SOCIAL STRATIFICATION IN THE MORTGAGE MARKET POST THE GREAT RECESSION

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ABSTRACT

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My dissertation aims to expand our understanding of social stratification in the mortgage market post the Great Recession (2010 to 2017) and assesses the relationship between mortgage loan outcomes and interracial couples, Latino racial groups, and the intersection of gender and race/ethnicity. This dissertation draws on annual data from the Home Mortgage Disclosure Act (HMDA) to assess ethno-racial disparities in loan outcomes after the Great Recession. I show in my first paper that the relative social position of Latinos is significantly impacted by the incorporation of interracial couples in the mortgage market. In my second paper, I examine racial stratification among Latino mortgage applicants and compare these borrowers to Non-Latino racial groups. And in my third paper, I show that women of color are especially vulnerable and are severely disadvantaged in the mortgage market. In conclusion, my three papers describe the structural barriers minorities face in the mortgage market as well as the social position of different ethno-racial groups by incorporating interracial couples, Latino racial groups, and the intersection of gender and race/ethnicity.

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INTRODUCTION

My dissertation aims to extract a deeper understanding of social stratification in the mortgage market post the Great Recession (2010 to 2017) and examines the relationship between mortgage loan outcomes and interracial couples, racial disparities among Latinos, and the intersection of gender and race and ethnicity. I argue that in order to understand the social hierarchy in the housing market, research must include growing segments of the U.S population such as interracial couples, Latinos, and women of color. Previous studies have largely ignored interracial couples when studying ethno-racial disparities amongst couples in the mortgage market. Rather than assuming homogenous ethno-racial partnerships, I investigate mortgage disparities across different interracial couplings. In my second paper, I examine racial stratification among Latino mortgage applicants and compare these borrowers to Non-Latino racial groups. Rather than treating Latinos as a homogeneous group, I take advantage of the racial diversity among Latinos and examine mortgage outcomes across racial groups. Finally, in my third paper, I focus on disparate mortgage loan outcomes by examining the intersection of gender and race and ethnicity, across single applicants and co-applicants. Instead of examining gender or ethno-racial differences in the mortgage market separately, I examine the complex interaction of gender and race and ethnicity in order to focus on the additional barriers women of color face in obtaining mortgage credit.

There are two prevailing theories used to explain social stratification in homeownership. First, the human capital and demographic perspective expects homeownership to reflect differential tastes and preferences based on life-cycle characteristics such as age, marriage, and childbearing, subject to financial and economic

constraints. Homeownership is shaped by human capital and economic characteristics and as a result, it is more available to those with more resources such as those with higher income and education, with a professional or technical profession, and among those that are married and have a family (Carruthers and Kim 2011; Dwyer 2007; Faber and Ellen 2016; Kuebler and Rugh 2013). Previous studies show that socio-demographic characteristics account for a large share of the homeownership disparities across different groups.

The second perspective is the social stratification and discrimination perspective. Large differences in homeownership rates across groups remain even after accounting for economic and demographic characteristics (Flippen 2001; Kuebler and Rugh 2013). More specifically, previous studies in housing focus on ethno-racial, class, and gender stratification. As demonstrated in quantitative and qualitative analysis, minorities are regularly steered into predominantly lower income neighborhoods, communities of color, and often receive lower quality service throughout the homebuying process (Massey et al. 2016; Ross and Turner 2005). The discrimination faced by minority applicants often leads to application withdrawals, higher fees, and outright rejection in the mortgage process (Faber 2013; Fry and Brown 2016; Hwang, Hankinson, and Brown 2015). Minority borrowers are more likely to receive high cost loans and loans with less favorable terms compared to their white counterparts (Anacker and Carr 2011; Bayer, Ferreira, and Ross 2018). In addition to individual level discrimination, housing inequality is highly spatialized. Communities of color have lower property values, lower quality housing, and higher levels of rental units, thus reducing investment and local tax revenue in the area (Carter 2012; Flippen 2004).

Government intervention to reduce discrimination in the sale, rental, and financing of housing came in the form of the Fair Housing Act of 1968 and the Community Reinvestment Act (CRA) in 1977. Both major pieces of legislation were intended to combat "redlining" by financial institutions. First, the Fair Housing Act outlawed deliberate discrimination in the housing market. Second, the CRA mandated that financial institutions with a national charter offer banking and loan products to low- and moderate- income communities. In addition, a key element of the CRA is the collection of information on all loan applications including borrower, institutional, and property characteristics which is used to monitor loan discrimination. This information is also released to the public through the Home Mortgage Disclosure Act (HMDA).

Homeownership rates have steadily increased from the 1960s until about 2006 across ethno-racial and gender groups, in part due to the policy and deregulation of the mortgage industry. However, the increase in homeownership among minorities was largely due to the changes in loan products offered by lenders. In the 1990s, deregulation and the expansion of mortgage-backed securities in the financial market led to a massive rise in high cost lending. Investors were incentivized to purchase home loan portfolios because it was argued that by pooling mortgage loans and spreading risk across investors, the returns to these investment products would be consistent and stable over time. In addition, many of the mortgages were guaranteed by the federal government through quasi-independent mortgage entities, Fannie Mae and Freddie Mac. The increased levels of high cost loans provided homeownership opportunities across a wider distribution of incomes. Because of the this, growth in homeownership for blacks, Latinos, and women

was more pronounced during the housing boom than it was for whites and men (Baker 2014; Bayer, Ferreira, and Ross 2016).

The sharp increase in high cost lending shifted ethno-racial disparities in the housing market from outright denials to more costly and unsustainable mortgage loans. In the year prior to the Great Recession (2007-2009), 54 percent of black and 47 percent of Latino homebuyers received a high cost loan, compared to only 18 percent of white borrowers (Avery, Brevoort, and Canner 2007; Immergluck 2010). Also, minority applicants were more likely to steered into a high cost loan even though they would have qualified for a low-cost conventional mortgage (Dymski, Hernandez, and Mohanty 2013). In addition to targeting minority individuals with high cost loans, communities of color were disproportionately impacted by these lending products. The growth of high cost lending was negatively correlated with income growth in the neighborhood (Mian and Sufi 2009), and positively correlated with neighborhoods that had a larger proportion of black and Latino residents (Mayer and Pence 2008).

The 2007 housing collapse and Great Recession disproportionately affected marginalized households and communities. Minority households faced steeper wealth declines as black and Latino homeowners were more likely than whites to owe more on their homes than it was worth (Faber and Ellen 2016). In addition, foreclosures were heavily concentrated in lower income and minority neighborhoods, many of which had higher levels of high cost loans (Hwang et al. 2015; Schuetz, Been, and Ingrid Gould 2008). The increase in foreclosures further cemented residential segregation between minorities and whites (Charles 2003; Rugh, Albright, and Massey 2015; Rugh and Massey 2010).

Ultimately access to mortgage credit declined significantly as a result of the Great Recession and the new regulation on mortgage underwriting of financial institutions (Krainer and McCarthy 2014). As such, high cost loan products all but disappeared in the year following the housing collapse and have remained at low levels in subsequent years (Acolin et al. 2016; Loya and Flippen 2020). The health of the U.S. housing market has steadily improved since the Great Recession, but potentially new forms of discrimination in the housing market require constant monitoring and evaluation.

The housing boom, from 2002 to 2006, was being propped up by high cost loans and unstable housing prices. The housing market during the Great Recession, 2007 to 2009, was marked with falling home prices and a contraction of available mortgage credit. The years following the Great Recession is an ideal time period to examine the mortgage market because financial institutions were lending once again, as their loan portfolios grew at about 6 percent per year (Estenssoro and Cissi 2015). Lending standards and regulation from the Great Recession remain and have limited the role of predatory lending in the form of subprime and high cost loans. Thus, my dissertation adds to the current literature on social stratification in the housing market, by examining mortgage loan disparities across and among different sub-groups from 2010 to 2017.

To address my research questions related to interracial couples, Latinos, and the intersection of race and ethnicity and gender in mortgage loan outcomes, I primarily draw on publicly available data from the Home Mortgage Disclosure Act (HMDA) for the years 2010 through 2017. As part of the CRA requirement to monitor lending and investments in low-income and minority neighborhoods, all national chartered financial institutions are required to submit HMDA information. The HMDA dataset is comprised

of a record for every loan application received, including primary borrower, co-borrower, institutional, loan, and property characteristics. In addition, the HMDA dataset covers 80 percent of all originated mortgages, thus making it a broadly representative sample of home lending in the United States (Avery et al. 2007). Finally, HMDA is the only publicly available mortgage dataset that contains borrowers' race and ethnicity, gender, and applicant neighborhood (Bradford 2002).

By examining the importance of the ethno-racial composition of co-applicants, racial disparities among Latinos, and the intersection of gender and race and ethnicity, I challenge the assumptions that all couples are ethno-racially homogenous, that Latinos are racially similar, and that ethno-racial stratification is consistent by gender. My work describes how previous studies of ethno-racial stratification in the housing market have under-reported ethno-racial inequality because they do not consider the ethno-racial variation among couples, they have racialized Latinos, and they have excluded women of color.

Paper 1: Ethno-Racial Stratification in the Mortgage Market: The Role of Co-applicants

Having a dual income and credit is becoming more important as home prices continue to increase. As a result, the proportion of co-applicants in the mortgage market has continued to grow over time (Loya and Flippen 2020). In addition, ample research shows that large ethno-racial disparities exist in access and outcomes throughout the mortgage process at both the individual and neighborhood levels. However, these

previous studies have assumed that couples applying for a mortgage are ethno-racially homogenous. It is unclear how our view of ethno-racial stratification would change when considering the race of both applicants in the mortgage market.

I show significant racial and ethnic disparities in loan outcomes when considering the ethno-racial identity of the co-applicant. More specifically, couples with a black or Latino co-applicant are substantially more likely to experience an adverse loan outcome than couples with white or Asian co-applicants, net of the primary borrower's race and ethnicity. Finally, I further discuss the large loan outcome variation across and within ethno-racial groups and the implications that these results have on ethno-racial stratification in the U.S.

Paper 2: Racial Stratification among Latinos in the Mortgage Market

Studies on inequality in the mortgage industry have long focused on loan outcomes between different ethno-racial groups. However, most of these studies have primarily focused on white and black home seekers and when they have included Latinos, they have been examined as a separate ethno-racial group. Racializing Latinos in these studies can be potentially problematic, as Latinos are a racially diverse ethnic group. As such, I assess variation in racial disparities on loan outcomes among Latino applicants and compare their experiences to non-Latino racial groups.

In my second paper, I show that loan rejections and high cost originations are highest among black Latinos and that they experience similar adverse loan outcomes as non-Latino blacks. White and Asian Latinos generally outperform the other Latino groups in the mortgage market. However, white and Asian Latinos are disadvantaged

relative to their non-Latino counterparts. Loan outcomes among other-race Latinos is mixed as they generally underperform white and Asian Latinos and outperform black Latinos. Finally, the paper discusses the implications of these distinct patterns in loan outcomes found among Latinos and across non-Latino racial groups on the ethno-racial hierarchy in the U.S.

Paper 3: Gender and Ethno-Racial Disparities in Access to Mortgage Credit

Previous research discusses the unequal treatment and discrimination minority and women face in the mortgage market. Most of these studies have focused on single person applicants and have considered race and ethnicity and gender separately, while largely ignoring the dynamic intersection of these characteristics. It is unclear what the mortgage loan disparities are when examining the intersection of gender and race and ethnicity across applicant types.

In my final paper, I assess gender and racial and ethnic disparities in loan outcomes. Among single applicants, I show that women generally outperform men in the mortgage market. However, among mixed sex couples, I show that women and minority headed couples are more likely to experience an adverse loan outcome compared to male- and white- headed couples. In addition, the gender gap for mortgage loan outcomes is substantially larger among black and Latino couples than white couples. This is particularly true for black women and Latinas being denied a mortgage. I discuss the implications for gender and ethno-racial stratification as I detail the troubling mortgage lending outcomes of minority women.

Conclusion

In conclusion, my dissertation aims to understand the nuance of social stratification in the mortgage market after the Great Recession. As the U.S. continues to promote homeownership as a wealth generating vehicle and as an opportunity for upward social mobility, mortgage access remains a major challenge for minorities. My dissertation sheds light on the persistence of inequality and structural barriers minorities face in the mortgage market. I show how segments of the U.S. population, such as the growing importance of interracial couples, Latinos, and women, are marginalized in the mortgage market. By examining these sub-groups, I add to the breadth of research on social stratification in housing and expand knowledge on the U.S social hierarchy more broadly.

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Ethno-Racial Stratification in the Mortgage Market: The Role of Co-applicants

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Abstract

Unequal access to homeownership has long been central to ethno-racial stratification. Ample research demonstrates large ethno-racial disparities that exist in access and outcomes throughout the mortgage process at both the individual and neighborhood levels. However, the underlying assumption in most of these studies is that the couples applying for a mortgage are ethno-racially homogenous. It is unclear what the ethno-racial stratification is, when examining different ethno-racial couples. This paper draws on annual data from the Home Mortgage Disclosure Act (HMDA) from 2010 to 2017 to assess variation in ethno-racial disparities in loan outcomes associated with different ethno-racial couplings. I show that racial and ethnic disparities in loan outcomes vary tremendously when factoring the ethno-racial identity of the co-applicant. Inter-racial couples involving a white applicant and a black or Latino partner are more likely to experience an adverse loan outcome than mono-racial white couples. This is not the case for Asian co-applicants. In particular, applications that have a black or Latino co-applicant are disproportionately channeled into high cost loans, while Asian applicants perform on par with whites. This pattern of racial hierarchy differs when examining mortgage denials. More specifically, the performance of Asian applicants differs depending on the ethno-racial classification of their partner. In addition, large variation exists between and within ethno-racial couples that support and challenge the fluidity of ethno-racial stratification in housing.

Introduction

Homeownership is the cornerstone of financial security for most Americans, especially for blacks and Latinos. The ethno-racial disparities in access to homeownership is a major part of inequality (Oliver and Shapiro 2006), as black and Latino households are unable to access federal, state, and municipal housing subsidies, tax-favored form of investment, contributing to ethno-racial disparities in tax liabilities and inheritance that perpetuate inequality today and across generations. In addition to wealth benefits, homeownership is also associated with neighborhood amenities such as better public schools, lower crime, and increased social networks (Charles 2003; Massey 2005; Yinger 1995). Equal access to homeownership remains elusive, despite decades of anti-discrimination laws and regulation. Since 2016, the homeownership rate for Non-Hispanic whites (hereafter "whites") has hovered around 73 percent, 57 percent for Asians, 46 percent and 42 for Hispanics (hereafter "Latinos") and Non-Hispanic blacks (hereafter "blacks") (Callis and Kresin 2016; Joint Center for Housing Studies of Harvard University 2016). In addition, the 2007 recession and its aftermath had impeded the convergence of homeownership convergence across ethnic and racial groups. For African Americans, homeownership rates were lower in lower in 2016 than in 1994 and disparities with whites has only grown larger (Joint Center for Housing Studies of Harvard University 2016).

Disparate homeownership access across ethnic and racial groups is strongly linked to ethno-racial inequality even after accounting for economic and preferential differences. The mortgage industry has a long history of racial and ethnic discrimination. Audit studies continue to demonstrate poor treatment of black and Latino loan applicants,

who are more likely to be steered into poorer neighborhoods and smaller and more expensive loans than similar whites (Massey 2005; Squires 2007; Stuart 2003; Williams, Nesiba, and McConnell 2005). While the levels of discrimination have fallen across multiple decades due to laws and regulations such as the Fair Housing Act of 1968 and Community Reinvestment Act of 1977, unequal treatment remains (Ross and Turner 2005; Turner et al. 2002; Yinger 1995). More specifically, the shift from outright denials to receiving high cost loans, continued to cost minority borrowers in the housing market prior to the 2007 housing crisis (Faber 2013; Jacob William Faber 2018; Weller 2010).

Concurrent with unequal access to homeownership at the individual level is the relationship between loan outcomes and neighborhood ethno-racial composition. "Redlining" and other systematic practices were used to deny credit opportunities to communities of color for much of the 20th century. Even with targeted legislation stemming from the Civil Rights Movement, research has documented the continued troubles of spatially and ethno-racial targeted discrimination. Communities of color absorbed the bulk of high cost lending, during the subprime boom, with lenders targeting minorities specifically during the 1990s and 2000s. Subprime lending accounted for as much as 50 percent of homeownership growth during the housing boom (Williams et al. 2005). Because of this inequality, the 2007 housing crisis disproportionately fell on communities of color (Faber 2018; Faber 2018; Immergluck 2011).

Research on ethno-racial disparities in homeownership has primarily focused on ethno-racially homogenous applicants ignoring the increase in interracial couples across ethnic and racial groups. This growing segment of the U.S. population adds an additional dimension in studying ethno-racial inequality. The growth of interracial couples and

marriages has been on the rise since the late 1960s (Pew Research Center). In 2016, interracial marriages accounted for one in twelve marriages (Lee and Bean 2016). As the number of interracial couples continues to increase, it is important to understand how these couples are being racialized and performing in the mortgage market. In addition, the increase of interracial couples is not uniform across ethno-racial groups. For instance, more than 25 percent of Asian and Latino marriages are among interracial couples, and mostly marrying whites (Lee and Bean 2007). On the other hand, less than 10 percent of white and black marriages are with a partner of another race (Lee and Bean 2007). Thus, measures of ethno-racial disparities in housing must also account for the ethno-racial variation among co-applicants, as the proportion of co-applicants is growing and becoming a significant part of the mortgage applicant pool (Loya and Flippen 2020).

Accordingly, in this paper I draw on the Home Mortgage Disclosure Act (HMDA) from 2011 to 2017 to examine ethno-racial variation in mortgage application outcomes, taking into consideration the race and ethnicity of both the primary and secondary applicants (Among completed applications with 2 applicants). My main objective is to examine the ethno-racial stratification in the mortgage market when including the ethno-racial identity of the co-applicant in the mortgage market. I also detail demographic, economic, loan, and locational characteristics of the various ethno-racial combinations across mortgage applicants. And finally, I also examine the inter-related impact of the primary applicant's race and ethnicity and the secondary applicant's race and ethnicity on application outcomes. The results highlight that interracial couples perform differently when compared to their ethno-racially homogenous counterparts. More specifically, applicants with a black or Latino co-applicant underperform couples

with a white co-applicant, while the loan outcomes for couples with an Asian co-applicant are mixed. This provides a more nuanced view of a ethno-racially stratified home mortgage market and suggests that previous analyses have underestimated the salience of race and ethnicity in mortgage outcomes.

Theoretical background

The broad theoretical perspectives in understanding racial and ethnic disparities in homeownership focus on demographic and human capital differences across groups and on discrimination and ethno-racial stratification. Neoclassical economic theories expect homeownership to reflect tastes and preferences based on life-cycle characteristics such as age, marriage, and childbearing, subject to financial and employment constraints. As a result, homeownership is shaped by human capital and financial characteristics, and is often more available to those with more resources such as those with higher levels of income, education, with a professional career, and among those who are married and have children (Dwyer 2007; Dwyer et al. 2016; Flippen 2004; Hodson, Dwyer, and Neilson 2014). In fact, socio-demographic characteristics account for a large share of the homeownership rate differences among racial and ethnic minority groups (Flippen 2001b).

However, large differences in homeownership remain even after accounting for economic and demographic characteristics thus emphasizing the importance of ethno-racial stratification and discrimination in housing inequality (Faber and Ellen 2016; Flippen 2010; Haurin, Herbert, and Rosenthal 2007; Rugh and Douglas S. Massey 2010; Schuetz, Been, and Ingrid Gould 2008). As demonstrated in audit studies, minority

buyers are regularly steered into predominantly minority communities and will receive lower quality service throughout their home buying experience (Turner et al. 2002; Yinger 1998). The discriminatory treatment of minorities often leads to application withdrawals, poor service, and steering into lower income and less desirable neighborhoods (Yinger 1998). Also, minority borrowers are more likely to receive high cost loans and loans with less favorable terms (Bayer, Ferreira, and Ross 2018; Evans, Blount-Hill, and Cubellis 2019). In addition to studies of individual discrimination, homeownership also impacts the spatial organization of groups and levels of residential segregation between white and non-white neighborhoods. More specifically, minority neighborhoods have lower quality housing and property values, thus reducing investment and government amenities in the area (Adelman 2005; Dwyer and Phillips Lassus 2015; Flippen 2001a; Kain and Quigley 1975).

In order to combat ethno-racial discrimination in the sale, rental, and financing of housing, the Fair Housing Act of 1968 was passed. In addition, Congress passed the Community Reinvestment Act (CRA) in 1977 to reduce discriminatory practices, like "redlining", by institutional financial lenders. The CRA mandates that financial institutions offer banking and lending products to low- and moderate-income communities. A key element to the CRA is the collection of information on all loan applications including borrower, institutional, and property characteristics which is available to the public through the Home Mortgage Disclosure Act (HMDA).

Homeownership rates steadily increased from the 1960s to the mid 2000s across ethno-racial groups. However, much of the homeownership growth among minorities was due to the changes in loan products offered by financial institutions. In the 1990s,

government deregulation and the expansion of mortgage-backed securities in financial market led to a rise in high cost lending. Home loan portfolios became a popular product among investors because it was argued that by pooling mortgage loans and spreading risk across investors, the returns on these investment products would be consistent and stable over time. In addition, these mortgage- backed securities increased homeownership opportunities across a wider income distribution. As a result, the rise in homeownership rates for blacks and Latinos during the housing boom (early 2000s) was more pronounced that it was for whites (Friedman and Squires 2005; Rugh and Massey 2010).

The boom in high cost lending shifted ethno-racial disparities in the housing market from outright denials to more expensive and unsustainable mortgage loans. In 2006, 54 percent of black and 47 percent of Latino homebuyers received high cost loans, relative to only 18 percent among white borrowers (Avery, Brevoort, and Canner 2007). In addition, minority applicants that would have qualified for conventional loans were often steered into high cost loans (Weller 2010). Vulnerable communities were disproportionately targeted with high cost loans in the height of the housing boom. At the zip code level, the growth of high cost lending was negatively correlated with income growth (Mian and Sufi 2009) and positively correlated in areas with higher levels of black and Latino residents (Berwick 2010; Immergluck 2011; Mayer and Pence 2008).

As a result, the 2007 housing collapse and recession disproportionately affected minority households and communities. Foreclosures were highly concentrated in minority communities with high levels of high cost lending (Anacker and Carr 2011; Anacker, Carr, and Pradhan 2012; Bayer et al. 2018; Immergluck 2011; Massey et al. 2016; Rugh, Albright, and Massey 2015). Also, the foreclosure crisis further cemented residential

segregation between minorities and whites (Hall, Crowder, and Spring 2015; Rugh and Douglas S. Massey 2010). Minorities also faced steeper economic declines as black and Latino homeowners were more likely to owe more on their home than it was worth compared to whites (Faber 2013).

Overall access to mortgage credit declined significantly as a result of the 2007 housing crisis and the subsequent regulation on underwriting conditions from financial institutions (Krainer and McCarthy 2014). The levels of high cost lending fell dramatically after the housing crisis and have remained at low levels (Bhutta and Ringo 2014). After emerging from the recession, the health of the U.S. housing market has continued to improve without major increases in high cost loans. Potentially new forms of discrimination in the housing market require constant monitoring.

The examination of ethno-racial disparities in homeownership has primarily focused on the ethno-racial identification of the primary borrower or assumed that in the case of co-applicants, the pairs are ethno-racially homogenous. As such, it is unclear how interracial couples fit as it pertains to ethno-racial inequality in the housing market. With the growth of interracial couples and the recently improved mortgage market, examining the complex interactions between a primary and secondary applicant's race and ethnicity in structuring lending patterns allows for a comparative assessment of the ethno-racial hierarchy in the form of mortgage access.

Interracial Couples and minority access to credit

The concentration of Asian and Latino households is forcing a shift in ethno-racial boundaries in certain areas of the country, while other areas continue to prove that

the traditional black-white boundary remains strong and clear. The patterns of interracial couples vary across spatial regions and gender. In locations with higher concentrations of Asians and Latinos, such as California, the level of interracial couples is also higher. In areas with small minority populations, such as West Virginia and Maine, they also exhibit small levels of interracial couples (Lee and Bean 2016). In addition, southern states that have large black populations also exhibit low levels of interracial couples (Lee and Bean 2016). As it pertains to gender dynamics and spatial location of interracial couples, interracial relationships that involve white men are associated with living in whiter neighborhoods, while relationships with a white woman are associated with residing in neighborhoods that have a higher concentration of non-whites (Wright, Holloway, and Ellis 2013).

The interpretation of inter-relationships of Asians and Latinos is critical in assessing how the ethno-racial hierarchy is shaped. Asians and Latinos can be viewed as a racialized minority (Bonilla-Silva 2004). This theory provides the necessary framework to understand the loan outcome differences across interracial couples. As a racialized minority, Asians and Latinos are closer to blacks than whites in terms of social disadvantage (Lee and Bean 2016). This study examines how each couple combination reifies, expands, or contradicts the tri-racial (white-honorary white-nonwhite) and binary (white-black) frames of racial stratification in mortgage loans outcomes (Bonilla-Silva 2004; Kim 1999). The tri-racial system of stratification argues that the traditional binary of racial hierarchy has now expanded to include new groups like Latinos and Asians (Bonilla-Silva 2004, 2013). The new group of honorary whites includes individuals that will be able to assimilate into whiteness such as light skinned Latinos and multi-racial

individuals, and most Asian groups (Bonilla-Silva 2013). Finally, the rest will fit as the collective non-white, which include blacks, dark skinned Latinos and many Southeast Asian groups (Bonilla-Silva 2013).

The impact of interracial couples on ethno-racial stratification in the mortgage market is unclear. On the one hand, positive loan outcomes among these interracial groups might suggest that disadvantages due to ethno-racial status might be fading for nonwhite groups. However, poor loan outcomes across interracial partnerships may suggest that the racialized hierarchy continues to be reified and reproduced itself in the housing market. If the loan outcomes are mixed across interracial borrowers, the structure of the racialized hierarchy may support a white-black relationship or white-non-white relationship depending on the types of ethno-racial groups involved (Bonilla-Silva 2013; Charles 2000; Lee and Bean 2016; Massey 2005).

Data and Methods

To address the issue of how the race and ethnicity of the co-borrower shape disparities in institutional mortgage outcomes after the Great Recession (2010-2017), I draw on publicly available data from the Home Mortgage Disclosure Act (HMDA) for the years 2010 through 2017. As part of the Community Reinvestment Act (CRA) mandate to monitor the services, lending, and investments in low-income and minority neighborhoods, all financial institutions with a national charter are required to submit HMDA information annually to the Federal Financial Institutions Examination Council (FFIEC). Financial institutions are examined by various tests depending on their size and strategic plan for fulfilling the needs of low-income communities. CRA-regulated

financial institutions face major sanctions, such as the inability to merge with other banks or limitations in the growth of their lending business, if they receive a poor rating from their CRA examination. These potential penalties are expected to dampen discrimination against minority borrowers and boost lending in low-income areas (Friedman and Squires 2005).

The HMDA dataset is comprised of a record for every loan application received, including primary borrower, co-borrower, institutional, loan, and property characteristics. Borrower characteristics include demographic and income information, while institutional characteristics include the name of the lender, loan status, and type of loan originated. The loan characteristics include loan amount, type, purpose of the loan, outcome of the application, reason for denial, and high cost loan indicators. Property characteristics include the property type, and census tract identifier.

One important limitation of the public HMDA dataset is that it lacks information on the borrower's marital status, credit score, the down payment amount, sale price of the home, and the exact interest rate of the loan. In spite of these limitations, the HMDA dataset is a broadly representative sample of home lending in the United States, covering 80 percent of all originated mortgages (Avery et al. 2007). In addition, HMDA is the only public national mortgage dataset that includes borrowers' race and ethnicity and application neighborhood (Bradford 2002). As such, it is by far the most commonly used source of information on ethno-racial disparities in access to mortgage credit.

I restrict the HMDA sample to non-institutional two-person applicants requesting financing for owner-occupied single-family homes (1-4 units) in the United States, through a conventional or jumbo mortgage (i.e., Veteran's Association and re-finance

applications are not included). In addition, only borrowers that completed their application and were vetted by their primary lender are considered. That is, mortgages that were bought by other financial institutions and recorded in the HMDA dataset are excluded, because they were already documented as a mortgage transaction by the initial financial institution. In addition, I employed list-wise deletion for observations containing missing data. Previous evaluations of the issue of missing data in HMDA have shown that data quality improved dramatically after 2003, when reporting rules and guidelines were made more stringent. While missing values hinder analyses of re-financing loans applications, they are generally not a concern for mortgage origination observations (Faber 2013). Our analysis ends with 2017 because this is the last year for which the completed data file is available. Finally, I restrict the sample to primary and secondary applicants that are white, black, Latino, and Asians, excluding American Indians, and Native Hawaiians due to small sample sizes in certain regions within the United States.

In addition to using HMDA data from 2010 to 2017, this study also uses locational data from the Bureau of Labor Statistics, Federal Housing Finance Agency, and private data from Experian Credit Company. Annual county-level unemployment rate data from 2010 to 2017 was used from the bureau of labor statistics. List-wise deletion was used for counties without an unemployment rate for any given year. The Federal Housing Finance Agency measures housing prices across the country through the quarterly housing price index. The housing price index captures the volume and sales price of homes within a Metropolitan Statistical Areas (MSA). The index begins at 100 and rises accordingly. For this study, the quarterly results of the housing price index were aggregated annually from 2010 to 2017 and list-wise deletion was used for any missing

observations. Finally, I used the 2010 average Experian credit score for the top 100 MSA's in the country. The top 100 MSA's were determined by the population size of the MSA as determined by the 2010 Census. The Experian average credit scores include all borrowers and their different credit accounts within a given MSA.

