INVESTIGATING THE DUAL MORTGAGE MARKET: THE DISTRIBUTION
OF SUBPRIME LENDING BY RACE AND ITS CONSEQUENCES
FOR MINORITY COMMUNITIES

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ABSTRACT

**Investigating the Dual Mortgage Market: The Distribution
of Subprime Lending by Race and Its Consequences for
Minority Communities Candidates**

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This dissertation examines the overlap of the racial composition of a neighborhood and the existence of a dual mortgage market in which prime and subprime lenders serve different neighborhoods and borrowers. Does subprime lending represent the democratization of credit or does it serve to track people by race? This dissertation employs Home Mortgage Disclosure Act Data, U.S. Census Data and the HUD Subprime Lender List to identify subprime loans.

I use Hierarchical Linear Modeling to predict the likelihood of subprime for a borrower in Philadelphia, Baltimore, San Francisco and Alameda County California. The findings demonstrate that blacks and borrowers in black neighborhoods have a higher likelihood of originating a subprime loan than whites or borrowers in white neighborhoods. Further, blacks borrowing in largely white neighborhoods have an even higher likelihood of originating a subprime loan compared to their white neighbors than do blacks borrowing in largely black neighborhoods. These findings indicate that subprime lenders not only serve different neighborhoods, but also different borrowers regardless of the neighborhood in which they are borrowing and support the existence of a dual mortgage market that is defined by race.

The results from the analysis examining the consequences of subprime lending for neighborhoods indicate that after controlling for neighborhood characteristics, the positive relationship between earlier and later rates of subprime lending disappears. Also, while higher

rates of subprime refinance lending were associated with a decrease in neighborhood median income in 2000, subprime lending was associated with positive changes in median house value and percent of homeowners that are black in the neighborhood, although the effects of subprime on median house value disappeared after controlling for neighborhood conditions.

The study points to the continued difficulties that black borrowers and borrowers in black neighborhoods face in obtaining a fair loan. As lending practices are reformed, it is important to keep in mind the need to ensure that minority borrowers who are in the position to afford a home loan maintain the ability to get a loan, but increased care must be taken to ensure that they obtain the ability to do so on fair terms.

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CHAPTER 1

INTRODUCTION AND LITERATURE REVIEW

In recent years, there has been a push to expand access to homeownership, as urban development plans have favored the opening up of the American Dream to low-income and minority borrowers. At the same time, a major shift in credit markets and mortgage financing has occurred, as the development of a new form of conventional lending, termed subprime, took shape and rapidly expanded. Many researchers have become concerned that such new loan products have interacted with the history of racial residential segregation and the prime mortgage market neglect of minority communities and given rise to a dual mortgage market in metropolitan areas, with different lenders and loan types serving different borrowers and neighborhoods (Apgar and Calder 2005; Immergluck and Wiles 1999). Further concern stems from the largely unregulated nature of the subprime market and the ease with which unscrupulous lenders have been able to profit from borrowers by charging them more than warranted for credit or even coercing them into loans they did not want or need.

In this dissertation I examine the overlap of the racial composition of a neighborhood and the existence of a dual mortgage market. The fundamental question this dissertation seeks to answer is: How do neighborhood conditions interact with the dual mortgage market? How important are neighborhood conditions in determining mortgage market segment of a loan origination and how does a concentration of subprime lending affect neighborhood conditions? More generally, it engages the question: Is all capital good capital? Does subprime lending represent the democratization of credit as Alan Greenspan asserted in the early 2000s or does it interact with the history of racial residential segregation and discrimination in this country and

serve to track people by race? And given the high rates of foreclosure associated with subprime lending, should the increased access to capital that characterized the early- to mid- 2000s be considered an unmitigated failure?

