcomes. An example of this class of explanations is taste-based age discrimination. Second, age is a proxy for certain age-related credit risks (e.g., age-related mortality risk) or is correlated with other classes of unobservable credit risk (e.g., financial distress).

5.3.1 Selection and Omitted Variable Bias

As mentioned in the methodology section, the regression results on rejection probability are conditional correlations, which means that they do not address the issues of selection and omitted variable bias. As such, it is possible that the sample of applicants used in the analyses presented thus far disproportionately includes older applicants who are in financial distress, which renders them less creditworthy. By omitting measures of financial distress from the regressions, age becomes a proxy of financial distress and, hence, appears to be systematically correlated with mortgage application outcomes.

Anecdotally, would-be retirees avoid carrying debt into retirement. Therefore, it is possible that older individuals who carry a mortgage and, hence, apply for a rate-and-term refinance are in weaker financial conditions than older individuals who do not carry any mortgage debt. The pertinent point is

simple refinance. In this situation, the loan amount on the new mortgage would have increased substantially relative to the property value.

that unobservable financial conditions among older applicants in the sample must, generally, get worse with age to produce a spurious correlation between age and mortgage application rejection probability. This correlation structure is plausible, given that, as people age, their incomes are lower and their savings are depleted by retirement consumption.

Selection bias may also play an important role among the youngest applicants in the sample. In 2022, the median age among first-time home buyers is 33 years old and the median age of homeowners is 47 years old, which implies that it is very uncommon for individuals who are younger than 30 years old to buy new homes and, even more so, to refinance their existing mortgages.[30] Therefore, it is likely that individuals who are between 18 and 29 years old who appear in the CHMDA data set are highly irregular; that is they are likely to have higher-than-average credit quality compared to other individuals in their age group. In addition, younger applicants may have older mortgage guarantors associated with the application, which I cannot observe in CHMDA. Since I cannot fully control for such unobservable credit quality, it is likely that the conditional rejection probability for applications associated with younger individuals in the sample is too low and the conditional rejection probability for applications associated with older individuals in the sample is too high. Together, these two effects are likely causing the age gap in rejection probabilities to be too large.

Lastly, the selection bias explanation can also explain the insufficient collateral rejection result. It is intuitive that financial distress leads to significant deterioration of the property because the owner cannot afford work that maintains the property's structural integrity and, hence, the owner's refinance application is more likely to be rejected for insufficient collateral.

5.3.2 Age-Related Mortality Risk

A potentially creditworthiness-relevant variable that is highly correlated with age is life expectancy or age-related mortality risk. In the event that a borrower dies, it is typically the case that an executor or administrator will be appointed to manage the estate, which includes the mortgage and the associated property. The executor will identify the heir who may choose to sell the property and pay back the loan

[30]The statistics are gathered from the ascent and the National Association of Realtors, https://www.fool.com/the-ascent/mortgages/articles/this-is-the-average-age-of-first-time-home-buyers/. https://www.nar.realtor/sites/default/files/documents/2021-home-buyers-and-sellers-generational-trends-03-16-2021.pdf.

or work with the lender to take over the mortgage. In the rare even that an heir cannot be identified, the executor will use the estate's assets to pay off the loan. If the estate's assets are insufficient, then the executor could try to sell the property to pay off the loan, offer the lender a deed-in-lieu of foreclosure, or arrange a short sale. Ultimately, in the event that there are insufficient funds to pay off the loan, the lender may choose to foreclose on the property.

From an economic perspective, the borrower's death is an event that causes uncertainty in loan performance for the lender because the likelihood of the loan being paid off early (prepayment risk) or entering foreclosure (default and recovery risk) is higher. All else being equal, this set of risks is higher for older borrowers than for younger borrowers because the former group has significantly higher age-related mortality risk. Therefore, a rational and risk-averse lender should consider age-related mortality risk when making lending decisions.

Age-related mortality risk could drive the correlations presented above because the regression results appear consistent with the behavior of mortality risk presented in Figure A1. First, Figure 1 shows that, much like mortality risk, the probability of rejection generally increases with age. Second, the same figure shows that the increase in rejection probability accelerates for older individuals, which is consistent with the fact increases in mortality risk are much higher for older individuals. Third, regression results presented in Online Appendix Table B15 show that the difference in rejection probability between men and women becomes larger for older individuals, which agrees with the fact that the difference in mortality risk between men and women widens in old age. Lastly, the positive correlation between applicant age and the probability that the application gets rejected for insufficient collateral can also be interpreted as being consistent with the idea that, all else equal, lenders may require the borrower to put up more collateral or take out a smaller loan as age-related mortality risk increases with age. This idea is consistent with the second example from Section 2 regarding the way in which age can be considered when making underwriting decisions; that is, life expectancy can be considered in relation to loan term and the cost of collateral value realization.

It is important to note the subtle difference in economic interpretation of whether the documented age effect is picking up the effect of selection bias (e.g., financial distress) or risks that are fundamentally related to age (e.g., mortality risk). If the age effect were mostly driven by selection with respect to financial distress, then age contains no economically important information. On the other hand, if the

age effect were mostly driven by age-related mortality risk, then, even though it is a form of omitted variable bias, age could be interpreted as containing economically important information, since mortality risk is largely determined by age.

5.3.3 Other Explanations

Due to systematic correlation structures between demographic variables (e.g., race, ethnicity, sex, and age) and economically relevant variables (e.g., income and credit score), seemingly demographic-blind statistical models can produce different outcomes across demographic groups. For example, Fuster et al. (2022) show that implementing seemingly race-blind machine learning models in the context of mortgage lending decisions will likely cause Black and Hispanic borrowers to be worse off. Similarly, Amornsiripanitch (2020) shows that conventional property tax assessment methods produce regressive residential property tax rates, which adversely impacts any demographic group that tends to own less expensive homes. For the current paper, it is plausible that lenders do not use borrower age to make lending decisions, but the correlations presented above still manifest in the data because age is systematically correlated with "permissible" credit-relevant variables such that a seemingly age-blind statistical underwriting model still yields different outcomes across age groups.

In principle, it is plausible that taste-based age discrimination is a factor that is driving the rejection probability results. However, it seems unlikely that rejection probability would evolve as shown in Figure 1 and that age would be systematically correlated with rejection for insufficient collateral, if age discrimination were the main driver. Nonetheless, I do not directly explore whether taste-based age discrimination contributes to the correlations documented above, and so I cannot rule in or rule out the explanation.

6 Coupon Rate Study Results

6.1 Age and Coupon Rate

Table 7 presents regression results for the conditional correlation between borrower age and points-adjusted coupon rate for the main single-borrower refinance mortgage sample. The sample only includes mortgages that were originated. Column 1 presents the result for the specification where I include the full set of control variables. Similar to the rejection probability results, there is a monotonically increasing relationship between applicant age and points-adjusted coupon rate. Much like the estimates from the literature on differences in mortgage interest rates across racial groups (Bhutta et al., 2020; Bartlett et al., 2022), the economic magnitude is small relative to the unconditional mean of 320 bps.[31] However, the sizes of the age coefficients (1 to 8 bps) are comparable to the race and ethnicity effects estimated by Bartlett et al. (2022), which find that Black and Hispanic borrowers, on average, pay 9 bps in coupon rate.[32]

Column 2 presents the results for the specification where I include lender by year-quarter fixed effects. The same qualitative pattern holds and the size of the coefficients does not significantly change, which suggests that the bulk of the baseline pattern is not driven by differential sorting; that is, it is not the case that older borrowers are more likely to accept loans from more expensive lenders.

I exploit the granularity of the age data by re-estimating the second specification using individual age value indicator variables instead of age group indicator variables. Figure 2 presents the result. Much like the rejection probability result, points-adjusted coupon rate increases smoothly with age, which suggests that the mechanisms at play also evolves smoothly with age.

Columns 3 and 4 explore the correlation structure between the age, race, and ethnicity indicator variables. Like before, the exercise shows that omitting one set of demographic variables does not significantly affect the estimated coefficients of the included set, which implies that, if the age and the race effects are driven by unobservable credit risk, then the respective sets of credit risk appear to be orthogonal to each other.[33]

[31] The small, but detectable, variation in conditional coupon rate differences across age groups may be driven by the presence of the GSEs and the political pressure that they face (Hurst et al., 2016).

[32] The same conclusions hold for the LLPA grid regression results discussed below.

[33] The same conclusions hold for the LLPA grid regression results discussed below.

In the same fashion as the rejection analysis, I explore whether the positive correlation between borrower age and points-adjusted coupon rate holds across demographic groups and loan types. Regression results presented in Table 8 show that the pattern holds across demographic groups. Regression results presented in Table 8 show that the same pattern appears among conforming and non-conforming, but not government guaranteed refinance mortgages.

Online Appendix Tables B16, B18, and B19 and Figure B1 show that the same qualitative pattern holds for single-borrower home purchase mortgages, across demographic groups and loan types. The difference between the rejection probability results and the coupon rate results among applications for home purchase mortgages may be driven by the elimination of certain classes of unobservable risk during the approval/deny stage. Online Appendix Table B17 shows that the core coupon rate result is not driven by the COVID-19 pandemic. Online Appendix Table B20 shows that the positive correlation between borrower age and points-adjusted coupon also appears among refinance and home purchase mortgages that have two borrowers.

Online Appendix Tables B21 and B22 present regression results for the relationship between borrower age and coupon rate, unadjusted for points purchased. Comparing the raw coupon rate results to the points-adjusted coupon rate results reveals that, for refinance mortgages, the positive relationship between borrower age and points-adjusted coupon rate can be mostly explained by differences in points purchasing behavior across age group. This statement is not true for home purchase mortgages, since the adjusted and unadjusted results are very similar. The main takeaway from this section is that the points-adjusted coupon rate appears to be another dimension in which older borrowers face higher barriers to mortgage access.

6.2 Potential Explanations

In this section, I discuss potential mechanisms behind the the positive correlation between borrower age and points-adjusted coupon rate. For each regression specification that I use to estimate the conditional correlation between the two variables of interest, I provide a set of potential explanations where any combination of the listed and unlisted explanations can be responsible for the core coupon rate results.

6.2.1 Risk-Based Explanations

As discussed above, since I do not attempt to control for selection and omitted variable bias, the positive correlation between borrower age and points-adjusted coupon rate estimated using variants of regression equation 1 is likely to be contaminated by unobservable risks such as financial distress and age-related mortality risk. In this section, I provide additional empirical evidence that such risks are likely to be an important contributor to the documented pattern.

It is well-established in the mortgage literature that adverse selection plagues the securitization process; that is, lenders appear to sell riskier mortgages to Fannie Mae and Freddie Mac, the GSEs (Keys et al., 2010, 2012; Gorton and Metrick, 2013; Jiang et al., 2014; Bubb and Kaufman, 2014; Echeverry, 2022). I provide suggestive evidence that age is a proxy for credit and/or prepayment risk by using regression equation 1 to estimate the conditional correlation between borrower age and the probability that the mortgage is sold to the Fannie Mae or Freddie Mac, the GSEs. The regression results for conforming single-borrower refinance and home purchase mortgages are presented in Online Appendix Table B23. Qualitatively, with the exception of within-lender estimates for the single-borrower refinance sample, the results seem to suggest that lenders are more likely to sell mortgages held by older borrowers to the GSEs. Online Appendix Tables B24 and B25 show that the same qualitative conclusion holds among the conforming two-borrowers mortgage sample. Although the point estimates are not economically large when compared to the unconditional sale probability of 60% to 70% (depending on the sample) and not always statistically different from zero, taken together with the rejection and coupon rate results, the risk-based explanation appears to be generally supported by the data.[34]

6.2.2 LLPA Grid Regression Results and Remaining Explanations

The advantage of using the whole sample of single-borrower refinance mortgages to estimate the conditional correlation between borrower age and points-adjusted coupon rate is that I can show that the baseline pattern holds for many parts of the market for refinance mortgages. Furthermore, the larger sample allows me to explore differences in GSE sale probability, which sheds light on potential mechanisms. Of course, the clear disadvantage is that the baseline regression analysis suffers from omitted

[34]Regression results are quantitatively and qualitatively similar when I control for the loans' raw coupon rates or points-adjusted coupon rates where the coupon rate information enters the regression as 100 bps bins.

variable bias from unobservable credit risk.

For the subset of mortgages that were sold to Fannie Mae and Freddie Mac, the LLPA grid identification strategy from Bartlett et al. (2022) allows me to address the concern that the conditional correlation between borrower age and points-adjusted coupon rate is driven by unobservable credit risk. Table 10 presents the regression results for the main single-borrower refinance mortgage sample. Overall, the core qualitative pattern holds under the LLPA grid identification strategy. Specifically, relative to the 30-to-39 age group, older borrowers appear to pay higher points-adjusted coupon rates. The economic magnitude of the estimates are also similar to the baseline results. Regression results presented in Online Appendix Tables B26 and B27 show that the same conclusion holds for the single-borrower home purchase mortgage and the two-borrowers mortgage samples. Online Appendix Tables B28, B29, and B30 show that the LLPA grid results cannot be fully explained by differences in points purchasing behavior across age groups. Like before, the contribution of points purchased appears to be larger for refinance mortgages.

Under the LLPA grid identification strategy, several potential explanations remain. The first potential explanation is differences in shopping behavior across age groups(Woodward and Hall, 2012; Mota et al., 2023). Since search can be costly (Hortaçsu and Syverson, 2004), it is plausible that, due to higher likelihood of physical or mental fatigue and technology aversion, older borrowers may perform a less comprehensive search of potential lenders than younger borrowers. Therefore, older borrowers end up receiving less favorable coupon rates because they cannot provide competing rates for lenders to match.

If older borrowers do not shop as intensely as younger borrowers, then older borrowers may also face less favorable origination fee, which is another margin in which borrowers and lenders can bargain over. I use regression equation 1 to estimate the conditional correlation between borrower age and gross origination fee, defined as the sum of origination charges and lender credits expressed as basis points of loan amount. Table 11 presents regression results for single-borrower mortgages. For both refinance and home purchase mortgages, I find that older borrowers generally pay higher gross origination fees. The economic magnitude is sizeable compared to the average gross origination fee of 102 bps and 89 bps for single-borrower refinance and home purchase mortgage samples, respectively. The same pattern shows up among two-borrowers mortgages, as shown in Online Appendix Table B31. Taken together with the coupon rate results, the fee results appear to be consistent with the shopping explanation.[35] However, it

[35]Mota et al. (2023) find that shopping behavior is an important determinant of mortgage closing costs.

is important to note that the positive correlation between borrower age and origination fee can also be the result of other mechanisms such as age discrimination and differences in rates-points-fees combination menu offerings.

Along similar veins, market segmentation or differences in the degree of competition can also give rise to the coupon rate result. Suppose that lenders specialize in different segments of the mortgage market (e.g., by geography, loan amount range, credit score range) that happen to be correlated with age and if the degree of competition across these market segments varies such that the competition is less intense for mortgages associated with older individuals, then the age gap in mortgage coupon rate result could arise.

Differences in menu offerings across age groups can potentially contribute (Zhang and Willen, 2021). The relatively important contribution of differences in points purchasing behavior across age group among refinance mortgages is suggestive that this channel may matter. Lastly, in principle, taste-based age discrimination can cause a positive relationship between borrower age and coupon rate. However, it seems unlikely that age discrimination would be the main driver behind the pattern presented in Figure 2 as it is unlikely that the effect that stems from such discrimination would produce a relatively smooth increasing pattern. Nonetheless, I do not directly test whether taste-based age discrimination contributes to the correlation between age and coupon rate, and so I cannot rule in or rule out the explanation.

7 Caveats

The goals of this paper are to (1) document the conditional correlations between applicant age and mortgage application outcomes, and (2) discuss potential mechanisms that *may* drive the correlations. At its core, this paper seeks to draw attention to the potentially important issue of age and mortgage access, much like the way in which the seminal work by Munnell et al. (1996) drew attention to the importance of race and ethnicity in mortgage lending decisions. This paper does not seek to make any welfare or normative statement about whether older individuals should have easier access to credit.

Since the results touch upon the issue of fair lending, additional caveats need to be discussed. First, as stated in the methodology section and throughout the paper, the regression results show correlations

and not causal relationships. Therefore, the results do not necessarily indicate that lenders are making lending decisions based on age because the correlations presented above are not necessarily informative about the underwriting models that lenders use. To be able to make such definitive statements, I would need to perform a fair lending analysis of an individual lender's activities, which is not an accurate description of the analyses presented above and is beyond the scope of this paper.

Second, since the correlations presented above are not necessarily informative about the variables that are considered in lenders' underwriting models, it follows that the results do not provide definitive evidence of whether or not the lenders that appear in the sample of analysis are legally or illegally using borrower age to make lending decisions. Therefore, I cannot take a stand on whether the lenders that I study are violating fair lending laws.

8 Conclusion

This paper is the first to use a large data set of mortgage applications to document stylized facts about the relationship between applicant age and mortgage application outcomes. Since the mortgage market is one of the largest retail credit markets, the analyses presented here, to the best of my knowledge, serve as the most systematic study of the relationship between age and credit access. I find that, conditional on a rich set of applicant and loan characteristics, older applicants for a mortgage refinance generally face higher rejection probabilities. This empirical pattern is robust within lenders and across loan types. By exploring loan officers' reasons for rejection, I find that insufficient collateral appears to be a significant contributor. Conditional on being originated, home purchase and refinance mortgages held by older borrowers also carry higher points-adjusted coupon rates. The same results hold under the LLPA grid identification strategy from Bartlett et al. (2022), which suggests that the conditional correlation between borrower age and points-adjusted coupon rate is unlikely to be driven by unobservable credit risk. Finally, I document that older borrowers pay higher origination fees. Taken together, the findings suggest that, for a large part of the market for simple refinance and home purchase mortgages, older individuals systematically face higher barriers and costs.

The results presented above should be interpreted as a set of carefully estimated conditional correlations, which implies that mortgage access barriers are not necessarily raised by age itself because

age may be a proxy for certain risks or omitted variables that are highly correlated with age. As such, potential explanations for the documented empirical patterns include, but are not limited to, selection bias, age-related mortality risk, differential impacts from statistical underwriting models, differences in shopping behavior across age groups, taste-based age discrimination, and market segmentation.

In relation to the larger literature on the disparity in mortgage application outcomes across different subgroups of the population, the results presented in this paper suggest that, relative to his or her race and ethnicity, an applicant's age appears to be an equally important correlate of mortgage access. As a practical matter for researchers, regressions that study the relationship between mortgage application outcomes and any variable of interest should condition on applicant/borrower age.

A potentially fruitful avenue of research is to document and explain the relationship between borrower age and loan performance. The infra-marginality problem (Simoiu et al., 2017) prevents me from taking up this task in the current paper. The findings in this paper also pose important questions such as who are these older borrowers and why are they applying for retail credit products that appear to be inappropriate for their age? A large-scale survey can potentially make significant progress on this front. Given its economic importance and many unexplored questions, the relationship between age and credit access should be an active area of economic research, especially when aging becomes a more pressing policy concern.