The dataset after adjusting, merging, and using list-wise deletion in this study contains roughly 3.95 million completed mortgage applications from 2010 to 2015. Due to the massive size of the dataset, I took a stratified sample of approximately a 150 thousand observations based on ethno-racial groups of both the primary and secondary borrowers to conduct the descriptive and multivariate analysis. Ultimately, 30 percent of the dataset was randomly selected for most pairs but for ethno-racial pairs that were significantly over-represented only 1.5 percent was selected. The pairs that were significantly over-represented include ethno-racially homogenous pairings such as white primary borrowers with a white co-applicant, a black primary borrower with a black co-applicant, a Latino primary borrower with a Latino co-applicant, and an Asian primary applicant with an Asian co-applicant. Several different stratified samples were used to verify consistent results from the multivariate analyses.[1]

Model specification

The dependent variable for this analysis is the outcome of the completed loan application, based on information provided from the Federal Financial Institutions Examination Council and the Consumer Financial Protection Bureau

[1] The stratified samples that were tested included sampling based on equal and unequal counts and proportions across ethno-racial pairings. The results produced using these various samples were consistent with the results shown.

(http://www.ffiec.gov/hmda) (http://www.consumerfinance.gov/hmda). There are four possible outcomes to all applications: they can be granted a conventional loan, approved for a high cost loan, denied a mortgage due to bad credit, or denied a mortgage due to other reasons.

First, I define a high cost loan. High cost loans are defined as any loan originated with an above-market annual percentage interest rate (APR). After 2009, a mortgage loan is flagged as a high cost loan in HMDA when the APR is 1.5 points higher than the survey-based (Freddie Mac Mortgage Market Survey) APR estimate currently offered on comparable prime mortgage loans. HMDA only provides information on accepted or offered high cost loans, thus there is no data on high cost loan rejections.

Once I designate a high cost loan, I define conventional loans as all originated or offered loans that are not high cost. For denied mortgage loans, the HMDA dataset contains information on reasons for denial. I distinguish between denials in two ways. First, mortgage denials that reflect bad credit or "credit-worthiness," include reasons such as high debt to income ratio, employment history, credit history, insufficient collateral, and insufficient cash. The second type of mortgage denial includes those that are listed as denials for "other" reasons. The end result is a dependent variable distinguishing between conventional loan approvals; high cost loan approvals, bad credit denials, and other denials. This specification allows us to test for ethno-racial disparities for different loan types and the economic and non-economic reasons for a loan denial.

The primary independent variables of interest relate to the race and ethnicity of the primary borrower and co-borrower. These variables are defined by the race and ethnicity of the primary borrower of the loan application and the race and ethnicity of the

co-borrower. In the multivariate setting, I interact the race/ethnicity of the primary borrower and the ethno-racial composition the co-applicant, distinguishing between white primary borrowers with a white co-applicant, white primary borrowers with a black co-borrower, and so on. Moreover, to ensure that my measure of ethno-racial disparities across and among ethno-racial groups is not reflecting the demographic and economic variation across applicants and neighborhoods, I also control locational characteristics of the property.

Finally, I control for the demographic and economic characteristics of the borrowers, including gender of both the primary and secondary borrowers, and the total income of applicants (distinguishing between nine categories rising in $25,000 increments, with incomes below $25,000 being the lowest and $200,000 and above being the highest). Property characteristics include the loan amount (divided into nine categories with less than $100,000 being the lowest and $800,000 and above being the highest) and U.S. region in which the property is located, as defined according to Census guidelines (http://www2.census.gov/geo/docs/maps-data/maps/reg_div.txt). In addition, I control for the percent of Non-Hispanic whites in the census tract (distinguishing between those neighborhoods with less than 25 percent white; 25 percent to 50 percent white; 50 percent to 75 percent white; and above 75 percent white). I also control for the mean household income of the census tract in which the property is located (distinguishing between those with a median income of less than $50,000; $50,000 to $60,000; $60,000 to $80,000; and a median income above $80,000). The additional controls for location characteristics include annual average county unemployment rate, annual average MSA housing price index, and the 2010 average MSA credit score.

Analytic strategy and methods

The first step in my analysis is to provide descriptive statistics of completed mortgage applications. Second, I show the bivariate relationship between mortgage outcomes by race and ethnicity of primary and secondary applicants. Finally, I assess a multivariate analysis using a multinomial multi-level hierarchal linear model (HLM) on the loan outcome (acceptance into a conventional loan (reference), acceptance into a subprime loan, a mortgage denial due to poor credit, and a mortgage denial due to other reasons). The model examines ethno-racial differences between primary and secondary borrowers controlling for observed individual, neighborhood, and locational characteristics.

Homeownership research is challenging because the process of obtaining a mortgage depends on assessing risk at both the individual and neighborhood levels (Massey 2005; Sharkey and Faber 2014). The two-level hierarchal linear model for multinomial outcomes, also known as a multi-level random effects model, takes advantage of the hierarchical nature of the HMDA data structure. In this study, applicants are nested within the neighborhoods the property they are applying to are located in. The nested nature of HMDA provides HLM a tremendous advantage over the use of a conventional logistic OLS regression.

The benefits of using a hierarchal linear model include improving estimation of effects within individual units, the testing of hypotheses in regards to cross-level effects, and the portioning of variance and covariance components among levels (Raudenbush and Bryk 2002; Skrondal and Rabe-Hesketh 2004). HLM is able to efficiently use all the

covariates in the dataset and provide separate prediction equations for white, black, Latino, and Asian primary borrowers across the race and ethnicity of the co-borrowers. The coefficients produced using HLM are subject-specific rather than population averages coefficients, which is helpful because this study is concerned with ethno-racial disparities at the individual level. In addition, HLM is able to identify differentiating effects from one level to the next, thus allowing for the variability in the higher levels to effect the estimated parameters at the individual level (Raudenbush and Bryk 2002). Finally, HLM draws on the estimation of variance and covariance components with unbalanced, nested data (Long and Freese 2014).[2] The HLM is limited however, as it is computationally intensive and is not suited to successfully execute complicated models using datasets above 150 thousand observations.

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[2] The notation of the multi-level hierarchal linear model used in this study is:

$$Level\ 1\text{:}$$

$$\log\left[\frac{\rho_{ij}}{1-\rho_{ij}}\right] = \beta_{0j} + \beta_{1j}X_{1ij} + \beta_{2j}X_{2ij} + \ldots + \beta_{Qj}X_{Qij} + r_{ij}$$

$$= \beta_{0j} + \sum_{q=1}^{Q}\beta_{qj}X_{qij} + r_{ij} \text{ where } r_{ij} \sim N(0,\sigma^2),$$

I denote the outcome for person *i* in neighborhood (census tract) *j as* $\log\left[\frac{\rho_{ij}}{1-\rho_{ij}}\right]$. This outcome is represented as a function of individual characteristics, X_{qij}, and a model error r_{ij}. The regression coefficients $\beta_{qj}, q = 0, \ldots, Q$, indicate in neighborhood j as a function of the measured person characteristics (Long and Freese 2014; Raudenbush and Bryk 2002).

$$Level\ 2\text{:}$$

$$\beta_{qj} = \gamma_{q0} + \gamma_{q1}W_{1j} + \gamma_{q2}W_{2j} + \ldots + \gamma_{qs_q}W_{s_qj} + u_{qj}$$

$$= \gamma_{q0} + \textstyle\sum_{s=1}^{S_q}\gamma_{qs}W_{sj} + u_{qj} \text{ for each } q = 0, \ldots, Q\ ,$$

Where, a unique set of predictors $W_s\ (\mathrm{s} = 1, \ldots, S_q)$ may be specified for each β_q.

The effects for each neighborhood, captured in the set of β_{qj}s vary across units. Each β_{qj} is an outcomes variable that depends on a set of neighborhood-level variables, W_{sj}, and a unique neighborhood effect, u_{qj}. The γ_{qs} coefficients capture the influence of neighborhood variables, W_{sj}, on the within-neighborhood relationships represented by β_{qj}.

Descriptive Results

Figure 1 presents my dependent variable, the outcome of completed loan applications, by race, ethnicity of the primary borrower and co-borrower. The figure clearly shows large ethno-racial disparities in application outcomes across and within ethno-racial groups. Across primary ethno-racial groups, black and Latino primary loan applicants were less likely to be approved for a conventional loan, more likely to be approved for a high cost loan, and more likely to have their application denied both due to bad credit and other reasons. On the other hand, Asian applicants seem to perform like whites on all these loan outcomes.

The figure also highlights dramatic ethno-racial differences among primary ethno-racial groups. Regardless of the ethno-racial identity of the primary applicant, black and Latino co-applicants have the lowest levels of receiving a conventional loan and are more likely to obtain a high cost loan. For instance, among white primary borrowers, over 90 percent of applicants with a white co-borrower obtained a conventional loan while, only 85 percent of applicants with a black or Latino co-borrower were offered a conventional loan. The five-point difference between white, and black and Latino co-borrowers seems to be due to the increased proportion of high cost loans black and Latino co-borrowers receive. Primary applicants with an Asian co-applicant appear to perform slightly better than white co-applicants.

Denials due to bad credit and other reasons show a marked variation by race and ethnicity. Across ethno-racial groups, whites and Asians are less likely to be denied for bad credit than black and Latino primary borrowers. Among ethno-racial groups, black

and Latino co-borrowers have higher levels of being rejected for bad credit. Asian co-applicants perform slightly worse than white co-applicants. When assessing mortgage denials due to other reasons across ethno-racial groups, white primary borrowers perform better than black, Latino, and Asian primary borrowers. Among ethno-racial groups, there does not appear to be dramatic differences across the various ethno-racial co-borrowers.

Table 1 presents average demographic, loan, and locational characteristics overall and by race and ethnicity of the primary applicant and co-applicant. For ease of interpretation, I present summary averages for each ethno-racial combination of applicants. The stratified sample of approximately a 150 thousand observations provides enough ethno-racial group variation in the results. About 60 percent of the sample has a white primary borrower, followed by 20 percent black, 12 percent Latino, and 7 percent Asian.

The overall proportion of applications have a primary male borrower with a female co-borrower. Across ethno-racial groups, gender proportions for whites, blacks, and Asians remain relatively consistent, whereas Latino primary applicants have the lowest proportions of primary male applicants with a female co-applicant. The different levels experienced by primary Latino applicants stems from a high number of applications with a primary female applicant and male co-applicant. Among ethno-racial groups, Asian co-borrowers have the highest levels of having a primary male applicant and a female co-applicant, while black co-borrowers have the lowest levels.

The income distribution for all applicants tends to center between 50 thousand dollars to 150 thousand dollars. However, there is a sharp spike in applicants with an

income of 200 thousand dollars or more. The income distribution remains relatively consistent across primary ethno-racial groups. Among primary ethno-racial groups, the income distribution is slightly skewed towards lower income for black and Latino co-borrowers. On the other hand, the income distribution is skewed towards higher incomes for Asian co-borrowers.

As it pertains to the loan amount requested, the overall distribution is centered between 100 thousand dollars and 300 thousand dollars. Across primary ethno-racial groups, black primary applicants are applying for slightly smaller mortgage loans. Latino primary borrowers seek slightly more expensive mortgage loans, while the loan amount distribution for primary Asian borrowers resembles the distribution for primary white borrowers. Among primary ethno-racial groups, applicants with an Asian co-borrower are applying for slightly higher mortgage loan amounts. On the other hand, applicants with a black co-applicant are applying for lower mortgage loan amounts. The loan amount distribution for Latino co-borrowers resembles that of white co-borrowers.

The overwhelming majority of applicants are applying in predominately white neighborhoods and more expensive communities. Over 80 percent of borrowers applied in neighborhoods that are 50 percent white or more. Across primary ethno-racial groups, blacks, Latinos, and Asians, applied in more diverse neighborhoods compared to white applicants. Among primary ethno-racial groups, borrowers with a white co-borrower applied in predominantly white neighborhoods. On the other hand, applicants with a black, Latino, or Asian co-applicant sought more diverse neighborhoods and applied more heavily in predominantly minority communities. Over 85 percent of applications were in communities with an average household income of 60 thousand dollars or more.

Across primary ethno-racial groups, black primary borrowers sought homes in lower income neighborhoods. Also, Asian primary borrowers to a lesser extent sought homes in lower income neighborhoods. The distribution of the average household income in the neighborhood for Latino primary borrowers resembles that of white primary borrowers. Among primary ethno-racial groups, applicants with black and Latino co-applicants applied for homes in lower income neighborhoods. In contrast, the majority of Asian and white co-borrowers sought homes in higher income neighborhoods.

The location and economic conditions of the area also vary by race and ethnicity. Most homes are located in the Southern and Western regions of the United States. The distribution of the spatial location of homes remain stable across ethno-racial groups. Among primary ethno-racial borrowers, black and Latino co-borrowers applied in the West and Southern regions. Asian co-borrowers were more concentrated in the West compared to all other ethno-racial co-borrowers. Overall, the county average unemployment rate hovered around 7 percent. Black and Latino primary applicants sought homes in slightly more unemployed areas than white and Asian primary applicants. Among primary ethno-racial groups, black, Latino, and Asian co-borrowers applied in higher unemployed areas. The overall 2010 average MSA credit score was 690 and remained stable and relatively consistent across and within ethno-racial groups. The average MSA housing price index was 216. Primary Latino borrowers applied in areas with slightly more expensive housing prices compared to whites and blacks, while Asian primary borrowers applied in the most expensive areas. The housing price index remained consistent among ethno-racial co-borrowers.

Multivariate Results

Figure 2, displays stark differences when examining the odds ratios for obtaining a high cost mortgage loan versus a conventional mortgage among co-applicants. In general, a rigid ethno-racial hierarchy emerges across ethno-racial groups. White and Asian primary applicants generally outperform their black and Latino counterparts across ethno-racial groups. For example, the odds of obtaining a high cost loan for a white (Asian) primary borrower with a Latino co-applicant, is 1.43 (1.20) times compared to 2.88 (2.13) times for a black (Latino) primary applicant. Given the ethno-racial composition of the primary borrower, black co-borrowers have the highest odds of accepting a high cost loan followed by Latinos, whites, and Asians. The only exception to his pattern occurs with an Asian primary borrower and black co-borrower as the odds of obtaining a high cost loan resembles those of their black and Latino primary borrower counterparts.

A similar pattern of ethno-racial stratification exists when examining the odds ratios for high cost loans (versus conventional loans) among ethno-racially homogenous mortgage applicants. Homogenous whites and Asian mortgage applicants drastically outperform their black and Latino counterparts. For example, the odds ratios for a high cost loan (versus a conventional loan) is 2.89 (2.13) times for ethno-racially homogenous black (Latino) applicants and .75 times for homogenous Asian applicants compared to white applicants.

Regardless of the racial and ethnic classification of the primary borrower, mortgage applicants with a white and Asian co-borrower outperform their black and Latino co-applicant counterpart. Among each ethno-racial group of the primary borrower,

the odds ratios for obtaining a high cost loan (versus conventional loan) are highest when a mortgage application has a black co-borrower; followed by Latino, white, and Asian co-borrower. The "check-mark" pattern holds firm across primary ethno-racial groups. For example, among mortgage applicants with a white primary borrower, the odds ratios of obtaining a high cost loan (versus a conventional loan), when the co-applicant is black (Latino) is 1.67 (1.43) times, compared to 1 (.67) times when the co-applicant is white (Asian). Similarly, among mortgage applicants with a Latino primary borrower, the odds ratios for black (Latino) co-applicants is 2.41 (2.13) times compared to 1.48 (1.25) times when the co-applicant is white (Asian).

As shown in Figure 3, the ethno-racial disparities and patterns slightly change when examining the odds ratios for mortgage rejections due to other reasons versus a conventional mortgage among co-applicants. Across ethno-racial groups, white primary applicants generally outperform their black, Latino, and Asian counterparts given a specific ethno-racial co-applicant. For example, the odds ratios for a mortgage denial due to other reasons (versus a conventional loan) for a white primary borrower with a Latino co-applicant, is 1.19 times compared to 2.37 times for a black primary borrower, 2.05 times for a Latino primary borrower, and 1.71 times for an Asian primary borrower. Also, the range in which white primary borrowers are likely to be denied due to other reasons is much smaller than that of the other ethno-racial groups. For instance, the odds for primary white applicants ranges from 1 to 1.55 times, while the odds for black primary applicants ranges from 1.80 to 2.72 times more likely to be denied due to other reasons (versus conventional).

A similar ethno-racial hierarchy exists when comparing denials due to other reasons (versus a conventional origination) across ethno-racially homogenous mortgage applications. Homogenous white pairs (reference group) are the least likely to rejected for other reasons; followed by Asians, Latinos, and blacks. For example, black applicants are 2.72 times more likely to be denied a mortgage due to other reasons, Latinos 2.05 times, and Asians 1.59 times compared to white couples.

The ethno-racial classification of the co-borrower among mortgage applicants reinforces the pattern of ethno-racial hierarchy that was found among primary applicants. The pattern formed among each primary applicant ethno-racial group resembles an increasing line as black co-applicants fare the worse, followed by Latinos and Asians. Again, white co-applicants are the least likely to be rejected due to other reasons among ethno-racial groups. For instance, among black primary borrowers, black co-borrowers are 2.72 times, Latino co-borrowers are 2.37 times, Asian co-borrowers are 1.99 times, and white co-borrowers are 1.80 times more likely to be denied a mortgage due to other reasons. Mortgage applications with a black co-borrower among ethno-racial primary applicant groups have the highest odds of being rejected due to other reasons except in the case of primary Latino applicants. For example, white primary applicants with a black co-applicant are 1.55 times more likely to be denied a mortgage due to other reasons compared to a ethno-racially homogenous white couple.

Figure 4 displays the ethno-racial differences of odds ratios for mortgage denials due to bad credit (versus a conventional loan). In general, white primary applicants outperform the other ethno-racial groups. For instance, the odds ratios for a mortgage denial due to bad credit for a white primary borrower with a Latino co-applicant, is 1.13

times compared to 1.86 times for a black primary borrower, 1.70 times for a Latino primary borrower, and 1.41 times for an Asian primary borrower. In addition, there is less variation in mortgage denials due to bad credit for white primary applicants with different ethno-racial co-applicants compared to the other ethno-racial primary applicant groups. For example, the odds ratios for a bad credit denial for white primary applicants ranges from .98 times to 1.18 times compared to Latino primary borrowers whose range is between 1.21 times to 1.76 times.

Among ethno-racially homogenous applications, black pairs are the most likely to be denied a mortgage due to bad credit (versus conventional) compared to the other ethno-racially homogenous pairs. White homogenous pairs (reference group) are the least likely to de denied for bad credit. Black pairs are 2.25 times more likely to denied for bad credit compared to 1.69 times for Latino pairs and 1.49 times for Asian pairs compared to a homogenous white couple.

Similar patterns of the ethno-racial hierarchy are found when assessing ethno-racial disparities of co-applicants among primary applicant groups. In general, there is a positive but flatter slope formed among ethno-racial primary groups. Black co-applicants fare worse in terms of being denied a mortgage due to bad credit followed Latino and Asian co-applicants. Once again, white co-applicants are the least likely to be rejected due to bad credit within each primary applicant ethno-racial group. For example, among Latino primary borrowers, black co-borrowers are 1.76 times, Latino co-borrowers are 1.70 times, Asian co-borrowers are 1.35 times, and white co-borrowers are 1.21 times more likely to be denied a mortgage due to bad credit. In the case of Latino and Asian co-borrowers, the ethno-racial hierarchy is less clear as their relative disadvantage differs

across ethno-racial primary groups. For example, among white and Latino primary applicants, the pattern of ethno-racial hierarchy remains consistent. However, among black and Asian primary applicant groups, the odds of being rejected due to bad credit for Asian co-borrowers increases above the level of Latino co-applicants. This shift in the ethno-racial hierarchy suggests that the ethno-racial hierarchy for Asians is more fluid compared to the rigid structure for black and Latino applicants.

Conclusions and directions for additional research

The mortgage industry is a key component in the perpetuation of ethno-racial inequality in homeownership. The highly ethno-racialized outcomes in the mortgage industry requires a continuous study of the evolution in the lending industry and warrants additional attention to how access to homeownership is shaped by interracial couples. Drawing on HMDA data, I document variation in ethno-racial disparities in access to mortgage outcomes among co-applicants.

The continued strength of race and ethnicity in structuring mortgage access is overwhelming. Black primary applicants are substantially more likely to be steered into high cost loans or rejected, either due to bad credit or unspecified reasons when accounting for the race, ethnicity of the co-borrower. On the other hand, white primary borrowers face the least obstacles and observe the most favorable mortgage outcomes across ethno-racial groups. For the most part, Latino and Asian primary applicants experience outcomes somewhere in the middle between white and black primary applicants. Furthermore, the differences across primary ethno-racial groups were not only statistically significant, they were also substantively large. The implications for ethno-

racial stratification are profound even if there is missing information on applicant characteristics. When examining ethno-racial disparities in mortgage outcomes between ethno-racially homogenous couples, a distinct pattern emerges. Black and Latino homogenous couples on one end and their white and Asian counterparts on the other. More specifically, ethno-racially homogenous black and Latino couples experience much poorer mortgage outcomes than white and Asian couples.

I also demonstrate the impact of co-borrowers on mortgage outcomes. More specifically, tremendous variation in mortgage outcomes exists among primary ethno-racial groups when considering the race and ethnicity of the co-borrower. Overall, black and Latino co-borrowers face the largest disadvantage relative to white co-borrowers in mortgage outcomes. The performance of Asian co-borrowers varies depending on the mortgage outcome of interest. For high cost loans, Asian co-borrowers outperform their white counterparts. However, Asian co-applicants perform slightly worse than their white counterparts when examining mortgage denials. These findings are consistent with the widening body of literature that supports the rigid ethno-racial stratification structure in homeownership. In spite of having a white co-borrower, black and Latino primary borrowers significantly underperform their white counterparts. Finally, the ethno-racial stratification patterns exhibited by including the co-borrower's race and ethnicity demonstrates the substantial mortgage outcome differences that exist across interracial couples.

The implications of these patterns for ethno-racial stratification are overwhelming. These findings support previous literature demonstrating the shifts of ethno-racial disparities in lending. Ethno-racial disparities in the mortgage market

expands and contracts when considering the race and ethnicity of the co-borrower. Couples with a black or Latino primary or secondary borrower are less likely to obtain a conventional mortgage and more likely to experience an adverse mortgage outcome. Thus, the ethno-racially stratified mortgage market, constrains homeownership opportunities for black and Latino applicants and limits the efforts of using homeownership to close the ethno-racial wealth gap.

These findings also show the need for better data on ethno-racial disparities in mortgage lending. The lack of information on applicant credit information and economic circumstances of the co-borrower limits the ability to hold lenders accountable for discrimination. The CRA should add information on credit scores of all applicants, down payments, debt-to-income ratios, sales price of the home, and other economic factors that potentially affect mortgage loan outcomes among minority applicants.

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Figure 1: Loan Application Outcomes,
by Race and Ethnicity of Primary applicant and Co-applicant: 2010 - 2017

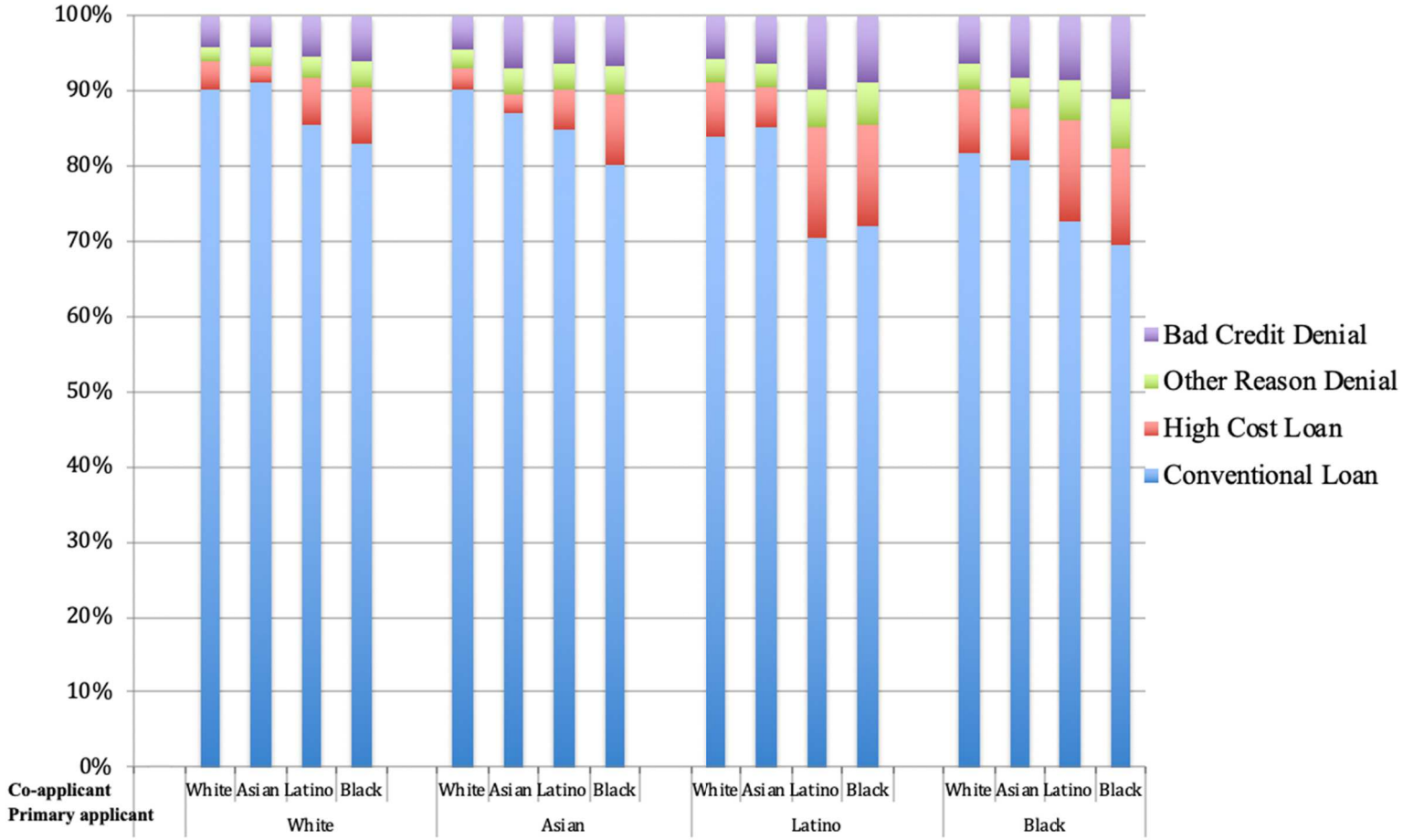

Figure 2: Odds Ratios from Multi-Level HLM Predicting Loan Application Outcomes from 2010-2017: High Cost Loan Origination
(Ref= Conventional, and White primary applicant with a White co-applicant)

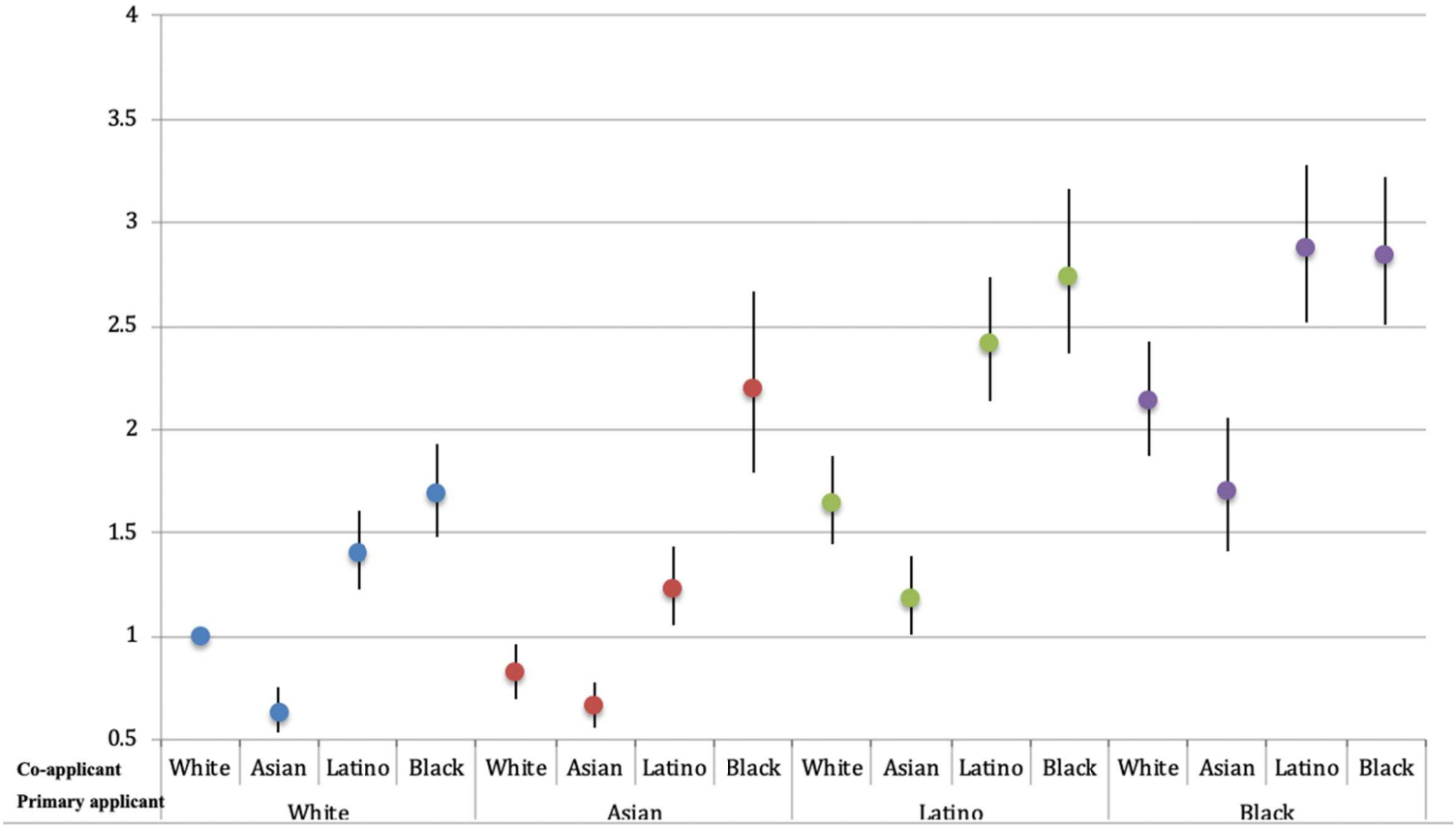

Figure 3: Odds Ratios from Multi-Level HLM Predicting Loan Application Outcomes from 2010-2017:
Other Reason Denial
(Ref= Conventional, and White primary applicant with a White co-applicant)