In recent months, the collapse of the subprime mortgage market has been blamed for much of the large scale economic woes the United States is experiencing as well as the corresponding large-scale credit crisis. Although this is perhaps an oversimplification of the underlying causes of the current state of the economy, it is easy for many to see few or no redeeming qualities in the subprime mortgage market. In the early 2000s, however, proponents of subprime mortgage lending argued that it served to expand the American dream of homeownership to previously underserved individuals and communities. Subprime mortgage lending, it was argued, was the vehicle for providing credit to those who, because of limited or marred credit histories, were unable to obtain financing. Borrowers excluded from the mortgage market were, through subprime lending, granted access. But even as many were singing the praises of the new credit landscape, many housing advocates were concerned that the new loan structure brought rise to a new, more subtle form of discrimination. Concerns began to surface that instead of being unable to access credit, minority borrowers were unable to access fair credit (Immergluck 2004). Concerns mounted that borrowers, after years of exclusion from the mortgage market, paid more than they could afford for credit or perhaps more than was warranted. A number of housing advocates began to warn of the ethically dubious practices of predatory lenders, a subset of the subprime segment of the mortgage market engaged in abusive lending practices. As Bradford (2000) characterized the question, was the increased likelihood of subprime loans among minority borrowers a result of "risk or race?" Was the distribution of

subprime lending a result of the uneven distribution of borrowers with poor or limited credit histories or was the distribution a result of a dual mortgage market which limited the exposure of minority borrowers to the various credit options for which they might qualify and increased their exposure to unregulated, perhaps unscrupulous, lenders?

Concerns about subprime lending are numerous and beg the question: are the benefits of broadened homeownership worth the risks and the consequences? While the benefits of subprime lending include the opening up of the credit markets to many individuals who could not qualify for a prime loan, the risks associated with subprime lending include borrowers being tracked or steered into the subprime segment of the market based on characteristics other than risk and paying more than necessary for credit. Further, the burden of loan failure is not only shouldered by the individual borrower, but as is discussed in further detail below, also extends into the surrounding community. While the story of subprime lending continues to unfold, my research will consider the existence of a dual mortgage market as well as the possible benefits and consequences of subprime lending.

This chapter begins with a review of the previous literature on homeownership and the institutional theoretical perspective on housing that helps shape the current research. This sets up a discussion of the history of discrimination in the mortgage market and its more recent, subtler forms including the "dual mortgage delivery system" (Apgar and Calder 2005) in which differential lenders and loan types serve different borrowers and neighborhoods. I discuss the recent explosion in subprime lending- what it is and how it works. I then discuss the demographics of subprime borrowers at both the individual and neighborhood levels. I close the chapter by laying out the goals of my research and my hypotheses.

Theoretical Perspectives on Homeownership

Owning a home is central to the idea of the American Dream. A home is more than a physical structure; it represents a personal domain to claim as one's own. It is the primary investment for many Americans[1] and while the dream does not always match reality, homeownership often represents the best method to begin building assets and wealth. Homeowners expect to build equity that can be used to, among other things, finance an education, make home improvements which will subsequently increase the value of the investment, and pass on wealth to children which will aid them in accumulating their own wealth (Conley 1999; Stein 2005).[2] The economic advantages associated with homeownership have often been used as the rationale behind recent policy initiatives meant to extend homeownership to low-income households (Shlay 2006).

Beyond, financial factors, the home in which a person resides influences a number of other life outcomes. The consumption of housing can be viewed as socially significant as the choice of a place to live, whether renting or purchasing, has several far-reaching and potentially long lasting implications for various life opportunities and outcomes (Squires 1994). When choosing a place to live, it is necessary to select a neighborhood in which to reside; choosing a neighborhood means selecting the quality of schools children will attend, access to public amenities and services including police and fire protection, access to employment and

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[1] According to Survey of Income and Program Participation (SIPP) data, home equity constituted the largest share of household net worth in 2000, accounting for 32.3 percent of total net worth with the next largest share in net worth, 15.6 percent, made up by stocks and shares in mutual funds outside of IRAs or 401k plans (Orzechowski and Sepielli 2003).

[2] Renting, on the other hand, has been characterized as giving money away; by paying someone else's mortgage, renting can seem like an investment in someone else's future.

transportation as well as recreational and retail opportunities. The location of the property also heavily contributes to the value of the property and the soundness of the investment.

The delineation of neighborhood boundaries is essential to the construction of housing markets. When looking online at the listings of houses for sale, most realtors not only list a description of the dwelling, but also a description of the neighborhood in which it is located- including recent population change, median income and a brief discussion of the school district. The neighborhood sets the context through which the value and desirability of a property is assessed. "It is the neighborhood, especially in cities, that is the most important component of 'location' in the buying, selling and financing of residential real estate" (Stuart 2003, p. 135). Agents and brokers find functionality in delineating neighborhoods; situating the property in a neighborhood is essential for determining the appropriate list price based on the recent neighboring sales.