References

Amornsiripanitch, N. (2020). Why are residential property tax rates regressive? *Available at SSRN 3729072*.

Bartlett, R., A. Morse, R. Stanton, and N. Wallace (2020). Algorithmic accountability: A legal and economic framework. *Berkeley Technology Law Journal, forthcoming*.

Bartlett, R., A. Morse, R. Stanton, and N. Wallace (2022). Consumer-lending discrimination in the fintech era. *Journal of Financial Economics 143*(1), 30–56.

Bayer, P., F. Ferreira, and S. L. Ross (2014). Race, ethnicity and high-cost mortgage lending. *NBER Working Paper No. 20762*.

Bertrand, M. and S. Mullainathan (2004). Are emily and greg more employable than lakisha and jamal? a field experiment on labor market discrimination. *American Economic Review 94*(4), 991–1013.

Bhutta, N., A. Fuster, and A. Hizmo (2020). Paying too much? Price dispersion in the US mortgage market. *FEDS Working Paper No. 2020-62*.

Bhutta, N. and A. Hizmo (2021). Do minorities pay more for mortgages? *The Review of Financial Studies 34*(2), 763–789.

Bhutta, N., A. Hizmo, and D. Ringo (2021). How much does racial bias affect mortgage lending? Evidence from human and algorithmic credit decisions. *FRB Working Paper*.

Black, H., R. L. Schweitzer, and L. Mandell (1978). Discrimination in mortgage lending. *American Economic Review 68*(2), 186–191.

Brueckner, J. K. (1994). Borrower mobility, adverse selection, and mortgage points. *Journal of Financial Intermediation 3*(4), 416–441.

Bubb, R. and A. Kaufman (2014). Securitization and moral hazard: Evidence from credit score cutoff rules. *Journal of Monetary Economics 63*, 1–18.

Campbell, J. Y., S. Giglio, and P. Pathak (2011). Forced sales and house prices. *American Economic Review 101*(5), 2108–31.

Clapp, J. M., Y. Deng, and X. An (2006). Unobserved heterogeneity in models of competing mortgage termination risks. *Real Estate Economics 34*(2), 243–273.

Dietrich, J. (2005). Searching for age and gender discrimination in mortgage lending. *Comptroller of the Currency Working Paper*.

Dobbie, W., A. Liberman, D. Paravisini, and V. Pathania (2021). Measuring bias in consumer lending. *The Review of Economic Studies 88*(6), 2799–2832.

Dunson, B. H. and W. R. Reed (1991). Age discrimination in consumer finance markets. *Southern Economic Journal 58*(1), 225–239.

Echeverry, D. (2022). Adverse selection without a housing boom: Evidence from fannie mae's credit risk transfers. *Available at SSRN 4127332*.

Epley, D. R. and K. Liano (1999). Borrower age differences in residential mortgage lending by commercial banks. *Social Science Quarterly 80*(3), 604–613.

Fuster, A., P. Goldsmith-Pinkham, T. Ramadorai, and A. Walther (2022). Predictably unequal? The effects of machine learning on credit markets. *The Journal of Finance 77*(1), 5–47.

Gorton, G. and A. Metrick (2013). Securitization. In *Handbook of the Economics of Finance*, Volume 2, pp. 1–70. Elsevier.

Hortaçsu, A. and C. Syverson (2004). Product differentiation, search costs, and competition in the mutual fund industry: A case study of S&P 500 index funds. *The Quarterly Journal of Economics 119*(2), 403–456.

Hurst, E., B. J. Keys, A. Seru, and J. Vavra (2016). Regional redistribution through the US mortgage market. *American Economic Review 106*(10), 2982–3028.

Jiang, W., A. A. Nelson, and E. Vytlacil (2014). Securitization and loan performance: Ex ante and ex post relations in the mortgage market. *The Review of Financial Studies 27*(2), 454–483.

Kaul, K. and L. Zhu (2021). Mortgage denial rates and household finances among older americans.

Keys, B. J., T. Mukherjee, A. Seru, and V. Vig (2010). Did securitization lead to lax screening? evidence from subprime loans. *The Quarterly journal of economics 125*(1), 307–362.

Keys, B. J., A. Seru, and V. Vig (2012). Lender screening and the role of securitization: Evidence from prime and subprime mortgage markets. *The Review of Financial Studies 25*(7), 2071–2108.

Ladd, H. F. (1998). Evidence on discrimination in mortgage lending. *Journal of Economic Perspectives 12*(2), 41–62.

Mayer, C. and S. Moulton (2020). The market for reverse mortgages among older Americans. *Wharton Pension Research Council Working Paper 2020-22*.

Mota, N., M. Palim, and S. Woodward (2023). Mortgages are still confusing... and it matters – how borrower attributes and mortgage shopping behavior impact costs. *Fannie Mae Research Publication*.

Munnell, A. H., G. M. Tootell, L. E. Browne, and J. McEneaney (1996). Mortgage lending in Boston: Interpreting HMDA data. *American Economic Review 86*(1), 25–53.

Myers, D., S. S. Choi, and S. W. Lee (1997). Constraints of housing age and migration on residential mobility. *The Professional Geographer 49*(1), 14–28.

Quigley, J. M. and D. H. Weinberg (1977). Intra-urban residential mobility: A review and synthesis. *International Regional Science Review 2*(1), 41–66.

Simoiu, C., S. Corbett-Davies, and S. Goel (2017). The problem of infra-marginality in outcome tests for discrimination.

South, S. J. and K. D. Crowder (1998). Leaving the Hood: Residential mobility between black, white, and integrated neighborhoods. *American Sociological Review 63*(1), 17–26.

Vestman, R. (2019). Limited stock market participation among renters and homeowners. *The Review of Financial Studies 32*(4), 1494–1535.

Woodward, S. E. and R. E. Hall (2012). Diagnosing consumer confusion and sub-optimal shopping effort: Theory and mortgage-market evidence. *American Economic Review 102*(7), 3249–3276.

Zhang, D. H. and P. S. Willen (2021). Do lenders still discriminate? a robust approach for assessing differences in menus. Technical report, National Bureau of Economic Research.

Figure 1: Marginal Difference in Rejection Probability by Age – Refinance

This figure plots the point estimates from a regression where the rejection indicator variable is regressed onto individual age indicator variables. The sample is composed of single-borrower refinance mortgage applications. The reference group is composed of applications associated with applicants with ages 18 to 24. The regression specification includes the full set of control variables, year-month by tract fixed effects and lender by year-quarter fixed effects. Heteroskedasticity-robust standard errors are clustered at the lender level. Data source: CHMDA.

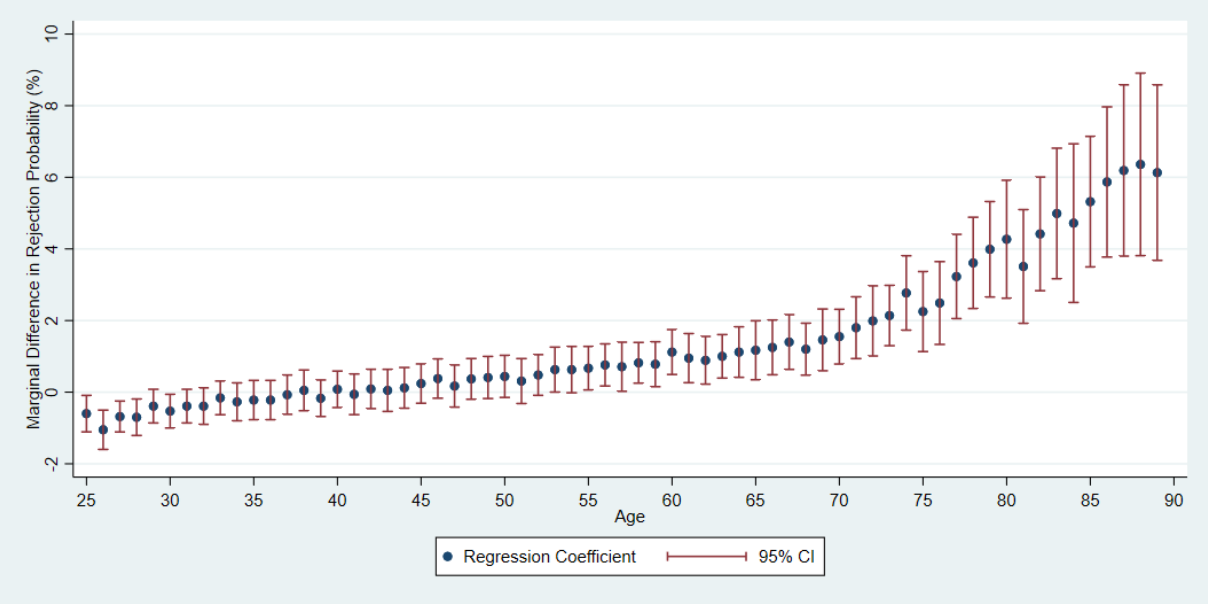


Figure 2: Marginal Difference in Points-Adjusted Coupon Rate by Age – Refinance

This figure plots the point estimates from a regression where points-adjusted coupon rate is regressed onto individual age indicator variables. The sample is composed of single-borrower refinance mortgages. The reference group is composed of mortgages associated with borrowers with ages 18 to 24. The regression specification includes the full set of control variables, year-month by tract fixed effects and lender by year-quarter fixed effects. Heteroskedasticity-robust standard errors are clustered at the lender level. Data source: CHMDA.

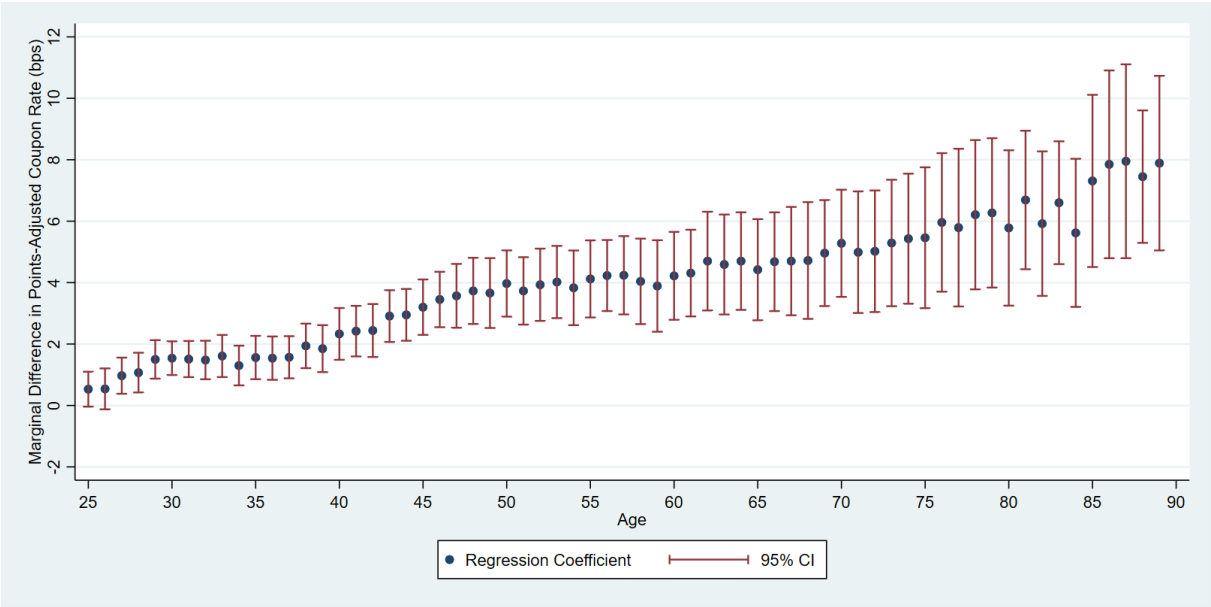


Table 1: Refinance Applicant and Application Characteristics Summary Statistics

This table presents summary statistics on applicant and application characteristics for the sample of single-borrower refinance mortgage applications. The bottom panel contains fewer observations because the sample is composed of originated refinance mortgages. Nominal dollar amounts are reported. Points-adjusted coupon rate adds back the number of points that the borrower purchased to the observed coupon rate at the rate of 25 bps per point. Net points purchased is defined as the dollar amount of points purchased minus the dollar amount of lender credits, all divided by the total loan amount. One percent of the loan amount equals one point. Net points purchased is presented as basis points of the total loan amount. Additional variable definitions can be found in Appendix A. Continuous variables are winsorized at the top and bottom one percent. Data source: CHMDA.

Variable	n	Mean	S.D.	Min	25th	50th	75th	Max
Applicant Age	4,220,019	47.10	13.71	18.00	36.00	45.00	57.00	120.00
Rejected	4,225,061	0.15	0.36	0.00	0.00	0.00	0.00	1.00
Income ('000)	3,545,139	98.12	70.04	0.00	55.00	82.00	122.00	424.00
Loan Amount ('000)	4,225,061	293.21	164.08	60.00	178.07	256.80	367.30	997.50
CLTV (%)	3,813,221	71.24	16.44	29.00	60.00	73.91	81.91	101.51
DTI (%)	3,501,975	35.13	12.80	7.32	26.62	35.20	43.00	81.13
Applicant Credit Score	3,852,421	745.82	54.45	586.00	712.00	758.00	790.00	819.00
AUS Approved	4,225,061	0.73	0.44	0.00	0.00	1.00	1.00	1.00
Female	4,225,061	0.34	0.47	0.00	0.00	0.00	1.00	1.00
Black	4,225,061	0.08	0.27	0.00	0.00	0.00	0.00	1.00
Hispanic	4,225,061	0.10	0.30	0.00	0.00	0.00	0.00	1.00
Asian	4,225,061	0.08	0.27	0.00	0.00	0.00	0.00	1.00
Other Minority	4,225,061	0.01	0.10	0.00	0.00	0.00	0.00	1.00
VA	4,225,061	0.15	0.36	0.00	0.00	0.00	0.00	1.00
FHA	4,225,061	0.04	0.20	0.00	0.00	0.00	0.00	1.00
Non-conforming	4,225,061	0.04	0.21	0.00	0.00	0.00	0.00	1.00

Variable	n	Mean	S.D.	Min	25th	50th	75th	Max
Coupon Rate (bps)	3,439,853	318.76	60.22	3.80	275.00	300.00	350.00	1299.00
Points-Adjusted Coupon Rate (bps)	3,439,853	321.41	63.02	3.80	278.48	311.83	350.00	1299.00
Net Points Purchased (bps)	3,439,853	10.60	83.77	-985.86	-19.86	0.00	36.70	846.59

Table 2: Applicant and Application Characteristics Summary Statistics by Age Group

This table presents summary statistics on applicant and application characteristics by age group. The sample is composed of refinance applications that have one applicant. Observations that contain missing age values are omitted from the sample. Percentage of sample is calculated based on the remaining observations. The bottom panel contains fewer observations because the sample is composed of originated refinance mortgages. Nominal dollar amounts are reported. Points-adjusted coupon rate adds back the number of points that the borrower purchased to the observed coupon rate at the rate of 25 bps per point. Net points purchased is defined as the dollar amount of points purchased minus the dollar amount of lender credits, all divided by the total loan amount. One percent of the loan amount equals one point. Net points purchased is presented as basis points of the total loan amount. Additional variable definitions can be found in Appendix A. Continuous variables are winsorized at the top and bottom one percent. Data source: CHMDA.

Applications	18-24	25-29	30-39	40-49	50-59	60-69	70+
# of Observations	38,064	278,659	1,160,672	1,074,476	817,374	536,606	314,168
% of Sample	0.9%	6.6%	27.5%	25.5%	19.4%	12.7%	7.4%
Rejected	0.15	0.11	0.12	0.14	0.16	0.18	0.22
Income ('000)	56.87	73.56	99.58	114.55	105.05	84.36	63.91
Loan Amount ('000)	213.44	250.48	304.82	328.00	299.28	254.28	230.02
CLTV (%)	80.72	79.30	75.38	71.74	68.77	64.67	62.52
DTI (%)	36.56	35.05	34.34	34.50	35.11	36.37	38.74
Applicant Credit Score	721.31	741.43	750.35	744.39	740.86	746.98	751.84
AUS Approved	0.71	0.77	0.77	0.75	0.71	0.70	0.60
Female	0.26	0.29	0.29	0.33	0.37	0.41	0.41
Black	0.04	0.04	0.06	0.08	0.10	0.11	0.09
Hispanic	0.15	0.12	0.11	0.11	0.10	0.07	0.05
Asian	0.05	0.08	0.11	0.10	0.06	0.04	0.02
Other Minority	0.01	0.01	0.01	0.01	0.01	0.01	0.01
VA	0.17	0.13	0.13	0.12	0.16	0.18	0.30
FHA	0.06	0.04	0.04	0.04	0.04	0.04	0.02
Non-conforming	0.02	0.02	0.04	0.06	0.05	0.04	0.03

Originated Loans	18-24	25-29	30-39	40-49	50-59	60-69	70+
# of Observations	30,708	237,708	985,649	887,574	651,477	415,779	230,635
% of Sample	0.9%	6.9%	28.7%	25.8%	18.9%	12.1%	6.7%
Coupon Rate (bps)	329.32	322.09	318.30	320.17	319.53	317.56	310.43
Points-Adjusted Coupon Rate (bps)	330.65	323.07	319.22	321.79	322.92	323.58	318.17
Net Points Purchased (bps)	5.32	3.90	3.68	6.48	13.56	24.10	30.93

Table 3: Age and Refinance Application Rejection

This table reports OLS regression results where mortgage application rejection indicator variable is regressed on age group indicator variables. The full set of demographic control variables are included but a selected subset is presented. The dependent variable is an indicator variable that equals 100 if the mortgage application was rejected and zero otherwise. The reference group is composed of applications associated with borrowers with ages between 18 and 24 years old. Refer to Appendix A for a detailed discussion of control variables and variable definitions. Heteroskedasticity-robust standard errors are clustered at the lender level. *, **, and *** denote 10%, 5%, and 1% statistical significance levels, respectively. Data source: CHMDA.

	(1)	(2)	(3)	(4)
25 – 29	-0.45*	-0.65***		-0.63***
	[0.24]	[0.22]		[0.22]
30 – 39	0.05	-0.23		-0.15
	[0.25]	[0.25]		[0.24]
40 – 49	0.53*	0.16		0.25
	[0.29]	[0.27]		[0.26]
50 – 59	1.25***	0.58**		0.62**
	[0.36]	[0.29]		[0.28]
60 – 69	2.23***	1.09***		1.10***
	[0.51]	[0.33]		[0.33]
70+	4.46***	2.66***		2.62***
	[0.98]	[0.50]		[0.50]
Female	-1.00***	-0.73***	-0.61***	-0.72***
	[0.13]	[0.08]	[0.07]	[0.09]
Black	2.01***	1.80***	1.88***	
	[0.31]	[0.27]	[0.25]	
Hispanic	1.02***	1.06***	0.91***	
	[0.23]	[0.20]	[0.19]	
Asian	1.69***	1.52***	1.31***	
	[0.29]	[0.18]	[0.18]	
Controls	Y	Y	Y	Y
Tract × Year-Month FE	Y	Y	Y	Y
Lender × Year-Quarter FE	-	Y	-	Y
Observations	3,533,454	3,526,043	3,526,043	3,526,043
R-squared	0.56	0.62	0.62	0.62

Table 4: Age and Refinance Application Rejection by Demographic Group

This table reports OLS regression results where mortgage application rejection indicator variable is regressed on age group indicator variables. The dependent variable is an indicator variable that equals 100 if the mortgage application was rejected and zero otherwise. The reference group is composed of applications associated with borrowers with ages between 18 and 24 years old. Each column presents regression results for each major demographic group in the sample. NHW stands for non-Hispanic white. The samples used in columns 1 through 4 exclude observations where the borrower's ethnicity or race is unknown. The samples used in columns 5 and 6 exclude observations where the borrower's sex is not male or female. Refer to Appendix A for a detailed discussion of control variables and variable definitions. Heteroskedasticity-robust standard errors are clustered at the lender level. *, **, and *** denote 10%, 5%, and 1% statistical significance levels, respectively. Data source: CHMDA.