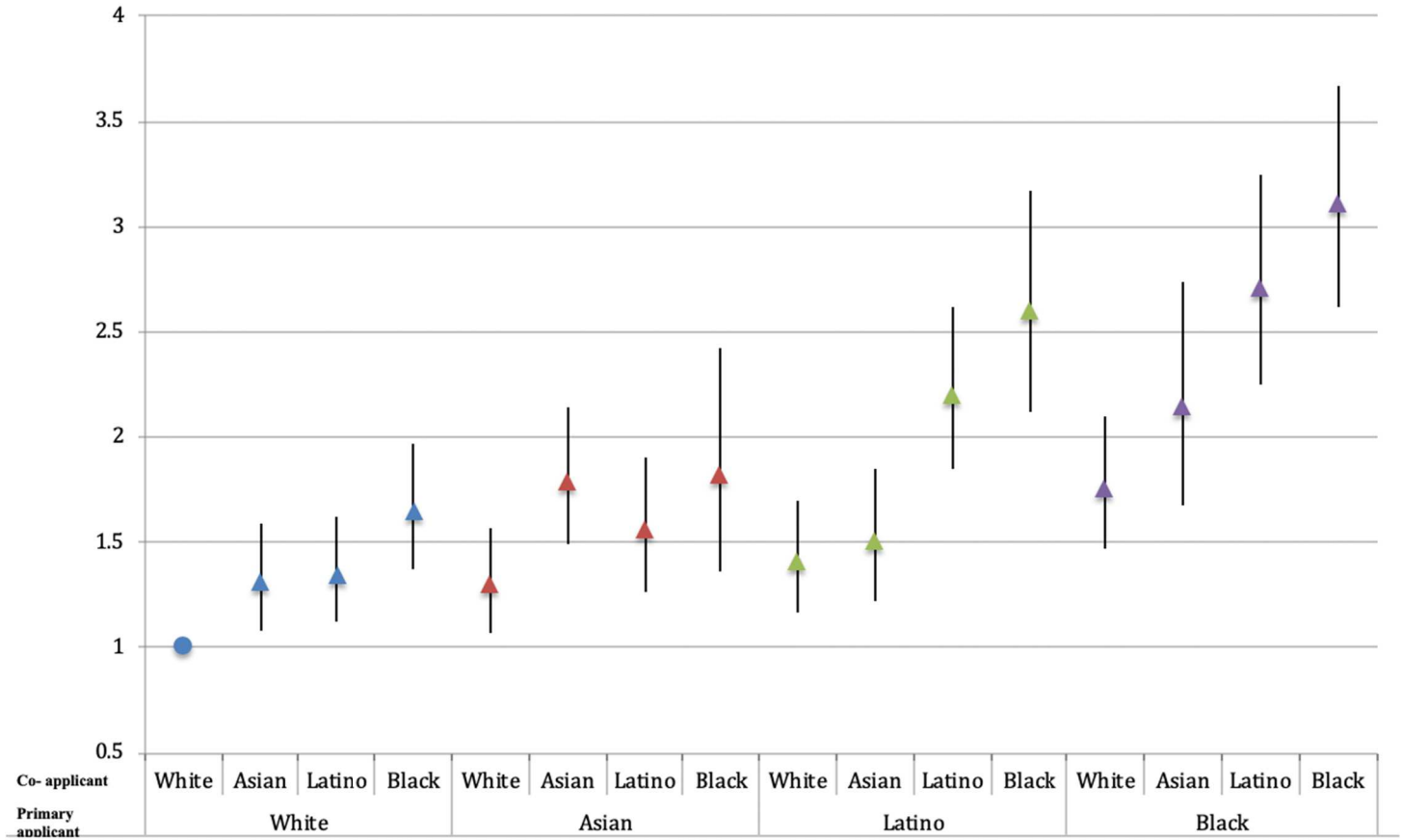

Figure 4: Odds Ratios from Multi-Level HLM Predicting Loan Application Outcomes from 2010-2017: Bad Credit Denial
(Ref= Conventional, and White primary applicant with a White co-applicant)

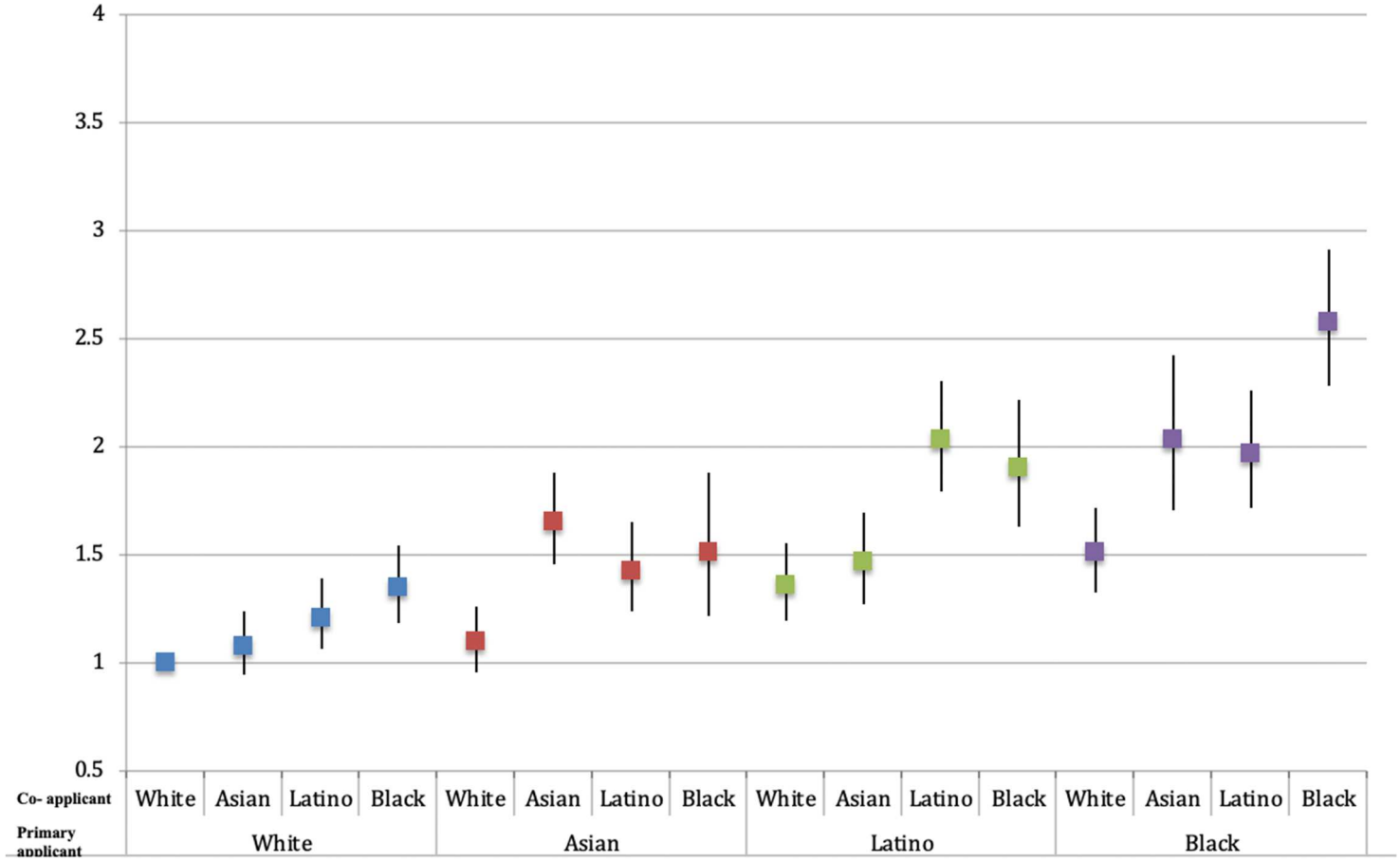

Table 1: Borrower Characteristics, by race and ethnicity of primary and co-borrower: 2010-2016

Primary Applicant / Co-applicant	All	white				black				Latino				Asian			
		white	black	Latino	Asian	white	black	Latino	Asian	white	black	Latino	Asian	white	black	Latino	Asian
Race, Ethnicity of Primary Applicant																	
Non-Hispanic W.	61.77																
Black	19.96																
Hispanic	11.74																
Asian	6.53																
Sex of Applicants (% Primary - Co-applicant)																	
Male - Female	74.67	77.97	52.03	72.83	87.57	74.53	49.58	69.85	82.16	58.12	47.38	64.52	75.44	79.79	66.24	78.99	86.88
Female - Male	19.64	16.78	42.04	21.62	9.05	19.71	42.99	17.47	12.68	36.07	44.32	29.10	16.63	14.13	23.55	15.02	8.75
Male - Male	3.30	2.89	2.98	3.41	2.27	3.38	3.03	7.45	3.35	3.72	2.84	4.25	4.97	3.17	3.82	2.96	1.56
Female - Female	2.39	2.36	2.96	2.14	1.12	2.38	4.39	5.23	1.81	2.08	5.46	2.12	2.96	2.91	6.40	3.03	2.81
Household Income (%)																	
< 25k	0.63	0.54	0.56	0.48	0.47	0.62	1.57	2.27	0.47	0.29	1.75	0.64	1.24	0.77	1.02	1.28	0.62
25k - 50k	8.12	7.34	8.59	7.73	5.20	9.09	11.92	22.03	8.52	4.52	11.35	7.34	11.48	8.92	14.19	10.71	9.22
50k - 75k	17.16	16.56	18.76	18.26	11.83	19.34	22.80	30.19	16.63	11.55	17.03	16.03	14.12	19.28	25.00	25.39	17.66
75k - 100k	19.18	19.7	21.46	20.88	15.08	20.82	25.00	19.84	17.57	15.29	16.81	18.67	12.70	22.10	21.08	20.40	19.38
100k - 125k	15.82	16.41	16.55	16.71	14.68	16.52	16.42	11.66	15.29	14.88	12.45	15.45	11.70	16.44	14.89	15.56	17.5
125k - 150k	11.39	11.95	11.01	11.87	12.41	10.80	8.16	5.18	13.35	12.10	11.57	12.04	9.96	10.85	8.28	10.17	10.31
150k - 175k	7.73	7.73	7.10	7.27	9.57	7.140	5.02	3.33	8.18	10.04	6.99	9.08	8.34	7.22	5.00	6.73	8.28
175k - 200k	5.43	5.28	4.89	5.09	7.69	4.69	2.82	1.79	4.69	7.51	7.86	5.22	6.85	4.64	3.17	3.84	5.00
> 200k	14.55	14.51	11.08	11.7	23.07	10.99	6.28	3.71	15.29	23.82	14.19	15.52	23.61	9.79	7.37	5.93	12.03
Loan Amount (%)																	
< 100k	5.61	6.75	6.68	5.05	3.30	5.51	7.95	10.39	3.22	3.13	6.33	2.64	3.66	7.37	10.00	5.66	4.38
100k - 200k	28.19	30.03	31.84	29.78	18.27	31.75	38.18	39.43	23.27	18.06	24.89	22.67	19.00	32.03	37.47	35.76	28.91
200k - 300k	27.48	27.75	28.93	29.47	23.15	29.24	28.35	28.71	27.57	25.10	26.20	26.46	20.72	29.39	27.63	30.91	26.09
300k - 400k	17.30	16.55	15.95	17.95	18.68	16.95	15.17	13.12	17.51	19.94	19.21	20.8	18.91	16.24	14.19	16.30	18.59
400k - 500k	9.65	9.06	8.10	8.97	13.34	8.32	5.65	4.77	13.15	13.35	9.61	12.30	13.60	7.79	6.29	6.94	10.47
500k - 600k	4.28	3.49	3.49	3.57	7.55	3.40	2.82	1.83	6.98	6.77	5.46	5.28	7.28	3.23	2.42	2.09	5.62
600k - 700k	2.77	2.25	2.30	1.92	5.55	2.11	0.73	0.85	3.09	4.92	4.15	3.99	5.90	1.50	0.91	1.01	1.72
700k - 800k	1.45	1.25	0.91	1.04	2.98	0.87	0.73	0.37	1.74	2.46	1.09	1.61	3.71	0.82	0.38	0.34	1.88
> 800k	3.28	2.87	1.79	2.24	7.18	1.85	0.42	0.52	3.49	6.27	3.06	4.25	7.23	1.63	0.70	1.01	2.34

Source: HMDA

Table 1: Borrower Characteristics, by race and ethnicity of primary and co-borrower: 2010-2016

Primary Applicant	All	white				black				Latino				Asian			
Co-applicant		white	black	Latino	Asian	white	black	Latino	Asian	white	black	Latino	Asian	white	black	Latino	Asian
Percent Whites In Census Tract (%)																	
< 25%	6.66	1.57	7.12	6.66	4.88	7.21	19.56	33.42	14.89	5.02	16.16	14.55	14.17	6.25	22.96	18.52	15.62
25% - 50%	13.24	6.28	14.11	15.20	13.93	15.41	22.49	25.50	25.29	13.09	22.27	21.76	22.75	14.22	23.06	24.51	26.41
50% - 75%	30.97	23.94	32.50	34.95	34.26	35.12	33.05	26.59	36.02	33.48	37.55	38.18	34.91	32.38	29.62	35.15	30.63
> 75%	49.14	68.22	46.28	43.18	46.93	42.25	24.90	14.49	23.81	48.41	24.02	25.50	28.17	47.15	24.35	21.82	27.34
Household Income In Census Tract (%)																	
< 50k	7.00	4.74	8.33	7.44	4.81	8.16	14.02	21.92	8.72	5.34	11.35	8.95	5.47	8.80	13.60	11.85	10.31
50k - 60k	7.56	6.71	8.87	8.17	5.11	8.48	12.03	15.93	6.91	5.53	8.52	7.15	5.92	8.70	12.47	11.38	8.91
60k - 80k	23.26	23.33	25.09	24.78	17.89	25.51	31.69	28.84	26.16	18.17	21.83	22.47	16.67	26.13	26.61	31.65	23.91
> 80k	62.18	65.22	57.70	59.62	72.19	57.85	42.26	33.31	58.22	70.96	58.30	61.43	71.94	56.37	47.31	45.12	56.88
Region of Home (%)																	
Northeast	11.30	14.92	13.27	8.91	10.65	8.60	12.03	5.54	6.24	11.39	8.52	7.73	10.91	12.33	10.70	11.52	11.41
Midwest	16.50	23.67	19.79	12.60	13.37	13.17	10.77	7.37	7.58	15.36	14.85	7.98	11.77	20.30	13.28	11.04	11.09
South	37.71	37.21	42.04	42.15	28.29	40.70	50.21	41.70	30.38	29.88	37.55	33.16	29.64	42.35	63.06	46.06	40.00
West	34.48	24.21	24.91	36.34	47.69	37.52	26.99	45.39	55.80	43.36	39.08	51.13	47.67	25.01	12.96	31.38	37.5
Average Unemployment Rate (Cou	6.93	6.72	6.83	7.00	6.91	7.07	7.20	7.75	7.53	6.88	7.01	7.34	6.97	6.84	6.98	7.30	7.08
2010 Average Credit Score (MSA)	690	692	691	687	694	687	687	683	688	693	692	689	693	691	687	686	691
Average Housing Price Index (MSA	215.53	210.77	212.71	217.73	223.17	216.07	211.60	213.15	216.64	221.61	219.99	217.67	221.25	210.33	208.14	209.80	212.39
Observations	144523	43660	4296	24992	16317	21598	956	4803	1491	10531	458	1553	4426	5457	1860	1485	640

Source: HMDA

Appendix A: Odds Ratios from Multinomial Hierarchial Linear Model of Loan Outcomes (Ref= Convetional Origination):
High Cost Loan Origination

		Odds Ratios		Std. Error	95% Confidence Interval	
Race, Ethnicity of Primary Applicant and Secondary Applicant (ref=white * white)						
White *	Black	1.67	***	0.12	1.46	1.91
	Latino	1.43	***	0.06	1.33	1.55
	Asian	0.67	***	0.04	0.59	0.76
Black *	White	1.98	***	0.12	1.76	2.22
	Black	2.89	***	0.23	2.46	3.38
	Latino	2.87	***	0.25	2.42	3.41
	Asian	1.62	**	0.28	1.15	2.28
Hispanic *	White	1.48	***	0.06	1.37	1.60
	Black	2.41	***	0.27	1.94	3.00
	Latino	2.13	***	0.12	1.90	2.38
	Asian	1.25		0.16	0.98	1.60
Asian *	White	0.87	*	0.06	0.76	0.99
	Black	2.57	***	0.44	1.84	3.58
	Latino	1.20		0.15	0.94	1.54
	Asian	0.75	**	0.08	0.62	0.92
Sex of Applicants (ref= Male - Female)						
	Female - Male	1.17	***	0.04	1.10	1.24
	Male - Male	1.34	***	0.09	1.18	1.52
	Female - Female	1.16	*	0.08	1.01	1.34
Household Income ($25,000)		0.83	***	0.01	0.81	0.84
Loan Amount ($100,000)		0.92	***	0.01	0.90	0.95
Percent Whites In Census Tract (%) (ref= >75% white)						
	>25%	1.62	***	0.09	1.46	1.80
	25% - 50%	1.46	***	0.06	1.34	1.59
	50% - 75%	1.33	***	0.05	1.25	1.43
Household Income In Census Tract (1000's) (ref= >80k)						
	< 50k	1.86	***	0.09	1.69	2.04
	50k - 60k	1.83	***	0.08	1.68	1.99
	60k - 80k	1.53	***	0.05	1.44	1.63
Region of Home (ref= South)						
	Northeast	0.98		0.08	0.83	1.16
	Midwest	0.85	*	0.06	0.74	0.98
	West	0.99		0.05	0.90	1.09
Average County Unemployment Rate (Year)						
	2010	1.08		0.05	0.99	1.19
	2011	0.99		0.08	0.85	1.16
	2012	0.93		0.07	0.80	1.08
	2013	1.38	***	0.10	1.20	1.58
	2014	0.76	**	0.07	0.63	0.92
	2015	0.74	**	0.08	0.60	0.91
	2016	1.32	***	0.08	1.18	1.48
Average MSA Housing Price Index (Year)						
	2010	1.00		0.00	0.99	1.00
	2011	0.98	**	0.01	0.97	0.99
	2012	1.02	**	0.01	1.01	1.04
	2013	1.01		0.01	0.99	1.03
	2014	0.99		0.01	0.98	1.00
	2015	0.99		0.01	0.97	1.00
	2016	1.01	*	0.00	1.00	1.02
2010 Average MSA Credit Score		0.99	***	0.00	0.98	0.99
Constant		363.70	***	454.37	31.43	4208.61

*** p<.001, ** p<.01, * p<.05

(p.1 of 3)

Appendix A: Odds Ratios from Multinomial Hierarchial Linear Model of Loan Outcomes (Ref= Convetional Origination): Other Reason Denial

		Odds Ratios		Std. Error	95% Confidence Interval	
Race, Ethnicity of Primary Applicant and Secondary Applicant (ref=white * white)						
White *	Black	1.55	***	0.14	1.29	1.85
	Latino	1.19	***	0.06	1.07	1.32
	Asian	1.18	**	0.07	1.04	1.33
Black *	White	1.80	***	0.14	1.54	2.11
	Black	2.72	***	0.29	2.20	3.36
	Latino	2.37	***	0.30	1.86	3.03
	Asian	1.99	***	0.41	1.33	2.98
Hispanic *	White	1.31	***	0.07	1.18	1.45
	Black	2.01	***	0.32	1.47	2.74
	Latino	2.05	***	0.16	1.76	2.38
	Asian	1.38	*	0.21	1.02	1.87
Asian *	White	1.13		0.08	0.98	1.31
	Black	2.65	***	0.56	1.75	4.02
	Latino	1.71	***	0.24	1.30	2.24
	Asian	1.59	***	0.15	1.32	1.91
Sex of Applicants (ref= Male - Female)						
	Female - Male	1.15	***	0.05	1.06	1.24
	Male - Male	1.54	***	0.12	1.32	1.79
	Female - Female	1.60	***	0.14	1.36	1.89
Household Income ($25,000)		0.86	***	0.01	0.84	0.88
Loan Amount ($100,000)		1.07	***	0.02	1.04	1.10
Percent Whites In Census Tract (%) (ref= >75% white)						
	>25%	1.07		0.08	0.93	1.23
	25% - 50%	1.09		0.06	0.97	1.21
	50% - 75%	1.03		0.04	0.94	1.12
Household Income In Census Tract (1000's) (ref= >80k)						
	< 50k	1.75	***	0.11	1.54	1.98
	50k - 60k	1.45	***	0.09	1.28	1.63
	60k - 80k	1.34	***	0.06	1.24	1.45
Region of Home (ref= South)						
	Northeast	1.34	**	0.13	1.11	1.63
	Midwest	0.98		0.09	0.82	1.17
	West	0.90		0.06	0.80	1.02
Average County Unemployment Rate (Year)						
	2010	1.15	*	0.07	1.02	1.29
	2011	0.98		0.10	0.81	1.18
	2012	0.88		0.08	0.74	1.06
	2013	1.01		0.09	0.85	1.20
	2014	1.14		0.14	0.91	1.45
	2015	0.95		0.13	0.73	1.23
	2016	0.94		0.07	0.82	1.09
Average MSA Housing Price Index (Year)						
	2010	1.01		0.00	1.00	1.01
	2011	1.00		0.01	0.98	1.01
	2012	1.00		0.01	0.98	1.02
	2013	1.01		0.01	0.99	1.03
	2014	0.99		0.01	0.97	1.00
	2015	1.01		0.01	1.00	1.03
	2016	1.00		0.00	0.99	1.01
2010 Average MSA Credit Score		0.99	***	0.00	0.98	0.99
Constant		369.76	***	561.44	18.86	7250.77

*** p<.001, ** p<.01, * p<.05

Appendix A: Odds Ratios from Multinomial Hierarchial Linear Model of Loan Outcomes (Ref= Convetional Origination): Bad Credit Denial

		Odds Ratios		Std. Error	95% Confidence Interval	
Race, Ethnicity of Primary Applicant and Secondary Applicant (ref=white * white)						
White *	Black	1.18	*	0.08	1.03	1.35
	Latino	1.13	***	0.04	1.05	1.22
	Asian	0.98		0.05	0.90	1.08
Black *	White	1.44	***	0.09	1.28	1.62
	Black	2.25	***	0.18	1.91	2.64
	Latino	1.86	***	0.18	1.54	2.25
	Asian	2.34	***	0.32	1.80	3.06
Hispanic *	White	1.21	***	0.05	1.13	1.31
	Black	1.76	***	0.21	1.40	2.21
	Latino	1.69	***	0.10	1.51	1.90
	Asian	1.35	**	0.15	1.09	1.67
Asian *	White	0.96		0.05	0.86	1.07
	Black	1.67	**	0.30	1.17	2.37
	Latino	1.41	***	0.15	1.15	1.73
	Asian	1.49	***	0.10	1.31	1.69
Sex of Applicants (ref= Male - Female)						
	Female - Male	1.25	***	0.04	1.18	1.32
	Male - Male	1.83	***	0.10	1.64	2.03
	Female - Female	1.45	***	0.10	1.28	1.65
Household Income ($25,000)		0.77	***	0.01	0.76	0.79
Loan Amount ($100,000)		1.21	***	0.01	1.19	1.24
Percent Whites In Census Tract (%) (ref= >75% white)						
	>25%	1.01		0.05	0.91	1.13
	25% - 50%	1.05		0.04	0.97	1.14
	50% - 75%	0.98		0.03	0.92	1.04
Household Income In Census Tract (1000's) (ref= >80k)						
	< 50k	1.53	***	0.07	1.40	1.68
	50k - 60k	1.34	***	0.06	1.23	1.46
	60k - 80k	1.16	***	0.04	1.10	1.24
Region of Home (ref= South)						
	Northeast	1.26	***	0.09	1.10	1.45
	Midwest	1.04		0.07	0.92	1.19
	West	0.65	***	0.03	0.59	0.71
Average County Unemployment Rate (Year)						
	2010	1.16	***	0.05	1.07	1.26
	2011	0.91		0.07	0.79	1.05
	2012	1.16	*	0.08	1.02	1.32
	2013	0.96		0.06	0.85	1.09
	2014	0.90		0.08	0.76	1.07
	2015	1.02		0.10	0.84	1.24
	2016	0.95		0.05	0.85	1.05
Average MSA Housing Price Index (Year)						
	2010	1.02	***	0.00	1.01	1.02
	2011	0.98	***	0.01	0.97	0.99
	2012	1.01		0.01	0.99	1.02
	2013	1.00		0.01	0.98	1.01
	2014	1.00		0.01	0.99	1.01
	2015	1.02	***	0.01	1.01	1.03
	2016	0.99	***	0.00	0.98	0.99
2010 Average MSA Credit Score		0.99	***	0.00	0.99	1.00
Constant		8.30		9.23	0.94	73.34

*** p<.001, ** p<.01, * p<.05 (p.3 of 3)

Racial Stratification among Latinos in the Mortgage Market

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Abstract

Studies of the mortgage industry's impact on racial stratification have long focused on racial disparities found between white and black homeowners. Ample research demonstrates that unequal access and treatment between white and black home seekers has created major differences in the type of loan products they are offered in the marketplace. While numerous studies also document disadvantaged Latino homebuyers, studies have yet to examine racial variation within the Latino population. This paper draws on annual data from the Home Mortgage Disclosure Act (HMDA) from 2010 to 2017 to assess variation in racial disparities among Latinos in loan outcomes and compare them to Non-Latino whites, blacks, Asians, and others. I show that loan rejections and high cost originations are highest among black Latinos and lowest among white and Asian Latinos. Other Latinos perform somewhere in the middle. These trends are particularly true when examining mortgage denials. The racial disparities found between black and Asian Latinos also exists when examining high cost loans. The distinct patterns in loan outcomes found among Latino racial groups provides evidence of a tri-racial hierarchy in the mortgage market.

Introduction

The largest vehicle for wealth creation and growth in the United States is homeownership, including Latinos. Racial inequality in access to homeownership is also a large component of asset inequality (Oliver and Shapiro 2006; Salgado and Ortiz 2019), as minority households are unable to take advantage of the tax incentives that subsidize mortgages and provides opportunities to transfer wealth at a reduced tax rate. This discrepancy perpetuates and expands inheritance inequality today and across generations. In addition to financial benefits, homeownership is associated with better neighborhood amenities such as public schools, lower crime rates, and increased social networks (Yinger 1995). Equal access to homeownership remains a major challenge for Latinos, despite decades of anti-discrimination laws and regulation. In 2016, the homeownership rate for Non-Latino whites was 73 percent, compared to 46 percent among Latinos (Callis 2014; Joint Center for Housing Studies of Harvard University 2016). While homeownership disparities between Non-Latino whites and Latinos decreased in the 1990's and early 2000's, the 2007 housing crisis reversed this trend. More specifically, the Latino homeownership rate increased from 46 percent in 2000 to about 50 percent during the peak of the housing boom in 2006, and 47 percent in 2017 (Fry and Brown 2016; Goodwin and Zumpano 2011; Rugh 2020).

While policy and regulation, such as the Fair Housing Act of 1968 and Community Reinvestment Act of 1977, have tried to combat racial discrimination in housing, unequal treatment across racial groups continues to plague the housing market. Latino and black mortgage applicants are more likely to rejected and steered into smaller

and more expensive loans than their white counterparts (Friedman and Squires 2005; Massey 2005; Stuart 2003; Williams, Nesiba, and McConnell 2005). Audit studies have shown that the level of discrimination against Latino and black homebuyers has declined slowly over time, but stark differences remain as minority home seekers continue to be provided poor service and are less likely to obtain a conventional mortgage loans (Ross and Turner 2005; Yinger 1998). More specifically, the growth of credit, especially in the form of high cost loans during the housing boom, disproportionately targeted minority borrowers even when they qualified for stable low-cost conventional mortgages (Weller 2010).

The housing literature has also highlighted spatial dynamics within the relationship between race and mortgage credit access. Racial discrimination at both the individual and neighborhood level in the form of "redlining", was a common and legal practice used to systematically block minorities from housing opportunities and lower real estate values in predominantly minority communities. While housing discrimination was outlawed in the 1960s, the relationship between mortgage lending and neighborhoods continues to be highly spatialized. During the housing boom of the early 2000s, high cost lending was concentrated in communities of color and to minority borrowers. In low-income and minority communities, subprime lending accounted for as much as 50 percent of homeownership growth during the housing boom (Williams et al. 2005). Therefore, the fallout from the economic recession in 2007 fell disproportionately on communities of color (Immergluck 2011).

While recent scholarship has highlighted important differences across racial and ethnic groups in the housing market, there remains a relative paucity of comparative

analysis of racial variation among Latinos in access to mortgage credit. While Latino loan applicants as a whole perform somewhere in the middle between their white and black counterparts, it is unclear how mortgage loan outcomes differ among different racial Latino groups and how they compare to other non-Latino racial groups. This within-group variation is important, as it relates to ongoing debates about racialization and the position of Latinos in the U.S. ethno-racial hierarchy.

Accordingly, in this paper I draw from the Home Mortgage Disclosure Act (HMDA) to compare racial variation in loan application outcomes among Latino applicants from 2010 to 2017 and compare the mortgage outcomes of Latino racial groups to non-Latino racial groups. Results highlight racialized outcomes among Latinos, particularly related to mortgage loan denials, as black Latino and Non-Latino applicants are the most likely to experience an adverse loan outcome. In addition, white Latinos consistently underperform compared to their white Non-Latino counterparts. My findings suggest that blacks regardless of Latino ethnicity are the most disadvantaged in the mortgage market. And finally, that there is a mortgage "penalty" for being Latino across racial groups.

Theoretical background

There are two broad theoretical perspectives that are used in understanding racial stratification in home ownership in the United States, one that focuses on racial discrimination and the other that focuses on demographic and human capital differences. From the demographic and human capital perspective, homeownership is an outcome of

the household decision making process. As such, homeownership reflects differential tastes and preferences based on life circumstances such as age, marriage, family status, and financial constraints. For example, homeownership is more common among those with higher levels of income and education, those that are gainfully employed with a steady and professional career, and those that are married with children (Dwyer 2007). In addition, homeownership rates are higher among native born compared to immigrants, but the homeownership gap diminishes with longer periods of residency in the United States (Krivo and Kaufman 2004). Finally, socio-economic differences across groups accounts for a large share of homeownership rate differential across racial and ethnic groups (Flippen 2001a).

However, large differences in homeownership remain even after controlling for demographic and economic characteristics, thus pointing to the importance of racial stratification and discrimination in structuring housing inequality (Flippen 2010a; Haurin, Herbert, and Rosenthal 2007; Rugh and Massey 2010). The discriminatory behavior in the real estate industry has a strong structural history and is illustrated through audit studies that highlight differential treatment for black homebuyers and minority steering (Yinger 1998). In addition, the legacy of structural discrimination has imposed barriers on homeownership through residential segregation (Flippen 2001b, 2010b; Kain and Quigley 1975), which tends to concentrate minorities into older and lower quality housing.

The mortgage industry is also central to understanding racialized housing outcomes. At the individual level, minority borrowers face disparate treatment throughout the loan application process. Due to discriminatory experiences, minorities are more

likely to withdraw their mortgage applications, receive poor service, and be steered towards predominantly non-white and low-income neighborhoods (Charles 2000; Dwyer, Rachel E. 2007; Iceland and Wilkes 2006; Roscigno, Karafin, and Tester 2009; Ross and Turner 2005). Minority borrowers are also more likely to be steered towards high cost loans with less favorable terms (Williams et al. 2005).

There is a long history of systematic exclusion of minority borrowers and communities of color in the mortgage industry. The discriminatory approach by the federal and local government has led to tremendous housing loss, exclusion, and displacement for different Latinos groups (McConnell 2013). For example, zoning and residential ordinances created additional stress on immigrant Latino groups by forcing families to reconsider their housing situations and lowering the strength of their networks in the community (McConnell 2013). In addition, federal lending regulations excluded minority communities from access to credit by establishing regulations that favored new developments and explicitly discouraged lending in minority communities (Jackson 1985).

The 1968 Fair Housing Act, which explicitly prohibits discrimination in the sale, rental, and financing of housing based on race and national origin and later gender, disability, and family status, was intended to combat discrimination in housing, but enforcement has remained weak. The 1977 Community Reinvestment Act encourages financial institutions with a national charter to offer banking and lending products to low- and moderate-income communities. A key component of the legislation was the collection of data from all loan applications including borrower, loan, institutional, and

property characteristics, in order to regulate and discourage discriminatory lending behavior (Friedman and Squires 2005).

The emphasis on fair lending was intended to increase minority access to mortgage products and reduce the concentration of residential segregation over time. Large ethno-racial disparities in the housing market remained throughout the 1970s and 1980s, as minorities were perceived as greater credit risk. In the 1990s, government deregulation and the growth of mortgage-backed securities transformed the mortgage market with an influx of high cost lending. Specifically, high costs loans were bundled into mortgage-backed securities to increase rates of return on relatively high-risk portfolios. By pooling multiple mortgage loans and spreading risk across investors, more credit was made available to a larger pool of loan applicants. As a result of the increase in high cost lending, homeownership rose across all racial and ethnic and income groups, but particularly for Latinos and blacks and those with weaker credit (Friedman and Squires 2005; Rugh and Massey 2010).

However, much of the expansion in access to credit among black and Latino borrowers occurred via subprime and high cost loans, rather than access to conventional low-cost credit. However, overall access to credit declined significantly as a result of the 2007 housing crisis and the restrictions placed on mortgage loan underwriting in subsequent housing policy (Krainer and McCarthy 2014). The credit tightening and housing collapse had a terrible impact on minority homeownership access and maintenance. First, minority borrowers faced high levels of foreclosures, negative equity, and debt during the housing collapse thus reducing their ability to seek home loans and refinancing options (Amromin and McGranahan 2015). Second, minority workers were

more negatively affected in the labor market, thus reducing their financial wellbeing. The impact of a weakened financial market and labor market reduced the volume of mortgage applicants from Latino and black households. The economic impact of the crisis was not equally absorbed, as Latino and black homeowners were more likely to owe more on their home than it was worth compared to whites (Faber 2013). While the recession officially end in 2009, the unemployment levels and mortgage defaults remained above 5 percent for years especially in areas with high levels of high cost loans (Atlas, Dreier, and Squires 2008; Board of Governors of the Federal Reserve System 2018; United States 2018).

While the racialized impact in the housing market has been amply documented, many questions remain. Most work on racial disparities in the mortgage market focuses on distinct ethno-racial groups, such as Non-Latino whites, Non-Latino blacks, Latinos, and Asians. Less clear is how race shapes mortgage outcomes among Latino applicants. Latinos are the largest ethnic group in the U.S but are often treated as a racial group in previous studies. By treating Latinos as a homogeneous group, the results mask the implications of race among Latinos. Previous literature highlights distinct racial variation among Latinos with respect to wages and education, but no study has examined the mortgage market. Important racial variation is lost by framing Latinos as a collective, thus limiting an accurate assessment of how Latinos are performing in the mortgage market. In addition to studying the racial differences amongst Latinos in mortgage access, I also compare Latino racial groups to Non- Latino racial groups in the mortgage market.

Latinos are the largest minority group in the U.S and their presence continues to grow. For instance, the Latino population has grown from 12 percent in 2000 to about 18

percent in 2019 (Census.gov). In addition, Latinos are not a racial monolith, as 55 percent of Latinos identify as white, 42 percent as "other" race, and 3 percent as black (Census 2010). The racial diversity among Latinos provides a challenge in studying ethno-racial stratification in housing as previous research relies on average effects by racializing Latinos in their analysis. This is potentially problematic because it is unclear if Latino racial groups experience the mortgage market similarly or whether they have a similar experience as their Non-Latino counterpart. The comparison across racial groups provides additional insight into where Latino racial groups fit within the racial hierarchy.

Racial and skin-tone stratification is evident among Latinos across a wide array of socio-economic outcomes. More specifically, white or light skin Latino experience more favorable economic outcomes than their black or darker skinned counterparts. For instance, black and dark skinned Latinos are more likely to experience job loss, lower wages, and obtain lower education attainment than white and lighter skinned Latinos (Hersch 2008; Hunter 2002; Villarreal 2010). Latinos with lighter skin tone and those with U.S. citizenship or legal status have higher levels of wealth (McConnell and Akresh 2008). In addition, black Latinos face severe disadvantages as they experience high levels of adverse health outcomes including mental health and chronic stressors (Burgos and Rivera 2009). The impact of colorism and skin-tone stratification has been incorporated into the ethno-racial hierarchy (Frank, Akresh, and Lu 2010; Hochschild and Weaver 2007; Monk 2015).

Latino homeownership has remained steady and has remained between 45 percent and 50 percent from 2000 to 2018 (Census 2020). However, there is tremendous variation in homeownership rates among Latinos. Homeownership rates differ among Latinos with

different skin complexions, as Latinos with darker skin are less likely to own a home and experience positive economic outcomes, such as holding a bank account and higher occupational status, compared to lighter skinned Latinos (Dávila, Mora, and Stockly 2011). In addition to differences in skin tone, socio-demographic differences affect Latino homeownership. Latino homeownership increases in neighborhoods with a strong network and higher minority populations (Painter and Yu 2010). Access and accumulation of economic resources is also a major factor in Latino homeownership differences. Latinos that send remittances to their country of origin are less likely to buy a home (McConnell and Akresh 2008), while Latino with higher levels of wealth are more likely to purchase a home (Rugh 2020; Salgado and Ortiz 2019). Lastly, time living in the U.S is positively correlated with homeownership (Rugh 2019).

The experience of Latinos in the homeownership process is mixed, as financial institutions attempt to recognize and lend to the growing population, while structural barriers limit access to mortgage credit. The lack of evidence on the relationship between legal status and housing tenure among Latinos suggests that financial institutions recognize the growing demand of credit for Latino applicants regardless of legal status (McConnell and Marcelli 2007).

Latino diversification across racial groups and socio-demographic characteristic points to a complex tri-racial divide that has formed in the U.S. (Bonilla-Silva 2004). The tri-racial hierarchy is divided into three distinct categories, white (Non-Latino), honorary whites, and collective blacks (Bonilla-Silva 2004). The honorary white strata captures lighter skin and white Latinos as they have higher levels of wealth and homeownership (McConnell and Akresh 2013). And the collective black includes all other Latino racial

groups because they experience higher levels of residential segregation and social isolation (Hall, Crowder, and Spring 2015; Rugh 2019; Rugh and Hall 2016).

The impact of race among Latinos in access to mortgage credit remains unclear. Latinos are often treated as a racially homogenous group, thus providing an opportunity for scholars to study disparities across racial and ethnic groups. However, the results mute the racial diversity found among Latinos. Thus, by separating and investigating mortgage outcomes by race among Latinos, an additional dimension of social stratification emerges that would have been lost by averaging the variation across all Latinos. More broadly, my comparison of Latino racial groups to Non-Latinos in the mortgage market tests the tri-racial divide as well as the ways in which Latinos are being racialized.

Data and Methods

To examine racial disparities in mortgage outcomes among Latinos and compare them to non-Latino racial groups, I draw on publicly available data from the Home Mortgage Disclosure Act (HMDA) for the years 2010 through 2017. A major component of the Community Reinvestment Act (CRA) is to monitor the services, lending, and investments in low-income and minority neighborhoods by requiring all financial institutions with a national charter to submit HMDA information annually to the Federal Financial Institutions Examination Council (FFIEC).

The HMDA dataset is comprised of a record for every loan application received, including borrower, institutional, loan, and property characteristics. Borrower characteristics include demographic and income information, while institutional

characteristics include the name of the lender, loan status, and type of loan originated. The loan characteristics include loan amount, type, purpose of the loan, outcome of the application, reason for denial, and high cost loan indicators. Property characteristics include the property type and census tract identifier.

One important limitation of the public HMDA dataset is that it lacks information on the borrower's credit score, the down payment amount, sale price of the home, and the exact interest rate of the loan. However, the HMDA dataset is a broadly representative sample of home lending in the United States, covering 80 percent of all originated mortgages (Avery, Brevoort, and Canner 2007). In addition, HMDA is the only public national mortgage dataset that includes borrowers' race and application neighborhood (Bradford 2002), thus making HMDA the most commonly used source of information on racial disparities in access to mortgage credit.

I restrict the HMDA sample to non-institutional applicants requesting financing for owner-occupied single-family homes (1-4 units) in the United States, through a conventional or jumbo mortgage. Veteran's Association mortgages are not included because typical civilians do not have access to these mortgage loan opportunities. Re-finance applications are not included in the study due to concerns of reliability and the high levels of missing data (Faber 2013). In addition, only applicants that completed their loan application and were vetted by their primary lender are considered. That is, mortgages that were bought by other financial institutions and recorded in the HMDA dataset are excluded, because they are already documented as a mortgage transaction by the initial financial institution. In addition, I employed list-wise deletion for observations containing missing data. Previous evaluations on the issue of missing data in HMDA

have shown that data quality improved dramatically after 2003, when reporting rules and guidelines were made more stringent (Bhutta and Ringo 2014). While missing values hinder analyses of re-financing loans applications, they are generally not a concern for mortgage origination observations (Faber 2013). After 2009, the high cost loan definition changed and was linked to the average prime mortgage rates from the Freddie Mac Mortgage Market Survey I begin my analysis in 2010 because I am interested in measuring mortgage loan disparities in a stable mortgage market, thus I avoid the years during and prior to the Great Recession (2007- 2009). Financial institutions restricted their mortgage credit following the housing collapse in 2007, thus limiting homeownership opportunities for everyone (Amromin and McGranahan 2015). Since 2010, lenders have increased their mortgage portfolios by 6 percent annually and the volume of subprime loans has remained relatively low (Estenssoro and Cissi 2015). My analysis ends with 2016 because this is the last year for which the completed HMDA data file is available without additional edits. I then restrict the sample to applicants that classify themselves as Non-Latino (NL) white, black (NL), Asian (NL), other, and Latino. Due to the size of the dataset, 18.3 million observations, I then obtained a stratified random sample of about 150 thousand complete mortgage applications from 2010 to 2017 by racial groups of Latinos and Non-Latinos.[3]

This is a very artful way of "hiding" the fact that such a large share of HMDA Latinos self-identify as whites. For the sake of transparency, you should add a footnote in this section that says that while this stratified sample produces equal sample sizes across

[3] Several types of stratified random samples were examined. The substantive results remained consistent across the different stratified random samples used..

groups (with the exception of Asian Latinos), in your non-stratified sample, X percent of Latinos identify as white, Y as black, etc.

Model specification

The dependent variable for this analysis is the outcome of the completed loan application, based on information provided from the Federal Financial Institutions Examination Council (FFIEC) and the Consumer Financial Protection Bureau (CFPB). There are three possible outcomes to all applications: they can be approved for a conventional loan; they can be approved for a high cost loan; or they can be denied.

My first step is to define high cost loan originations. Following the convention established by the previous literature (Faber 2013; Hwang, Hankinson, and Brown 2015; Immergluck 2010), high cost loans are defined as any loans originated with an above-market annual percentage interest rate (APR). The HMDA dataset has an indicator of high cost origination, defined as an APR 1.5 points or more over the monthly prime rate average were designated as high cost.

Once I designate loans as high cost loans, I then define conventional loans as all originated loans that are not high cost. For denied loans, the HMDA dataset also contains information on reasons for denial. To compensate for the lack of information on factors such as down payment size and credit score, I distinguish between denials justified with reasons that could potentially reflect racial variation in "credit-worthiness" (specifically, debt to income ratio, employment history, credit history, collateral, and insufficient cash), [4] and those for whom the reason for rejection was listed as "other." The end result is a

[4] The two main credit-related reasons for a denied mortgage application include having a high debt-to-income ratio, and a poor credit history. About 43 percent of denied mortgages were related to these credit

multinomial variable distinguishing between conventional loan approval; high cost loan approval; bad credit denial; and other denials. This specification thus allows me to test for racial disparities in both better and worse forms of approval, and more and less justifiable forms of economic denial.

The primary independent variables of interest relate to the race of Latino and Non-Latino applicants. As in the Census, mortgage applicants are asked about Hispanic origin. Hispanics are defined as Latinos and Non-Hispanics as defined as Non-Latino. Then applicants are asked for their race. Applicants can be distinguished as white, black, Asian, Native American, and Pacific Islander. For this study, Native Americans and Pacific Islanders have been combined to establish an Other racial group.[5] As such, a Latino applicant can be distinguished as a white Latino, black Latino, Asian Latino, or Other Latino, while a Non-Latino (NL) applicant can be distinguished as a NL white, NL black, NL Asian, NL Other.

In addition to the race of Latino and Non-Latino, I also examine variation at the individual level and transition to neighborhood characteristics. I also control for the economic characteristics of the borrower, including gender, whether or not there is a co-applicant on the application, and the total income of applicants. In addition, I also include property characteristics, specifically the amount of the loan requested.

At the neighborhood level, I control for the percent of Non-Latino whites in the census tract. Moreover, to ensure that my measure of the racial composition of

issues. A lack of collateral or insufficient down payment accounted for an additional 16 percent of denied loans. And finally, about 40 percent of mortgage denials were due to other reasons, not related to credit. Because social desirability bias is likely to shape the reported reasons for loan denial, these should be taken as a lower-bound estimate of racial disparities.

[5] The analysis was also conducted by separating Native Americans and Pacific Islanders and I found no substantial differences in the multivariate setting.

neighborhoods is not reflecting the impact of economic variation across neighborhoods, I also control for the mean household income for the census tract in which the property is located.

Finally, because both racial groups and economic conditions are unevenly distributed across the country, I also control for larger contextual forces that could contribute to racial disparities in mortgage access. The labor and housing markets are both racialized and spatially organized. It is therefore important to take into account local variation in factors such as unemployment, change in housing prices, and aggregate credit scores. Thus, I control for the annual county-level unemployment rate, using the Bureau of Labor Statistics calculation of the share of individuals in the labor force who are unemployed (https://www.bls.gov/cps/cps_htgm.htm). I also include the average annual housing price index (HPI), which is a score above 100 that captures changes in the value of single-family homes within a metropolitan statistical area (https://www.fhfa.gov/DataTools/Downloads/Pages/House-Price-Index.aspx). I also include the average 2010 Experian credit score, which includes all consumers and types of credit, for the top one hundred MSA's in the United States (Rugh and Massey 2010). Finally, I control for the U.S. region in which the property is located, as defined according to Census guidelines (http://www2.census.gov/geo/docs/maps-data/maps/reg_div.txt).

Analytic strategy and methods

The first step in my analysis is to provide descriptive statistics of application outcomes by the primary independent variables of interest; race of primary Latino and

non- Latino applicants. Second, I describe the variation found between Latino and non-Latino racial groups. To facilitate ease of interpretation, I use the average characteristics found across Latino and non-Latino racial groups.

The final step in the analysis is to estimate a multinomial logistic model with robust standard errors of loan outcomes (acceptance into a conventional loan (reference), acceptance into a high cost loan, rejection due to bad credit, or other rejection). The multinomial logistic model provides consistent and efficient parameter estimations. By using robust standard errors, I correct for the underestimation of standard errors that occurs from spatial variables in the model. A comparison of these results with those from a multi-level multinomial hierarchal linear model with census tract clustered standard errors was also examined, but there were no substantive differences. In addition, my primary theoretical concern is variation among the different racial groups within the mortgage market for borrowers, thus initially making a multi-level hierarchal linear models (HLM) more desirable compared to the multinomial logistic regression. However, the multi-level HLM is much more computationally intensive, requiring a substantially reduced sample size, thus making it too difficult to obtain consistent and reliable coefficients and parameters for Asian Latinos and Non-Latinos.

Descriptive Results

Figure 1 presents my dependent variable, the outcome of completed loan applications, by race among Latinos and Non-Latinos, from 2010 to 2017. The figure shows racial disparities in application outcomes among Latinos and Non-Latinos. More specifically, black Latino loan applicants were the least likely to be approved for a

conventional loan, most likely to accept a high cost loan, and most likely to be denied a mortgage due to "poor credit" or unspecified reasons. Other Latinos perform similarly to white Latinos across mortgage outcomes. Finally, Asian Latinos appear to outperform all Latino racial groups, as they are the most likely to be approved for a conventional loan, least likely to obtain a high cost loan, and least likely to be denied a mortgage loan due to bad credit or other reasons.

Non-Latino racial groups display a similar pattern as Latino racial groups, but loan disparities are even larger. Once again, Non-Latino blacks are the least likely to obtain a conventional loan and the most likely to obtain a high cost loan and be denied a mortgage. White and Asian Non-Latinos outperform all other racial groups. Other Non-Latinos lie between Non-Latino whites and blacks in mortgage outcomes. When comparing across Latino and Non-Latino applicants, white, Asian and Other Non-Latinos outperform their Latino counterparts. They are more likely to obtain a conventional loan are less likely to experience an adverse loan outcome than white, Asian, and other Latino applicants. However, black Non-Latino and Latinos experience similar loan outcomes.

In addition to considering the racial variation among and across Latino and Non-Latino groups in mortgage outcomes, there are important socio-demographic differences across racial groups. Table 1 presents average demographic, socioeconomic, loan, and locational characteristics overall and by race of Latino and Non-Latino applicants. For ease of interpretation, I present summary averages for all and for each Latino and Non-Latino racial group. Because I took a stratified random sample by Latino and Non-Latino racial groups, the sample is equally divided evenly across racial groups except in the case

of Asian Latinos, which have the smallest number of applications in the dataset.[6] Among Latino racial groups, black Latinos have the highest proportion of male applicants (46 percent), while all other Latino racial groups have similar male level (About 33 percent). Similar trends emerge among Non-Latino racial groups with the exception of Others as they lie in the middle at 37 percent. Additionally, about 37 percent of Latino racial groups have a co-applicant, except for black Latinos, who have a lower proportion of co-applicants (27 percent). Non-Latinos experience a similar pattern. When comparing across Latinos and Non-Latinos, all Non-Latino racial groups have higher levels of co-applicants than Latino racial groups, except in the case of Asians.

Among Latinos, the average household income of applicants is about 73 thousand dollars across racial groups, except for Asian Latino who have a substantially higher average income (About a 100 thousand dollars). There is much more income variation among Non-Latinos. Non-Latino whites and Asians have the highest income levels (Above 115 thousand dollars), followed by others (98 thousand dollars), and blacks at 76 thousand dollars. All Non-Latino racial groups have higher incomes than their Latino counterparts. Additionally, Asian Latinos applied for the highest loan amounts (284 thousand dollars), while black Latinos had the lowest loan amounts (195 thousand dollars). White and other Latinos were in the middle as they asked for an average of 210 thousand dollars. Non-Latino racial groups experienced a similar pattern. Finally, all Non-Latino racial groups applied for larger loan amounts than their Latino counterparts, except in the case of blacks as Latino and Non-Latinos applied for similar loan amounts.

[6] This is the smallest racial group and the dataset only contains approximately 10 thousand observations. Additionally, I will focus my attention on differences among and across Latino and Non-Latino racial groups because interpreting the summary statistics for "All" is limited because I used a stratified random sample.

Neighborhood and spatial characteristics also varied across Latino and Non-Latino racial groups. White, black, and other Latinos are applying in neighborhoods with an average income of about 70 thousand dollars, while Asian Latinos are applying in higher income neighborhoods (87 thousand dollars). Among Non-Latino racial groups, Asians are applying in the highest income neighborhoods (100 thousand dollars), followed by whites, others, and blacks. All Non-Latino racial groups are applying in higher income neighborhoods than their Latino counterparts. A similar pattern emerges when examining the percent of whites in the neighborhood. Once again, all Latino racial groups are applying in neighborhoods that are about 45 percent white, while Asian Latinos are applying in neighborhoods with a higher proportion of whites (52 percent). There is a very different pattern that emerges when examining Non-Latino racial groups. Non-Latino whites (75 percent), others (63 percent), and Asians (57 percent) applied in predominantly white neighborhoods, while Non-Latino blacks applied in more diverse neighborhoods (46 percent). Finally, Non-Latino racial groups generally applied in neighborhoods had higher proportions of whites than their Latino counterparts.

Latino and Non-Latino racial groups are situated in similar parts of the U.S. For example, all Latino and Non-Latino racial groups are concentrated in the South and Western regions of the country, except for black Latinos and Non-Latinos. They are heavily concentrated in the South and either in the Northeast (black Latinos) or the Midwest (black Non-Latinos). Among Latino and Non-Latino racial groups, applicants applied in counties with similar unemployment rates. Non-Latino racial groups applied in areas with slightly lower unemployment than their Latino counterparts. Additionally, the mean MSA-level credit score is consistent among Latino and Non-Latino racial groups.

And there is no difference in credit scores between Latino and Non-Latino racial groups. There is more variation when examining the average MSA-level Housing Price Index. White and Asian Latinos applied in less affordable areas compared to black and other Latinos. Among Non-Latinos, Asians applied in the most expensive areas, and blacks in the most affordable areas. Whites and others were in the middle. When comparing across Latinos and Non-Latinos, white and black Latinos applied in slightly less affordable areas than their Non-Latino counterparts, while Asian and other Latinos applied in slightly more affordable areas that their Non-Latino counterparts. Finally, the distribution of the applications by year remained consistent and similar among and across Latino and Non-Latino racial groups.

Multivariate Logistic Regression Results

The ethno-racial disparities in demographic, economic, neighborhood, and locational characteristics evident in Table 1 necessitate an examination of mortgage application outcomes in a multivariate setting. As such, I estimate a multinomial logistic regression with robust standard errors using loan outcomes as my dependent variable. The patterns of income, loan amount, average credit score, Housing Price Index, unemployment rate, and region all align with previous analyses (with lower denials and high cost lending relative to conventional acceptances among low economic risk applicants that have higher incomes, lower loan amounts, in areas that have higher credit scores, lower unemployment rates, and lower housing price indexes). I report the full results from the model in Appendix A and focus my discussion on the main variable of interest, race of Latino and Non-Latino applicants.

Figures 2 through 4 present the odds ratios of mortgage outcomes by the race of Latino and Non-Latino applicants (i.e., the figures chart the odds ratios produced in Appendix A). The results show variation in higher rejection rates and high cost loans for Latino and Non-Latino racial groups.

First, applicants approved for high cost loans (Figure 2), show markedly different patterns within and across groups. Among Latinos, whites and blacks fare the worse. They are more than 2.1 and 2.4 times more likely to be approved for a high cost loan compared to obtaining a conventional loan, relative to Non-Latino whites, even net of borrower, loan, neighborhood, and spatial characteristics. Asian Latinos fare the best as they are "only" 30 percent more likely to be approved for a high cost loan relative to receiving a conventional loan. And other Latinos are in the middle at 80 percent more likely to obtain a high cost loan compared Non-Latino whites. When examining Non-Latinos, blacks fare the worse (2.5 times), while Asians outperform whites and are 40 percent less likely to be approved for a high cost loan compared to obtaining a conventional loan. Once again, other Non-Latinos lie in the middle.

When comparing the odds ratios across Latino and Non-Latino racial groups, a different pattern emerges. All Latino racial groups are significantly more likely to obtain a high cost loan compared to receiving a conventional loan than their Non-Latino counterpart, except for black Latinos. For example, white Latinos are 110 percent more likely to obtain a high cost loan than white Non-Latinos. Asian Latinos are 68 percent more likely to obtain a high cost loan than their the Asian Non-Latino counterpart, and other Latinos are 45 percent more likely compared to their Non-Latino other counterpart. There is no statistical difference between black Latino and Non-Latino in the odds of

obtaining a high cost loan relative to obtaining a conventional loan, as they are both about 2.5 times more likely to obtain a high cost loan than white Non-Latinos. These results indicate, that within the black population, there is no significant difference by Latino origin.

Figure 5 shows the odds ratios from the same multivariate model of loan outcomes, this time for a mortgage denial due to bad credit, relative to acceptance into a conventional loan.

Important patterns emerge when examining mortgage denials due to poor credit, even though this mortgage outcome was intended to control for some of unobserved credit variation found across groups. Among Latinos, a distinct pattern emerges. On the one hand, black and other Latinos are much more likely to be denied a mortgage due to poor credit relative to obtaining a conventional loan compared to white and Asian Latinos. For instance, black and other Latinos are approximately 2.25 times more likely to be denied due to bad credit relative to Non-Latino whites, compared to 1.6 times for white and Asian Latinos. The pattern is different for Non-Latino racial groups as black Non-Latino are the most likely to be denied to bad credit, followed by Asian and Other Non-Latinos. Non-Latino whites are the least likely to be denied a mortgage for bad credit compared to obtaining a conventional loan.

When comparing the odds ratios across Latino and Non-Latino racial groups, there is no statistical difference between black racial groups, and they are also the most likely to be denied a mortgage due to bad credit compared to all other racial groups. There is no statistical difference between Latino and Non-Latino Asians, as they are both about 50 percent more likely to be denied due to poor credit compared to a Non-Latino

white. However, both white and other Latinos are more than 50 percent more likely to be denied a mortgage due to bad credit relative to receiving a conventional loan then their Non-Latino counterparts.

The trends for rejection due to other reasons, presented in Figure 4, resembles those of poor credit rejections. Among Latinos, there is no statistical difference between blacks, Asian, and other in the odds of being rejected for other reasons relative to obtaining a conventional loan. They are between 2.0 and 2.5 times more likely to be denied due to other reasons than Non-Latino whites. White Latinos are 1.8 times more likely to be denied a mortgage for other reasons relative to receiving a conventional loan, compared to a Non-Latino white. Among Non-Latinos, blacks (2.5) are the most likely to be denied for other reasons, followed by others (1.8) and Asians (1.5). Once again, Non-Latino whites are the least likely to be denied a mortgage for other reasons relative to receiving a conventional loan.

When comparing the odds ratios for rejections due to other reasons across Latino and Non-Latino racial groups, a similar pattern is observed as denials due to bad credit. Once again, blacks (2.5) are the most likely to be denied due to other reasons compared to all other racial groups, and there is no statistical difference between black Latinos and Non-Latinos. In addition, there is no statistical difference between other Latinos- and Non-Latinos as they are about twice as likely to be denied due to other reasons relative to a conventional loan acceptance, compared to Non-Latino whites. However, Asian Latinos are 50 percent more likely to be denied due to other reasons than Asian Non-Latinos. Finally, white Latinos are 80 percent more likely to be denied due to other reasons relative to receiving a conventional loan, compared to Non-Latino whites.

Conclusions and directions for additional research

The mortgage market has played a major role in shaping racial inequality between whites and blacks in homeownership. The highly racialized homeownership process has included outright mortgage denials, minority steering, and changes to loan products, all in order to sustain and maintain the racial hierarchy. This process points to a need for continuous study of the changes that occur in the mortgage market and warrants additional attention to how ethnic groups, such as Latinos, are reinforcing and shaping the racialized structure in homeownership. Drawing on HMDA data from 2010 to 2017, I document important racial disparities found among Latinos and Non-Latinos in access to mortgage credit.

As in education and labor force outcomes, race among Latinos exerts a powerful influence over mortgage outcomes. The salience of race among Latinos in access to mortgage credit is striking. Black Latino mortgage applicants are substantially more likely to receive a high cost loan or be rejected either due to bad credit or unspecified reasons relative to white Non-Latinos. On the other hand, Asian Latinos face relatively fewer obstacles in the lending market relative to all the other Latino racial groups. In addition, other Latinos perform somewhere between black and white/Asian Latinos in the mortgage market.