	(1)	(2)	(3)	(4)	(5)	(6)
25 – 29	-0.64**	-0.5	-0.67	-0.57	-0.53	-0.91***
	[0.29]	[0.85]	[1.23]	[1.99]	[0.49]	[0.33]
30 – 39	-0.18	-0.25	0.04	-0.58	-0.27	-0.41
	[0.30]	[0.83]	[1.25]	[1.77]	[0.49]	[0.36]
40 – 49	0.10	0.11	0.60	0.08	-0.02	0.01
	[0.31]	[0.86]	[1.27]	[1.84]	[0.49]	[0.36]
50 – 59	0.52*	0.81	1.08	0.41	0.34	0.50
	[0.29]	[0.91]	[1.30]	[1.77]	[0.51]	[0.38]
60 – 69	1.13***	1.40	1.46	0.67	0.57	1.11***
	[0.27]	[0.91]	[1.46]	[1.70]	[0.51]	[0.37]
70+	2.47***	2.23***	2.66*	1.85	1.48**	3.07***
	[0.38]	[0.85]	[1.54]	[1.73]	[0.62]	[0.51]
Sample	NHW	Hispanic	Black	Asian	Female	Male
Controls	Y	Y	Y	Y	Y	Y
Tract × Year-Month FE	Y	Y	Y	Y	Y	Y
Lender × Year-Quarter FE	Y	Y	Y	Y	Y	Y
Observations	1,725,927	182,065	176,586	136,359	862,711	1,767,543
R-squared	0.64	0.72	0.63	0.71	0.70	0.62

Table 5: Age and Refinance Application Rejection by Loan Type

This table reports OLS regression results where the mortgage application rejection indicator variable is regressed on age group indicator variables. The dependent variable is an indicator variable that equals 100 if the mortgage application was rejected and zero otherwise. The reference group is composed of loan applications associated with borrowers with ages between 18 and 24 years old. Guaranteed mortgage applications are applications associated with VA or FHA loans. The non-conforming mortgage sample is composed of jumbo mortgage applications or mortgage applications that the automated underwriting system classified as being ineligible for the GSEs to purchase. Refer to Appendix A for a detailed discussion of control variables and variable definitions. Heteroskedasticity-robust standard errors are clustered at the lender level. *, **, and *** denote 10%, 5%, and 1% statistical significance levels, respectively. Data source: CHMDA.

	(1)	(2)	(3)	(4)	(5)	(6)
25 – 29	-0.34	-0.43**	-7.89	-4.72	0.15	-0.44
	[0.24]	[0.22]	[8.83]	[9.27]	[0.82]	[0.76]
30 – 39	0.25	0.01	-6.06	-2.28	-0.05	-0.24
	[0.22]	[0.20]	[8.75]	[8.91]	[1.07]	[1.02]
40 – 49	0.80***	0.45**	-4.81	-1.03	-0.08	-0.58
	[0.23]	[0.19]	[8.65]	[8.82]	[1.19]	[1.14]
50 – 59	1.52***	0.93***	-3.57	-0.25	0.35	-0.5
	[0.26]	[0.21]	[8.62]	[8.74]	[1.37]	[1.21]
60 – 69	2.38***	1.34***	-1.62	1.02	1.48	0.18
	[0.39]	[0.31]	[8.57]	[8.76]	[1.66]	[1.10]
70+	4.25***	2.64***	1.45	3.22	4.43*	2.55**
	[0.72]	[0.58]	[8.71]	[9.01]	[2.34]	[1.03]
Sample	Conforming		Non-Conforming		Guaranteed	
Controls	Y	Y	Y	Y	Y	Y
Tract × Year-Month FE	Y	Y	Y	Y	Y	Y
Lender × Year-Quarter FE	-	Y	-	Y	-	Y
Observations	2,572,906	2,565,005	53,503	48,929	442,845	438,896
R-squared	0.58	0.64	0.73	0.79	0.50	0.60

Table 6: Age and Refinance Application Rejection Reasons

This table reports OLS regression results where rejection reason indicator variables are regressed on age group indicator variables. All dependent variables are multiplied by 100. The dependent variable for each column is as follows. Column 1: The application was rejected because of high debt-to-income ratio. Column 2: The application was rejected because of insufficient work history. Column 3: The application was rejected because of insufficient credit history. Column 4: The application was rejected because of insufficient collateral. Column 5: The application was rejected because of insufficient cash for down payment and fees. Column 6: The application was rejected because of unverifiable information. Column 7: The application was rejected because the application was incomplete. Column 8: The application was rejected because the borrower's application for mortgage insurance was rejected. Column 9: The application was rejected because of reasons not listed above. This set of regressions uses the same control variables as the baseline rejection regressions. The reference group is composed of loan applications associated with borrowers with ages between 18 and 24 years old. Refer to Appendix A for a detailed discussion of control variables. Average Outcome reports the unconditional average of the dependent variable. Heteroskedasticity-robust standard errors are clustered at the lender level. *, **, and *** denote 10%, 5%, and 1% statistical significance levels, respectively. Data source: CHMDA.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	DTI	Job Hist	Cred Hist	Collateral	Cash	Info	Incomplete	Insurance	Other
25 – 29	-0.15*	-0.03	0.12	-0.06	-0.03	-0.06	-0.12	0.00	-0.23*
	[0.08]	[0.05]	[0.12]	[0.06]	[0.05]	[0.06]	[0.14]	[0.01]	[0.14]
30 – 39	-0.1	-0.04	0.46***	0.06	-0.03	-0.11*	-0.2	0.00	-0.15
	[0.08]	[0.05]	[0.15]	[0.06]	[0.05]	[0.06]	[0.18]	[0.01]	[0.14]
40 – 49	-0.02	-0.02	0.72***	0.15**	-0.01	-0.11*	-0.25	0.00	-0.14
	[0.08]	[0.06]	[0.17]	[0.06]	[0.05]	[0.06]	[0.20]	[0.01]	[0.15]
50 – 59	0.05	-0.03	0.76***	0.25***	0.01	-0.04	-0.13	0.00	-0.11
	[0.08]	[0.06]	[0.18]	[0.07]	[0.05]	[0.07]	[0.21]	[0.01]	[0.16]
60 – 69	0.01	-0.11	0.67***	0.37***	0.01	-0.04	0.33	0.00	-0.03
	[0.09]	[0.07]	[0.17]	[0.08]	[0.05]	[0.07]	[0.24]	[0.01]	[0.14]
70+	0.04	-0.23***	0.70***	0.63***	0.04	-0.07	1.33***	0.00	0.31*
	[0.12]	[0.08]	[0.17]	[0.15]	[0.05]	[0.07]	[0.39]	[0.01]	[0.16]
Average Outcome	4.2%	0.3%	3.7%	1.2%	0.5%	0.8%	3.7%	0.2%	2.3%
Controls	Y	Y	Y	Y	Y	Y	Y	Y	Y
Tract × Year-Month FE	Y	Y	Y	Y	Y	Y	Y	Y	Y
Lender × Year-Quarter FE	Y	Y	Y	Y	Y	Y	Y	Y	Y
Observations	3,526,043	3,526,043	3,526,043	3,526,043	3,526,043	3,526,043	3,526,043	3,526,043	3,526,043
R-squared	0.74	0.3	0.58	0.4	0.33	0.33	0.42	0.35	0.37

Table 7: Age and Points-Adjusted Coupon Rate on Refinance Mortgages

This table reports OLS regression results where the points-adjusted coupon rate is regressed on age group indicator variables. The full set of demographic control variables are included but a selected subset is presented. The sample is composed of refinance mortgages that were originated. The dependent variable is the points-adjusted coupon rate on the mortgage reported in basis points. Following Bartlett et al. (2022), each net point is worth 25 bps of coupon rate. Net points purchased is defined as the dollar amount of points purchased minus the dollar amount of lender credits, all divided by the total loan amount. One percent of the loan amount equals one point. The reference group is composed of mortgages associated with borrowers with ages between 18 and 24 years old. Refer to Appendix A for a detailed discussion of control variables. Heteroskedasticity-robust standard errors are clustered at the lender level. *, **, and *** denote 10%, 5%, and 1% statistical significance levels, respectively. Data sources: CHMDA.

	(1)	(2)	(3)	(4)
25 – 29	1.40***	1.04***		1.02***
	[0.35]	[0.29]		[0.29]
30 – 39	2.17***	1.58***		1.53***
	[0.47]	[0.33]		[0.33]
40 – 49	4.08***	2.99***		3.04***
	[0.69]	[0.45]		[0.46]
50 – 59	5.51***	3.95***		4.19***
	[0.98]	[0.60]		[0.62]
60 – 69	6.61***	4.52***		4.83***
	[1.38]	[0.80]		[0.83]
70+	7.85***	5.50***		5.83***
	[1.83]	[1.04]		[1.08]
Female	1.20***	0.97***	1.22***	1.06***
	[0.21]	[0.09]	[0.08]	[0.09]
Black	1.63***	0.95***	1.19***	
	[0.34]	[0.12]	[0.14]	
Hispanic	0.95***	0.61***	0.41**	
	[0.29]	[0.15]	[0.18]	
Asian	-7.62***	-6.00***	-6.37***	
	[0.48]	[0.37]	[0.44]	
Controls	Y	Y	Y	Y
Tract × Year-Month FE	Y	Y	Y	Y
Lender × Year-Quarter FE	-	Y	-	Y
Observations	2,793,373	2,785,943	2,785,943	2,785,943
R-squared	0.79	0.85	0.85	0.85

Table 8: Age and Points-Adjusted Coupon Rate on Refinance Mortgages by Demographic Group

This table reports OLS regression results where the points-adjusted coupon rate is regressed on age group indicator variables. The sample is composed of refinance mortgages that were originated. The dependent variable is the points-adjusted coupon rate on the mortgage reported in basis points. Following Bartlett et al. (2022), each net point is worth 25 bps of coupon rate. Net points purchased is defined as the dollar amount of points purchased minus the dollar amount of lender credits, all divided by the total loan amount. One percent of the loan amount equals one point. The reference group is composed of mortgages associated with borrowers with ages between 18 and 24 years old. Each column presents regression results for each major demographic group in the sample. NHW stands for non-Hispanic white. The samples used in columns 1 through 4 exclude observations where the borrower's ethnicity or race is unknown. The samples used in columns 5 and 6 exclude observations where the borrower's sex is not male or female. Refer to Appendix A for a detailed discussion of control variables and variable definitions. Heteroskedasticity-robust standard errors are clustered at the lender level. *, **, and *** denote 10%, 5%, and 1% statistical significance levels, respectively. Data source: CHMDA.

	(1)	(2)	(3)	(4)	(5)	(6)
25 – 29	1.19***	1.1	-2.54*	0.22	-0.8	1.06***
	[0.38]	[1.02]	[1.52]	[2.01]	[0.53]	[0.36]
30 – 39	2.11***	1.33	-3.97***	1.46	0.27	1.41***
	[0.45]	[1.02]	[1.36]	[2.12]	[0.57]	[0.40]
40 – 49	3.29***	2.39**	-2.83*	2.45	1.58***	2.71***
	[0.56]	[0.97]	[1.46]	[1.92]	[0.59]	[0.50]
50 – 59	3.80***	3.33***	-0.87	2.48	2.01***	3.87***
	[0.63]	[1.15]	[1.49]	[1.95]	[0.63]	[0.63]
60 – 69	4.34***	3.69***	0.25	3.45*	2.96***	4.12***
	[0.81]	[1.33]	[1.41]	[2.00]	[0.78]	[0.84]
70+	5.12***	3.73**	2.99*	3.82*	4.91***	4.25***
	[1.00]	[1.52]	[1.57]	[2.04]	[0.88]	[1.06]
Sample	NHW	Hispanic	Black	Asian	Female	Male
Controls	Y	Y	Y	Y	Y	Y
Tract × Year-Month FE	Y	Y	Y	Y	Y	Y
Lender × Year-Quarter FE	Y	Y	Y	Y	Y	Y
Observations	1,411,626	126,038	146,203	88,539	674,784	1,394,830
R-squared	0.85	0.86	0.87	0.88	0.85	0.85

Table 9: Age and Points-Adjusted Coupon Rate on Refinance Mortgages by Loan Type

This table reports OLS regression results where the points-adjusted coupon rate is regressed on age group indicator variables. The sample is composed of refinance mortgages that were originated. The dependent variable is the points-adjusted coupon rate on the mortgage reported in basis points. Following Bartlett et al. (2022), each net point is worth 25 bps of coupon rate. Net points purchased is defined as the dollar amount of points purchased minus the dollar amount of lender credits, all divided by the total loan amount. One percent of the loan amount equals one point. The reference group is composed of mortgages associated with borrowers with ages between 18 and 24 years old. Guaranteed mortgages are VA or FHA mortgages. The non-conforming mortgage sample is composed of jumbo mortgages or mortgages that the automated underwriting system classified as being ineligible for the GSEs to purchase. Refer to Appendix A for a detailed discussion of control variables and variable definitions. Heteroskedasticity-robust standard errors are clustered at the lender level. *, **, and *** denote 10%, 5%, and 1% statistical significance levels, respectively. Data source: CHMDA.

	(1)	(2)	(3)	(4)	(5)	(6)
25 – 29	1.45***	1.06***	8.05	4.32	0.53	0.01
	[0.35]	[0.34]	[13.67]	[9.62]	[0.89]	[0.67]
30 – 39	2.36***	1.67***	8.62	5.19	0.63	0.29
	[0.49]	[0.40]	[13.14]	[8.70]	[0.97]	[0.57]
40 – 49	4.73***	3.36***	10.63	6.42	0.27	-0.01
	[0.70]	[0.52]	[13.04]	[8.64]	[1.08]	[0.59]
50 – 59	6.77***	4.69***	12.69	7.9	-0.56	-0.41
	[0.99]	[0.65]	[13.17]	[8.78]	[0.98]	[0.63]
60 – 69	8.57***	5.61***	15.21	9.15	-1.29	-0.79
	[1.37]	[0.81]	[13.24]	[9.19]	[1.11]	[0.73]
70+	11.38***	7.46***	15.82	10.65	-2.21*	-1.03
	[1.73]	[1.00]	[13.52]	[9.39]	[1.25]	[0.81]
Sample	Conforming		Non-Conforming		Guaranteed	
Controls	Y	Y	Y	Y	Y	Y
Tract × Year-Month FE	Y	Y	Y	Y	Y	Y
Lender × Year-Quarter FE	-	Y	-	Y	-	Y
Observations	2,105,948	2,098,169	30,835	27,375	307,419	304,207
R-squared	0.78	0.84	0.86	0.91	0.81	0.85

Table 10: Age and Points-Adjusted Coupon Rate on Refinance Mortgages – LLPA Grid Regressions

This table reports OLS regression results where the points-adjusted coupon rate is regressed on age group indicator variables. The sample is composed of single-borrower refinance mortgages that were originated and sold to Fannie Mae or Freddie Mac. The dependent variable is the points-adjusted coupon rate on the mortgage reported in basis points. Following Bartlett et al. (2022), each net point is worth 25 bps of coupon rate. Net points purchased is defined as the dollar amount of points purchased minus the dollar amount of lender credits, all divided by the total loan amount. One percent of the loan amount equals one point. The reference group is composed of mortgages associated with borrowers with ages between 18 and 24 years old. Control variables include the complete set of demographic indicator variables and LLPA grid fixed effects. Refer to Appendix A for a detailed discussion of control variables. Heteroskedasticity-robust standard errors are clustered at the lender level. *, **, and *** denote 10%, 5%, and 1% statistical significance levels, respectively. Data sources: CHMDA.

	(1)	(2)	(3)	(4)	(5)
25 – 29	-0.76**	0.79**	-1.42***	-1.28***	-0.38
	[0.34]	[0.32]	[0.44]	[0.44]	[0.39]
30 – 39	-2.67***	0.7	-3.50***	-3.28***	-1.03***
	[0.56]	[0.51]	[0.55]	[0.56]	[0.38]
40 – 49	-1.56**	2.62***	-2.96***	-2.78***	0.17
	[0.78]	[0.83]	[0.46]	[0.48]	[0.43]
50 – 59	1.81	5.28***	-0.57	-0.48	2.04***
	[1.24]	[1.32]	[0.48]	[0.48]	[0.74]
60 – 69	6.73***	8.58***	3.11***	3.10***	4.53***
	[2.29]	[2.03]	[1.20]	[1.20]	[1.26]
70+	11.50***	12.49***	6.58***	6.52***	7.25***
	[3.02]	[2.57]	[1.78]	[1.77]	[1.65]
Year-Month × Grid × Purchaser Type FE	Y	Y	Y	Y	Y
Tract FE	-	Y	-	-	-
Lender FE	-	-	Y	-	-
Lender × Year-Quarter FE	-	-	-	Y	-
Lender × Tract FE	-	-	-	-	Y
Observations	1,731,666	1,727,369	1,731,573	1,729,607	1,180,731
R-squared	0.74	0.77	0.79	0.81	0.87

Table 11: Age and Gross Origination Fee

This table reports OLS regression results where gross origination fee is regressed on age group indicator variables. The sample is composed of single-borrower refinance and home purchase mortgages. The dependent variable is the origination charge plus lender credit, expressed as basis points of loan amount. Columns 1 and 2 report results for refinance mortgages. Columns 3 and 4 report results for home purchase mortgages. The reference group is composed of mortgages associated with borrowers with ages between 18 and 24 years old. Refer to Appendix A for a detailed discussion of control variables. Heteroskedasticity-robust standard errors are clustered at the lender level. *, **, and *** denote 10%, 5%, and 1% statistical significance levels, respectively. Data sources: CHMDA.