I compared Latino racial groups to Non-Latinos to examine the extent in which Latinos were being racialized in the mortgage market. Among Non-Latino racial groups, I document the recurring trends in mortgage disparities previous studies have shown. Whites generally outperform all other Non-Latino racial groups, while blacks are the

most likely to experience an adverse loan outcome. Other Non-Latinos lie between whites and blacks, while results for Asians are mixed. When comparing across Latino and Non-Latino racial groups, I display an alarming trend. Black applicants are the most disadvantaged in the mortgage market, regardless of ethnicity. In fact, there is no statistical difference in mortgage outcomes between black Latinos and Non-Latinos suggesting that anti-blackness supersedes ethnic discrimination in the housing market. On the other hand, white Latinos consistently underperform compared to their Non-Latino white counterparts across all mortgage outcomes, suggesting Latino discrimination and exclusion from the privileges of Non-Latino whites in the housing market. The results for Asian and other Latinos are mixed as they are just as likely or more likely to experience an adverse loan outcome, depending on the mortgage outcome.

The implications of these patterns on racial stratification are profound. These findings add to previous literature demonstrating the strength of racial disparities in lending. The racial disparities found among Latino mortgage applicants demonstrates the power of racialization and the racial hierarchy. Regardless of Latino identity, black applicants are heavily disadvantaged. In addition, there is a Latino penalty for white, Asian, and other Latino applicants in the mortgage market. This is best illustrated by white Latinos, as they are at least 50 percent to 110 percent more likely to experience an adverse loan outcome than Non-Latino whites. These findings support elements of the tri-racial stratification theory (Bonilla-Silva 2004), as I show that Non-Latino whites are the most advantaged in the mortgage market, while Latino and Non-Latino blacks are most disadvantaged. The consistent underperformance of white Latino applicants compared to their Non-Latino white counterpart and the mixed results for Asian and other Latinos in

the mortgage market suggest that Latinos continue to be penalized and are considered "honorary whites" in the tri-racial hierarchy compared to Non-Latino whites. Thus, the racially stratified mortgage market, which continues to make credit more difficult and expensive to obtain for minorities, limits homeownership as a tool for closing the ethno-racial wealth cap.

These findings also highlight the need for better data on ethno-racial disparities in mortgage lending. While HMDA data provides a snapshot of institutional lending patterns, the lack of information on applicant immigrant status, and credit information impedes the ability to hold lenders accountable for discriminatory patterns and assess how racial disparities are being molded. Previous changes to improve data quality have be useful for regulators and researchers alike. Finally, additional requirements on the HMDA report should include information on credit scores, down payments, loan-to-income ratios, and demographic information like legal status because these characteristics potentially affect higher rates of high cost loans and rejection among loan applicants.

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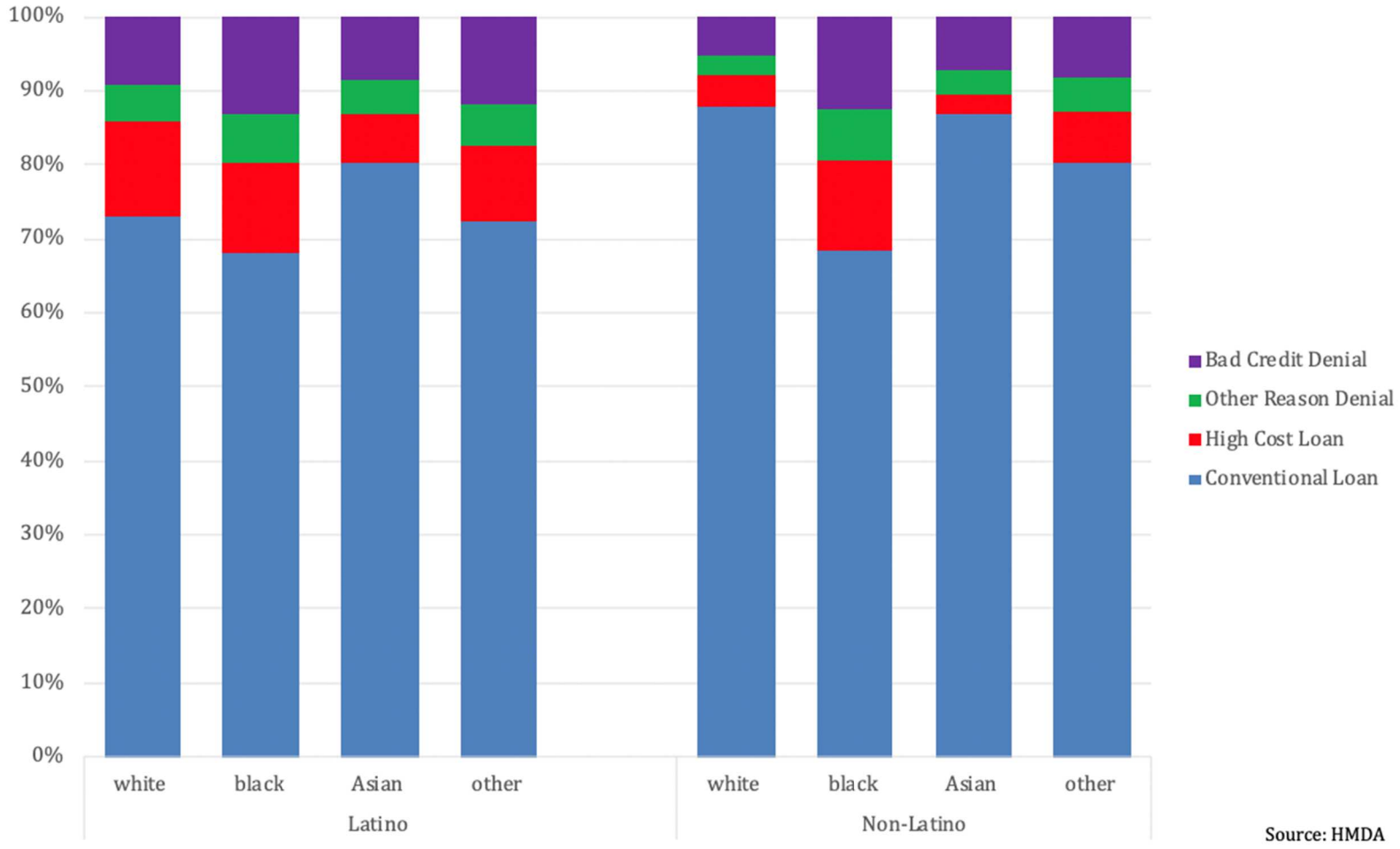
Table 1: Borrower Characteristics of Latinos and Non-Latinos, by race : 2010-2017

		All	Latinos				Non-Latino			
			white	black	Asian	other	white	black	Asian	other
Race and Ethnicity (%)										
Latino	white	13.11								
	black	13.11								
	Asian	8.24								
	other	13.11								
Non-Latino	white	13.11								
	black	13.11								
	Asian	13.11								
	other	13.11								
Male (%)		37.00	32.20	46.11	33.51	33.84	31.48	51.29	29.29	37.01
Co-applicant (%)		36.70	36.57	26.81	38.91	37.43	46.17	23.81	41.25	43.49
Mean Household Income ($1000s)		91.18	73.51	73.79	99.48	73.14	116.16	76.09	122.65	97.73
Mean Loan Amount ($1000s)		241.91	208.61	195.20	283.64	207.84	265.14	193.63	347.95	248.75
Mean Income in Census Tract ($1000s)		80.57	70.49	70.72	86.46	70.23	91.33	73.86	100.56	83.08
Mean Percent of Whites in Census Tract		53.70	44.01	45.49	52.40	46.14	75.47	46.02	56.64	62.93
Region of Home (%)										
	Northeast	10.26	6.52	19.37	8.03	4.90	14.83	10.73	10.24	6.67
	Midwest	13.18	9.82	10.11	10.52	11.45	22.51	17.04	11.83	11.19
	South	42.33	43.49	56.39	32.67	31.69	38.55	60.81	32.31	39.17
	West	34.22	40.17	14.13	48.78	51.97	24.11	11.41	45.62	42.96
Mean Unemployment Rate (County)		6.90	7.22	6.92	7.00	7.42	6.46	6.88	6.64	6.71
Mean Credit Score (MSA)		689	684	689	690	686	691	688	692	689
Mean Housing Price (MSA)		218.45	220.24	216.15	223.03	214.71	217.81	210.49	227.47	219.42
Year of Application (%)										
	2010	11.84	12.00	10.22	10.99	15.24	10.65	12.61	10.95	11.74
	2011	10.10	10.55	8.91	8.97	11.68	10.24	10.55	9.11	10.38
	2012	10.92	11.20	9.65	10.99	10.67	11.57	10.83	10.90	11.55
	2013	12.18	11.60	11.08	12.24	10.91	13.53	12.05	13.25	12.75
	2014	13.32	13.28	13.21	13.96	13.13	13.75	12.67	13.01	13.79
	2015	15.24	16.33	16.21	15.44	14.08	15.07	15.42	14.06	15.43
	2016	10.02	8.83	8.56	12.01	8.47	11.77	7.69	13.78	9.80
	2017	16.38	16.21	22.16	15.40	15.82	13.41	18.16	14.93	14.57
Observations (1000s)		114.43	15	15	9.43	15	15	15	15	15

Source: HMDA

Figure 1: Loan Application Outcomes,
by Race of Latinos and Non-Latinos: 2010-2017



Source: HMDA

Figure 2: Odds Ratios From Multinomial Logistic Regression Model Predicting Loan Application Outcomes:
High Cost Loan Origination (Ref= Conventional, and Non-Latino White Applicants)

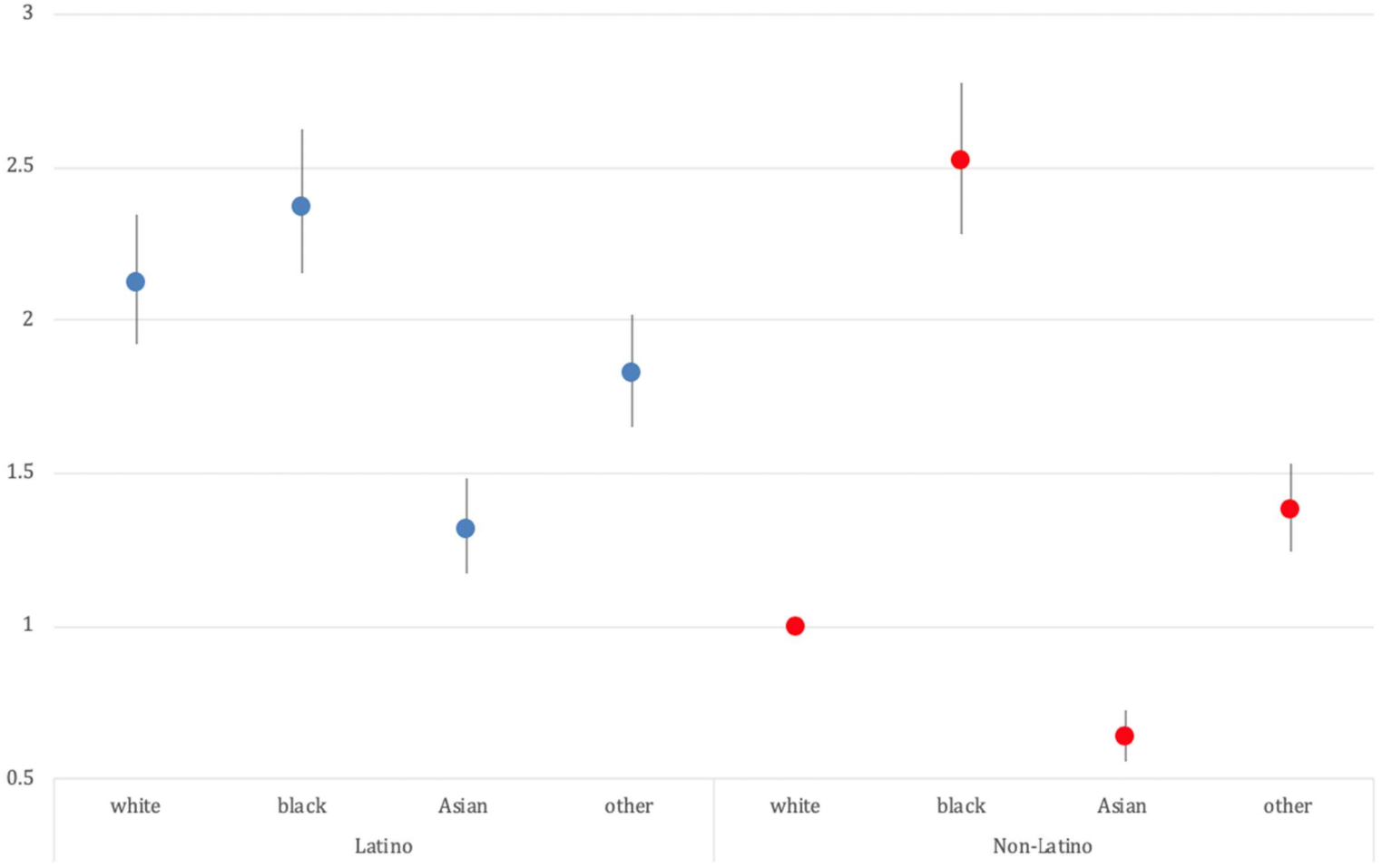


Figure 3: Odds Ratios From Multinomial Logistic Regression Model Predicting Loan Application Outcomes:
Bad Credit Denial (Ref= Conventional, and Non-Latino White Applicants)

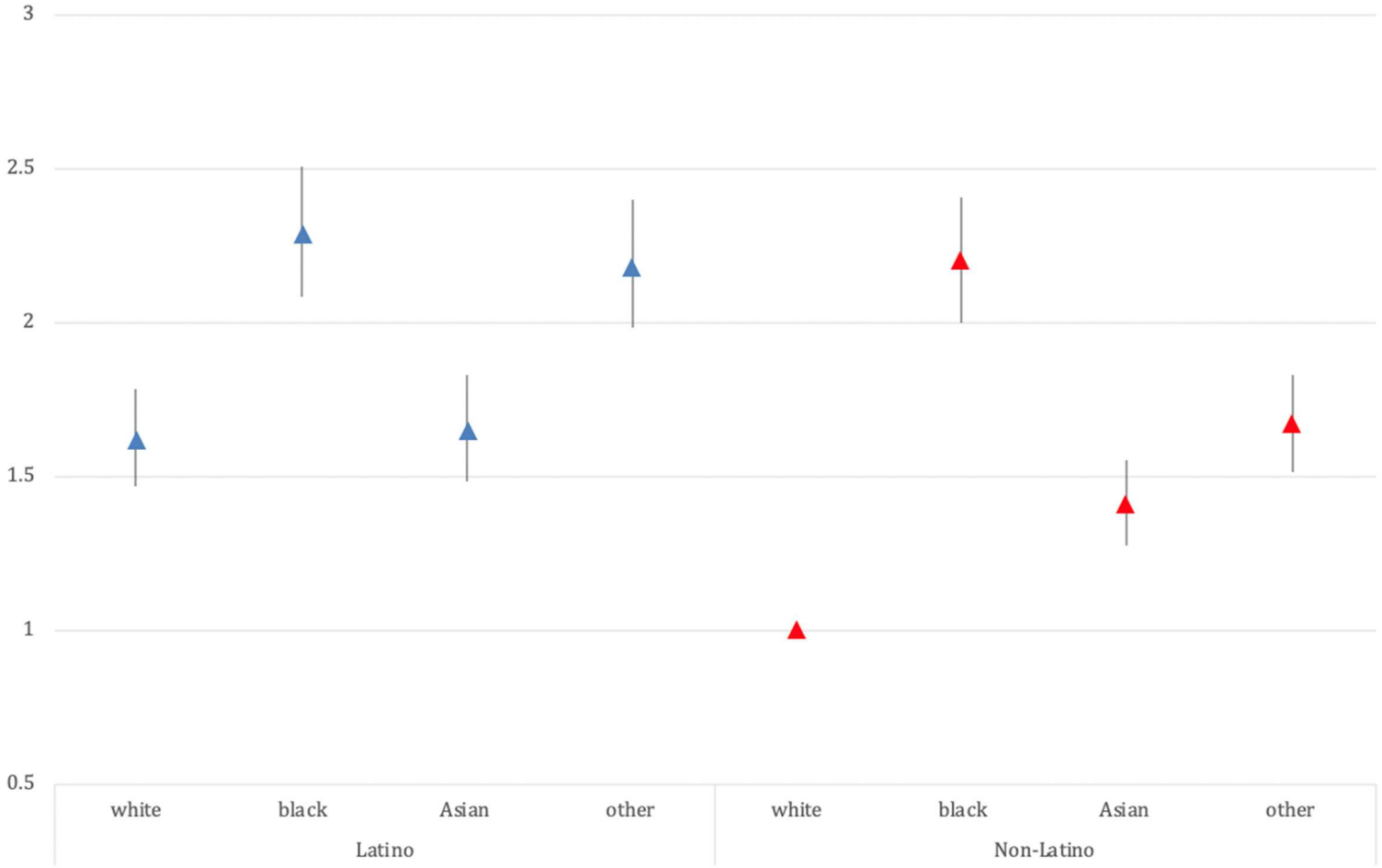
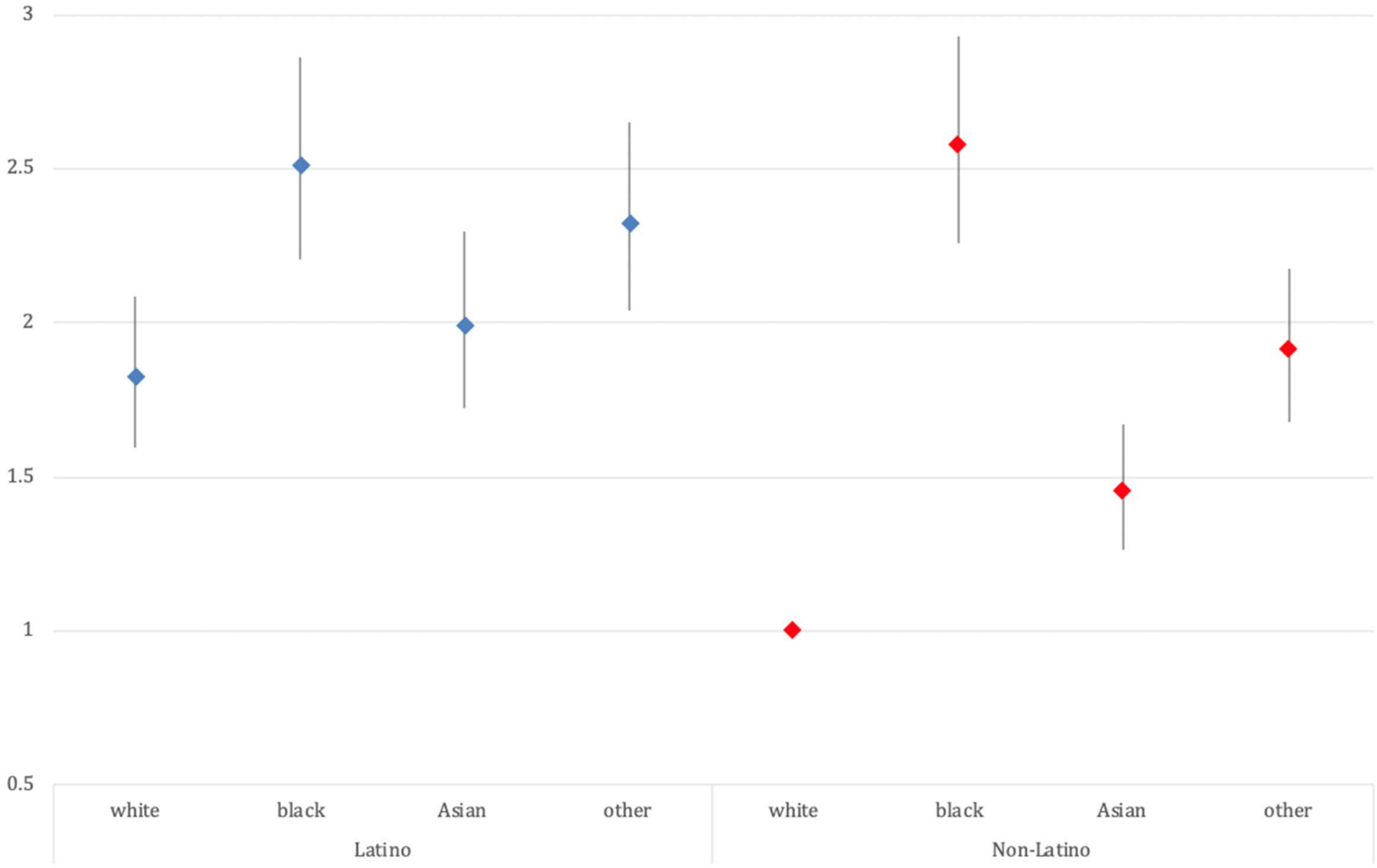


Figure 4: Odds Ratios From Multinomial Logistic Regression Model Predicting Loan Application Outcomes: Other Reason Denial (Ref= Conventional, and Non-Latino White Applicants)



Appendix A: Odds Ratios from Multinomial Logistic Regression Model of Loan Outcomes:
High Cost Origination (Ref=Conventional Origination)

		Odds Ratios		Std. Error	% Confidence Intervals	
Race of Latino and Non-Latino Applicant (ref= Non-Latino * white)						
Latino *	white	2.12	***	0.11	1.92	2.34
	black	2.37	***	0.12	2.15	2.62
	Asian	1.32	***	0.08	1.17	1.48
	other	1.83	***	0.09	1.65	2.02
Non-Latino *	black	2.52	***	0.13	2.28	2.78
	Asian	0.64	***	0.04	0.56	0.73
	other	1.38	***	0.07	1.25	1.53
Female		1.03		0.02	0.98	1.08
Co-applicant		1.17	***	0.03	1.12	1.24
Household Income ($1000s)		1.00	*	0.00	1.00	1.00
Loan Amount ($1000s)		1.00	***	0.00	1.00	1.00
Income Composition of Neighborhood		1.00	***	0.00	1.00	1.00
Neighborhood Racial Composition		1.00	***	0.00	1.00	1.00
Region (ref= Northeast)						
	Midwest	1.39	***	0.07	1.25	1.54
	South	1.11		0.07	0.99	1.25
	West	1.34	***	0.08	1.20	1.50
Avg Credit Score (MSA)		0.98	***	0.00	0.98	0.99
Unemployment Rate (County)		1.05	***	0.01	1.03	1.07
Avg Housing Price Index (MSA)		1.00	**	0.00	1.00	1.00
Year of Application (ref=2010)						
	2011	2.03	***	0.18	1.71	2.42
	2012	2.08	***	0.18	1.75	2.47
	2013	7.70	***	0.59	6.63	8.95
	2014	16.01	***	1.18	13.85	18.51
	2015	9.16	***	0.68	7.91	10.60
	2016	4.14	***	0.35	3.51	4.88
	2017	10.31	***	0.77	8.90	11.93
Constant		1464.63	***	1369.33	234.37	9152.61

Source: HMDA * p < .05 ** p< .01 *** p < .001 (p.1 of 3)

Appendix A: Odds Ratios from Multinomial Logistic Regression Model of Loan Outcomes:
Bad Credit Denial (Ref=Conventional Origination)

		Odds Ratios		Std. Error	% Confidence Intervals	
Race of Latino and Non-Latino Applicant (ref= Non-Latino * white)						
Latino *	white	1.62	***	0.08	1.47	1.78
	black	2.29	***	0.11	2.09	2.51
	Asian	1.65	***	0.09	1.48	1.83
	other	2.18	***	0.10	1.99	2.40
Non-Latino *	black	2.20	***	0.10	2.00	2.41
	Asian	1.41	***	0.07	1.28	1.55
	other	1.67	***	0.08	1.52	1.83
Female		0.99		0.02	0.94	1.03
Co-applicant		0.91	***	0.03	0.86	0.96
Household Income ($1000s)		1.00	***	0.00	0.99	1.00
Loan Amount ($1000s)		1.00	***	0.00	1.00	1.00
Income Composition of Neighborhood		1.00	***	0.00	1.00	1.00
Neighborhood Racial Composition		1.00	***	0.00	1.00	1.00
Region (ref= Northeast)						
	Midwest	0.93		0.04	0.86	1.01
	South	0.85	***	0.04	0.77	0.93
	West	0.54	***	0.02	0.49	0.59
Avg Credit Score (MSA)		1.00	*	0.00	0.99	1.00
Unemployment Rate (County)		1.07	***	0.01	1.05	1.09
Avg Housing Price Index (MSA)		1.00	**	0.00	1.00	1.00
Year of Application (ref=2010)						
	2011	0.92	*	0.04	0.85	0.99
	2012	0.91	*	0.04	0.85	0.99
	2013	0.99		0.04	0.92	1.07
	2014	0.87	**	0.03	0.81	0.94
	2015	0.72	***	0.03	0.66	0.77
	2016	0.64	***	0.03	0.59	0.71
	2017	0.61	***	0.02	0.57	0.66
Constant		0.77	***	0.67	0.14	4.19

Source: HMDA * p < .05 ** p< .01 *** p < .001 (p.2 of 3)

Appendix A: Odds Ratios from Multinomial Logistic Regression Model of Loan Outcomes:
Other Reason Denial (Ref=Conventional Origination)

		Odds Ratios		Std. Error	% Confidence Intervals	
Race of Latino and Non-Latino Applicant (ref= Non-Latino * white)						
Latino *	white	1.83	***	0.13	1.60	2.09
	black	2.51	***	0.17	2.21	2.86
	Asian	1.99	***	0.15	1.72	2.30
	other	2.33	***	0.16	2.04	2.65
Non-Latino *	black	2.57	***	0.17	2.26	2.93
	Asian	1.45	***	0.10	1.26	1.67
	other	1.91	***	0.13	1.68	2.18
Female		1.04		0.03	0.98	1.10
Co-applicant		0.97		0.03	0.91	1.04
Household Income ($1000s)		1.00		0.00	1.00	1.00
Loan Amount ($1000s)		1.00		0.00	1.00	1.00
Income Composition of Neighborhood		1.00	***	0.00	1.00	1.00
Neighborhood Racial Composition		1.00	***	0.00	1.00	1.00
Region (ref= Northeast)						
	Midwest	0.83	*	0.05	0.74	0.94
	South	0.98		0.06	0.87	1.11
	West	0.70	***	0.04	0.61	0.79
Avg Credit Score (MSA)		1.00	*	0.00	0.99	1.00
Unemployment Rate (County)		1.05	**	0.01	1.02	1.07
Avg Housing Price Index (MSA)		1.00		0.00	1.00	1.00
Year of Application (ref=2010)						
	2011	0.96		0.05	0.86	1.07
	2012	0.96		0.05	0.86	1.07
	2013	1.07		0.06	0.96	1.19
	2014	1.13	*	0.06	1.02	1.26
	2015	0.95		0.05	0.86	1.06
	2016	0.80	***	0.05	0.71	0.91
	2017	0.93		0.05	0.84	1.03
Constant		0.49		0.57	0.05	4.83

Source: HMDA * p < .05 ** p< .01 *** p < .001 (p.3 of 3)

Gender and Ethno-Racial Disparities in Access to Mortgage Credit

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Abstract

The United States has a long history of gender and racial and ethnic stratification in access to homeownership. Previous research highlights discriminatory and unequal treatment of minorities and women in the mortgage market. However, these studies have focused on gender and ethno-racial barriers separately and primarily among single loan applicants. It is unclear how mortgage lending disparities differ when taking into account the intersection of gender and race and ethnicity across single and co-applicants. This paper draws on annual data from the Home Mortgage Disclosure Act (HMDA) from 2010 through 2017 to assess gender and racial and ethnic disparities in loan outcomes. I show two diverging trends. On the one hand, single women generally outperform single men in the mortgage market even across ethno-racial groups. On the other hand, women-headed couples are more likely to experience an adverse loan outcome compared to male-headed couples among mixed sex co-applicants. The gender gap is substantially larger for black and Latino mixed sex couples than for white couples. This is particularly true for black women- and Latina- headed couples being denied a mortgage. The results for Asian couples are mixed; as gender disparities differ across mortgage outcomes. Inequality for women and minorities in mortgage lending is troubling, as black women- and Latina-headed couples face even larger barriers in access to credit. Trends for same- sex couples resemble those of single applicants. Implications for gender and ethno-racial stratification are discussed.

Introduction

Homeownership is the financial cornerstone and primary mechanism of wealth accumulation for most Americans; and unequal access to homeownership is a key source of gender and ethno-racial inequality in inheritance that contributes to the persistence of inequality across generations (Oliver and Shapiro 2006; Ruel and Hauser 2013). In addition, homeownership is associated with an array of positive neighborhood amenities such as greater safety, better performing schools, and enhanced social networks (Krivo and Kaufman 2004). It is troubling that in spite of decades of federal, state, and local housing legislation, ethno-racial and gender parity in access to homeownership remains elusive. Since 2012, the homeownership rate has remained around 72 percent for non-Hispanic whites (hereafter called "whites"), 57 percent for Asians, and a mere 42 and 46 percent for blacks and Hispanics (hereafter called "Latinos") (U.S. Bureau of the Census 2019). For African Americans in particular, homeownership rates were actually lower, and disparities with whites higher, in 2016 than in 1994 (Fry and Brown 2016). Similar to ethno-racial disparities in access to homeownership, women faced similar challenges as they maintained a homeownership rate of 47 percent compared to 54 percent among men in 2016 (U.S. Bureau of the Census 2019).

Differential access to mortgage credit remains a key structural source of inequality despite a variety of economic and social factors that contribute to disparate rates of homeownership across gender and ethno-racial groups. Even with federal policy, such as the 1968 Fair Housing Act and the 1977 Community Reinvestment Act, research has shown the persistence of discriminatory treatment of black and Latino loan

applicants, who are both more likely to be rejected overall and more likely to be steered into smaller and higher cost loans than similar whites (Bayer, Ferreira, and Ross 2018; Faber 2013; Kuebler and Rugh 2013; Williams, Nesiba, and McConnell 2005). Several audit studies since the 1980s reveal that overall discriminatory treatment of minority home-seekers has declined gradually over time, though poor treatment remains (Ross and Turner 2005; U.S. Department of Housing and Urban Development 2013). Even the expansion of mortgage credit in the 1990s and early 2000s was discriminatory, as many black and Latino homebuyers were steered into high cost and subprime loans even when they qualified for conventional, lower cost mortgages (Massey et al. 2016; Rugh, Albright, and Massey 2015; Weller 2010). While gender inequality in credit access has dramatically improved over time, women continue to experience higher levels of discrimination and restricted access to credit compared to men (Harkness 2016; Pager and Shepherd 2008).

Concurrently, a related literature highlights the overlap of gender and ethno-racial stratification in creating and sustaining wealth. Gender differences in access to credit and employment opportunities has reduced the accumulation of wealth for both single and married women over time and across cohorts (Harkness 2016; Neelakantan and Chang 2010; Ruel and Hauser 2013). Women face additional economic barriers in creating wealth as they are less likely to be promoted or offered high paying salaries at their place of employment (Pager and Shepherd 2008). However, large wealth differences exist between men and women even after accounting for life cycle, education, and family earnings (Grabka, Marcus, and Sierminska 2015; Schmidt and Sevak 2006). The barriers to wealth accumulation are magnified when examining the intersection of gender and

race, and ethnicity. More specifically, women of color often pay higher costs when accessing loans and have lower income which make it difficult to build wealth over time (Baker 2014; Chang 2010). As such, women of color are especially vulnerable in the mortgage market because of the relative importance of economic risk in a loan outcome.

While recent scholarship highlights disparate treatment of minority borrowers and audit studies document the broad secular trends of lending discrimination, there remains a relative paucity of intersectional analysis of gender and ethno-racial variation in access to credit. That is, while researchers know that ethno-racial minority borrowers have had unequal access to mortgage credit, it is not clear how women overall and women of color more specifically have fared in the mortgage market compared to their male counterparts. In addition, researchers have yet to assess how the intersection of gender and race and ethnicity impacts single applicants and co-applicants in access to mortgage lending.

In this paper I draw on data from the Home Mortgage Disclosure Act (HMDA) to compare gender and ethno-racial variation among single applicants and co-applicants in loan application outcomes between 2010 to 2017, the most recent time period after the Great Recession. After policy intervention such as the Dobb Frank Act of 2010, that was used to stem the housing crisis and deter another economic crisis from occurring in the future, access to mortgage credit and housing prices has steadily improved (Krainer and McCarthy 2014). Thus, this study seeks to examine gender and ethno-racial stratification during a relatively stable period in the mortgage market. My main objective is to examine the inter-related impact of the applicant's gender and their race and ethnicity on application outcomes. Results highlight that loan outcomes, particularly mortgage loan

denials due to poor credit and unspecified reasons, vary considerably, with important interactions between gender and race and ethnicity.

Theoretical background

There are two distinct homeownership frameworks. First, the life cycle and human capital perspective frames homeownership as the result of the household decision-making process (Carruthers and Kim 2011; Dwyer et al. 2016; Kuebler and Rugh 2013). This perspective describes homeownership as a reflection of differential taste and preferences such as age, marriage, and childbearing, subject to financial constraints. Human capital and financial characteristics also shape homeownership opportunities as those with higher levels of education and income, more steady and professional employment, and those who are married and living with children are likely to own a home (Dwyer 2007; Faber and Ellen 2016). U.S. citizenship is also an important factor, as homeownership is also higher among native born relative to immigrants, though the gap diminishes with longer residency in the United States (Krivo and Kaufman 2004). Socio-demographic differences across groups account for a large share of the homeownership rate differentials among women and racial and ethnic minorities (Flippen 2001a; Kuebler and Rugh 2013).

However, the large gaps in homeownership that remain after accounting for socio-demographic characteristics leads to an alternative perspective that emphasizes the importance of gender and ethno-racial stratification and discrimination (Flippen 2010; Haurin, Herbert, and Rosenthal 2007; Massey et al. 2016; Rugh and Massey 2010).

Research in this area points to the importance of discrimination in the real estate market, as demonstrated in audit studies that show minority home-seekers are regularly steered towards lower income and non-white neighborhoods and receive lower quality assistance overall in their search for housing (Massey et al. 2016; U.S. Department of Housing and Urban Development 2013). In addition, another body of research focuses on the barriers imposed on homeownership by residential segregation (Faber 2018; Flippen 2001b; Hwang, Hankinson, and Brown 2015), which points to the concentration of black and Latino residents in neighborhoods with older, more multi-family housing units with a lower share of homes available to buy (Dwyer 2007).

The mortgage industry has played a pivotal role in the ability to own a home across all ethno-racial and gender groups and has also been a key factor in the maintenance of racialized and gendered housing inequality. After the Great Depression, federal agencies that were created to re-stimulate the economy such as the Home Owners Loan Corporation (HOLC) and the Federal Housing Authority (FHA) who managed the expansion of credit available to homeowners, explicitly restricted lending towards minority home-seekers and communities alike. Women were ignored altogether in the creation of housing policy as it was assumed that those applying for loans were primarily men, who were considered the head of the household and breadwinners. In addition, the FHA created lending guidelines that spurred new development in suburban areas (as opposed to in central cities) and discouraged lending in minority communities. These policies also known as "redlining" systematically shifted and took away valuable credit lines from minority communities for most of the 20th century (Jackson 1985; Massey and Denton 2001), and institutionalized mortgage discrimination.

Enforcement of the 1968 Fair Housing Act has been weak even though it prohibits discrimination in the sale, rental, and financing of housing. Audit studies conducted by the Department of Housing and Urban Development in the 1970s documented disparate treatment of black and Latino home-seekers especially during the mortgage approval process. In 1977, Congress passed the Community Reinvestment Act (CRA) to encourage and mandate that lending institutions provide credit to low and moderate-income communities (and required data collection to assess and enforce progress).

The emphasis on fair lending was intended to increase minority access over time, but progress has been slow (Friedman and Squires 2005). The perceived credit risk of black and Latino borrowers and communities compared to whites remains a stubborn barrier in greater equity in mortgage lending. In the 1990s, government deregulation transformed the mortgage industry. More specifically, the growth of mortgage back securities in the secondary financial markets was championed by some as a new approach to "liberalize" credit. It was argued that by aggregating multiple loans and spreading the risk across investors, greater levels of credit would be available to a greater range of potential home buyers (wider income and demographic distribution). Investors managed their risk by linking their rewards with higher interest rates. From 1990 until the Great Recession (2007 to 2009), homeownership rates rose among all demographic groups, particularly blacks, Latinos, and women, as mortgage credit increased substantially (Friedman and Squires 2005; Rugh and Massey 2010).

The housing boom of the early 2000s that primarily stemmed from the growth of high cost lending shifted racial and ethnic inequalities in credit access (Bond and

Williams 2007). Rather than outright exclusion and denial from the mortgage market that minority home-seekers often faced prior to the housing boom, black and Latino homebuyers paid higher lending costs and experienced fewer consumer protections than their white peers in the form of subprime mortgages (Williams et al. 2005). Almost half of home mortgages originated in 2006 by black and Latino households was a subprime loan compared to less than 20 percent among whites and Asians (Avery, Brevoort, and Canner 2007). Black and Latino applicants experienced higher levels of predatory lending practices as they were more likely to be steered into unfavorable agreements (Dymski, Hernandez, and Mohanty 2013), even when they qualified for a low-cost conventional mortgage (Weller 2010). In addition, black and Latino neighborhoods were disproportionately targeted by subprime lenders in the form of "reverse redlining" (Faber 2013; Hyra et al. 2013; Rugh et al. 2015); as the growth of subprime lending from 2002 to 2005 was negatively correlated with income growth and positively correlated with higher concentrations of black and Latino residents (Mian and Sufi 2009). Minority areas with increased levels of residential segregation also experienced higher levels of subprime credit during the housing boom (Hwang et al. 2015; Schuetz, Been, and Ingrid Gould 2008).

As such, the impact of the Great Recession and housing crisis also disproportionately impacted minority individuals and communities alike. Foreclosures and vacant properties were highly concentrated in black and Latino neighborhoods that absorbed the volume of subprime loans during the housing boom as well as in highly ethno-racially segregated neighborhoods (Hall, Crowder, and Spring 2015). For homeowners that were able to avoid foreclosure, the economic impact of the Great

Recession was not equally distributed, as minority homeowners were more likely to be underwater (i.e. have a mortgage on their home that is greater than the value of the home) than their white counterparts (Rugh 2015). The overall recovery has been slow and uneven as unemployment levels and mortgage default rates persisted above 5 percent for years, especially in communities with the highest levels of high cost lending (Atlas, Dreier, and Squires 2008; U.S. Department of Labor 2018). In the years following the Great Recession, ethno-racial disparities in mortgage lending have slowly been increasing again for minorities and communities of color alike even after improved economic market conditions (Loya and Flippen 2020).

It is well known that the expansion of credit access during the housing boom from the 1900s to the early 2000s did not result in a narrowing of ethno-racial and gender disparities in access to credit. Instead, mortgage access for black and Latino home seekers increased via higher-risk and -cost loans, rather than improved access to conventional, low-risk and -cost credit. During the Great Recession and housing crisis from 2007 to 2009, studies have shown the lack of credit available to minority borrowers and all borrowers more broadly as financial institutions struggled to deal with large loan and investment losses. Overall access to credit declined significantly after 2008, as a result of stricter underwriting conditions from financial institutions due to the collapse of the subprime market (Krainer and McCarthy 2014). Even in the aftermath of the Great Recession, which has resulted in improved economic conditions and greater credit access across the U.S., studies continue to show unequal mortgage access for black and Latino homebuyers (Acolin et al. 2016; Acolin, Lin, and Wachter 2019; Faber 2018; Loya and Flippen 2020). Moreover, since 2012 the loan portfolios of financial institutions have

grown by 6 percent a year (Estenssoro and Cissi 2015). However, it is less clear what the gender mortgage credit disparities are across ethno-racial groups after the Great Recession.

Previous studies have shown conflicting results when estimating the extent of gender inequality in access to credit. Overall women have a lower homeownership rate than men, but single women have maintained higher homeownership rates than single men since 1986 (U.S. Census 2018). In addition, women continue to be perceived as less qualified and higher risk borrowers than men (Allen 2009; Evans, Blount-Hill, and Cubellis 2019; Harkness 2016; Haughwout et al. 2009). Previous research on gender inequality in homeownership and access to credit has long focused on single applicants, ignoring the challenges of couples where women are the primary loan applicants (Allen 2009; Pager and Shepherd 2008). As such, this paper focuses on mortgage credit access disparities among single applicants and co-applicants across gender and ethno-racial groups.

There are many reasons to anticipate that black women and Latinas face even larger challenges in accessing mortgage credit than white men and women applicants (and potentially Asians). First, black women and Latinas face higher levels of discrimination in several economic areas including employment opportunities, wages, and careers compared to white men and women, as well as their co-racial and ethnic male counterparts (Pager and Shepherd 2008). Second, there is a distinction between singles and couples, especially among women of color. Black women and Latinas are more likely to partner "down" as they often have similar or higher levels of education and income as their partners and have a smaller pool of potential partners compared to white

women (Bronzaft 1991; Choi and Tienda 2017). The power of these forces is strongly linked to a lower social and economic standing for black women and Latinas compared to white women (Grusky and Weeden 2011). Finally, lender bias may be compounded against black women and Latinas due to negative perceptions against both women and minority status. Thus, we can expect that women of color face larger barriers to mortgage credit than their white counterparts.

On the other hand, it is possible that the gender disparities in credit access may be more even across ethno-racial groups. In particular, the CRA mandates investments into minority and low- income communities from financial institutions, thus increasing the chances of a mortgage approval for women of color, at least to the extent to which they tend to apply for mortgages in predominantly minority communities. In addition, the mortgage market and lending environment has continued to improve since the Great Recession, thus allowing financial institutions to grow their loan portfolios. Indeed, subprime lending has fallen dramatically for all ethnic and racial groups between 2004 and 2015, and even more so for blacks and Latinos than for whites (Fry and Brown 2016).

Access to mortgage credit and homeownership opportunities have been particularly fruitful for single women compared to single men. In 2016, the homeownership rates for single women hovered above 50 percent compared to 47 percent for single men (U.S. Census 2018). The increased levels of homeownership among single women may provide a benefit for women- headed couples seeking to buy a home due to their success in the homeownership market compared to their male counterparts. As such, it is conceivable that gender inequality is absent in the mortgage market among both

singles and couples due to the growing importance and status of single women in the housing market. However, the economic recovery has not been equitable across gender or minority groups (Loya and Flippen 2020), thus limiting the opportunities women have in the mortgage market. It remains to be seen what the gender and ethno-racial inequality is across applicant types in the mortgage market post the Great Recession (2010 to 2017).

This paper seeks to address this gap in the literature. While the racialized process in the mortgage industry has been amply documented for borrowers and communities, many questions remain about gender and its intersection with race and ethnicity. First, most work on the post Great Recession period focuses on the lending conditions and disparities of black and Latino borrowers compared to whites and Asians. It is less clear how these disparities intersect with gender more broadly as well as the barriers women of color face compared to white women and all men generally. Second, the importance of couples in the mortgage market continues to grow as the price of housing has soared since the Great Recession. The proportion of couples applying for a mortgage has increased from 30 percent in 2004 to 43 percent in 2017 (Loya and Flippen 2020). Because continued escalation of housing costs has made having a dual-income and credit more valuable in access to mortgage credit (Board of Governors of the Federal Reserve System (U.S.) et al. 2017), it is particularly important to examine gender disparities among singles *and* couples, and not just single applicants as previous studies have done. Taken together, I use the most recent mortgage data available to assess the intersection of gender and ethno-racial disparities in mortgage lending across application types from 2010 to 2017. My analysis includes examining the complex interaction between the applicant's gender and race and ethnicity in structuring lending patterns.

Data and Methods

To address gender and ethno-racial disparities in institutional mortgage outcomes in the United States, I draw on publicly available data from the Home Mortgage Disclosure Act (HMDA) from 2010 to 2017. As part of the CRA's mandate to monitor lending practices, all financial institutions with a national charter are required to submit HMDA data annually to the Federal Financial Institutions Examination Council (FFIEC). As a result, the dataset contains a record for every loan application received, including applicant and co-applicant demographic and income characteristics; loan amount, property type, purpose of the loan, and census tract identifier; and outcome of the application, including reason for denial and high cost loan indicators. While the dataset does not contain information on the applicant's credit score, down payment amount, and marital status, it is a broadly representative sample of home lending in the United States, covering about 80 percent of all mortgage originations (Avery et al. 2007). HMDA is also the only public national mortgage dataset that includes the applicant's gender, race, ethnicity, and application neighborhood (Bradford 2002). As a result, HMDA is the most common used data source on gender and ethno-racial disparities in access to mortgage credit.

I restrict the HMDA sample to non-institutional singles and couples applying for financing for owner-occupied single-family homes (1-4 units) in the United States, through a conventional or jumbo mortgage (i.e., Veteran's Administration and re-finance applications are not included). In addition, only applicants who completed their

application and were vetted by their primary lender are considered. More specifically, mortgages that were bought by other financial institutions and recorded in the HMDA dataset are excluded, because they were already documented as a mortgage transaction by the initial mortgage lender. I also, employed list-wise deletion for observations with missing data. Past studies of missing data in HMDA has shown that data quality improved dramatically after 2003, when reporting requirements and guidelines were more strictly enforced. While missing observations hinder analyses of re-finance applications, they are not a concern for mortgage originations (Faber 2013). Unfortunately, the dataset does not contain the marital status of applicants, thus I discuss the type of applicants as either single or couples.

I begin my analysis with data from 2010 to avoid the influence of the impact of the housing bubble and the subsequent Great Recession on the mortgage market. By 2010, the mortgage market began to stabilize from the Great Recession in terms of the volume of loans, the types of loan products being offered to applicants, and for the most part, housing prices stabilized and began to grow again (Faber 2018; Sampson, Schachner, and Mare 2017; U.S. Department of Commerce 2014). In addition to avoiding the housing market conditions from the Great Recession, HMDA redefined important indicators in 2009. More specifically, the definition for high cost loans were changed to reflect prime interest rates in the mortgage market rather than the treasury rate. My analysis ends with 2017 because this is the last year of the complete publicly available data without any additional updates. Finally, I restrict the sample to white, black, Latino, and Asian applicants, excluding Native Americans due to small sample sizes. The final dataset contains 10.5 million applicants from 2010 to 2017.

Model specification

The dependent variable for this study is the outcome of completed loan applications. There are three potential outcomes to all applications: they can be approved for a conventional loan; applications can be approved for a high cost loan; or they can be denied a mortgage. My first step is to define high cost loan originations. High cost loans are defined as those originated with an above-market annual percentage interest rate (APR), following the standards set by previous literature (Avery et al. 2007; Faber 2013; Hwang et al. 2015; Immergluck 2010). The HMDA dataset has a high cost loan indicator, which is defined as any loan origination that has an APR of 1.5 points or more than the average 30 years fixed rate conventional loan.

Once I designate loans as high cost, I then define conventional loans as all originated loans that are not high cost. For loan denials, the HMDA dataset contains information on reasons for denial. I distinguish between denials due to "credit worthiness" (specifically, debt-to-income ratio, employment history, credit history, collateral, and insufficient cash), and rejections whose reasons are listed as "other." I separate these two reasons for denials in order to compensate for the lack of information and that could potentially reflect gender and ethno-racial variation on factors such as down payment size and credit score. The result is a multinomial variable distinguishing between conventional loan approval; high cost loan approval; bad credit denial; and denials due to unspecified reasons. This specification enables me to test for gender and ethno-racial disparities for better and worse forms of approval and more and less justifiable forms of denial.

The primary independent variables of interest includes the type, gender and race and ethnicity of the applicants. In the multivariate setting, I interact the applicant type, race and ethnicity, and gender of the applicants, distinguishing between single white men, single white women, white couple with a primary male applicant and female co-applicant, white couple with a primary female applicant and male co-applicant, white male same sex couple, white female same sex couple, and so on. Moreover, to ensure that my measure of gender and ethno-racial inequality at the applicant level is not reflecting the impact of economic variation across groups, I also control for the total household income of applicants.

I also control for neighborhood factors that may influence how financial institutions deem a mortgage loan application economically risky and undesirable. The neighborhood factors include the percent of whites and the mean household income in the census tract in which the property is located. In addition, I also include property characteristics, such as the amount of the loan requested. Finally, because gender, ethno-racial groups, and economic conditions are unevenly distributed across the country, I also control for larger contextual factors that may contribute to gender and ethno-racial disparities in mortgage access. Labor and housing markets across the country are gendered, racialized, and spatially stratified (Dwyer and Phillips Lassus 2015; Faber 2018). Thus, it is important to consider local variation in factors such as unemployment, changes in housing prices, and aggregate credit scores. As such, I control for the annual county-level unemployment rate which measures individuals in the labor force who are unemployed (https://www.bls.gov/cps/cps_htgm.htm). Metropolitan statistical areas enjoying more rapid housing price growth may be viewed more favorably by lenders,

encouraging more mortgage lending, therefore I also include the average House Price Index (HPI), which is a score above 100 that captures changes in the value of single-family homes (https://www.fhfa.gov/DataTools/Downloads/Pages/House-Price-Index.aspx). I also, include the average Experian National Score Index, which includes all credit consumers and types of credit, for the top one hundred MSAs in the United States (Rugh and Massey 2010). Because black and Latinos are disproportionately located in the largest metro areas, I want to confirm that estimates of household and community-level gender and ethno-racial disparities are net of larger perceived risk patterns.[7] Finally, I control for the U.S. region in which the property is located, as defined according to Census guidelines (http://www2.census.gov/geo/docs/maps-data/maps/reg_div.txt).

Analytic strategy and methods

The first step in my analysis is to provide descriptive statistics of loan outcomes by applicant type, gender, and race and ethnicity. Second, I show applicant characteristics detailing averages by applicant type, race and ethnicity, and gender. The final step in the analysis is to examine how gender and ethno-racial disparities in mortgage outcomes vary by applicant type, net of differences across groups in socio-demographic, loan, property, and locational characteristics.

To assess gender and ethno-racial disparities in mortgage outcomes by applicant type, I estimate a multinomial logistics model with robust standard errors of loan

[7] While I control for these factors as an average over time (2010 to 2017), annual averages and lagged specifications produced the same substantive findings.

outcomes (acceptance into a conventional loan (reference), acceptance into a high cost loan, rejection due to bad credit, or other reason rejection. The multinomial logistic model enables me to maximize the entire dataset, which is over 10.5 million observations, provide population average coefficients, and consistent and efficient parameter estimations. By using robust standard errors, I correct for the underestimation of standard errors that occurs from having neighborhood variables in the model.[8] I also considered an alternative modeling approach, a multi-level multinomial hierarchical linear model (HLM), which examines individual, neighborhood, county, and metro level influences on mortgage outcomes. The main disadvantage of the multi-level HLM approach is that it is much more computationally intensive, requiring a substantially smaller sample size that renders it difficult to assess outcomes among black and Asian women headed couples. The substantive results across both modeling approaches were similar and consistent, and because neighborhood, metro and county level effects were not my primary concern, I report the findings from the multinomial logistic model.

The role of selection into women headed applicants versus male headed applicants or versus single women applicants could be potentially problematic. Differentials in credit may affect whether a woman applies for a loan as the sole applicant or with a partner. However, a report from Experian in 2019 (https://www.experian.com/blogs/ask-experian/research/married-couples-have-higher-credit-scores-and-debt-than-single-adults/) shows that couples have a higher credit score and have half the number of bad or delinquent accounts than singles. With regards to

[8] I am not able, however, to simultaneously correct for multiple levels of clustering, such as at the county and MSA levels. However, the results from my model are consistent with those from a multi-level HLM model, which does simultaneously account for multiple levels of clustering.

selection bias among couples, each couple decides who will be the primary applicant when applying. The individual who has the best chance of obtaining a mortgage is typically the primary applicant. When examining Table 1, the gender difference in household income between single men and women (25 thousand dollars) is much greater than the gender differences between male and women headed mixed sex couples. Credit scores are not available in the HMDA dataset which may be problematic when considering the selection of the primary applicant. However, I compared credit score differences between couples (women versus male headed households) in a nationally representative sample, called the Survey of Mortgage Originations from 2013 to 2016, and found no major credit score or economic differences between types of couples.[9] I have also included same sex couples in my analysis, but they only make up 3.5 percent of the total sample. The number of observations gets even smaller, when examining the intersection of race and ethnicity and gender. Because of this this, I primarily focus my analysis on gender and ethno-racial disparities between single and mixed sex couples. Finally, I adjusted the monetary controls such as income and loan amounts for inflation and found not substantive differences in the results.

Descriptive Results

Figure 1 presents the dependent variable, the outcome of completed loan applications, by type, gender, and race, ethnicity from 2010 to 2017. The figure shows large ethno-racial and gender disparities in application outcomes that also varies by

[9] I also conducted a propensity score analysis to examine mortgage outcomes (high-cost loans versus a conventional loan) using the Survey of Mortgage Originations and found similar results for the intersection of gender and race and ethnicity as those presented in the multivariate analysis.

applicant type. First, among single applicants, white and Asian women are just as likely or slightly less likely to be approved for a conventional loan, more likely to obtain a high cost loan, and more likely to have their application denied than their single male counterparts. In contrast, single black women and Latinas are more likely to be approved for a conventional loan compared to single black men and Latinos. The gender gap of obtaining a conventional mortgage is small or non-existent across ethno-racial groups. Second, among couples with different sex partnerships, male-headed households generally and across ethno-racial groups are more likely to be approved for a conventional loan than their woman-headed counterparts. When comparing across ethno-racial groups, the gender gap of obtaining a conventional loan is smallest between white and Asian couples compared to black and Latino couples. And finally, among couples with same sex partnerships, men and women couples perform similarly in the mortgage market across ethno-racial groups. There is no gender gap across ethno-racial groups among same sex couples.

The figure also highlights dramatic ethno-racial differences in application outcomes. Blacks and Latinos regardless of applicant type and gender, display the lowest levels of obtaining a conventional mortgage compared to whites and Asians. In addition, black and Latino applicants experienced higher levels of adverse loan outcomes (high-cost loan origination, bad credit denial, and other reason denials) compared to white and Asian applicants.

Part of the disparities evident in Figure 1 could relate to well-known differences in socio-demographic characteristics across groups. Table 1 presents average demographic, socioeconomic, loan, and locational characteristics overall and by the

application type, race and ethnicity, and gender. Overall, single applicants are the majority of the mortgage market (60 percent). In addition, the applicant pool is disproportionately white and male. Among single applicants, about 40 percent are white males and 30 percent are white women. There are about half as many single Asian women and Latinas applying for a mortgage as Asian and Latino men. In contrast, there are about twice as many single black women as black men in the mortgage market. The average income of single women is 26 thousand dollars less than men (96 thousand dollars). The pattern remains the same across ethno-racial groups, as single women have a lower average household income than their male counterparts. Whites and Asian women face the largest income gap with a difference between 25 and 30 thousand dollars. However, single blacks and Latinos have the lowest average incomes compared to whites and Asian. The average loan amounts followed a similar pattern as single women in general requested about 50 thousand dollars less than single men. Across ethno-racial groups, single whites and Asians have the greatest gender gap in terms of loan amount. Regardless of gender, single blacks and Latinos request the lowest loan amounts compared to whites and Asians.

Single applicants sought mortgages in similar types of neighborhoods. Single women generally applied in similar income and racially diverse neighborhoods as single men. A similar gender pattern is observed across ethno-racial groups for both average income and percent of whites in the neighborhood. In addition, single blacks and Latinos applied in lower income neighborhoods and more racially diverse neighborhoods than single whites and Asians. Single whites applied in overwhelmingly white neighborhoods compared to all other ethno-racial groups. Overall, single men and women applied in

similar U.S. regions. Also, across ethno-racial groups, single whites and blacks are heavily concentrated in the South, while single Asians and Latinos are concentrated in the South and West.

Single men and women applied in locations with similar unemployment rates, credit scores, and housing price affordability. All ethno-racial groups applied in counties with similar unemployment rates. Single whites and Asians applied in areas with slightly higher credit scores than single blacks and Latinos. Across ethno-racial groups, single whites and Latinos applied in areas with similar housing affordability. Single blacks applied in the most affordable areas, while single Asians applied in the least affordable areas. Finally, among singles, the distribution of the applicant year was similar across ethno-racial groups and gender.

Among mixed sex couples, 65 percent are white male- headed couples and 15 percent are white women- headed couples. Across all ethno-racial groups there are 4 times more male- headed couples in the mortgage market than women-headed couples. The average income of women- headed couples is 10 thousand dollars less than men at 136 thousand dollars. Across ethno-racial groups the pattern remains the same, as women headed households have a lower average household income than male- headed households. White and Asian women- headed couples face the largest income gap with a difference between 10 thousand dollars and 15 thousand dollars. Black and Latino couples have the lowest average income compared to whites and Asians. The average loan amounts exhibit a similar gender pattern as average household income among mixed sex couples. Across ethno-racial groups, white and Asian couples have the largest gender

gap in average loan amounts. Black and Latin couples regardless of gender request the lowest loan amounts compare to white and Asian couples.

Mixed sex couples applied for homes in different types of neighborhoods. Male-headed households applied in higher income neighborhoods and in neighborhoods that were slightly less racially diverse. A similar pattern for average income and racial composition in the neighborhood is observed across ethno-racial groups. Also, black and Latino mixed sex couples applied in lower income and more racially diverse neighborhoods than mixed sex white and Asian couples. Similar to singles, white mixed sex couples applied in disproportionately white neighborhoods. Overall, mixed sex couples applied in similar U.S. regions. Across ethno-racial groups, white and black couples were concentrated in the South, while Asian and Latino couples were concentrated in the South and West.

Male- and women- headed couples applied in locations with similar unemployment rates, credit scores, and housing affordability. Mixed sex couples applied in areas with similar unemployment rates across ethno-racial groups. White and Asian mixed sex couples applied in areas with higher credit scores compared to black and Latino couples. Asian couples applied in the least affordable areas, while black couples in the most affordable areas. Finally, the distribution of the year of the application is similar among mixed sex couples.

Among same sex couples, approximately 65 percent are white (35 percent male and 30 percent women). Across all other ethno-racial groups, no same sex sample exceeded 10 percent. The average income of same sex women couples is 40 thousand dollars less than men. Across ethno-racial groups, same sex women couples have lower

average incomes than same sex male couples. White same sex male couples have an average income of about 50 thousand dollars more than their women counterpart. For all other ethno-racial groups, same sex male couples have an average income of about 15 thousand dollars more than same sex women couples. The average loan amounts followed a similar pattern among same sex women couples as they requested about 28 thousand dollars less than same sex male couples. White and Latino same sex women couples have the greatest gender gap in loan amounts requested. Overall, black and Latino same sex couples requested the lowest loan amounts compared to white and Asian couples.

Same sex women couples applied in similar income and racially diverse neighborhoods as same sex male couples. Across ethno-racial groups, a similar gender pattern is observed for both average income and racial composition in the neighborhood. Also, white and Asian same sex couples applied in higher income neighborhoods than black and Latino same sex couples. White same sex couples applied in predominantly white neighborhoods, while all other same sex couples applied in more diverse neighborhoods. In general, same sex couples applied in similar U.S. Across ethno-racial groups, white and black same sex couples applied heavily in the South, while Asian and Latino same sex couples applied disproportionately in the South and West.

Same sex couples applied in areas with similar unemployment rates, credit scores, and housing price affordability. In addition, same sex couples applied in areas with similar unemployment rates, except in the case of Latinos, as they applied in slightly higher unemployed areas. White, Asian, and black same sex couples applied in areas with similar average credit scores, while Latinos applied in areas with slightly lower average

credit scores. Across ethno-racial groups, Asian same sex couples applied in the least affordable areas, while black same sex couples applied in the most affordable areas. Finally, the distribution of the applicant year was similar across same sex couplings.

Multinomial Logistic Regression Results

The combination of type, ethno-racial, and gender disparities in socioeconomic and loan characteristics as well as the variation found in locational characteristics necessitates an examination of loan outcome disparities in a multivariate setting. Accordingly, I estimate a multinomial logistic regression of loan outcomes. As the patterns of income, loan amount, average credit score, House Price Index, unemployment rate, and region all follow those reported in previous analyses (with lower denial and high cost lending relative to conventional acceptances among higher income earners, lower loan amounts, and low economic risk areas), I report results of the full model in Appendix A and focus my attention on the main variables of interest, namely the application type and intersection of race and ethnicity and gender.