	(1)	(2)	(3)	(4)
25 – 29	3.43***	2.95***	1.50***	1.49***
	[0.86]	[0.84]	[0.32]	[0.27]
30 – 39	6.92***	5.48***	3.73***	2.84***
	[1.29]	[1.18]	[0.51]	[0.37]
40 – 49	8.21***	5.92***	4.72***	3.36***
	[1.74]	[1.60]	[0.69]	[0.53]
50 – 59	9.96***	6.88***	4.37***	3.52***
	[2.07]	[1.82]	[0.87]	[0.67]
60 – 69	13.10***	8.91***	5.03***	4.31***
	[2.99]	[2.49]	[1.14]	[0.90]
70+	16.68***	10.98***	4.16***	3.89***
	[3.84]	[3.12]	[1.08]	[0.85]
Sample	Refi	Refi	Purchase	Purchase
Controls	Y	Y	Y	Y
Tract × Year-Month FE	Y	Y	Y	Y
Lender × Year-Quarter FE	-	Y	-	Y
Observations	2,793,373	2,785,943	3,969,083	3,964,644
R-squared	0.39	0.51	0.41	0.52

A Appendix

A.1 CHMDA Definition of Simple and Cash-Out Refinance Mortgages

The following definitions are excerpts from "A Guide to HMDA Reporting: Getting It Right!" The document is available at `https://www.ffiec.gov/hmda/pdf/2021Guide.pdf`. All analyses presented in this paper exclude line of credit.

Refinancing – A Refinancing is a Closed-End Mortgage Loan or Open-End Line of Credit in which a new Dwelling-secured debt obligation satisfies and replaces an existing Dwelling-secured debt obligation by the same borrower. 12CFR 1003.2(p). Generally, whether the new debt obligation satisfies and replaces an existing obligation is determined by reference to the parties' contract and applicable law. In order for a Covered Loan to be a Refinancing, both the new and existing transactions must be secured by a Dwelling. Only one borrower need be the same on the new and existing transactions. Comments 2(p)-1, -3, and -4.

Cash-out Refinancing – A Financial Institution reports a Covered Loan or an Application as a cash-out Refinancing if it is a Refinancing and the Financial Institution considered it to be a cash-out Refinancing when processing the Application or setting the terms under its or an investor's guidelines. For example, if a Financial Institution considers a loan product to be a cash-out Refinancing under an investor's guidelines because of the amount of cash received by the borrower at closing or account opening, it reports the transaction as a cash-out Refinancing. If a Financial Institution does not distinguish between a cash-out Refinancing and a Refinancing under its own guidelines, sets the terms of all Refinancings without regard to the amount of cash received by the borrower at loan closing or account opening, and does not offer loan products under investor guidelines, it reports all Refinancings as Refinancings, not cash-out Refinancings. Comment 4(a)(3)-2.

A.2 Regression Variable Definition

This section lists all explanatory variables that I include in the regressions presented in the paper and gives additional details on the way in which the control variables are included in each regression. The rejection, non-LLPA coupon rate, GSE sale, and gross origination fee regressions use the same set of control variables. The choice of control variables and their definitions largely follows Bhutta et al. (2021). Credit score, CLTV ratio, and DTI ratio indicator variables are interacted to form a credit score-CLTV-DTI grid. The grid is then interacted with loan type indicator variables. There are four loan programs in the sample: conforming conventional, non-conforming conventional, FHA, and VA mortgages. Separately, loan program indicator variables are interacted with loan amount indicator variables, income indicator variables, and AUS approval indicator variable.

The non-demographic control variables (e.g., non-age, non-sex, non-race, non-ethnicity related variables) are excluded from all LLPA grid regressions. LLPA grid indicator variables are constructed based on Fannie Mae's LLPA grid, presented in Figure A2. LTV ratios used to construct the LLPA grids are manually computed using loan amount and property value data provided in CHMDA.

For regressions that use samples of two-borrowers mortgage applications, I also control for co-applicant's credit score, which enters the regression equation as a set of indicator variables that are interacted with loan program indicator variables. For LLPA grid regressions that are estimated using samples of two-borrowers mortgage applications, I use the main applicant's credit score to construct the LLPA grid.

Age Group Indicator Variables – A set of indicator variables that captures the age group in which the applicant associated with each loan application belongs to. The age groups are 18 to 24, 25 to 29, 30 to 39, 40 to 49, 50 to 59, 60 to 69, 70 or older, and missing age. The regression uses mortgages associated with applicants in the first age group as the reference group. The missing age group indicator variable is included in the estimation but omitted from the regression outputs.

Maximum Age Group Indicator Variables – A set of indicator variables that captures the age group in which the maximum age between the two applicants belongs to. The age groups are 18 to 24, 25 to 29, 30 to 39, 40 to 49, 50 to 59, 60 to 69, and 70 or older. The regression uses mortgages associated with the first age group as the reference group. Maximum age is considered to be missing if either the

main applicant's age or the co-applicant's age is missing. Observations with missing maximum age are dropped. This variable is used for regressions that are estimated for two-borrowers mortgage applications.

Minimum Age Group Indicator Variables – A set of indicator variables that captures the age group in which the minimum age between the two applicants belongs to. The age groups are 18 to 24, 25 to 29, 30 to 39, 40 to 49, 50 to 59, 60 to 69, and 70 or older. The regression uses mortgages associated with the first age group as the reference group. Minimum age is considered to be missing if either the main applicant's age or the co-applicant's age is missing. Observations with missing minimum age are dropped. This variable is used for regressions that are estimated for two-borrowers mortgage applications.

Average Age Group Indicator Variables – A set of indicator variables that captures the age group in which the average age between the two applicants belongs to. The age groups are 18 to 24, 25 to 29, 30 to 39, 40 to 49, 50 to 59, 60 to 69, and 70 or older. The regression uses mortgages associated with the first age group as the reference group. Average age is considered to be missing if either the main applicant's age or the co-applicant's age is missing. Observations with missing average age are dropped. This variable is used for regressions that are estimated for two-borrowers mortgage applications.

Age – The applicant's age in years.

70+ – An indicator variable that equals 1 if the applicant is older than 69 years old and zero otherwise.

Applicant Credit Score Indicator Variables – Applications are sorted into groups according to the applicant's credit score value. Missing credit scores form one group. Negative credit scores form one group. Credit scores between 0 and 299 form one group. Credit scores from 300 to 499 are broken down into two 100-point groups. Credit scores from 500 to 579 form one group. Credit score values from 580 to 849 are broken into 10-points groups. Credit scores of 850 or greater form a group.

Co-applicant Credit Score Indicator Variables – Applications are sorted into groups according to the co-applicant's credit score value. Missing credit scores form one group. Negative credit scores form one group. Credit scores between 0 and 299 form one group. Credit scores from 300 to 499 are broken down into two 100-point groups. Credit scores from 500 to 579 form one group. Credit score values from 580 to 849 are broken into 10-points groups. Credit scores of 850 or greater form a group.

CLTV Indicator Variables – Applications are sorted into groups according to the loan's CLTV value.

CLTV values from 0 to 19 form one group. CLTV values from 20 to 79 form 10-points groups. CLTV values from 80 to 94 form 5-points groups. CLTV values from 95 to 100 form 1-point groups. CLTV values from 101 to 110 form one group. CLTV values from 111 to 120 form one group. CLTV values greater than 120 form one group. Missing CLTV values form one group. Negative CLTV values form one group.

DTI Indicator Variables – Applications are sorted into groups according to the loan's DTI value. DTI values between 0 and 30 form 5-points groups. DTI values between 31 and 60 form 1-point groups. DTI values from 61 to 80 form one group. DTI values from 81 to 100 form one group. DTI values greater than 100 form one group. Missing DTI values from one group. Negative DTI values form one group.

Income Indicator Variables – Applications are sorted into groups according to the applicant's annual income. The reference group is made up of applications with income values between 0 and $50,000. The remaining groups are formed by $25,000 increments of income values up to $499,999. The final group is made up of loans associated with applicants with income values greater than $499,999. Loans that have missing income values form a separate group.

Loan Amount Indicator Variables – Applications are sorted into groups according to their loan amounts. The reference group is made up of applications with loan amounts between $0 and $50,000. The remaining groups are formed by $50,000 increments of loan amount up to $749,999. The final group is made up of loans with loan amounts greater than $749,999.

Female – An indicator variable that equals one if there is at least one female applicant associated with the loan application and zero otherwise.

Asian – An indicator variable that equals one if there is at least one Asian applicant associated with the loan application and zero otherwise.

Black – An indicator variable that equals one if there is at least one Black applicant associated with the loan application and zero otherwise.

Hispanic – An indicator variable that equals one if there is at least one Hispanic applicant associated with the loan application and zero otherwise.

Other Minority – An indicator variable that equals one if there is at least one minority applicant who is not Asian or Black associated with the loan application and zero otherwise.

Unknown Sex – An indicator variable that equals one if there is at least one applicant whose sex is unknown and zero otherwise.

Both Sexes – An indicator variable that equals one if, for at least one applicant, the applicant reported being both male and female and zero otherwise.

Unknown Race – An indicator variable that equals one if there is at least one applicant whose race is unknown and zero otherwise.

Unknown Ethnicity – An indicator variable that equals one if there is at least one applicant whose ethnicity is unknown and zero otherwise.

AUS Approved – An indicator variable that equals one if the loan application was approved by at least one AUS and zero otherwise.

A.3 Appendix Figures

Figure A1: Probability of Death Within One Year by Age and Sex

This figure plots the probability of death within one year by age for men and women living in the United States. The blue line plots the probability of death for men and the red line plots the probability of death for women. Data source: Social Security Agency's 2019 Actuarial Life Table.

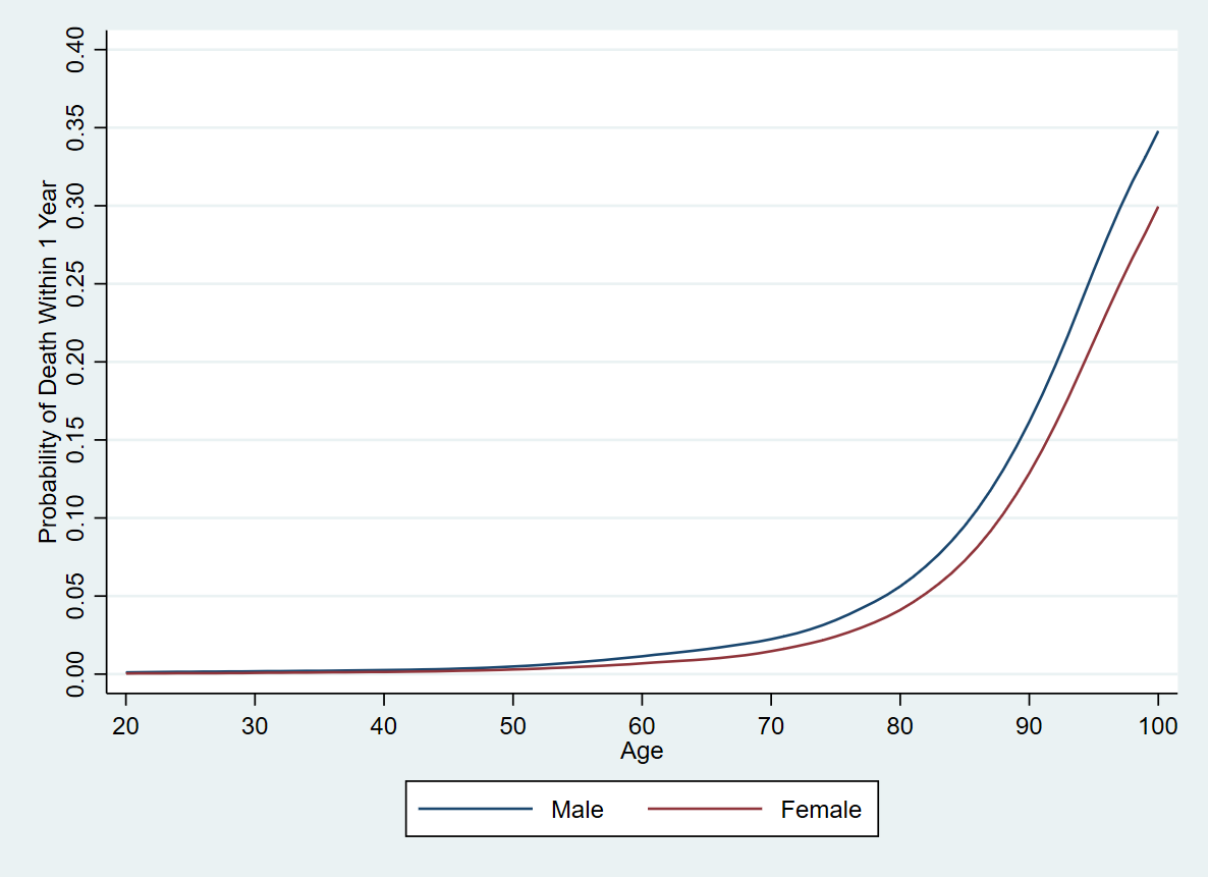


Figure A2: Fannie Mae LLPA Grid

This figure presents Fannie Mae's loan-level price adjustment (LLPA) grid, also called Exhibit 19, for eligible mortgages backed by single-family homes. This information was published on April 6, 2022. The information in this grid has not changed since at least 2018. This information is used to construct the LLPA grid fixed effects that are included in the coupon rate regressions presented in the main text. Data source: Fannie Mae.

Table 1: All Eligible Loans – LLPA by Credit Score/LTV Ratio										
Representative Credit Score	LTV Range									
	Applicable for all loans with terms greater than 15 years									
	≤ 60.00%	60.01 – 70.00%	70.01 – 75.00%	75.01 – 80.00%	80.01 – 85.00%	85.01 – 90.00%	90.01 – 95.00%	95.01 – 97.00%	>97.00%	SFC
≥ 740	0.000%	0.250%	0.250%	0.500%	0.250%	0.250%	0.250%	0.750%	0.750%	N/A
720 – 739	0.000%	0.250%	0.500%	0.750%	0.500%	0.500%	0.500%	1.000%	1.000%	N/A
700 – 719	0.000%	0.500%	1.000%	1.250%	1.000%	1.000%	1.000%	1.500%	1.500%	N/A
680 – 699	0.000%	0.500%	1.250%	1.750%	1.500%	1.250%	1.250%	1.500%	1.500%	N/A
660 – 679	0.000%	1.000%	2.250%	2.750%	2.750%	2.250%	2.250%	2.250%	2.250%	N/A
640 – 659	0.500%	1.250%	2.750%	3.000%	3.250%	2.750%	2.750%	2.750%	2.750%	N/A
620 – 639	0.500%	1.500%	3.000%	3.000%	3.250%	3.250%	3.250%	3.500%	3.500%	N/A
< 620[1]	0.500%	1.500%	3.000%	3.000%	3.250%	3.250%	3.250%	3.750%	3.750%	N/A

Figure A3: Freddie Mac Credit Fee Grid

This figure presents Freddie Mac's loan-level credit fee grid for eligible mortgages backed by single-family homes. This information was published on May 4, 2022. The information in this grid has not changed since at least 2018. Data source: Freddie Mac.

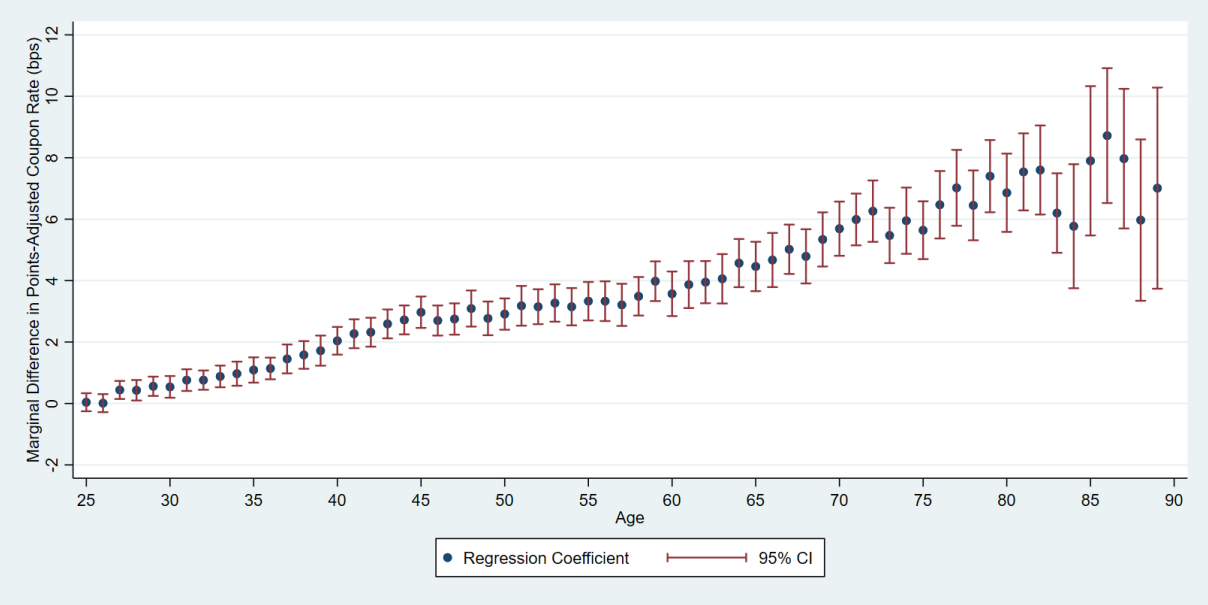
INDICATOR SCORE / LOAN-TO-VALUE [1, 2, 3]									
Product	Credit Score [1, 2]	LTV Ratios							
		All Eligible							
		≤ 60%	> 60% & ≤ 70%	> 70% & ≤ 75%	> 75% & ≤ 80%	> 80% & ≤ 85%	> 85% & ≤ 90%	> 90% & ≤ 95%	> 95%
All Eligible Product	≥ 740	0.00%	0.25%	0.25%	0.50%	0.25%	0.25%	0.25%	0.75%
	≥ 720 & < 740	0.00%	0.25%	0.50%	0.75%	0.50%	0.50%	0.50%	1.00%
	≥ 700 & < 720	0.00%	0.50%	1.00%	1.25%	1.00%	1.00%	1.00%	1.50%
	≥ 680 & < 700	0.00%	0.50%	1.25%	1.75%	1.50%	1.25%	1.25%	1.50%
	≥ 660 & < 680	0.00%	1.00%	2.25%	2.75%	2.75%	2.25%	2.25%	2.25%
	≥ 640 & < 660	0.50%	1.25%	2.75%	3.00%	3.25%	2.75%	2.75%	2.75%
	≥ 620 & < 640	0.50%	1.50%	3.00%	3.00%	3.25%	3.25%	3.25%	3.50%
	< 620	0.50%	1.50%	3.00%	3.00%	3.25%	3.25%	3.25%	3.75%

B Online Appendix

B.1 Supplementary Figures

Figure B1: Marginal Difference in Points-Adjusted Coupon Rate by Age – Home Purchase

This figure plots the point estimates from a regression where points-adjusted coupon rate is regressed onto individual age indicator variables. The sample is composed of single-borrower home purchase mortgages. The reference group is composed of mortgages associated with applicants between ages 18 and 24. The regression specification includes the full set of control variables, year-month by tract fixed effects and lender by year-quarter fixed effects. Heteroskedasticity-robust standard errors are clustered at the lender level. Data source: CHMDA.



B.2 Supplementary Summary Statistics Tables

Table B1: Product Market Share by Age Group

This table presents, for each age group, the percentage of total loan amount that belongs to each mortgage product. The percentages are calculated from nominal loan amounts on all single-family fixed rate mortgage applications that appear in CHMDA between 2018 and 2021. The final row presents total loan amount by age group in billions of dollars. Data source: CHMDA.

	Age Group						
Product	18 – 24	25 – 29	30 – 39	40 – 49	50 – 59	60 – 69	70+
Line of Credit	0.6%	0.7%	0.8%	0.6%	0.5%	4.9%	22.9%
Reverse Mortgage	6.7%	10.6%	22.2%	31.9%	38.0%	39.4%	31.5%
Home Purchase Mortgage	79.5%	63.6%	41.0%	28.4%	23.1%	19.5%	10.7%
Home Improvement Mortgage	0.7%	0.9%	1.2%	1.5%	1.5%	1.4%	0.9%
Refinance Mortgage	9.1%	18.3%	24.1%	22.9%	21.2%	20.8%	25.3%
Cash-out Refinance Mortgage	2.4%	4.8%	9.6%	13.3%	14.0%	12.1%	7.3%
Other Mortgage	1.1%	1.2%	1.1%	1.4%	1.7%	1.9%	1.5%
Total ($ billions)	$6.79	$21.08	$91.38	$113.80	$111.02	$79.69	$57.74

Table B2: Applicant and Application Characteristics – Single-Borrower Home Purchase Sample

This table presents summary statistics on applicant and application characteristics for the sample of single-borrower home purchase mortgage applications. The bottom panel contains fewer observations because the sample is composed of originated mortgages. Nominal dollar amounts are reported. Points-adjusted coupon rate adds back the number of points that the borrower purchased to the observed coupon rate at the rate of 25 bps per point. Net points purchased is defined as the dollar amount of points purchased minus the dollar amount of lender credits, all divided by the total loan amount. One percent of the loan amount equals one point. Net points purchased is presented as basis points of the total loan amount. Additional variable definitions can be found in Appendix A. Continuous variables are winsorized at the top and bottom one percent. Data source: CHMDA.

Variable	n	Mean	S.D.	Min	25th	50th	75th	Max
Applicant Age	5,461,967	41.12	13.15	18.00	31.00	38.00	50.00	120.00
Rejected	5,463,055	0.08	0.27	0.00	0.00	0.00	0.00	1.00
Income ('000)	5,414,736	90.80	65.06	0.00	51.00	73.00	109.00	424.00
Loan Amount ('000)	5,463,055	282.53	170.38	60.00	164.90	242.30	354.43	997.50
CLTV (%)	5,402,406	86.18	13.36	29.00	80.00	90.00	95.00	101.51
DTI (%)	5,402,413	37.45	10.60	7.32	30.55	38.35	44.33	81.13
Applicant Credit Score	5,370,621	744.91	50.66	586.00	712.00	755.00	787.00	819.00
AUS Approved	5,463,055	0.89	0.31	0.00	1.00	1.00	1.00	1.00
Female	5,463,055	0.38	0.49	0.00	0.00	0.00	1.00	1.00
Black	5,463,055	0.08	0.27	0.00	0.00	0.00	0.00	1.00
Hispanic	5,463,055	0.12	0.32	0.00	0.00	0.00	0.00	1.00
Asian	5,463,055	0.08	0.27	0.00	0.00	0.00	0.00	1.00
Other Minority	5,463,055	0.01	0.10	0.00	0.00	0.00	0.00	1.00
VA	5,463,055	0.07	0.25	0.00	0.00	0.00	0.00	1.00
FHA	5,463,055	0.04	0.20	0.00	0.00	0.00	0.00	1.00
Non-conforming	5,463,055	0.05	0.22	0.00	0.00	0.00	0.00	1.00

Variable	n	Mean	S.D.	Min	25th	50th	75th	Max
Coupon Rate (bps)	4,869,322	371.71	84.85	0.10	300.00	350.00	437.50	1262.50
Points-Adjusted Coupon Rate (bps)	4,869,322	373.20	86.21	-34.45	300.00	354.95	442.69	1256.66
Net Points Purchased (bps)	4,869,322	5.97	70.29	-999.79	-4.50	0.00	15.29	995.90

Table B3: Applicant and Application Characteristics Summary Statistics by Age Group – Single-Borrower Home Purchase Sample

This table presents summary statistics on applicant and application characteristics by age group. The sample is composed of home purchase applications that have one applicant. Observations that contain missing age values are omitted from the sample. Percentage of sample is calculated based on observations that have valid age values. The bottom panel contains fewer observations because the sample is composed of originated mortgages. Nominal dollar amounts are reported. Points-adjusted coupon rate adds back the number of points that the borrower purchased to the observed coupon rate at the rate of 25 bps per point. Net points purchased is defined as the dollar amount of points purchased minus the dollar amount of lender credits, all divided by the total loan amount. One percent of the loan amount equals one point. Net points purchased is presented as basis points of the total loan amount. Additional variable definitions can be found in Appendix A. Continuous variables are winsorized at the top and bottom one percent. Data source: CHMDA.

Applications	18-24	25-29	30-39	40-49	50-59	60-69	70+
# of Observations	290,740	838,204	1,788,614	1,158,950	784,381	426,608	174,470
% of Sample	5.3%	15.3%	32.7%	21.2%	14.4%	7.8%	3.2%
Rejected	0.09	0.07	0.08	0.09	0.10	0.09	0.08
Income ('000)	53.03	70.04	94.30	108.06	102.46	83.49	68.42
Loan Amount ('000)	188.08	242.94	305.84	322.83	284.62	238.79	220.73
CLTV (%)	91.19	89.79	87.98	85.88	83.24	78.55	76.15
DTI (%)	37.21	37.10	37.28	37.61	37.27	37.94	39.86
Applicant Credit Score	727.79	743.55	747.19	741.59	742.99	753.86	765.30
AUS Approved	0.90	0.92	0.89	0.87	0.88	0.91	0.92
Female	0.34	0.36	0.34	0.37	0.43	0.50	0.54
Black	0.04	0.06	0.08	0.10	0.10	0.09	0.08
Hispanic	0.13	0.12	0.13	0.14	0.11	0.08	0.06
Asian	0.05	0.08	0.11	0.09	0.05	0.03	0.02
Other Minority	0.01	0.01	0.01	0.01	0.01	0.01	0.01
VA	0.04	0.05	0.07	0.07	0.08	0.09	0.14
FHA	0.06	0.04	0.04	0.05	0.04	0.03	0.01
Non-conforming	0.02	0.02	0.05	0.08	0.06	0.04	0.03

Originated Loans	18-24	25-29	30-39	40-49	50-59	60-69	70+
# of Observations	258,589	763,289	1,607,919	1,019,917	686,573	376,883	155,515
% of Sample	5.3%	15.7%	33.0%	20.9%	14.1%	7.7%	3.2%
Coupon Rate (bps)	375.73	370.72	369.00	373.50	375.22	372.65	368.22
Points-Adjusted Coupon Rate (bps)	375.55	371.08	370.32	375.46	377.56	375.27	370.28
Net Points Purchased (bps)	-0.74	1.45	5.30	7.82	9.36	10.49	8.22

Table B4: Applicant and Application Characteristics – Two-Borrowers Refinance Sample

This table presents summary statistics on applicant and application characteristics for the sample of refinance mortgage applications that have two borrowers. The bottom panel contains fewer observations because the sample is composed of originated refinance mortgages. Nominal dollar amounts are reported. Points-adjusted coupon rate adds back the number of points that the borrower purchased to the observed coupon rate at the rate of 25 bps per point. Net points purchased is defined as the dollar amount of points purchased minus the dollar amount of lender credits, all divided by the total loan amount. One percent of the loan amount equals one point. Net points purchased is presented as basis points of the total loan amount. Additional variable definitions can be found in Appendix A. Continuous variables are winsorized at the top and bottom one percent. Data source: CHMDA.

Applications	n	Mean	S.D.	Min	25th	50th	75th	Max
Applicant Age	3,529,487	48.01	14.28	18.00	36.00	45.00	58.00	120.00
Appendix Aplicant Age	3,512,787	47.12	14.07	18.00	36.00	44.00	58.00	119.00
Rejected (×100)	3,533,744	10.74	30.96	0.00	0.00	0.00	0.00	100.00
Income ('000)	2,925,864	136.10	90.18	0.00	79.00	117.00	169.00	527.00
Loan Amount ('000)	3,533,744	349.68	191.91	78.63	220.00	309.00	431.32	1250.00
CLTV (%)	3,192,865	70.30	16.76	27.49	59.51	73.06	80.00	100.59
DTI (%)	2,902,457	32.64	12.15	7.11	24.08	32.44	40.88	73.29
Applicant Credit Score	2,815,748	750.54	50.28	598.00	720.00	764.00	790.00	817.00
Appendix Aplicant Credit Score	1,429,138	751.47	52.64	586.00	722.00	766.00	792.00	818.00
AUS Approved	3,533,744	0.73	0.45	0.00	0.00	1.00	1.00	1.00
Female	3,533,744	0.88	0.32	0.00	1.00	1.00	1.00	1.00
Black	3,533,744	0.05	0.21	0.00	0.00	0.00	0.00	1.00
Hispanic	3,533,744	0.11	0.31	0.00	0.00	0.00	0.00	1.00
Asian	3,533,744	0.08	0.27	0.00	0.00	0.00	0.00	1.00
Other Minority	3,533,744	0.01	0.12	0.00	0.00	0.00	0.00	1.00
VA	3,533,744	0.17	0.38	0.00	0.00	0.00	0.00	1.00
FHA	3,533,744	0.03	0.18	0.00	0.00	0.00	0.00	1.00
Non-conforming	3,533,744	0.06	0.24	0.00	0.00	0.00	0.00	1.00

Originated Loans	n	Mean	S.D.	Min	25th	50th	75th	Max
Coupon Rate (bps)	3,043,534	316.05	58.48	100.00	275.00	300.00	349.00	1350.00
Points-Adjusted Coupon Rate (bps)	3,043,534	317.98	60.56	60.85	276.20	307.90	349.70	1328.20
Net Points Purchased (bps)	3,043,534	7.71	75.64	-923.88	-18.20	0.00	25.00	989.80

Table B5: Applicant and Application Characteristics Summary Statistics by Age Group – Two-Borrowers Refinance Sample

This table presents summary statistics on applicant and application characteristics by age group. The sample is composed of refinance applications that have two applicants. Observations are assigned to age groups according to the main applicant's age. Observations that contain missing age values are omitted from the sample. Percentage of sample is calculated based on observations that have valid age values. The bottom panel contains fewer observations because the sample is composed of originated refinance mortgages. Nominal dollar amounts are reported. Points-adjusted coupon rate adds back the number of points that the borrower purchased to the observed coupon rate at the rate of 25 bps per point. Net points purchased is defined as the dollar amount of points purchased minus the dollar amount of lender credits, all divided by the total loan amount. One percent of the loan amount equals one point. Net points purchased is presented as basis points of the total loan amount. Additional variable definitions can be found in Appendix A. Continuous variables are winsorized at the top and bottom one percent. Data source: CHMDA.

	Applicant's Age Group						
Applications	18-24	25-29	30-39	40-49	50-59	60-69	70+
# of Observations	21,551	190,484	1,011,138	863,724	614,999	475,088	356,760
% of Sample	0.6%	5.4%	28.6%	24.4%	17.4%	13.4%	10.1%
Applicant Age	23.10	27.56	34.82	44.19	54.25	64.29	74.99
Co-applicant Age	30.75	30.21	35.43	43.53	52.63	61.70	70.26
Rejected (×100)	13.41	8.57	7.85	9.93	12.68	13.07	15.43
Income ('000)	94.89	108.11	140.90	159.12	145.93	113.77	88.48
Loan Amount ('000)	248.88	289.80	362.70	393.80	362.99	307.36	277.42
CLTV (%)	80.98	79.81	75.10	71.07	67.54	63.05	62.36
DTI (%)	34.95	32.59	31.38	31.64	33.03	34.73	35.85
Applicant Credit Score	715.70	738.03	754.04	749.31	745.06	753.20	758.46
Co-applicant Credit Score	720.06	739.55	755.35	750.43	746.35	754.08	757.30
AUS Approved	0.73	0.79	0.78	0.73	0.69	0.71	0.58
Female	0.84	0.88	0.89	0.89	0.88	0.88	0.88
Black	0.03	0.03	0.04	0.05	0.06	0.06	0.05
Hispanic	0.18	0.14	0.12	0.12	0.12	0.09	0.06
Asian	0.06	0.07	0.09	0.10	0.08	0.06	0.04
Other Minority	0.02	0.01	0.01	0.01	0.02	0.02	0.01
VA	0.13	0.11	0.12	0.15	0.19	0.19	0.36
FHA	0.08	0.05	0.03	0.03	0.03	0.03	0.02
Non-conforming	0.03	0.03	0.06	0.09	0.07	0.05	0.03

	Applicant's Age Group						
Originated Loans	18-24	25-29	30-39	40-49	50-59	60-69	70+
# of Observations	17,818	168,162	903,932	753,216	517,019	396,756	286,631
% of Sample	0.6%	5.5%	29.7%	24.7%	17.0%	13.0%	9.4%
Coupon Rate (bps)	333.18	325.40	317.98	316.93	315.86	314.26	303.91
Points-Adjusted Coupon Rate (bps)	334.01	326.03	318.56	318.10	318.09	318.37	309.39
Net Points Purchased (bps)	3.34	2.51	2.30	4.66	8.91	16.42	21.92

Table B6: Applicant and Application Characteristics – Two-Borrowers Home Purchase Sample

This table presents summary statistics on applicant and application characteristics for the sample of home purchase mortgage applications that have two borrowers. The bottom panel contains fewer observations because the sample is composed of originated mortgages. Nominal dollar amounts are reported. Points-adjusted coupon rate adds back the number of points that the borrower purchased to the observed coupon rate at the rate of 25 bps per point. Net points purchased is defined as the dollar amount of points purchased minus the dollar amount of lender credits, all divided by the total loan amount. One percent of the loan amount equals one point. Net points purchased is presented as basis points of the total loan amount. Additional variable definitions can be found in Appendix A. Continuous variables are winsorized at the top and bottom one percent. Data source: CHMDA.

Applications	n	Mean	S.D.	Min	25th	50th	75th	Max
Applicant Age	4,431,281	41.81	13.70	18.00	31.00	38.00	50.00	120.00
Co-applicant Age	4,412,269	42.12	14.04	18.00	31.00	38.00	52.00	120.00
Rejected (×100)	4,432,246	6.11	23.95	0.00	0.00	0.00	0.00	100.00
Income ('000)	4,380,453	135.19	86.07	0.00	80.00	114.00	163.00	527.00
Loan Amount ('000)	4,432,246	355.60	209.27	78.63	217.09	308.00	436.50	1250.00
CLTV (%)	4,392,457	83.99	14.11	27.49	80.00	86.30	95.00	100.59
DTI (%)	4,390,448	35.89	10.63	7.11	28.48	36.44	43.24	73.29
Applicant Credit Score	3,747,771	745.78	49.63	598.00	713.00	757.00	786.00	817.00
Co-applicant Credit Score	2,092,186	748.23	50.11	586.00	717.00	760.00	789.00	818.00
AUS Approved	4,432,246	0.89	0.31	0.00	1.00	1.00	1.00	1.00
Female	4,432,246	0.90	0.30	0.00	1.00	1.00	1.00	1.00
Black	4,432,246	0.05	0.22	0.00	0.00	0.00	0.00	1.00
Hispanic	4,432,246	0.13	0.33	0.00	0.00	0.00	0.00	1.00
Asian	4,432,246	0.09	0.29	0.00	0.00	0.00	0.00	1.00
Other Minority	4,432,246	0.01	0.12	0.00	0.00	0.00	0.00	1.00
VA	4,432,246	0.07	0.26	0.00	0.00	0.00	0.00	1.00
FHA	4,432,246	0.04	0.18	0.00	0.00	0.00	0.00	1.00
Non-conforming	4,432,246	0.08	0.28	0.00	0.00	0.00	0.00	1.00

Originated Loans	n	Mean	S.D.	Min	25th	50th	75th	Max
Coupon Rate (bps)	4,049,704	369.93	82.10	0.10	300.00	350.00	437.50	1350.00
Points-Adjusted Coupon Rate (bps)	4,049,704	371.80	83.27	-1.74	300.00	355.50	437.50	1350.00
Net Points Purchased (bps)	4,049,704	7.50	61.42	-998.87	-3.39	0.00	13.16	987.50

Table B7: Applicant and Application Characteristics Summary Statistics by Age Group – Two-Borrowers Home Purchase Sample

This table presents summary statistics on applicant and application characteristics by age group. The sample is composed of home purchase applications that have two applicants. Observations are assigned to age groups according to the main applicant's age. Observations that contain missing age values are omitted from the sample. Percentage of sample is calculated based on observations that have valid age values. The bottom panel contains fewer observations because the sample is composed of originated mortgages. Nominal dollar amounts are reported. Points-adjusted coupon rate adds back the number of points that the borrower purchased to the observed coupon rate at the rate of 25 bps per point. Net points purchased is defined as the dollar amount of points purchased minus the dollar amount of lender credits, all divided by the total loan amount. One percent of the loan amount equals one point. Net points purchased is presented as basis points of the total loan amount. Additional variable definitions can be found in Appendix A. Continuous variables are winsorized at the top and bottom one percent. Data source: CHMDA.

	Applicant's Age Group						
Applications	18-24	25-29	30-39	40-49	50-59	60-69	70+
# of Observations	174,650	629,371	1,590,468	873,080	559,580	396,911	208,186
% of Sample	3.9%	14.2%	35.9%	19.7%	12.6%	9.0%	4.7%
Applicant Age	22.75	27.28	34.23	44.01	54.22	64.20	74.52
Co-applicant Age	31.83	30.66	35.34	43.43	52.16	61.00	68.82
Rejected (×100)	7.91	5.15	5.27	6.95	7.69	6.34	5.72
Income ('000)	97.68	112.81	142.97	155.11	145.91	116.35	98.45
Loan Amount ('000)	230.47	302.53	389.24	407.56	355.21	291.94	268.48
CLTV (%)	90.74	89.20	85.88	83.87	80.89	75.11	73.88
DTI (%)	36.01	34.93	35.20	36.31	36.42	37.15	38.44
Applicant Credit Score	719.08	737.01	748.23	742.69	744.40	758.69	767.89
Co-applicant Credit Score	725.08	739.94	750.62	745.13	747.04	760.16	768.67
AUS Approved	0.92	0.93	0.89	0.86	0.89	0.92	0.93
Female	0.84	0.89	0.90	0.90	0.90	0.91	0.92
Black	0.03	0.04	0.05	0.06	0.06	0.05	0.04
Hispanic	0.17	0.14	0.13	0.14	0.13	0.09	0.07
Asian	0.06	0.08	0.11	0.11	0.08	0.05	0.03
Other Minority	0.02	0.01	0.01	0.02	0.01	0.01	0.01
VA	0.03	0.05	0.06	0.08	0.09	0.08	0.15
FHA	0.07	0.04	0.03	0.04	0.03	0.02	0.01
Non-conforming	0.02	0.04	0.10	0.12	0.09	0.06	0.04

	Applicant's Age Group						
Originated Loans	18-24	25-29	30-39	40-49	50-59	60-69	70+
# of Observations	157,098	583,585	1,469,706	789,273	500,561	359,799	189,682
% of Sample	3.9%	14.4%	36.3%	19.5%	12.4%	8.9%	4.7%
Coupon Rate (bps)	378.70	371.49	366.73	371.40	372.82	370.54	367.73
Points-Adjusted Coupon Rate (bps)	379.70	372.57	368.54	373.68	375.26	372.79	369.42
Net Points Purchased (bps)	4.01	4.34	7.22	9.13	9.75	8.98	6.78

Table B8: Age Difference and Age Pair Summary Statistics

The top panel presents age difference between the main applicant and the co-applicant for the two-borrowers refinance and home purchase mortgage application samples. Age difference is defined as the main applicant's age minus the co-applicant's age. Applications where either the main applicant's age or the co-applicant's age is missing are excluded. The middle panel presents the percentage of refinance mortgage applications that fall into each age group cell pair. The bottom panel presents the percentage of home purchase mortgage applications that fall into each age group cell pair. Data source: CHMDA.