Figures 2 through 5 present the odds ratios of each of the mortgage outcomes by type, race and ethnicity, and gender (i.e., I chart the odds ratios in Appendix A). The reference category is a white single male approved for a conventional loan. While results show significantly higher rejection rates and high cost loan originations for black and Latino applicants relative to whites and Asians, there are nevertheless noteworthy differences in these disparities associated with gender.

First, for applicants approved for high cost loans relative to conventional loans (Figure 2), there are distinct patterns between blacks and Latinos on the one hand and

whites and Asians on the other. Black and Latino applicants regardless of type and gender are significantly more likely than whites to be approved for high cost loans relative to conventional loans, even net of applicant, loan, and locational characteristics. Asians, in contrast, are less likely than whites to receive a high-cost loan origination.

There are important differences, however, in the magnitudes, as women fare differently across applicant type. Among single applicants, women are less likely to obtain a high cost loan relative to a conventional loan than men. This trend is maintained across ethno-racial groups. For example, single white women are about 10 percent less likely to obtain a high cost loan than single white men.

Among mixed sex couples, women- headed couples are heavily disadvantaged across ethno-racial groups. To illustrate, relative to white male- headed couples, the odds of obtaining a high cost loan relative to a conventional loan are about 20 percent higher for white women- headed couples. The odds ratios when examining high-cost loans relative to conventional loans are even larger for black women- headed and Latina-headed couples compared to their male counterparts. For example, black women- headed couples are more than 3 times more likely to receive high cost loans than single white males. In comparison, the odds of a high cost loan origination is "only" 2.68 times for black male- headed couples. The gender difference of the odds ratios for high cost loan origination among black mixed sex couples is more than 37 percent (3.05 minus 2.68) compared to the 20 percent (.98 minus .78) gender difference among white mixed sex couples.

Latino and Asian mixed sex couples display similar gender differences as white mixed sex couples. To illustrate, relative to their single white male counterparts, the odds

of obtaining a high-cost loan relative to a conventional loan are 2.54 times higher for Latina headed couples, while the odds ratios for Latino- headed couples are slightly lower at 2.34 times. Similar to the gender difference found among white couples, Latino couples have a gender difference of about 20 percent (2.54 minus 2.34). In general, Asian couples slightly outperform white couples, but gender differences remain. Asian women-headed couples are 15 percent less likely to obtain a high cost loan compared to a conventional loan, while Asian male- headed couples are 36 percent less likely. The gender difference among Asians is about the same as white and Latino mixed sex couples, as their difference is 21 percent (.85 minus .64) compared to a 20 percent gender difference among white couples.

Gender disparities in high cost loans among same sex couples differs considerably compared to the results seen among mixed sex couples. Across ethno-racial groups, the gender differences are not statistically significant. Thus, it appears that male and women couples perform similarly across ethno-racial groups in obtaining a high cost loan relative to a conventional loan.

Figure 3 presents the odds ratios from the same multivariate model of loan outcomes, this time for denials due to bad credit, relative to acceptance into a conventional loan. This outcome was primarily included as a way to control for unobserved variation across gender and ethno-racial groups in credit concerns, but interesting trends remain. Black, Latino, and Asian single applicants and couples are more likely to be rejected due to bad credit than their white counterparts, though blacks generally fare noticeably worse than Latinos and Asians. Unlike in the case of high-cost lending, Asians underperform whites.

Among single applicants, gender differences are inconsistent across ethno-racial groups. For instance, white and black women are 12 percent and 22 percent less likely to be denied for bad credit than their male counterpart. However, Asian women are 12 percent more likely to be denied for bad credit than single male Asians. There is no statistical difference between single Latinos and Latinas.

Gender disparities in bad credit rejections among mixed sex couples, similar to high-cost lending, is clear. Like high-cost loan differences, white couples fared the best. White women- headed couples are 18 percent more likely to be denied due to bad credit than their white male- headed counterparts. In contrast, the black gender differential is the largest among mixed sex couples. To illustrate, black women- headed couples are more than 2.32 times more likely, and black male- headed couples are 1.86 times more likely to be denied due to bad credit relative to conventional loans. The black gender gap is .46 (2.32 minus 1.86) compared to .18 for whites (.85 minus .67). Latino couples also experienced a larger gender gap than previously observed for high cost origination. Latina- headed couples are more than 1.63 times and Latino- headed couples are 1.29 times more likely to be denied due to poor credit than their single white male counterpart. The Latino gender differential is .34 (1.63 minus 1.29) compared to the Latino gender gap of .20 that was observed in high cost origination. While Asian couples are more likely to be denied for bad credit, their gender difference is slightly higher than white couples. Asian women- headed couples are 1.35 times and Asian male- headed couples are 1.12 times more likely to be denied due to bad credit compared to single white men. The white gender differential is slightly smaller (.18), than the Asian gender gap of .23 (1.35 minus 1.12).

Among same sex couples, a different gender pattern emerges across ethno-racial groups. On the one hand, black and white women couples are less likely to be denied to poor credit than their same sex male counterparts. For example, white (black) women couples are 23 percent (51 percent) less likely to be denied for bad credit than white and black male couples. On the other hand, there are no gender differences among Asian and Latino same sex couples.

The trends for rejection due to other reasons, presented in Figure 4, resemble those of bad credit rejections. Once again, blacks, Latinos, and Asians are more likely to be denied due to unspecified reasons than whites. Regardless of application type, blacks are the most likely to be rejected due to other reasons, followed by Latinos and then Asians.

The pattern of gender disparities across ethno-racial groups for mortgage denials due to other reasons relative to conventional loans among single applicants resembles those observed for denials due to bad credit. For example, white and black single women are 11 percent (.89 minus 1) and 24 percent (2.35 minus 2.11) less likely to be denied due to unspecified reasons than their male counterparts. However, single Asian women are 11 percent (1.29 minus 1.18) more likely to be denied due to other reasons than single Asian men. There are no gender differences between single Latinas and Latinos in being denied due to other reasons.

Gender disparities among mixed sex couples for mortgage denials due to unspecified reasons are similar to the results shown for denials due to bad credit across ethno-racial groups. More specifically, white women- headed couples are 13 percent (.82 minus .69) more likely to be denied due to other reasons compared to white male- headed

couples. Black women- headed couples are 2.55 times more likely to be denied for unspecified reasons, while black male- headed couples are 2.08 times more likely to be denied for other reasons. The black gender gap is .47 (2.55 minus 2.08) compared to the much smaller white gender gap of .13. Latina headed couples are also more likely to be denied due to other reasons. To illustrate, Latina- headed couples are 1.92 times more likely and Latino headed couples are 1.56 times more likely to denied for unspecified reasons. The Latino gender gap for denials due to other reasons is .36 (1.92 minus 1.56). Similar to the trend found when examining denials due to bad credit, Asian couples are more likely to being denied for unspecified reasons than their white counterparts. More specifically, Asian women- headed couples are 1.42 times more likely to be denied for other reasons compared to 1.17 times for Asian male headed couples. The Asian gender gap is almost double that of the smaller white gender gap of .13.

Among same sex couples, women generally outperform men across ethno-racial groups when examining other reason denials. For example, white women are 20 percent (1.06 minus 1.26) less likely to be denied for unspecified reason than white males. Asian women and Latina couples similarly outperform their male counterparts, as they are 28 percent and 26 percent less likely to denied due to other reasons compared to Asian male and Latino couples. However, there are no statistical gender differences among black same sex couples in being rejected due to other reasons.

Conclusion

The mortgage market is a major actor in the persistence of gender and ethno-racial homeownership inequality, which is also central to wealth stratification more

broadly. The evolution of discriminatory treatment laid bare by the housing bubble and subprime lending collapse point to the need for constant monitoring of the lending industry and its practices. While lending has since stabilized, additional attention is still needed in order to minimize ongoing barriers to minority and gender access to homeownership, particularly for black women and Latinas. Drawing on HMDA data, I document important gender and ethno-racial variation across applicant type in disparities in mortgage access.

The persistence of gender and race and ethnicity in structuring access to mortgage credit is striking. Overall, gender disparities vary depending on the whether women apply as a single applicant versus having a co-applicant. Moreover, gender disparities were not only statistically significant, they were also substantively large. The stratification of race and ethnicity also shape mortgage outcomes, as blacks and Latinos in all cases and Asians when it comes to mortgage denials face worse mortgage outcomes that their white peers. The findings are consistent with the widening body of literature that highlights the disparate treatment and mortgage access of minority borrowers (Bayer et al. 2018; Faber 2013; Massey et al. 2016). When women apply as a single applicant, they generally outperform their male counterparts in the mortgage market across ethno-racial groups, except in the case of Asians. Single women are less likely to obtain a high cost loan and are less likely to be rejected, either due to bad credit or unspecified reasons, then their male counterparts.

I also demonstrate that there are large differences in mortgage access when examining the intersection of gender and race and ethnicity among mixed sex couples. Mortgage access disparities between men- and women- headed couples differ

tremendously by race and ethnicity. Gender disparities among white couples was between 10 percent to 20 percent across mortgage outcomes. The gender gap among Asians couples was larger and it ranged between 20 percent to 25 percent across adverse loan outcomes. Except in the case of high cost lending for Latinos, the gender gap among black and Latino mixed sex couples is significantly larger for each adverse mortgage loan outcome compared to the white and Asian gender gap. The gender gap for blacks across mortgage outcomes is between 150 percent and 325 percent larger than the gender gap between whites. Black women- headed couples face the largest disadvantage across all mortgage outcomes. Latina- headed couples fare slightly better mortgage outcomes compared to black women- headed couples, but significantly trail the performance of white and Asian women- headed couples. The gender gap for mortgage denials among Latino couples is between 175 percent and 300 percent larger than the white gender gap.

Among same sex couples, there are no gender differences across ethno-racial groups in obtaining a high cost loan, but generally women couples are less likely to be rejected than their male couple counterparts. For instance, white women couples are about 20 percent less likely to be denied a loan than white male couples. Among Asian, black, and Latino same sex couples, women couples are between statistically indifferent and 50 percent less likely to be denied a mortgage for either bad credit or unspecified reasons than their male couple counterpart.

The findings add to the previous literature demonstrating the complexity of gender and ethno-racial disparities in lending especially between single applicants and co-applicants. Mortgage access continues to be a large barrier for ethno-racial minority groups and women headed mixed sex households even after public policy intervention to

deter abusive lending. The patterns I show suggest that women of color face even larger obstacles in the mortgage market than previously understood. Regardless of the precise mechanisms, it seems that the large gender gap among black and Latino mixed sex couples in mortgage access is more of the norm than the exception.

The implications of these patterns for gender and ethno-racial stratification are profound.

Regardless of application type, blacks and Latinos underperform in the mortgage market compared to whites and Asians. When considering gender, women generally outperform their male counterparts across all ethno-racial groups among single applicants and same sex couples. However, among mixed sex couples, minority women are significantly more disadvantaged than their male counterpart. On the one hand, black (Latinas) women-headed couples are 2.3 to 3.05 (1.6 to 2.55) times more likely to experience an adverse loan outcome compared to single white men. On the other hand, white women headed couples are between 20 percent less likely to just as likely to experience an adverse loan outcome as to single white men. Asian women headed couples lie somewhere in the middle as they are 20 percent less likely to 1.45 times more likely to experience an adverse loan outcome as single white men. The magnitude of these mortgage barriers for women- headed couples far exceed their male counterparts across ethno-racial groups. In addition, black and Latino couples in the mortgage market are more likely than white and Asian couples to have a woman as the primary applicant, thus any bias against women in the co-applicant market may be contributing to the ethno-racial inequality in loan outcomes. These barriers in the entry into homeownership for women headed couples should be added to our understanding of the gender and race and ethnic consequences of

wealth disparities in the U.S. The patterns demonstrate that obtaining credit continues to be especially difficult and expensive for black women and Latina headed couples, limiting the utility of homeownership as a tool for closing the gender and racial and ethnic wealth gap.

This study also suggests avenues for future projects. The trends in applicant's characteristics points to a need for better understanding selection into the mortgage application pool between single and co-applicants. In addition, the variation found at the neighborhood level from this study suggests that future projects could explore variation in lending patterns across different types of minority concentration in the neighborhood, to assess whether black, Latino, and mixed neighborhoods differ from one another in terms of mortgage access.

Finally, these findings highlight the need for better data on gender and ethno-racial disparities in the mortgage market. While the HMDA dataset is the most commonly used tool for assessing institutional barriers to lending for minorities, the lack of information on applicant credit impedes the ability to determine discriminatory behavior. Efforts in 2004 and 2009 to improve data quality have been successful (Bhutta and Ringo 2014). 2019 HMDA data will contain additional information on credit scores, down payment, and debt to income indicators which may assist researchers, policy makers, and regulators in deterring mortgage discrimination. It is worth noting that the results likely underestimate gender and ethno-racial disparities in mortgage access, because prior to the Great Recession, a large share of high-cost lending were from refinancing, rather than original home purchases. The quality of these types of loans in HMDA (Avery et al.

2007) is far lower than loan originations, making it an important area of improvement and future research.

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Table 1: Applicant characteristics, by type, race and ethnicity, and gender: 2010 - 2017

Type of Applicant	All	Single		Single							
Race and Ethnicity of Applicant(s)		All		white		Asian		black		Latino	
Gender of Primary Applicant		Male	Female	Male	Female	Male	Female	Male	Female	Male	Female
Gender of Secondary Applicant		-	-	-	-	-	-	-	-	-	-
Type of Applicant (%)											
Single	59.47										
Co-applicant	40.53										
Gender (%) Male	66.82										
Female	33.18										
Race and Ethnicity (%)											
NH white	71.65	66.95	66.29								
Asian	8.79	7.34	13.97								
black	7.50	15.04	12.53								
Latino	12.07	10.66	7.21								
Mean Household Income ($1000s)	104.65	95.59	69.27	101.96	72.19	109.11	85.94	74.83	59.63	67.81	55.01
Mean Loan Amount ($1000s)	254.43	244.49	195.40	247.62	196.64	328.85	272.85	190.80	168.89	196.95	173.77
Mean Household Income in Census Tract ($1000s)	87.44	84.91	80.48	87.49	83.97	100.21	90.68	72.47	70.52	68.66	67.28
Percent Whites in Census Tract (%)	67.64	65.49	64.14	73.96	73.60	57.23	54.39	45.87	42.65	43.18	43.68
Region of Home (%)											
Northeast	12.73	12.07	12.23	13.91	14.03	9.70	8.83	10.37	10.15	6.36	6.98
Midwest	20.56	19.84	20.68	23.29	24.11	12.31	11.62	18.24	18.33	10.63	10.38
South	40.01	41.34	41.74	39.45	38.20	35.60	30.67	60.20	62.09	44.60	44.16
West	26.70	26.75	25.35	23.35	23.66	42.39	48.87	11.18	9.42	38.41	38.49
Mean Unemployment Rate (County)	6.62	6.69	6.70	6.56	6.53	6.58	6.87	6.90	6.94	7.23	7.21
Mean Credit Score (MSA)	690	690	690	691	691	692	691	688	688	684	684
Mean Housing Price Index (MSA)	217.73	217.17	215.67	216.01	215.63	226.92	224.63	209.75	208.34	219.05	218.87
Year of Application (%)											
2010	11.21	11.08	12.04	11.02	11.56	9.85	11.72	12.15	13.89	11.70	12.72
2011	*10.11*	10.06	10.63	*10.10*	10.47	8.82	10.00	10.39	11.15	10.60	11.30
2012	11.41	11.40	11.65	11.63	11.77	10.58	11.29	10.94	11.26	11.16	11.64
2013	13.17	13.21	12.89	13.50	13.18	13.22	13.30	12.10	11.74	12.46	12.39
2014	13.30	13.41	12.88	13.40	12.99	13.23	12.52	13.29	12.62	13.62	12.85
2015	15.06	15.14	14.86	14.96	14.82	14.60	13.64	15.78	15.34	15.99	15.22
2016	11.40	11.16	10.48	11.58	11.39	14.61	13.07	7.53	6.73	8.62	8.37
2017	14.36	14.54	14.56	13.80	13.82	15.11	14.46	17.82	17.27	15.85	15.51
Observations (1000s)	10505	3636	2616	2435	1734	388	189	267	366	547	328

Source: HMDA

Table 1 continued: Applicant characteristics, by type, race and ethnicity, and gender: 2010 - 2017

Type of Applicant	All	Coapplicant				Coapplicant															
Race and Ethnicity of Applicant(s)		All				white				Asian				black				Latino			
Gender of Primary Applicant		Male	Female	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female
Gender of Secondary Applicant		Female	Male	Male	Female	Female	Male	Male	Female	Female	Male	Male	Female	Female	Male	Male	Female	Female	Male	Male	Female
Type of Applicant (%)																					
Single	59.47																				
Co-applicant	40.53																				
Gender (%) Male	66.82																				
Female	33.18																				
Race and Ethnicity (%)																					
NH white	71.65	80.48	77.36	65.91	71.65																
Asian	8.79	3.07	5.39	3.09	7.50																
black	7.50	8.37	9.58	19.42	12.07																
Latino	12.07	8.08	7.68	11.58	8.79																
Mean Household Income ($1000s)	104.65	136.32	126.21	148.23	107.92	140.34	131.35	171.65	120.21	156.12	140.38	122.51	109.50	108.35	103.02	102.73	85.72	88.77	86.36	91.33	72.53
Mean Loan Amount ($1000s)	254.43	309.23	273.31	264.92	236.58	306.71	272.75	268.76	240.30	427.59	370.28	302.37	297.88	252.49	233.24	208.54	201.47	239.93	222.61	238.52	211.02
Mean Household Income in Census Tract ($1000s)	87.44	95.62	90.70	82.91	81.49	97.19	92.96	87.73	86.25	108.65	100.63	87.34	86.27	82.47	79.31	72.98	72.60	72.73	70.85	65.47	65.92
Percent Whites in Census Tract (%)	67.64	72.80	70.19	61.49	62.10	78.32	76.69	72.11	73.18	57.59	55.61	50.73	48.48	52.02	48.12	44.59	42.95	41.99	41.85	34.56	37.11
Region of Home (%)																					
Northeast	12.73	13.21	15.07	13.87	14.46	14.35	16.63	15.79	16.65	11.21	11.42	11.68	8.79	9.67	11.30	13.95	15.52	5.42	7.55	8.65	8.41
Midwest	20.56	21.38	21.11	18.02	17.53	24.17	24.20	21.70	21.10	11.51	11.36	13.62	10.88	14.02	13.47	13.39	13.76	6.85	8.25	8.91	9.35
South	40.01	37.79	38.93	33.99	36.37	37.19	37.04	34.58	34.51	29.06	30.88	30.71	25.91	63.95	65.38	60.48	59.04	42.33	45.81	29.69	36.55
West	26.70	27.62	24.89	34.12	31.64	24.29	22.14	27.93	27.74	48.22	46.34	43.99	54.42	12.36	9.85	12.18	11.68	45.39	38.40	52.75	45.70
Mean Unemployment Rate (County)	6.62	6.49	6.46	6.84	6.76	6.39	6.34	6.64	6.55	6.59	6.62	6.79	6.93	6.63	6.67	6.80	6.89	7.36	7.14	7.56	7.38
Mean Credit Score (MSA)	690	690	691	691	691	692	693	692	692	694	693	693	693	687	687	688	689	683	684	686	686
Mean Housing Price Index (MSA)	217.73	219.12	220.52	220.61	221.01	218.02	219.62	219.69	220.46	230.52	229.42	225.13	228.37	214.63	214.63	218.02	213.79	220.32	223.98	221.43	223.26
Year of Application (%)																					
2010	11.21	10.89	9.87	12.69	11.76	10.79	9.61	12.38	11.23	11.23	10.61	11.05	12.05	11.53	10.89	14.40	13.16	11.25	10.77	14.45	12.91
2011	10.11	10.00	8.93	10.46	9.88	10.10	8.88	10.42	9.74	9.46	8.94	8.88	9.50	9.39	8.98	10.08	10.12	9.86	9.29	11.56	10.47
2012	11.41	11.51	10.25	10.87	11.69	11.71	10.45	11.30	11.96	10.73	9.94	9.42	10.26	10.70	9.54	12.28	12.99	10.60	9.28	10.02	10.67
2013	13.17	13.56	12.59	12.45	11.63	13.87	12.92	13.21	12.22	13.18	12.54	12.04	12.47	11.28	10.55	10.81	9.47	11.87	11.09	10.37	10.11
2014	13.30	13.57	13.24	12.83	12.41	13.57	13.26	12.83	12.47	13.19	12.75	12.70	12.25	13.42	13.20	12.09	11.46	13.99	13.49	13.02	12.76
2015	15.06	15.01	15.71	14.81	14.89	14.82	15.54	14.38	14.74	14.10	14.99	14.95	13.99	16.54	16.43	14.36	14.89	17.06	17.30	16.29	15.89
2016	11.40	12.21	12.50	10.63	10.52	12.54	13.18	11.59	11.77	13.96	13.87	13.42	13.18	8.54	8.00	5.90	5.97	8.75	8.50	6.45	6.87
2017	14.36	13.25	16.90	15.27	17.23	12.60	16.15	13.89	15.87	14.15	16.36	17.54	16.29	18.60	22.41	20.08	21.93	16.63	20.29	17.84	20.32
Observations (1000s)	10505	3232	747	152	122	2601	578	100	79	261	57	18	10	99	40	5	11	271	72	29	21

Source: HMDA

Figure 1: Loan Application Outcomes, by Applicant Type, Race and Ethnicity, and Gender

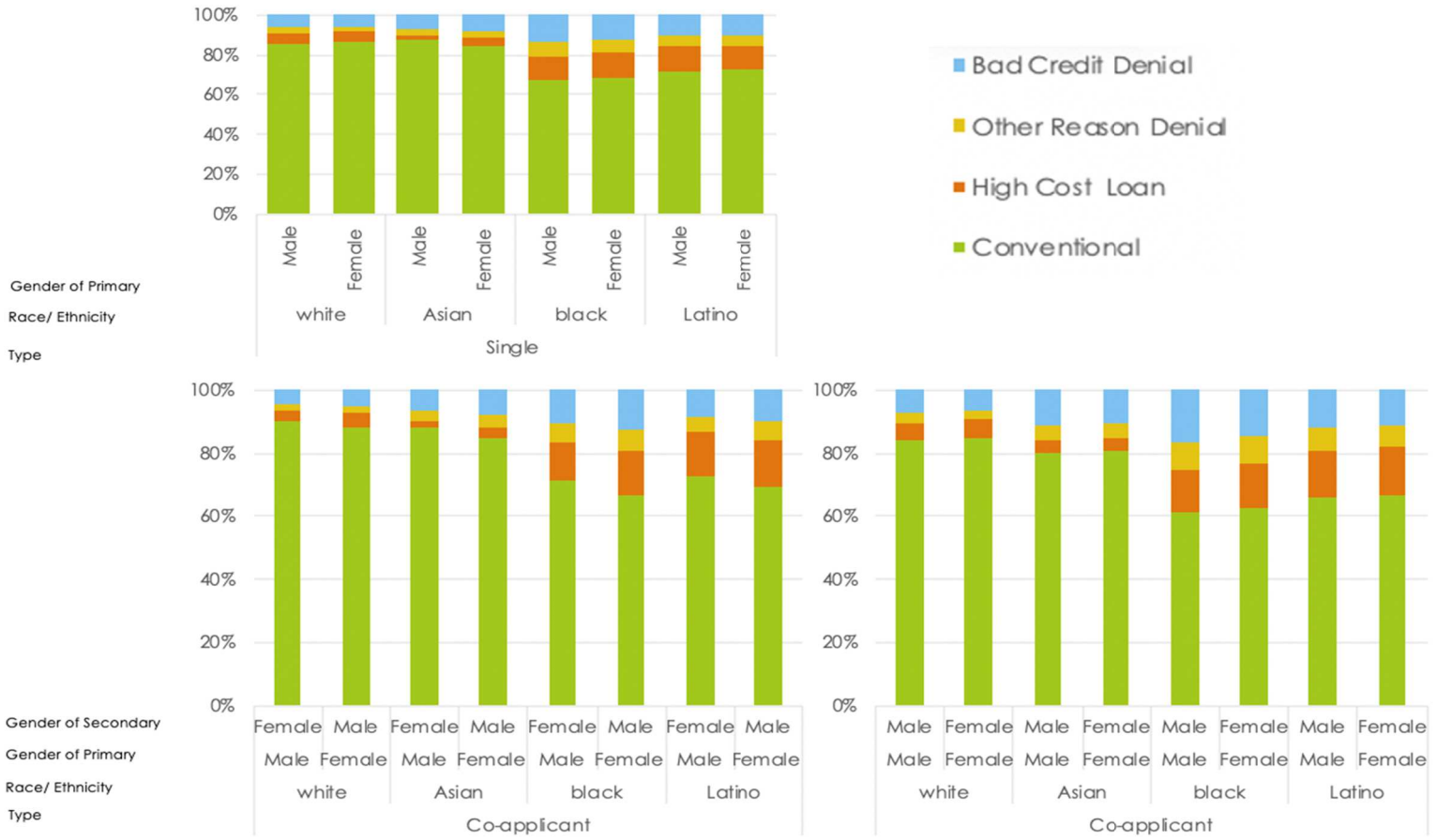
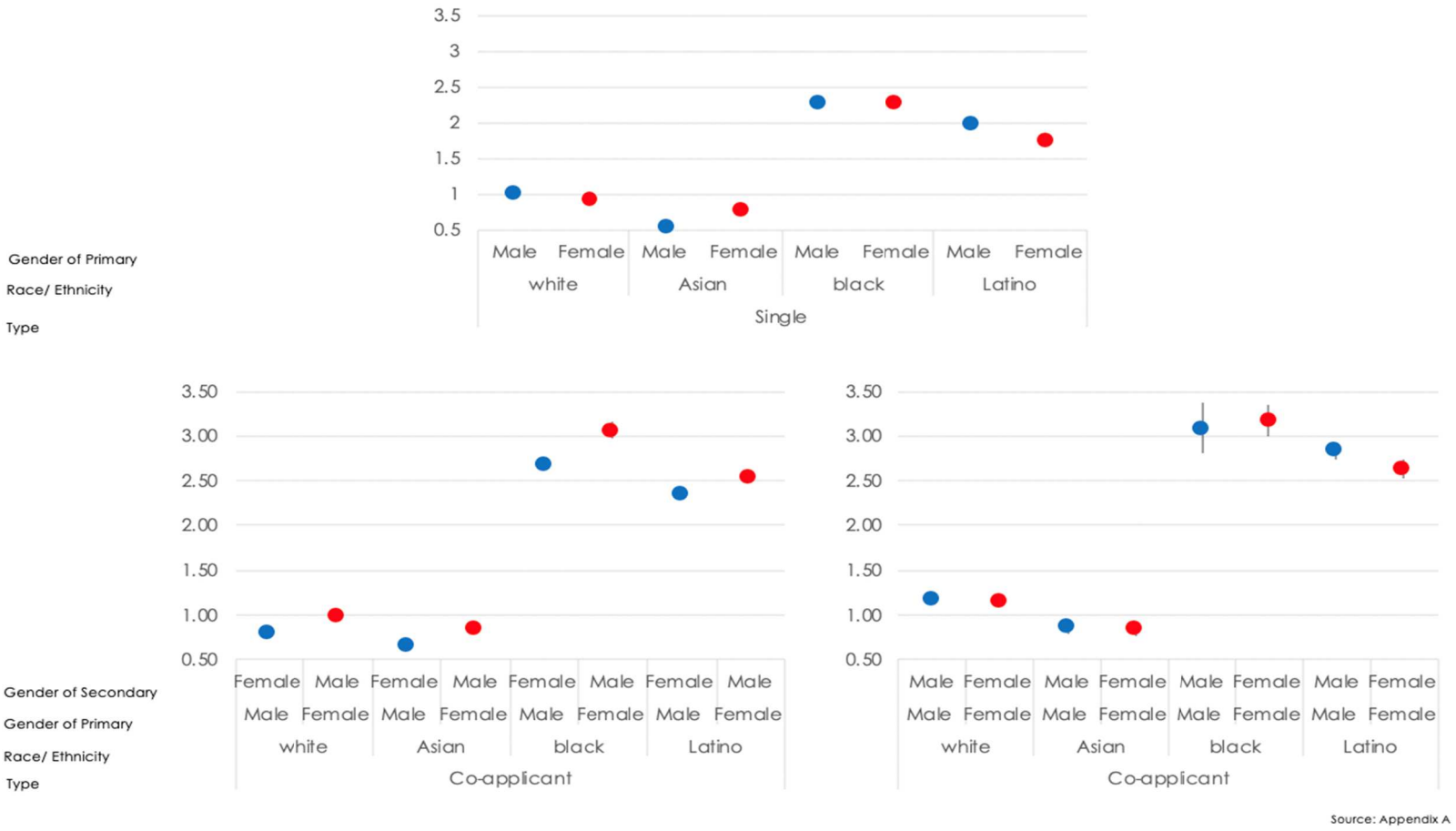
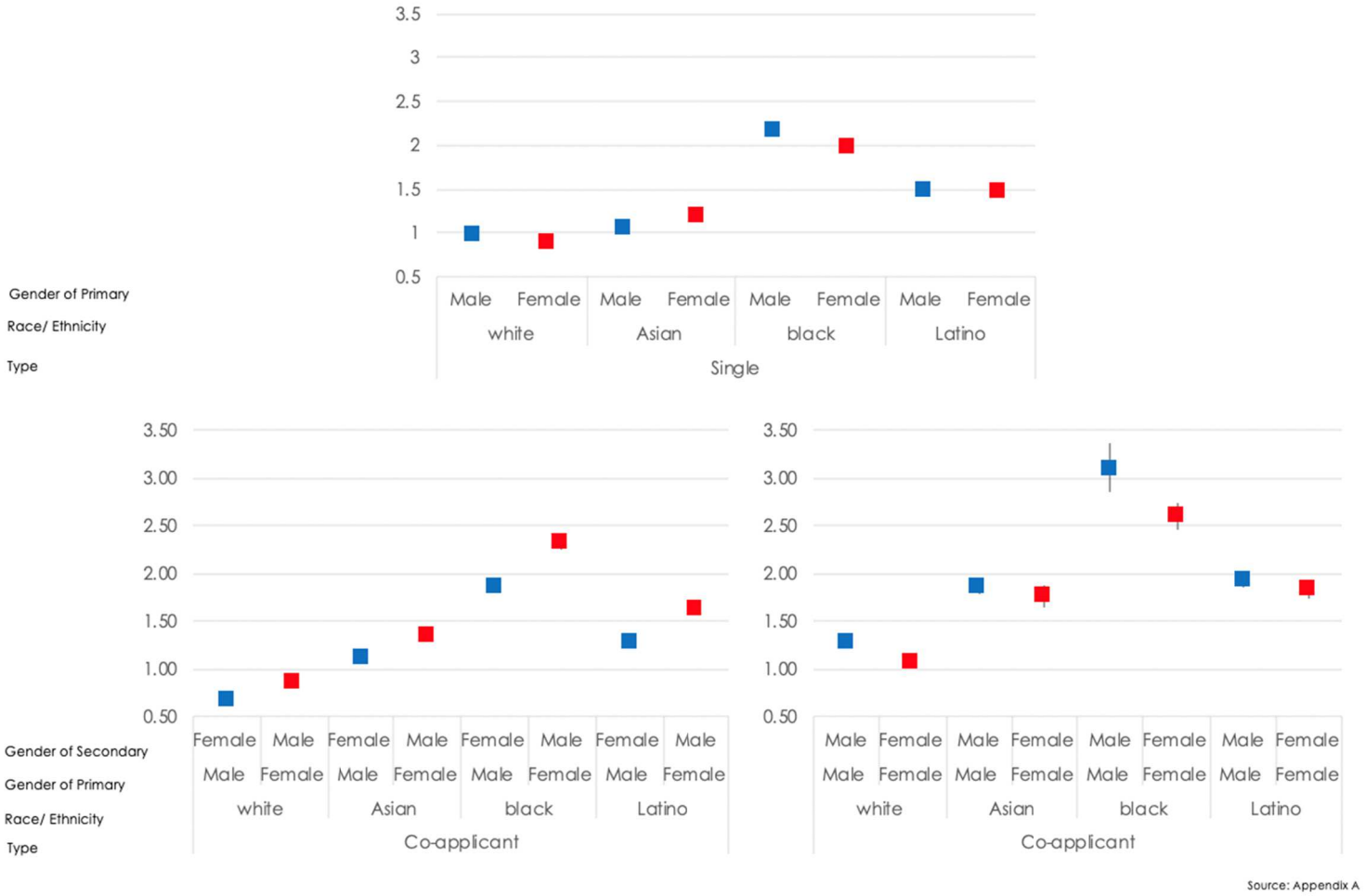