Variable	n	Mean	S.D.	Min	25th	50th	75th	Max
Age Difference – Refinance Sample	3,512,141	0.90	7.02	-92	-1	1	3	85
Age Difference – Purchase Sample	4,411,838	-0.31	9.14	-101	-2	0	3	102

Refinance	Co-applicant Age Group						
Applicant Age Group	18-24	25-29	30-39	40-49	50-59	60-69	70+
18-24	49%	6%	0%	0%	0%	0%	0%
25-29	26%	64%	8%	1%	1%	0%	0%
30-39	4%	22%	78%	22%	3%	2%	1%
40-49	6%	1%	10%	66%	24%	3%	2%
50-59	11%	3%	1%	9%	60%	24%	5%
60-69	3%	2%	1%	1%	10%	61%	30%
70+	1%	0%	1%	1%	2%	9%	62%

Purchase	Co-applicant Age Group						
Applicant Age Group	18-24	25-29	30-39	40-49	50-59	60-69	70+
18-24	51%	10%	1%	1%	1%	0%	0%
25-29	20%	62%	13%	1%	2%	1%	0%
30-39	3%	19%	73%	26%	4%	3%	1%
40-49	7%	1%	8%	58%	23%	4%	3%
50-59	13%	5%	2%	9%	57%	23%	6%
60-69	4%	3%	3%	2%	10%	60%	33%
70+	1%	1%	1%	2%	3%	9%	56%

B.3 Supplementary Regression Tables

Table B9: Age and Refinance Application Rejection – Pre-COVID-19

This table reports OLS regression results the where mortgage application rejection indicator variable is regressed on age group indicator variables. The dependent variable is an indicator variable that equals 100 if the mortgage application was rejected and zero otherwise. The reference group is composed of applications associated with borrowers with ages between 18 and 24 years old. Refer to Appendix A for a detailed discussion of control variables and variable definitions. The sample is composed of single-borrower refinance mortgage applications submitted in 2018 and 2019. Heteroskedasticity-robust standard errors are clustered at the lender level. *, **, and *** denote 10%, 5%, and 1% statistical significance levels, respectively. Data source: CHMDA.

	(1)	(2)
25 – 29	-0.66	-0.78
	[0.55]	[0.49]
30 – 39	-0.03	-0.47
	[0.62]	[0.55]
40 – 49	0.3	-0.26
	[0.67]	[0.59]
50 – 59	0.92	0.05
	[0.80]	[0.66]
60 – 69	2.14**	0.81
	[1.07]	[0.78]
70+	4.87***	2.41**
	[1.75]	[1.22]
Controls	Y	Y
Tract × Year-Month FE	Y	Y
Lender × Year-Quarter FE	-	Y
Observations	460,872	455,353
R-squared	0.64	0.70

Table B10: Age and Rejection – Single-Borrower Home Purchase Sample

This table reports OLS regression results where mortgage application rejection indicator variable is regressed on age group indicator variables. The full set of demographic control variables are included but a selected subset is presented. The dependent variable is an indicator variable that equals 100 if the mortgage application was rejected and zero otherwise. The reference group is composed of applications associated with borrowers with ages between 18 and 24 years old. Refer to Appendix A for a detailed discussion of control variables and variable definitions. Heteroskedasticity-robust standard errors are clustered at the lender level. *, **, and *** denote 10%, 5%, and 1% statistical significance levels, respectively. Data source: CHMDA.

	(1)	(2)	(3)	(4)
25 – 29	-0.30***	-0.28***		-0.26***
	[0.07]	[0.06]		[0.06]
30 – 39	-0.02	0.01		0.09
	[0.09]	[0.08]		[0.08]
40 – 49	0.48***	0.50***		0.60***
	[0.13]	[0.11]		[0.11]
50 – 59	0.83***	0.85***		0.90***
	[0.16]	[0.12]		[0.12]
60 – 69	0.60***	0.62***		0.65***
	[0.21]	[0.13]		[0.13]
70+	0.35	0.40**		0.39**
	[0.27]	[0.17]		[0.18]
Female	-0.44***	-0.33***	-0.27***	-0.32***
	[0.05]	[0.03]	[0.03]	[0.03]
Black	1.39***	1.11***	1.19***	
	[0.12]	[0.12]	[0.12]	
Hispanic	0.42***	0.65***	0.65***	
	[0.13]	[0.07]	[0.07]	
Asian	1.62***	1.22***	1.16***	
	[0.15]	[0.11]	[0.11]	
Controls	Y	Y	Y	Y
Tract × Year-Month FE	Y	Y	Y	Y
Lender × Year-Quarter FE	-	Y	-	Y
Observations	4,594,218	4,590,094	4,590,094	4,590,094
R-squared	0.55	0.59	0.59	0.59

Table B11: Age and Rejection – Two-Borrowers Refinance Sample

This table reports OLS regression results the where mortgage application rejection indicator variable is regressed on age group indicator variables. The sample is composed of refinance mortgage applications that have two borrowers. The dependent variable is an indicator variable that equals 100 if the mortgage application was rejected and zero otherwise. The age group variables are constructed in three ways. Columns 1 and 4 use age group indicator variables that are constructed from the minimum age between the two borrowers. Columns 2 and 5 use age group indicator variables that are constructed from the maximum age. Columns 3 and 6 use age group indicator variables that are constructed from the average age. The reference group is composed of applications associated with borrowers with ages between 18 and 24 years old. Columns 1 through 3 present regression results for refinance applications. Columns 4 through 6 present regression results for home purchase applications. Refer to Appendix A for a detailed discussion of control variables and variable definitions. Heteroskedasticity-robust standard errors are clustered at the lender level. *, **, and *** denote 10%, 5%, and 1% statistical significance levels, respectively. Data source: CHMDA.

	(1)	(2)	(3)	(4)	(5)	(6)
25 – 29	-0.98***	-0.90**	-0.31**	-0.19***	0.04	0.07
	[0.19]	[0.36]	[0.15]	[0.06]	[0.09]	[0.08]
30 – 39	-0.75***	-0.49	-0.32*	0.15**	0.38***	0.48***
	[0.21]	[0.37]	[0.17]	[0.07]	[0.10]	[0.09]
40 – 49	-0.41*	-0.12	-0.34*	0.59***	0.89***	0.96***
	[0.23]	[0.40]	[0.19]	[0.09]	[0.12]	[0.11]
50 – 59	0.12	0.43	-0.18	0.83***	1.29***	1.28***
	[0.23]	[0.42]	[0.20]	[0.10]	[0.13]	[0.12]
60 – 69	0.14	0.71	0.03	0.38***	1.11***	0.91***
	[0.27]	[0.45]	[0.22]	[0.11]	[0.14]	[0.13]
70+	1.43***	1.59***	0.76**	0.41***	0.92***	0.84***
	[0.42]	[0.51]	[0.31]	[0.15]	[0.16]	[0.16]
Sample	Refi	Refi	Refi	Purchase	Purchase	Purchase
Age Group Definition	Min	Max	Avg	Min	Max	Avg
Controls	Y	Y	Y	Y	Y	Y
Tract × Year-Month FE	Y	Y	Y	Y	Y	Y
Lender × Year-Quarter FE	Y	Y	Y	Y	Y	Y
Observations	2,892,860	2,892,860	2,892,860	3,591,343	3,591,343	3,591,343
R-squared	0.58	0.58	0.58	0.58	0.58	0.58

Table B12: Age and Rejection Reasons – Single-Borrower Home Purchase Sample

This table reports OLS regression results where rejection reason indicator variables are regressed on age group indicator variables. All dependent variables are multiplied by 100. The dependent variable for each column is as follows. Column 1: The application was rejected because of high debt-to-income ratio. Column 2: The application was rejected because of insufficient work history. Column 3: The application was rejected because of insufficient credit history. Column 4: The application was rejected because of insufficient collateral. Column 5: The application was rejected because of insufficient cash for down payment and fees. Column 6: The application was rejected because of unverifiable information. Column 7: The application was rejected because the application was incomplete. Column 8: The application was rejected because the borrower's application for mortgage insurance was rejected. Column 9: The application was rejected because of reasons not listed above. This set of regressions uses the same control variables as the baseline rejection regressions. The reference group is composed of loan applications associated with borrowers with ages between 18 and 24 years old. Refer to Appendix A for a detailed discussion of control variables. Average Outcome reports the unconditional average of the dependent variable. Heteroskedasticity-robust standard errors are clustered at the lender level. *, **, and *** denote 10%, 5%, and 1% statistical significance levels, respectively. Data source: CHMDA.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	DTI	Job Hist	Cred Hist	Collateral	Cash	Info	Incomplete	Insurance	Other
25 – 29	-0.06*	-0.26***	-0.10***	0.03	-0.09***	-0.09***	0.06**	0.00	-0.04
	[0.03]	[0.03]	[0.04]	[0.03]	[0.03]	[0.03]	[0.03]	[0.00]	[0.04]
30 – 39	0.01	-0.30***	0.07	0.05*	-0.07**	-0.03	0.09**	0.00	-0.02
	[0.03]	[0.04]	[0.04]	[0.03]	[0.03]	[0.02]	[0.03]	[0.01]	[0.03]
40 – 49	0.10***	-0.36***	0.34***	0.16***	-0.02	0.01	0.06	0.00	0.08**
	[0.04]	[0.05]	[0.05]	[0.03]	[0.04]	[0.02]	[0.04]	[0.01]	[0.03]
50 – 59	0.15***	-0.38***	0.44***	0.27***	-0.05	0.05*	0.12**	0.01	0.08**
	[0.04]	[0.05]	[0.05]	[0.04]	[0.04]	[0.02]	[0.05]	[0.01]	[0.04]
60 – 69	0.00	-0.47***	0.36***	0.33***	-0.09*	0.01	0.17***	0.01*	0.05
	[0.05]	[0.06]	[0.05]	[0.05]	[0.05]	[0.03]	[0.05]	[0.01]	[0.04]
70+	-0.30***	-0.67***	0.31***	0.35***	-0.11*	-0.05	0.29***	0.01	0.07
	[0.07]	[0.07]	[0.06]	[0.05]	[0.06]	[0.04]	[0.07]	[0.01]	[0.05]
Average Outcome	2.8%	0.5%	1.5%	1.4%	0.8%	0.7%	1.2%	0.0%	1.1%
Controls	Y	Y	Y	Y	Y	Y	Y	Y	Y
Tract × Year-Month FE	Y	Y	Y	Y	Y	Y	Y	Y	Y
Lender × Year-Quarter FE	Y	Y	Y	Y	Y	Y	Y	Y	Y
Observations	4,590,094	4,590,094	4,590,094	4,590,094	4,590,094	4,590,094	4,590,094	4,590,094	4,590,094
R-squared	0.70	0.35	0.50	0.41	0.35	0.34	0.37	0.37	0.37

Table B13: Age and Rejection for Insufficient Collateral – Two-Borrowers Refinance Sample

This table reports OLS regression results the where mortgage application rejection for insufficient collateral indicator variable is regressed on age group indicator variables. The sample is composed of refinance mortgage applications that have two borrowers. The dependent variable is an indicator variable that equals 100 if the mortgage application is rejected for insufficient collateral and zero otherwise. The age group variables are constructed in three ways. Columns 1 and 4 use age group indicator variables that are constructed from the minimum age between the two borrowers. Columns 2 and 5 use age group indicator variables that are constructed from the maximum age. Columns 3 and 6 use age group indicator variables that are constructed from the average age. The reference group is composed of applications associated with borrowers with ages between 18 and 24 years old. Refer to Appendix A for a detailed discussion of control variables and variable definitions. Heteroskedasticity-robust standard errors are clustered at the lender level. *, **, and *** denote 10%, 5%, and 1% statistical significance levels, respectively. Data source: CHMDA.

	(1)	(2)	(3)	(4)	(5)	(6)
25 – 29	0.06	0.05	0.08	0.05	0.20***	0.16**
	[0.05]	[0.05]	[0.11]	[0.11]	[0.07]	[0.07]
30 – 39	0.17***	0.14***	0.22**	0.18*	0.33***	0.29***
	[0.05]	[0.05]	[0.11]	[0.11]	[0.08]	[0.07]
40 – 49	0.29***	0.24***	0.34***	0.28**	0.45***	0.38***
	[0.06]	[0.06]	[0.11]	[0.11]	[0.08]	[0.08]
50 – 59	0.41***	0.30***	0.44***	0.34***	0.57***	0.45***
	[0.07]	[0.06]	[0.11]	[0.11]	[0.09]	[0.08]
60 – 69	0.57***	0.41***	0.58***	0.42***	0.73***	0.54***
	[0.11]	[0.06]	[0.13]	[0.11]	[0.12]	[0.09]
70+	0.86***	0.62***	0.84***	0.60***	1.01***	0.75***
	[0.27]	[0.15]	[0.24]	[0.15]	[0.27]	[0.15]
Age Group Definition	Minimum		Maximum		Average	
Controls	Y	Y	Y	Y	Y	Y
Tract × Year-Month FE	Y	Y	Y	Y	Y	Y
Lender × Year-Quarter FE	-	Y	-	Y	-	Y
Observations	2,900,405	2,892,860	2,892,860	2,892,860	2,900,405	2,892,860
R-squared	0.38	0.4	0.58	0.4	0.38	0.4

Table B14: Age and Rejection for Insufficient Collateral – Two-Borrowers Home Purchase Sample

This table reports OLS regression results the where mortgage application rejection for insufficient collateral indicator variable is regressed on age group indicator variables. The sample is composed of home purchase mortgage applications that have two borrowers. The dependent variable is an indicator variable that equals 100 if the mortgage application is rejected for insufficient collateral and zero otherwise. The age group variables are constructed in three ways. Columns 1 and 4 use age group indicator variables that are constructed from the minimum age between the two borrowers. Columns 2 and 5 use age group indicator variables that are constructed from the maximum age. Columns 3 and 6 use age group indicator variables that are constructed from the average age. The reference group is composed of applications associated with borrowers with ages between 18 and 24 years old. Refer to Appendix A for a detailed discussion of control variables and variable definitions. Heteroskedasticity-robust standard errors are clustered at the lender level. *, **, and *** denote 10%, 5%, and 1% statistical significance levels, respectively. Data source: CHMDA.

	(1)	(2)	(3)	(4)	(5)	(6)
25 – 29	0.04	0.02	0.17***	0.15***	0.14***	0.12***
	[0.03]	[0.03]	[0.05]	[0.05]	[0.04]	[0.04]
30 – 39	0.09***	0.06**	0.21***	0.18***	0.20***	0.16***
	[0.03]	[0.03]	[0.06]	[0.05]	[0.04]	[0.04]
40 – 49	0.20***	0.16***	0.33***	0.28***	0.30***	0.25***
	[0.04]	[0.03]	[0.07]	[0.06]	[0.05]	[0.04]
50 – 59	0.31***	0.27***	0.44***	0.39***	0.41***	0.37***
	[0.05]	[0.04]	[0.07]	[0.06]	[0.06]	[0.05]
60 – 69	0.29***	0.25***	0.43***	0.39***	0.42***	0.38***
	[0.06]	[0.05]	[0.08]	[0.07]	[0.08]	[0.06]
70+	0.39***	0.35***	0.48***	0.43***	0.50***	0.46***
	[0.08]	[0.07]	[0.09]	[0.08]	[0.09]	[0.07]
Age Group Definition	Minimum		Maximum		Average	
Controls	Y	Y	Y	Y	Y	Y
Tract × Year-Month FE	Y	Y	Y	Y	Y	Y
Lender × Year-Quarter FE	-	Y	-	Y	-	Y
Observations	3,595,890	3,591,343	3,595,890	3,591,343	3,595,890	3,591,343
R-squared	0.41	0.42	0.41	0.42	0.41	0.42

Table B15: Age, Sex, and Rejection Probability – Single-Borrower Refinance Mortgages

This table reports OLS regression results where mortgage application rejection indicator variable is regressed onto the borrower's age. The full set of demographic control variables are included but a selected subset is presented. The dependent variable is an indicator variable that equals 100 if the mortgage application was rejected and zero otherwise. The sample is composed of single-borrower refinance mortgage applications where the borrower's age is not missing and the borrower's sex is male or female. Age is the borrower's age at the date of application in years. 70+ equals one if the borrower is 70 years or older. Female equals one if the borrower is female. $Female \times 70+$ is included in the regression but omitted from the table for presentation purposes. Refer to Appendix A for a detailed discussion of control variables and variable definitions. Heteroskedasticity-robust standard errors are clustered at the lender level. *, **, and *** denote 10%, 5%, and 1% statistical significance levels, respectively. Data source: CHMDA.

	(1)	(2)	(3)	(4)
Age	0.07***	0.04***	0.08***	0.05***
	[0.01]	[0.01]	[0.02]	[0.01]
Age × 70+	0.24***	0.20***	0.25***	0.20***
	[0.05]	[0.04]	[0.05]	[0.04]
Age × Female			-0.03***	-0.03***
			[0.01]	[0.01]
Age × Female × 70+			-0.01*	-0.01
			[0.01]	[0.00]
Controls	Y	Y	Y	Y
Tract × Year-Month FE	Y	Y	Y	Y
Lender × Year-Quarter FE	-	Y	-	Y
Observations	3,149,166	3,141,626	3,149,166	3,141,626
R-squared	0.56	0.62	0.56	0.62

Table B16: Age and Points-Adjusted Coupon Rate on Single-Borrower Home Purchase Mortgages

This table reports OLS regression results where the points-adjusted coupon rate is regressed on age group indicator variables. The full set of demographic control variables are included but a selected subset is presented. The sample is composed of single-borrower home purchase mortgages that were originated. The dependent variable is the points-adjusted coupon rate on the mortgage reported in basis points. Following Bartlett et al. (2022), each net point is worth 25 bps of coupon rate. Net points purchased is defined as the dollar amount of points purchased minus the dollar amount of lender credits, all divided by the total loan amount. One percent of the loan amount equals one point. The reference group is composed of mortgages associated with borrowers with ages between 18 and 24 years old. Refer to Appendix A for a detailed discussion of control variables. Heteroskedasticity-robust standard errors are clustered at the lender level. *, **, and *** denote 10%, 5%, and 1% statistical significance levels, respectively. Data sources: CHMDA.