Figure 2: Multinomial Logistic Regression Model Predicting Loan Application Outcome: High Cost Loan Origination (ref= Conventional, and single white male applicant)



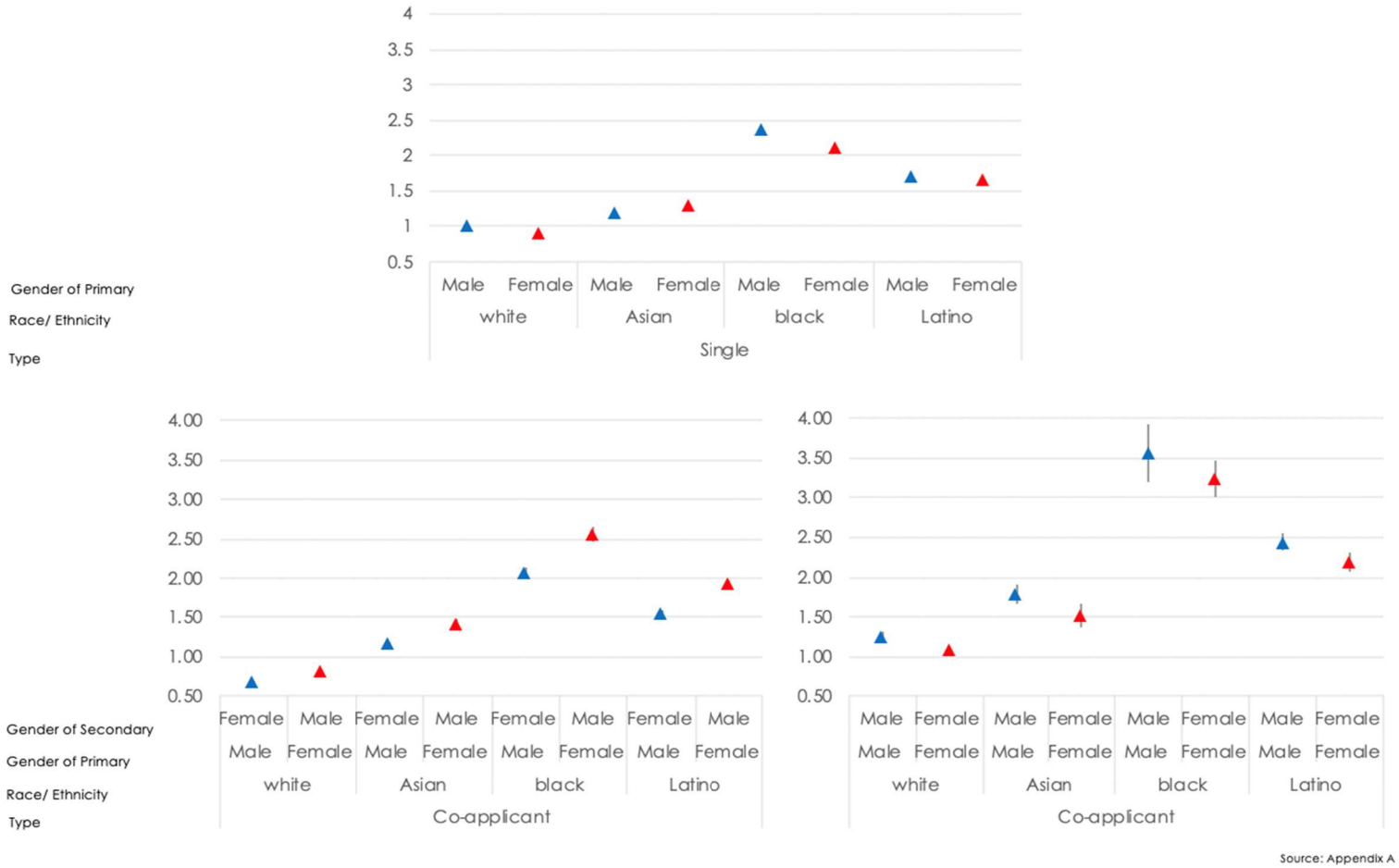
Source: Appendix A

Figure 3: Multinomial Logistic Regression Model Predicting Loan Application Outcome: Bad Credit Denial (ref= Conventional, and single white male applicant)



Source: Appendix A

Figure 4: Multinomial Logistic Regression Model Predicting Loan Application Outcome: Other Reason Denial (ref= Conventional, and single white male applicant)



Source: Appendix A

Appendix A: Odds Ratios from Multinomial Logistic Regression Model of Loan Outcomes

(Ref: Conventional Origination): High Cost Loan Origination

				Odds Ratio	Standard Error	95% Confidence Interval	
Type, Race and Ethnicity, and Gender of Applicants (ref= single* white * male)							
Single	white	Female	-	0.92 ***	0.00	0.91	0.93
	Asian	Male	-	0.52 ***	0.01	0.51	0.53
		Female	-	0.75 ***	0.01	0.73	0.77
	black	Male	-	2.25 ***	0.02	2.22	2.28
		Female	-	2.25 ***	0.01	2.22	2.28
	Latino	Male	-	1.96 ***	0.01	1.94	1.98
		Female	-	1.72 ***	0.01	1.70	1.74
Co-applicant	white	Male	Female	0.78 ***	0.00	0.78	0.79
		Female	Male	0.98 **	0.01	0.97	0.99
		Male	Male	1.17 ***	0.02	1.14	1.21
		Female	Female	1.13 ***	0.02	1.10	1.17
	Asian	Male	Female	0.64 ***	0.01	0.62	0.66
		Female	Male	0.85 ***	0.02	0.81	0.89
		Male	Male	0.85 ***	0.03	0.79	0.92
		Female	Female	0.85 **	0.04	0.76	0.94
	black	Male	Female	2.68 ***	0.03	2.62	2.73
		Female	Male	3.05 ***	0.05	2.96	3.15
		Male	Male	3.08 ***	0.14	2.81	3.37
		Female	Female	3.17 ***	0.09	2.99	3.35
	Latino	Male	Female	2.34 ***	0.02	2.31	2.37
		Female	Male	2.54 ***	0.03	2.48	2.60
		Male	Male	2.83 ***	0.05	2.73	2.93
		Female	Female	2.62 ***	0.05	2.52	2.73
Household Income (1000s)				1.00 ***	0.00	1.00	1.00
Loan Amount (1000s)				1.00 ***	0.00	1.00	1.00
Income Composition of Neighborhood				1.00 ***	0.00	1.00	1.00
White Composition of Neighborhood				1.00 ***	0.00	1.00	1.00
Region of Property (ref= Northeast)							
			Midwest	1.25 ***	0.01	1.24	1.27
			South	1.02 **	0.01	1.01	1.04
			West	1.25 ***	0.01	1.23	1.27
Avgerage Credit Score (MSA)				0.98 ***	0.00	0.98	0.98
Average Unemployment Rate (County)				1.03 ***	0.00	1.03	1.03
Average Housing Price Index (MSA)				1.00 ***	0.00	1.00	1.00
Year of Applicantion (ref=2010)							
			2011	1.79 ***	0.02	1.76	1.83
			2012	1.83 ***	0.02	1.79	1.87
			2013	5.94 ***	0.05	5.84	6.04
			2014	11.17 ***	0.09	10.99	11.35
			2015	6.69 ***	0.06	6.58	6.80
			2016	2.90 ***	0.03	2.84	2.95
			2017	7.74 ***	0.07	7.61	7.87
Constant				25290.95 ***	762.80	5020.23	8038.04

*** p<.001 ** p<.01. * p<.05 (p.1 of 3)

Source: HMDA

Appendix A continued: Odds Ratios from Multinomial Logistic Regression Model of Loan Outcomes
(Ref: Conventional Origination): Bad Credit Denial

				Odds Ratio	Standard Error	95% Confidence Interval	
Type, Race and Ethnicity, and Gender of Applicants (ref= single* white * male)							
Single	white	Female	-	0.88 ***	0.00	0.87	0.88
	Asian	Male	-	1.07 ***	0.01	1.05	1.08
		Female	-	1.19 ***	0.01	1.16	1.21
	black	Male	-	2.19 ***	0.01	2.16	2.22
		Female	-	1.97 ***	0.01	1.95	2.00
	Latino	Male	-	1.49 ***	0.01	1.48	1.51
		Female	-	1.47 ***	0.01	1.45	1.49
Co-applicant	white	Male	Female	0.67 ***	0.00	0.67	0.68
		Female	Male	0.85 ***	0.01	0.84	0.86
		Male	Male	1.29 ***	0.02	1.26	1.32
		Female	Female	1.06 ***	0.02	1.03	1.10
	Asian	Male	Female	1.12 ***	0.01	1.10	1.14
		Female	Male	1.35 ***	0.02	1.30	1.39
		Male	Male	1.86 ***	0.05	1.78	1.96
		Female	Female	1.76 ***	0.06	1.65	1.87
	black	Male	Female	1.86 ***	0.02	1.82	1.90
		Female	Male	2.32 ***	0.04	2.25	2.39
		Male	Male	3.11 ***	0.13	2.87	3.37
		Female	Female	2.60 ***	0.07	2.46	2.74
	Latino	Male	Female	1.29 ***	0.01	1.27	1.31
		Female	Male	1.63 ***	0.02	1.58	1.67
		Male	Male	1.93 ***	0.04	1.86	2.00
		Female	Female	1.82 ***	0.04	1.75	1.91
Household Income (1000s)				1.00 ***	0.00	1.00	1.00
Loan Amount (1000s)				1.00 ***	0.00	1.00	1.00
Income Composition of Neighborhood				1.00 ***	0.00	1.00	1.00
White Composition of Neighborhood				1.00 ***	0.00	1.00	1.00
Region of Property (ref= Northeast)							
			Midwest	1.03 ***	0.00	1.02	1.04
			South	0.90 ***	0.01	0.89	0.91
			West	0.66 ***	0.00	0.65	0.67
Avgerage Credit Score (MSA)				0.99 ***	0.00	0.99	1.00
Average Unemployment Rate (County)				1.10 ***	0.00	1.10	1.10
Average Housing Price Index (MSA)				1.00 ***	0.00	1.00	1.00
Year of Applicantion (ref=2010)							
			2011	0.98 ***	0.00	0.97	0.99
			2012	0.93 ***	0.00	0.92	0.94
			2013	0.97 ***	0.00	0.96	0.98
			2014	0.87 ***	0.00	0.87	0.88
			2015	0.72 ***	0.00	0.71	0.73
			2016	0.60 ***	0.00	0.60	0.61
			2017	0.60 ***	0.00	0.59	0.61
Constant				2.56 ***	0.29	2.05	3.20

*** p<.001 ** p<.01. * p<.05 (p.2 of 3)

Source: HMDA

Appendix A continued: Odds Ratios from Multinomial Logistic Regression Model of Loan Outcomes

(Ref: Conventional Origination): Other Reason Denial

				Odds Ratio	Standard Error	95% Confidence Interval	
Type, Race and Ethnicity, and Gender of Applicants (ref= single* white * male)							
Single	white	Female	-	0.89 ***	0.01	0.88	0.90
	Asian	Male	-	1.18 ***	0.01	1.15	1.20
		Female	-	1.29 ***	0.02	1.26	1.32
	black	Male	-	2.35 ***	0.02	2.31	2.39
		Female	-	2.11 ***	0.02	2.07	2.14
	Latino	Male	-	1.69 ***	0.01	1.67	1.72
		Female	-	1.66 ***	0.01	1.63	1.69
Co-applicant	white	Male	Female	0.69 ***	0.00	0.68	0.70
		Female	Male	0.82 ***	0.01	0.80	0.83
		Male	Male	1.26 ***	0.02	1.21	1.31
		Female	Female	1.06 **	0.02	1.02	1.11
	Asian	Male	Female	1.17 ***	0.01	1.14	1.20
		Female	Male	1.42 ***	0.03	1.36	1.48
		Male	Male	1.79 ***	0.06	1.67	1.91
		Female	Female	1.51 ***	0.07	1.38	1.66
	black	Male	Female	2.08 ***	0.03	2.02	2.14
		Female	Male	2.55 ***	0.05	2.45	2.66
		Male	Male	3.55 ***	0.19	3.20	3.93
		Female	Female	3.23 ***	0.11	3.02	3.46
	Latino	Male	Female	1.56 ***	0.02	1.53	1.59
		Female	Male	1.92 ***	0.03	1.86	1.98
		Male	Male	2.44 ***	0.06	2.33	2.55
		Female	Female	2.18 ***	0.06	2.06	2.30
Household Income (1000s)				1.00 ***	0.00	1.00	1.00
Loan Amount (1000s)				1.00 ***	0.00	1.00	1.00
Income Composition of Neighborhood				1.00 ***	0.00	1.00	1.00
White Composition of Neighborhood				1.00 ***	0.00	1.00	1.00
Region of Property (ref= Northeast)							
			Midwest	0.88 ***	0.01	0.87	0.89
			South	0.95 ***	0.01	0.94	0.97
			West	0.78 ***	0.01	0.76	0.79
Avgerage Credit Score (MSA)				1.00 ***	0.00	0.99	1.00
Average Unemployment Rate (County)				1.08 ***	0.00	1.08	1.08
Average Housing Price Index (MSA)				1.00 ***	0.00	1.00	1.00
Year of Applicantion (ref=2010)							
			2011	1.05 ***	0.01	1.04	1.07
			2012	1.03 ***	0.01	1.02	1.04
			2013	1.00	0.01	0.99	1.01
			2014	1.13 ***	0.01	1.12	1.15
			2015	0.98 **	0.01	0.96	0.99
			2016	0.77 ***	0.01	0.75	0.78
			2017	0.91 ***	0.01	0.89	0.92
Constant				1.05	0.18	0.74	1.47

*** p<.001 ** p<.01. * p<.05 (p.3 of 3)

Source: HMDA

CONCLUSION

My dissertation expands on research on social stratification in the mortgage market post the Great Recession (2010 to 2017) by examining the relationship between interracial couples, racial variation among Latinos, and the intersection of gender and race/ethnicity and mortgage loan outcomes. Constant re-evaluation of impediments in the mortgage market are necessary as segments of the U.S population continued to change. In my first paper, I investigated mortgage disparities across different interracial couplings, rather than assuming homogenous ethno-racial couples as previous studies have done. In my second paper, I examined mortgage loan disparities among Latino racial groups and compared them to Non-Latinos. Instead of racializing Latinos, I embraced the racial diversity among Latinos in the study. Finally, in my third paper, I focused on understanding the relationship between mortgage loan outcomes and the intersection of gender and race/ethnicity. I sought to understand the additional barriers minority women face in the mortgage market.

The two main theories on social stratification in homeownership revolve around human capital and demographic differences and ethno-racial stratification and discrimination. The human capital and demographic perspective expect homeownership to reflect differential tastes and preferences based on traits such as age, marriage, and childbearing, subject to economic constraints. In addition, homeownership is available to those with more resources such as higher incomes, education, have a professional or technical profession, and are married with children (Dwyer et al. 2016; Dwyer, Rachel E. 2007; Faber and Ellen 2016). These socio-demographic characteristics account for a large

proportion of the homeownership rate differentials across ethno-racial groups (Flippen 2001; Kuebler and Rugh 2013).

Even though socio-demographic characteristics account for a large share of homeownership rate differences, inequality remains. My research contributes to the literature on social stratification and discrimination in housing. More specifically, previous studies have focused on ethno-racial stratification in the housing market. Quantitative and qualitative studies have documented inequality at every stage of the homeownership process, such as looking for a realtor and home, the types of properties that home seekers view, the treatment and service applicants receive by realtors and mortgage brokers, and the types and terms of loan products applicants are offered. For example, minorities are generally provided poorer service by their real estate agent and are more likely to be steered into predominantly lower income neighborhoods, with lower levels of whites in the neighborhood (Massey et al. 2016; Turner et al. 2002). This discriminatory treatment often results in application withdrawals, higher costs, and mortgage loan denials (Faber 2013; Faber 2018; Fry and Brown 2016; Hwang, Hankinson, and Brown 2015). In addition, minority borrowers are more likely to obtain a high cost loan and receive less favorable loan terms than similar white borrowers (Faber 2013). Social stratification in the housing market extends to the neighborhood level as well. Minority neighborhoods have lower quality housing which leads to reduced investment, local tax revenue, and lower quality amenities in the area (Carter 2012; Flippen 2004).

Because the housing collapse and the Great Recession centered around high cost loans, minority households and communities primarily absorbed the economic

consequences. Minority homeowners experienced steep wealth declines as their property values fell dramatically compared to white homeowners (Faber and Ellen 2016). Additionally, minorities were more likely to be "underwater" on their home, which means that they owed more on their home than it was worth (Faber and Ellen 2016). Finally, minorities homeowners were more likely to lose their home through a foreclosure and minority neighborhoods were disproportionately affected by foreclosures (Anacker and Carr 2011; Hall, Crowder, and Spring 2015; Rugh and Massey 2010).

The housing market began to recover after the Great Recession, largely due to government intervention and policy that sought to re-establish consumer confidence in the mortgage market. As such, policy such as the Dodd Frank Act heavily regulated mortgage underwriting of financial institutions, resulting in a reduced level of high cost loans in the years following the Great Recession (Acolin et al. 2016; Loya and Flippen 2020). In addition, the housing market has steadily improved as banks continue to grow their loan portfolios by 6 percent a year (Estenssoro and Cissi 2015). The time period after the Great Recession offers a tremendous opportunity to study social stratification in the mortgage market, as home seekers are once again drawn into homeownership opportunities (Loya and Flippen 2020).

My dissertation expands on the social stratification in housing literature, by examining mortgage loan outcomes across ethno-racial and gender groups after the Great Recession (2010 to 2017). I incorporated growing segments of the U.S. population in my studies by including interracial couples, Latino racial groups, and women of color. Additionally, I used the Home Mortgage Disclosure Act (HMDA) data from 2010 to 2017 to investigate these different complex relationships. About 80 percent of all

mortgage transactions are documented in the HMDA dataset (Avery et al. 2007), thus making it a powerful tool to investigate loan outcome disparities in the U.S.

I expand on the theories related to social stratification in housing by challenging the assumptions that couples in the mortgage market are ethno-racially homogenous, that all Latinos have a similar mortgage experience, and that ethno-racial barriers are consistent across gender. My dissertation shows significant loan outcome variation when including interracial couples, substantive differences among Latino applicants, and varying loan outcomes when considering the intersection of gender and race and ethnicity. Each of these papers contributes to our understanding of the ethno-racial hierarchy in the U.S mortgage market. My analysis of the mortgage market shows how rigid and persistent the U.S racial hierarchy continues to be.

From a theoretical perspective, my work expands the complexity of the tri-racial hierarchy. The strata within the tri-racial hierarchy includes whites at the top, honorary whites in the middle, and the collective black at the bottom. In my first paper, I show that by taking into account interracial couples, actual Latino couples are just as likely to experience an adverse loan outcome as black couples. The results of Asian couples are mixed. My analysis suggests that the case can be made that Asian couples are among honorary whites in the U.S hierarchy. However, Latino couples fit firmly within the collective black strata.

In my second paper, my results expand the tri-racial hierarchy theory and the skin-tone stratification literature. The loan outcome variation across Latino racial groups shows differences in racial hierarchy incorporation. Black Latinos are equally disadvantaged as Non-Latino blacks in the mortgage market thus providing evidence that

they lie within the collective black strata. White Latinos perform the best in the mortgage market compared to all other Latino racial groups but underperform Non-Latino whites. These results suggest that white Latinos lie within the honorary white strata. The results for Asian and Other Latinos is mixed thus complicating the tri-racial hierarchy theory. In terms of skin-tone stratification, I show that black Latino are being racialized as black in the U.S racial hierarchy. White Latinos are more advantaged than blacks but are not considered white in the mortgage industry.

Finally, in my third paper, I primarily expand on the stratification literature that focuses on the intersection of gender and race/ethnicity. More specifically, I show diverging patterns in loan outcome disparities across ethno-racial groups and gender between single applicants and co-applicants. My results show the economic strength of women as they obtain similar loan outcomes as their male counterparts overall and across ethno-racial groups. However, among mixed sex couples, women- headed couples significantly underperform male- headed couples. More specifically, couples led by women of color are the most disadvantaged in the mortgage market.

Paper 1: Ethno-Racial Stratification in the Mortgage Market: The Role of Co-applicants

Previous studies on ethno-racial stratification in housing have assumed that couples applying for a mortgage are ethno-racially homogenous. In this paper, I consider the role of co-applicants in applying for a mortgage loan. More specifically, I examine the relationship between different ethno-racial couples and mortgage loan outcomes.

I demonstrate the importance of co-applicants in the mortgage market by showing significant variation in loan outcomes by different ethno-racial couplings. Indeed, couples with a Latino or black co-applicant face more obstacles in obtaining a conventional loan than couples with a white or Asian co-applicant. In addition, I show that ethno-racially homogenous black and Latino couples are more likely to experience an adverse loan outcome than similar white and Asian couples.

These results improve our understanding of the U.S. ethno-racial hierarchy. My results indicate that couples are penalized for having a black or Latino partner in the mortgage market regardless of their other partner's race and ethnicity. I show the persistence of the ethno-racial hierarchy in the mortgage market, as primary black and Latino couples experience the worse loan outcomes, while primary white and Asian applicants perform especially well in the mortgage market. However, the race and ethnicity of the co-applicant affects the degree in which ethno-racial groups perform in the mortgage. As the number of interracial couples grows in the U.S, the ethno-racial hierarchy is simply incorporating these couples into its current structure, where whites are the most advantaged group, followed by Asians and Latinos and blacks are the most disadvantaged groups.

Paper 2: Racial Stratification among Latinos in the Mortgage Market

Previous studies that examine ethno-racial stratification in the housing market, often racialize Latinos in order to understand their social position in the U.S. This can be potentially problematic because of the racial diversity found among Latinos. Racializing

Latinos can potentially lead to underestimating ethno-racial inequality, as previous studies are estimating an average effect from racializing an ethnic group. In this paper I assessed the variation in racial disparities among and between Latino and Non-Latino applicants in the mortgage market.

Black Latinos are more likely to experience an adverse loan outcome (receive a high cost loan or be denied a mortgage) than any other Latino racial group. Asian Latinos face the fewest mortgage obstacles among Latinos. White Latinos slight underperform Asian Latinos, while the results for other Latinos is mixed. When comparing Latino and Non-Latinos, I document an alarming trend. Black Latinos and Non-Latinos are just as likely to receive an adverse loan outcome and they underperform all racial groups. White Latinos face worse mortgage outcomes than their White Non-Latino counterparts. Finally, Asian and other Latinos either perform similarly or worse than their Non-Latino counterparts.

The racial disparities found among Latino mortgage applicants demonstrates the persistence of the ethno-racial hierarchy. Black applicants are heavily disadvantaged, regardless of Latino identity. I show that there is a penalty for being Latino in the mortgage market. For example, white Latinos are 50 percent to 110 percent more likely to experience an adverse loan outcome than Non-Latino whites. These findings supports the tri-racial stratification theory (Bonilla-Silva 2004), as I showed that Non-Latino whites are the most advantaged in the mortgage market, while black Latino and Non-Latinos are most disadvantaged. The underperformance of white Latinos and the mixed results for Asian and other Latinos in the mortgage market suggest that Latinos continue to be racialized and are viewed more negatively than their Non-Latino counterparts.

Paper 3: Gender and Ethno-Racial Disparities in Access to Mortgage Credit

Rather than focus on single applicants to understand ethno-racial and gender disparities in the mortgage market as previous studies have done, I examine the dynamic intersection of race/ethnicity and gender among singles *and* couples in the mortgage market. I show a diverging pattern in loan outcomes between single applicants and co-applicants. Among single applicants, men and women perform similarly in the mortgage market overall and across ethno-racial groups. However, I show that women of color (black women and Latinas) among mixed sex couples are more likely to experience an adverse loan outcome than any other ethno-racial and gender group. Also, the gender gap for loan outcomes is substantially larger for black and Latino couples than white couples.

The implications for these results are startling. Not only do minorities have unequal access to loans in the mortgage market, but minority women-headed households face even more obstacles than their male counterparts. Women-headed households regardless of race/ethnicity were more likely to receive an adverse loan outcome compared to men. My results suggest that women- headed households are perceived to be higher economic risk and of lower status than male- headed households across ethno-racial groups. This is especially troubling because of the high number of women- headed households among black couples. Policy intended to increase minority homeownership opportunities needs to consider the barriers women of color face in the mortgage market.

Conclusion

In conclusion, my dissertation adds to the current literature on social stratification in the mortgage market after the Great Recession. The U.S. continues to promote homeownership as a wealth generating vehicle and as an opportunity for upward social mobility, but stark mortgage inequality remains. My dissertation helps expose the inequality and structural barriers minorities continue to face in the mortgage market post the Great Recession. I show how the growing importance of interracial couples, Latinos, and women, are impacted in the mortgage market. The ongoing barriers that minorities and marginalized groups face in mortgage market is startling. Larger penalties and stronger enforcement of the Fair Housing Act and Community Reinvestment Act are necessary to reduce homeownership inequality and wealthy inequality more broadly. Due to the serious and significantly large disparities in mortgage outcomes, policy makers and researchers have to reconsider the support for linking homeownership to wealth and upward mobility in the U.S. In fact, I would argue that the value of homes is more a reflection of racial/ethnic segregation and the hoarding of wealth more so than the demand and supply of housing. As a result, I believe that the current structure of homeownership needs to be re-shaped and prioritize low income families rather than maintain a system of inequality.

The results I add to the current body of literature of social stratification necessitates a change in housing policy. The large disparities and inequality minorities continue to face needs to be addressed. As such, I recommend that financial institutions borrowing from the federal reserve bank pay different interest rates based on their lending patterns in low income neighborhoods. The interest rate differentials will

incentivize banks to lend and provide minorities with low cost loans. In addition, I propose ending mortgage interest deductions from the tax code. This subsidy is artificially inflating the value of homes and allows homeowners to continue to hoard wealth generating assets. And finally, stiff penalties including restricting financial institutions from lending altogether is necessary to combat discriminatory practices. These patterns of unequal lending have dramatic effects on social mobility and the current sanctions have not hindered the systematic exclusion of minorities.

Additional research is necessary in understanding the barriers minorities face in the mortgage market. As an Assistant Professor at UCLA, I hope to continue my research in ethno-racial stratification and housing by expanding my research to include trends over time. My first publication examined ethno-racial inequality, prior, during, and after the Great Recession at both the individual and neighborhood levels. My next project will examine gender and ethno-racial inequality over time, as well as re-examining neighborhood inequality by considering different types of ethno-racial neighborhoods (white versus black versus Latino versus Asian neighborhoods). And finally, I hope to examine minority experiences of obtaining a mortgage and understanding different predatory strategies used by real estate agents and mortgage brokers using the National Survey of Mortgage Originations.

The HMDA dataset, which I hope to use in my future research, provides a unique opportunity to study social stratification in the mortgage market, but improvements can be made. Because homeownership is so critical in creating and growing wealth in the U.S., policymakers need to continue to add important variables to the dataset. For example, credit score, citizenship status, and condition of the home would add

tremendous value to future studies on social stratification in housing. Previous additions have proved to be valuable and fruitful. In 2018, the value of the home, debt-to-income ratios, and additional property characteristics were added to the dataset, which will be critical for studying ethno-racial inequality and discrimination in the mortgage market in future studies. Additions like these, help researchers monitor and understand racial discrimination in the housing market.

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