	(1)	(2)	(3)	(4)
25 – 29	0.34*	0.31**		0.27**
	[0.19]	[0.13]		[0.13]
30 – 39	1.63***	1.03***		0.98***
	[0.36]	[0.17]		[0.17]
40 – 49	3.60***	2.53***		2.57***
	[0.39]	[0.22]		[0.22]
50 – 59	3.83***	3.22***		3.34***
	[0.38]	[0.27]		[0.28]
60 – 69	4.35***	4.25***		4.39***
	[0.52]	[0.35]		[0.37]
70+	5.85***	6.11***		6.25***
	[0.48]	[0.36]		[0.38]
Female	-0.49*	-0.15*	0.14*	-0.09
	[0.27]	[0.08]	[0.08]	[0.09]
Black	0.53	1.02***	1.31***	
	[0.56]	[0.33]	[0.34]	
Hispanic	5.77***	2.17***	2.12***	
	[1.79]	[0.33]	[0.33]	
Asian	-5.54***	-4.08***	-4.35***	
	[0.45]	[0.34]	[0.36]	
Controls	Y	Y	Y	Y
Tract × Year-Month FE	Y	Y	Y	Y
Lender × Year-Quarter FE	-	Y	-	Y
Observations	3,969,083	3,964,644	3,964,644	3,964,644
R-squared	0.86	0.91	0.91	0.91

Table B17: Age and Points-Adjusted Coupon Rate – Pre-COVID-19

This table reports OLS regression results where the points-adjusted coupon rate is regressed on age group indicator variables. The dependent variable is the points-adjusted coupon rate on the mortgage reported in basis points. Following Bartlett et al. (2022), each net point is worth 25 bps of coupon rate. Net points purchased is defined as the dollar amount of points purchased minus the dollar amount of lender credits, all divided by the total loan amount. One percent of the loan amount equals one point. The reference group is composed of mortgages associated with borrowers with ages between 18 and 24 years old. Refer to Appendix A for a detailed discussion of control variables. Columns 1 and 2 present results for single-borrower refinance mortgages originated in 2018 or 2019. Columns 3 and 4 present results for single-borrower home purchase mortgages originated in 2018 or 2019. Heteroskedasticity-robust standard errors are clustered at the lender level. *, **, and *** denote 10%, 5%, and 1% statistical significance levels, respectively. Data sources: CHMDA.

	(1)	(2)	(3)	(4)
25 – 29	0.59	0.85	0.11	0.09
	[0.74]	[0.67]	[0.25]	[0.19]
30 – 39	1.87***	1.58**	1.70***	0.92***
	[0.72]	[0.68]	[0.43]	[0.24]
40 – 49	5.02***	4.11***	4.01***	2.77***
	[0.94]	[0.86]	[0.46]	[0.32]
50 – 59	6.69***	5.34***	4.55***	3.56***
	[1.30]	[1.15]	[0.44]	[0.37]
60 – 69	7.74***	6.06***	5.52***	5.01***
	[1.83]	[1.51]	[0.58]	[0.44]
70+	9.86***	7.82***	7.16***	7.22***
	[2.31]	[1.79]	[0.53]	[0.46]
Sample	Refinance		Purchase	
Controls	Y	Y	Y	Y
Tract × Year-Month FE	Y	Y	Y	Y
Lender × Year-Quarter FE	-	Y	-	Y
Observations	329,913	324,749	1,621,376	1,618,854
R-squared	0.78	0.83	0.72	0.81

Table B18: Age and Points-Adjusted Coupon Rate on Home Purchase Mortgages by Demographic Group

This table reports OLS regression results where the points-adjusted coupon rate is regressed on age group indicator variables. The sample is composed of single-borrower home purchase mortgages. The dependent variable is the points-adjusted coupon rate on the mortgage reported in basis points. Following Bartlett et al. (2022), each net point is worth 25 bps of coupon rate. Net points purchased is defined as the dollar amount of points purchased minus the dollar amount of lender credits, all divided by the total loan amount. One percent of the loan amount equals one point. The reference group is composed of applications associated with borrowers with ages between 18 and 24 years old. Each column presents regression results for each major demographic group in the sample. NHW stands for non-Hispanic white. The samples used in columns 1 through 4 exclude observations where the borrower's ethnicity or race is unknown. The samples used in columns 5 and 6 exclude observations where the borrower's sex is not male or female. Refer to Appendix A for a detailed discussion of control variables and variable definitions. Heteroskedasticity-robust standard errors are clustered at the lender level. *, **, and *** denote 10%, 5%, and 1% statistical significance levels, respectively. Data source: CHMDA.

	(1)	(2)	(3)	(4)	(5)	(6)
25 – 29	0.59***	-0.25	-0.52	-0.04	0.15	0.63***
	[0.13]	[0.55]	[0.59]	[0.79]	[0.22]	[0.15]
30 – 39	1.41***	0.99*	-0.77	1.04	1.11***	1.34***
	[0.16]	[0.60]	[0.57]	[0.80]	[0.23]	[0.20]
40 – 49	2.85***	1.99***	0.81	1.97**	2.38***	2.78***
	[0.20]	[0.63]	[0.65]	[0.84]	[0.27]	[0.23]
50 – 59	3.61***	2.02***	2.33***	2.48***	2.97***	3.43***
	[0.25]	[0.64]	[0.72]	[0.90]	[0.31]	[0.27]
60 – 69	4.56***	2.57***	2.29***	5.23***	3.91***	4.42***
	[0.31]	[0.77]	[0.87]	[0.91]	[0.34]	[0.33]
70+	6.25***	3.55***	3.73**	5.51***	5.66***	6.19***
	[0.36]	[1.11]	[1.48]	[1.12]	[0.38]	[0.41]
Sample	NHW	Hispanic	Black	Asian	Female	Male
Controls	Y	Y	Y	Y	Y	Y
Tract × Year-Month FE	Y	Y	Y	Y	Y	Y
Lender × Year-Quarter FE	Y	Y	Y	Y	Y	Y
Observations	2,102,437	212,313	154,854	130,525	1,080,262	1,858,873
R-squared	0.93	0.93	0.94	0.93	0.93	0.92

Table B19: Age and Points-Adjusted Coupon Rate on Home Purchase Mortgages by Loan Type

This table reports OLS regression results where the points-adjusted coupon rate is regressed on age group indicator variables. The sample is composed of single-borrower home purchase mortgages that were originated. The dependent variable is the points-adjusted coupon rate on the mortgage reported in basis points. Following Bartlett et al. (2022), each net point is worth 25 bps of coupon rate. Net points purchased is defined as the dollar amount of points purchased minus the dollar amount of lender credits, all divided by the total loan amount. One percent of the loan amount equals one point. The reference group is composed of loan applications associated with borrowers with ages between 18 and 24 years old. Guaranteed loans are VA or FHA loans. The non-conforming loan sample is composed of jumbo loans or loans that the automated underwriting system classified as being ineligible for the GSEs to purchase. Refer to Appendix A for a detailed discussion of control variables and variable definitions. Heteroskedasticity-robust standard errors are clustered at the lender level. *, **, and *** denote 10%, 5%, and 1% statistical significance levels, respectively. Data source: CHMDA.

	(1)	(2)	(3)	(4)	(5)	(6)
25 – 29	0.42**	0.42***	-0.98	-5.70*	-0.05	-0.84
	[0.19]	[0.13]	[4.65]	[3.44]	[0.83]	[0.76]
30 – 39	1.78***	1.21***	-2.91	-6.91*	1.38	-0.15
	[0.37]	[0.17]	[4.85]	[3.65]	[0.96]	[0.66]
40 – 49	3.83***	2.75***	-2.03	-6.51*	2.68**	0.57
	[0.41]	[0.22]	[4.97]	[3.74]	[1.05]	[0.71]
50 – 59	3.80***	3.32***	0.07	-5.47	3.43***	1.29*
	[0.41]	[0.28]	[4.95]	[3.71]	[1.07]	[0.74]
60 – 69	4.27***	4.27***	2.62	-3.02	5.20***	2.98***
	[0.55]	[0.37]	[4.90]	[3.51]	[1.15]	[0.83]
70+	5.77***	6.03***	3.92	0.01	6.84***	4.11***
	[0.49]	[0.37]	[5.53]	[4.13]	[1.53]	[1.03]
Sample	Conforming		Non-Conforming		Guaranteed	
Controls	Y	Y	Y	Y	Y	Y
Tract × Year-Month FE	Y	Y	Y	Y	Y	Y
Lender × Year-Quarter FE	-	Y	-	Y	-	Y
Observations	3,276,081	3,271,373	66,994	61,707	174,471	168,761
R-squared	0.87	0.92	0.84	0.93	0.90	0.94

Table B20: Age and Points-Adjusted Coupon Rate – Two-Borrowers Sample

This table reports OLS regression results where the points-adjusted coupon rate is regressed on age group indicator variables. The sample is composed of refinance and home purchase mortgages that are associated with two borrowers. The dependent variable is the points-adjusted coupon rate on the mortgage reported in basis points. Following Bartlett et al. (2022), each net point is worth 25 bps of coupon rate. Net points purchased is defined as the dollar amount of points purchased minus the dollar amount of lender credits, all divided by the total loan amount. One percent of the loan amount equals one point. The age group variables are constructed in three ways. Columns 1 and 4 use age group indicator variables that are constructed from the minimum age between the two borrowers. Columns 2 and 5 use age group indicator variables that are constructed from the maximum age. Columns 3 and 6 use age group indicator variables that are constructed from the average age. The reference group is composed of mortgages associated with borrowers with ages between 18 and 24 years old. Columns 1 through 3 present regression results for refinance mortgages. Columns 4 through 6 present regression results for home purchase mortgages. Refer to Appendix A for a detailed discussion of control variables and variable definitions. Heteroskedasticity-robust standard errors are clustered at the lender level. *, **, and *** denote 10%, 5%, and 1% statistical significance levels, respectively. Data source: CHMDA.

	(1)	(2)	(3)	(4)	(5)	(6)
25 – 29	0.05	1.54***	1.08***	0.08	0.57***	0.57***
	[0.22]	[0.42]	[0.35]	[0.12]	[0.19]	[0.17]
30 – 39	0.3	1.68***	1.34***	0.45***	0.87***	1.05***
	[0.32]	[0.47]	[0.40]	[0.14]	[0.22]	[0.20]
40 – 49	2.04***	3.09***	3.07***	2.08***	2.30***	2.64***
	[0.43]	[0.54]	[0.47]	[0.17]	[0.25]	[0.24]
50 – 59	2.77***	4.27***	4.02***	2.63***	3.30***	3.49***
	[0.60]	[0.63]	[0.60]	[0.24]	[0.28]	[0.28]
60 – 69	2.95***	4.65***	4.28***	3.61***	4.01***	4.42***
	[0.76]	[0.74]	[0.77]	[0.32]	[0.32]	[0.36]
70+	3.55***	5.06***	4.74***	4.98***	5.35***	5.69***
	[0.99]	[0.96]	[0.98]	[0.41]	[0.39]	[0.44]
Sample	Refi	Refi	Refi	Purchase	Purchase	Purchase
Age Group Definition	Min	Max	Avg	Min	Max	Avg
Controls	Y	Y	Y	Y	Y	Y
Tract × Year-Month FE	Y	Y	Y	Y	Y	Y
Lender × Year-Quarter FE	Y	Y	Y	Y	Y	Y
Observations	2,455,150	2,455,150	2,455,150	3,225,867	3,225,867	3,225,867
R-squared	0.85	0.85	0.85	0.93	0.93	0.93

Table B21: Age and Raw Coupon Rate – Single-Borrower Sample

This table reports OLS regression results where the coupon rate, unadjusted for points, is regressed on age group indicator variables. The dependent variable is the coupon rate on the mortgage reported in basis points. The reference group is composed of mortgages associated with borrowers with ages between 18 and 24 years old. Refer to Appendix A for a detailed discussion of control variables. Columns 1 and 2 present results for single-borrower refinance mortgages. Columns 3 and 4 present results for single-borrower home purchase mortgages. Heteroskedasticity-robust standard errors are clustered at the lender level. *, **, and *** denote 10%, 5%, and 1% statistical significance levels, respectively. Data sources: CHMDA.

	(1)	(2)	(3)	(4)
25 – 29	0.05	0.04	-0.02	-0.01
	[0.25]	[0.21]	[0.17]	[0.11]
30 – 39	-0.41	-0.36*	0.78**	0.24
	[0.29]	[0.21]	[0.36]	[0.17]
40 – 49	0.52	0.37	2.49***	1.53***
	[0.36]	[0.27]	[0.37]	[0.19]
50 – 59	1.06**	0.89**	2.60***	2.17***
	[0.45]	[0.35]	[0.25]	[0.18]
60 – 69	0.63	0.59	3.12***	3.23***
	[0.57]	[0.44]	[0.30]	[0.19]
70+	0.71	0.94	5.23***	5.57***
	[0.78]	[0.59]	[0.28]	[0.22]
Sample	Refinance		Purchase	
Controls	Y	Y	Y	Y
Tract × Year-Month FE	Y	Y	Y	Y
Lender × Year-Quarter FE	-	Y	-	Y
Observations	2,793,373	2,785,943	3,969,083	3,964,644
R-squared	0.82	0.86	0.87	0.92

Table B22: Age and Raw Coupon Rate – Two-Borrowers Sample

This table reports OLS regression results where coupon rate, unadjusted for points purchased, is regressed on age group indicator variables. The sample is composed of mortgages that have two borrowers. The dependent variable is the raw coupon rate on the mortgage reported in basis points. Columns 1 through 3 report results for refinance mortgages. Columns 4 through 6 report results for home purchase mortgages. Columns 1 and 4 report results for age group indicator variables constructed using the minimum age between the two borrowers. Columns 2 and 5 report results for age group indicator variables constructed using the maximum age between the two borrowers. Columns 3 and 6 report results for age group indicator variables constructed using the average age between the two borrowers. The reference group is composed of applications associated with borrowers with ages between 18 and 24 years old. Columns 1 through 3 present regression results for refinance applications. Columns 4 through 6 present regression results for home purchase applications. Refer to Appendix A for a detailed discussion of control variables and variable definitions. Heteroskedasticity-robust standard errors are clustered at the lender level. *, **, and *** denote 10%, 5%, and 1% statistical significance levels, respectively. Data source: CHMDA.

	(1)	(2)	(3)	(4)	(5)	(6)
25 – 29	-0.62***	0.44	0.04	-0.40***	-0.09	-0.11
	[0.21]	[0.38]	[0.31]	[0.12]	[0.19]	[0.16]
30 – 39	-1.25***	-0.49	-0.73**	-0.46***	-0.38*	-0.15
	[0.22]	[0.39]	[0.32]	[0.14]	[0.21]	[0.19]
40 – 49	0.01	0.38	0.47	1.24***	1.02***	1.43***
	[0.25]	[0.42]	[0.35]	[0.15]	[0.23]	[0.22]
50 – 59	0.48	1.39***	1.18***	2.03***	2.13***	2.44***
	[0.37]	[0.48]	[0.44]	[0.17]	[0.24]	[0.22]
60 – 69	-0.03	1.09**	0.69	3.46***	3.07***	3.78***
	[0.44]	[0.52]	[0.50]	[0.18]	[0.22]	[0.22]
70+	0.15	0.90	0.73	5.44***	4.80***	5.64***
	[0.62]	[0.66]	[0.66]	[0.27]	[0.25]	[0.28]
Sample	Refi	Refi	Refi	Purchase	Purchase	Purchase
Age Group Definition	Min	Max	Avg	Min	Max	Avg
Controls	Y	Y	Y	Y	Y	Y
Tract x Month FE	Y	Y	Y	Y	Y	Y
Lender x Year-Quarter FE	Y	Y	Y	Y	Y	Y
Observations	1,250,086	1,250,086	1,250,086	1,552,633	1,552,633	1,552,633
R-squared	0.8	0.8	0.8	0.88	0.88	0.88

Table B23: Age and GSE Securitization

This table reports OLS regression results where GSE securitization indicator variable is regressed on age group indicator variables. The sample is composed of conforming single-borrower refinance and home purchase mortgages that were originated. The dependent variable equals 100 if the mortgage was sold to Fannie Mae or Freddie Mac and zero otherwise. The reference group for the dependent variable includes mortgages that were unsold by the end of the year or sold to other types of buyer, excluding Ginnie Mae and Farmer Mac. The reference group for the age group variables is composed of mortgages associated with borrowers with ages between 18 and 24 years old. Columns 1 and 2 present results for refinance mortgages. Columns 3 and 4 present results for home purchase mortgages. The control variables are identical to that of the rejection and coupon rate regressions. Refer to Appendix A for a detailed discussion of control variables and variable definitions. Heteroskedasticity-robust standard errors are clustered at the lender level. *, **, and *** denote 10%, 5%, and 1% statistical significance levels, respectively. Data source: CHMDA.

	(1)	(2)	(3)	(4)
25 – 29	0.10	-0.16	-0.27	-0.27**
	[0.52]	[0.30]	[0.19]	[0.12]
30 – 39	0.28	0.01	0.14	0.01
	[0.59]	[0.30]	[0.24]	[0.13]
40 – 49	0.48	0.11	0.36	0.10
	[0.70]	[0.32]	[0.29]	[0.13]
50 – 59	0.64	0.08	0.68**	0.35**
	[0.92]	[0.31]	[0.29]	[0.14]
60 – 69	1.07	-0.24	1.20***	0.50***
	[1.28]	[0.32]	[0.30]	[0.16]
70+	1.51	-0.49	1.59***	0.57***
	[1.70]	[0.35]	[0.39]	[0.19]
Sample	Refi	Refi	Purchase	Purchase
Controls	Y	Y	Y	Y
Tract × Year-Month FE	Y	Y	Y	Y
Lender × Year-Quarter FE	-	Y	-	Y
Observations	1,882,154	1,875,384	2,959,825	2,955,571
R-squared	0.34	0.75	0.39	0.72

Table B24: Age and GSE Securitization – Two-Borrowers Refinance Mortgages

This table reports OLS regression results where GSE securitization indicator variable is regressed on age group indicator variables. The sample is composed of two-borrowers conforming refinance mortgages. The dependent variable equals 100 if the mortgage was originated and sold to Fannie Mae or Freddie Mac in the same year and zero otherwise. The reference group for the outcome variable includes mortgages that were sold to other types of purchasers, excluding Ginnie Mae and Farmer Mac. The reference group for the age group variables is composed of applications associated with borrowers with ages between 18 and 24 years old. The age group indicator variables used in columns 1 and 2 are constructed from the minimum age among the two borrowers. For columns 3 and 4, maximum age is used. For columns 5 and 6, average age is used. Refer to Appendix A for a detailed discussion of control variables and variable definitions. Heteroskedasticity-robust standard errors are clustered at the lender level. *, **, and *** denote 10%, 5%, and 1% statistical significance levels, respectively. Data source: CHMDA.

	(1)	(2)	(3)	(4)	(5)	(6)
25 – 29	0.12	0.32	1.21	0.16	1.41*	0.35
	[0.57]	[0.33]	[1.02]	[0.61]	[0.77]	[0.50]
30 – 39	0.02	0.30	1.4	0.32	1.46*	0.44
	[0.64]	[0.34]	[1.04]	[0.62]	[0.81]	[0.49]
40 – 49	0.38	0.44	1.75	0.36	1.79**	0.56
	[0.76]	[0.34]	[1.10]	[0.62]	[0.88]	[0.50]
50 – 59	0.84	0.48	2.04*	0.46	2.17**	0.65
	[0.94]	[0.33]	[1.19]	[0.63]	[0.97]	[0.50]
60 – 69	0.96	0.39	2.37*	0.47	2.42**	0.60
	[1.16]	[0.35]	[1.27]	[0.64]	[1.11]	[0.52]
70+	1.54	0.55	2.70*	0.51	2.81**	0.57
	[1.48]	[0.38]	[1.41]	[0.64]	[1.37]	[0.54]
Age Group Definition	Min	Min	Max	Max	Avg	Avg
Controls	Y	Y	Y	Y	Y	Y
Tract × Year-Month FE	Y	Y	Y	Y	Y	Y
Lender × Year-Quarter FE	-	Y	-	Y	-	Y
Observations	1,324,974	1,318,453	1,324,974	1,318,453	1,324,974	1,318,453
R-squared	0.39	0.77	0.39	0.77	0.39	0.77

Table B25: Age and GSE Securitization – Two-Borrowers Home Purchase Mortgages

This table reports OLS regression results where GSE securitization indicator variable is regressed on age group indicator variables. The sample is composed of two-borrowers conforming home purchase mortgages. The dependent variable equals 100 if the mortgage was originated and sold to Fannie Mae or Freddie Mac in the same year and zero otherwise. The reference group for the outcome variable includes mortgages that were sold to other types of purchasers, excluding Ginnie Mae and Farmer Mac. The reference group for the age group variables is composed of applications associated with borrowers with ages between 18 and 24 years old. The age group indicator variables used in columns 1 and 2 are constructed from the minimum age among the two borrowers. For columns 3 and 4, maximum age is used. For columns 5 and 6, average age is used. Refer to Appendix A for a detailed discussion of control variables and variable definitions. Heteroskedasticity-robust standard errors are clustered at the lender level. *, **, and *** denote 10%, 5%, and 1% statistical significance levels, respectively. Data source: CHMDA.

	(1)	(2)	(3)	(4)	(5)	(6)
25 – 29	0.00	-0.08	0.20	0.24	0.46	0.28
	[0.23]	[0.15]	[0.33]	[0.23]	[0.30]	[0.23]
30 – 39	0.24	-0.04	0.59	0.38	0.82**	0.40*
	[0.29]	[0.17]	[0.39]	[0.25]	[0.36]	[0.24]
40 – 49	0.93**	0.29*	1.31***	0.63***	1.61***	0.74***
	[0.38]	[0.17]	[0.46]	[0.24]	[0.45]	[0.23]
50 – 59	1.28***	0.46**	1.84***	0.91***	1.98***	0.83***
	[0.41]	[0.20]	[0.49]	[0.25]	[0.45]	[0.25]
60 – 69	1.22**	0.25	1.85***	0.86***	1.88***	0.80***
	[0.48]	[0.22]	[0.46]	[0.27]	[0.45]	[0.27]
70+	1.63***	0.59**	2.14***	0.96***	2.30***	0.91***
	[0.59]	[0.28]	[0.47]	[0.28]	[0.56]	[0.34]
Age Group Definition	Min	Min	Max	Max	Avg	Avg
Controls	Y	Y	Y	Y	Y	Y
Tract × Year-Month FE	Y	Y	Y	Y	Y	Y
Lender × Year-Quarter FE	-	Y	-	Y	-	Y
Observations	1,856,374	1,851,546	1,856,374	1,851,546	1,856,374	1,851,546
R-squared	0.41	0.74	0.41	0.74	0.41	0.74

Table B26: Age and Points-Adjusted Coupon Rate on Home Purchase Mortgages – LLPA Grid Regressions

This table reports OLS regression results where the points-adjusted coupon rate is regressed on age group indicator variables. The full set of demographic control variables are included. The sample is composed of single-borrower home purchase mortgages that were originated and sold to Fannie Mae or Freddie Mac. The dependent variable is the points-adjusted coupon rate on the mortgage reported in basis points. Following Bartlett et al. (2022), each net point is worth 25 bps of coupon rate. Net points purchased is defined as the dollar amount of points purchased minus the dollar amount of lender credits, all divided by the total loan amount. One percent of the loan amount equals one point. The reference group is composed of mortgages associated with borrowers with ages between 18 and 24 years old. Control variables include the complete set of demographic indicator variables and LLPA grid fixed effects. Refer to Appendix A for a detailed discussion of control variables. Heteroskedasticity-robust standard errors are clustered at the lender level. *, **, and *** denote 10%, 5%, and 1% statistical significance levels, respectively. Data sources: CHMDA.

	(1)	(2)	(3)	(4)	(5)
25 – 29	-0.63*	0.25	-0.98***	-0.94***	0.21
	[0.36]	[0.19]	[0.31]	[0.32]	[0.23]
30 – 39	-0.79*	0.60**	-1.52***	-1.44***	0.45*
	[0.46]	[0.30]	[0.41]	[0.42]	[0.23]
40 – 49	1.07**	2.35***	-0.02	0.05	1.87***
	[0.49]	[0.46]	[0.35]	[0.35]	[0.27]
50 – 59	3.83***	4.04***	2.59***	2.58***	3.52***
	[0.64]	[0.70]	[0.30]	[0.31]	[0.42]
60 – 69	6.95***	5.85***	5.61***	5.55***	5.46***
	[0.92]	[0.90]	[0.57]	[0.56]	[0.67]
70+	9.40***	7.70***	8.29***	8.14***	7.50***
	[0.90]	[0.87]	[0.62]	[0.63]	[0.74]
Year-Month × Grid × Purchaser Type FE	Y	Y	Y	Y	Y
Tract FE	-	Y	-	-	-
Lender FE	-	-	Y	-	-
Lender × Year-Quarter FE	-	-	-	Y	-
Lender × Tract FE	-	-	-	-	Y
Observations	2,323,816	2,321,462	2,323,741	2,322,500	1,670,880
R-squared	0.85	0.87	0.88	0.89	0.92

Table B27: Age and Points-Adjusted Coupon Rate on Two-Borrowers Mortgages – LLPA Grid Regressions

This table reports OLS regression results where points-adjusted coupon rate is regressed on age group indicator variables. The sample is composed of mortgages that have two borrowers that were sold to Fannie Mae or Freddie Mac. The dependent variable is the points-adjusted coupon rate on the mortgage reported in basis points. Following Bartlett et al. (2022), each net point is worth 25 bps of coupon rate. Net points purchased is defined as the dollar amount of points purchased minus the dollar amount of lender credits, all divided by the total loan amount. One percent of the loan amount equals one point. Columns 1 through 3 report results for refinance mortgages. Columns 4 through 6 report results for home purchase mortgages. Columns 1 and 4 report results for age group indicator variables constructed using the minimum age between the two borrowers. Columns 2 and 5 report results for age group indicator variables constructed using the maximum age between the two borrowers. Columns 3 and 6 report results for age group indicator variables constructed using the average age between the two borrowers. The reference group is composed of mortgages associated with borrowers with ages between 18 and 24 years old. The full set of demographic control variables are included. Refer to Appendix A for a detailed discussion of control variables and variable definitions. Heteroskedasticity-robust standard errors are clustered at the lender level. *, **, and *** denote 10%, 5%, and 1% statistical significance levels, respectively. Data source: CHMDA.

	(1)	(2)	(3)	(4)	(5)	(6)
25 – 29	-1.34***	0.99	-0.36	-2.15***	-0.78**	-0.76**
	[0.41]	[0.70]	[0.56]	[0.32]	[0.33]	[0.29]
30 – 39	-2.62***	-0.76	-1.78***	-2.62***	-1.22***	-0.75**
	[0.63]	[0.81]	[0.67]	[0.31]	[0.39]	[0.34]
40 – 49	-0.56	0.46	0.05	-0.35	0.71*	1.81***
	[0.95]	[0.96]	[0.80]	[0.32]	[0.41]	[0.43]
50 – 59	2.68*	3.36***	3.14***	2.64***	3.85***	4.45***
	[1.48]	[1.23]	[1.16]	[0.61]	[0.55]	[0.67]
60 – 69	6.83***	7.10***	7.37***	5.30***	6.53***	7.35***
	[2.41]	[1.94]	[2.09]	[1.04]	[0.91]	[1.15]
70+	10.49***	11.10***	11.20***	7.60***	8.95***	9.72***
	[2.89]	[2.59]	[2.69]	[1.06]	[1.06]	[1.23]
Sample	Refi	Refi	Refi	Purchase	Purchase	Purchase
Age Group Definition	Min	Max	Avg	Min	Max	Avg
Year-Month × Grid × Purchaser Type FE	Y	Y	Y	Y	Y	Y
Observations	1,250,086	1,250,086	1,250,086	1,552,633	1,552,633	1,552,633
R-squared	0.75	0.75	0.75	0.86	0.86	0.86

Table B28: Age and Raw Coupon Rate on Refinance Mortgages – LLPA Grid Regressions

This table reports OLS regression results where coupon rate, unadjusted for points, is regressed on age group indicator variables. The sample is composed of single-borrower home purchase mortgages that were originated and sold to Fannie Mae or Freddie Mac. The dependent variable is the coupon rate on the mortgage reported in basis points. The reference group is composed of mortgages associated with borrowers with ages between 18 and 24 years old. Control variables include the complete set of demographic indicator variables and LLPA grid fixed effects. Refer to Appendix A for a detailed discussion of control variables. Heteroskedasticity-robust standard errors are clustered at the lender level. *, **, and *** denote 10%, 5%, and 1% statistical significance levels, respectively. Data sources: CHMDA.

	(1)	(2)	(3)	(4)	(5)
25 – 29	-0.96***	-0.28	-0.99***	-0.89***	-0.35
	[0.32]	[0.25]	[0.31]	[0.30]	[0.35]
30 – 39	-2.84***	-1.18***	-2.70***	-2.55***	-1.25***
	[0.42]	[0.28]	[0.33]	[0.31]	[0.30]
40 – 49	-2.29***	-0.18	-2.28***	-2.14***	-0.48*
	[0.44]	[0.32]	[0.29]	[0.27]	[0.27]
50 – 59	-0.86**	0.95**	-1.05***	-0.94***	0.48
	[0.42]	[0.38]	[0.28]	[0.27]	[0.32]
60 – 69	0.41	1.51***	-0.06	0.02	1.00*
	[0.68]	[0.57]	[0.55]	[0.56]	[0.53]
70+	2.46***	3.13***	1.54*	1.66**	2.08***
	[0.91]	[0.77]	[0.82]	[0.83]	[0.78]
Year-Month × Grid × Purchaser Type FE	Y	Y	Y	Y	Y
Tract FE	-	Y	-	-	-
Lender FE	-	-	Y	-	-
Lender × Year-Quarter FE	-	-	-	Y	-
Lender × Tract FE	-	-	-	-	Y
Observations	1,731,666	1,727,369	1,731,573	1,729,607	1,180,731
R-squared	0.8	0.82	0.82	0.84	0.88

Table B29: Age and Raw Coupon Rate on Home Purchase Mortgages – LLPA Grid Regressions

This table reports OLS regression results where coupon rate, unadjusted for points, is regressed on age group indicator variables. The sample is composed of single-borrower home purchase mortgages that were originated and sold to Fannie Mae or Freddie Mac. The dependent variable is the coupon rate on the mortgage reported in basis points. The reference group is composed of mortgages associated with borrowers with ages between 18 and 24 years old. Control variables include the complete set of demographic indicator variables and LLPA grid fixed effects. Refer to Appendix A for a detailed discussion of control variables. Heteroskedasticity-robust standard errors are clustered at the lender level. *, **, and *** denote 10%, 5%, and 1% statistical significance levels, respectively. Data sources: CHMDA.

	(1)	(2)	(3)	(4)	(5)
25 – 29	-0.91***	-0.13	-1.04***	-1.00***	-0.08
	[0.25]	[0.14]	[0.21]	[0.21]	[0.17]
30 – 39	-1.48***	-0.18	-1.73***	-1.64***	-0.01
	[0.34]	[0.17]	[0.26]	[0.26]	[0.17]
40 – 49	0.09	1.32***	-0.37	-0.28	1.27***
	[0.34]	[0.20]	[0.25]	[0.24]	[0.19]
50 – 59	2.45***	2.74***	1.92***	1.93***	2.72***
	[0.29]	[0.21]	[0.18]	[0.18]	[0.18]
60 – 69	5.10***	4.37***	4.55***	4.50***	4.36***
	[0.24]	[0.21]	[0.15]	[0.15]	[0.20]
70+	7.96***	6.72***	7.47***	7.33***	6.81***
	[0.27]	[0.21]	[0.24]	[0.25]	[0.23]
Year-Month × Grid × Purchaser Type FE	Y	Y	Y	Y	Y
Tract FE	-	Y	-	-	-
Lender FE	-	-	Y	-	-
Lender × Year-Quarter FE	-	-	-	Y	-
Lender × Tract FE	-	-	-	-	Y
Observations	2,323,816	2,321,462	2,323,741	2,322,500	1,670,880
R-squared	0.88	0.89	0.89	0.91	0.93

Table B30: Age and Raw Coupon Rate on Two-Borrowers Mortgages – LLPA Grid Regressions

This table reports OLS regression results where coupon rate is regressed on age group indicator variables. The sample is composed of mortgages that have two borrowers that were sold to Fannie Mae or Freddie Mac. The dependent variable is the coupon rate on the mortgage reported in basis points. Columns 1 through 3 report results for refinance mortgages. Columns 4 through 6 report results for home purchase mortgages. Columns 1 and 4 report results for age group indicator variables constructed using the minimum age between the two borrowers. Columns 2 and 5 report results for age group indicator variables constructed using the maximum age between the two borrowers. Columns 3 and 6 report results for age group indicator variables constructed using the average age between the two borrowers. The reference group is composed of mortgages associated with borrowers with ages between 18 and 24 years old. Refer to Appendix A for a detailed discussion of control variables and variable definitions. Heteroskedasticity-robust standard errors are clustered at the lender level. *, **, and *** denote 10%, 5%, and 1% statistical significance levels, respectively. Data source: CHMDA.

	(1)	(2)	(3)	(4)	(5)	(6)
25 – 29	-1.47***	0.43	-0.56	-2.31***	-1.10***	-1.11***
	[0.39]	[0.68]	[0.52]	[0.27]	[0.29]	[0.27]
30 – 39	-2.88***	-1.47*	-2.19***	-3.09***	-1.94***	-1.45***
	[0.50]	[0.77]	[0.61]	[0.31]	[0.36]	[0.32]
40 – 49	-1.60***	-0.79	-1.06*	-1.04***	-0.15	0.92***
	[0.53]	[0.73]	[0.58]	[0.33]	[0.37]	[0.33]
50 – 59	-0.22	0.94	0.47	1.65***	2.77***	3.24***
	[0.59]	[0.69]	[0.56]	[0.29]	[0.35]	[0.32]
60 – 69	0.78	1.78**	1.39*	4.16***	5.12***	5.86***
	[0.85]	[0.75]	[0.72]	[0.32]	[0.35]	[0.35]
70+	2.29**	3.23***	2.92***	7.15***	7.71***	8.80***
	[0.97]	[0.88]	[0.90]	[0.38]	[0.39]	[0.40]
Sample	Refi	Refi	Refi	Purchase	Purchase	Purchase
Age Group Definition	Min	Max	Avg	Min	Max	Avg
Year-Month × Grid × Purchaser Type FE	Y	Y	Y	Y	Y	Y
Observations	1,250,086	1,250,086	1,250,086	1,552,633	1,552,633	1,552,633
R-squared	0.8	0.8	0.8	0.88	0.88	0.88

Table B31: Age and Gross Origination Fee – Two-Borrowers Mortgages

This table reports OLS regression results where gross origination fee is regressed on age group indicator variables. The sample is composed of mortgages that have two borrowers. The dependent variable is origination fee plus lender credit, expressed as basis points of loan amount. Columns 1 through 3 report results for refinance mortgages. Columns 4 through 6 report results for home purchase mortgages. Columns 1 and 4 report results for age group indicator variables constructed using the minimum age between the two borrowers. Columns 2 and 5 report results for age group indicator variables constructed using the maximum age between the two borrowers. Columns 3 and 6 report results for age group indicator variables constructed using the average age between the two borrowers. The reference group is composed of mortgages associated with borrowers with ages between 18 and 24 years old. Refer to Appendix A for a detailed discussion of control variables and variable definitions. Heteroskedasticity-robust standard errors are clustered at the lender level. *, **, and *** denote 10%, 5%, and 1% statistical significance levels, respectively. Data source: CHMDA.

	(1)	(2)	(3)	(4)	(5)	(6)
25 – 29	0.79	1.75*	1.05	0.66**	2.05***	1.67***
	[0.74]	[1.04]	[0.84]	[0.28]	[0.40]	[0.35]
30 – 39	2.88***	4.34***	3.32***	1.49***	3.27***	2.96***
	[1.09]	[1.36]	[1.15]	[0.37]	[0.48]	[0.42]
40 – 49	2.92**	4.65***	3.57**	1.46***	3.79***	3.31***
	[1.43]	[1.65]	[1.45]	[0.47]	[0.56]	[0.53]
50 – 59	3.81**	5.10***	4.22***	1.50***	4.08***	3.35***
	[1.63]	[1.74]	[1.61]	[0.56]	[0.60]	[0.61]
60 – 69	4.98**	6.53***	5.82***	1.86**	4.46***	3.49***
	[2.22]	[2.25]	[2.21]	[0.73]	[0.75]	[0.79]
70+	5.72**	7.67***	6.41***	1.51*	4.09***	3.31***
	[2.48]	[2.56]	[2.48]	[0.79]	[0.85]	[0.85]
Sample	Refi	Refi	Refi	Purchase	Purchase	Purchase
Age Group Definition	Min	Max	Avg	Min	Max	Avg
Controls	Y	Y	Y	Y	Y	Y
Tract × Month FE	Y	Y	Y	Y	Y	Y
Lender × Year-Quarter FE	Y	Y	Y	Y	Y	Y
Observations	2,455,150	2,455,150	2,455,150	3,225,867	3,225,867	3,225,867
R-squared	0.49	0.49	0.49	0.5	0.5	0.5