The importance of place is also seen in the theoretical perspectives in which much of the research and discussions on housing are situated. The institutional perspective on housing views the distribution of actors into neighborhoods as "in an important way the result of identifiable private and public investment decisions, made by identifiable public actors and members of the real estate investment and development industry" (Bradford and Rubinowitz 1975, 79). The decisions and actions of the players in the real estate industry have direct consequences for the individuals living in and the neighborhoods that make up an urban area. The housing industry is itself made up of several industries including contractors, homebuilders, lenders, insurers, appraisers, real estate brokers and agents, landlords and lawyers as well as the many players in

the secondary mortgage market. Their decisions, it is argued, can be made otherwise and with different results for older, minority and low-income neighborhoods (Squires 1994).

The focus, from this perspective, is not on the individual, but on the structural determinants of inequality and uneven development. While the perspective does not point to a master overseer dictating the fates of urban neighborhoods, there is enough of an identifiable control by players in the real estate industry, as well as an integration of investment and development, that their decisions cannot merely be considered a response (Bradford and Rubinowitz 1975). The focus is on the social construction of space. The institutional perspective argues that urban space can only be fully understood by understanding the role that institutional investors, developers and other members of the real estate industry play in creating and sustaining the spatial patterns that comprise metropolitan areas.

The highly influential role of institutions in the spatial patterns of metropolitan development and the consequences for urban neighborhoods is evidenced in the high levels of residential segregation seen in metropolitan areas today that are directly linked to the racial discrimination that is a major part of the history of the mortgage market (Jackson 1985; Massey and Denton 1993). Nancy Denton (2006) states "discrimination in the sale and rental of housing in the United States was once complete, accepted and must have been close to 100 percent" (p. 66). Housing discrimination and residential segregation, Denton argues, are directly responsible for much of the racial and ethnic differences in access to housing.

Two common forms of housing discrimination by race were redlining and racial covenants. Redlining was a process by which banks coded neighborhoods, predominantly minority neighborhoods, "red," which meant they were unlikely or unwilling to lend in those

neighborhoods. Racial covenants were legal obligations imposed in a deed stipulating that the buyer agreed not to sell or lease the property to minorities. These overtly racist lending practices, among others, were not only carried out by private financial institutions but also by the government by way of the Homeowners Loan Corporation (HOLC) and the Federal Housing Administration (FHA). The HOLC institutionalized the practice of redlining while the FHA endorsed and enacted racial covenants.

Concurrent with the forces of discrimination, the FHA's practices were often those of "suburban, middle-class favoritism" (Jackson 1985) that had the effect of facilitating the flight of the white, middle-class from the inner city and the related decay of inner-city neighborhoods. By preferring to insure single-family as opposed to multi-family dwellings, enforcing stricter controls over rental as opposed to owner-occupied housing and by institutionalizing an appraised value that assesses the risk associated with the property itself, the borrower as well as the neighborhood, the FHA's policies in effect, if not in intent, had an anti-urban, pro-suburban bias (Jackson 1985). By insuring properties that met these standards, the FHA, beginning around the end of World War II, promoted investment in areas with newer homes and led to the development of inner-city ghettos and neighborhoods with concentrated poverty. The stripping of these neighborhoods of middle-class residents combined with the practice of redlining increased the risk of lending in these neighborhoods and resulted in neighborhoods that experienced a dearth of investment.

The Supreme Court ruled that racial covenants were illegal in 1948 and in 1950 the FHA stopped insuring mortgages on properties subject to racial covenants. Starting in the 1960s, a series of housing policies were implemented that were meant to achieve the goal of equalized

access to housing, each in their own way and with varying degrees of success. In 1968, the Fair Housing Act was passed (and subsequently amended in 1988). The Fair Housing Act outlawed discrimination with respect to the sale, renting or financing of housing, directly confronting the policy of redlining. Additional housing policies include the 1975 Home Mortgage Disclosure Act (HMDA- which requires lending institutions to maintain and report information about their lending activities) and the 1977 Community Reinvestment Act (the CRA- which requires that lenders under federal regulatory oversight invest in their local, surrounding communities). While none of these policies fully equalized access to housing, they served to chip away at the unfair structure of housing in the United States.

The history of racial residential segregation and the institutionalized discriminatory practices of redlining and racial covenants in this country, however, have left many neighborhoods in the throes of extreme disinvestment. Even after these practices were outlawed, their legacy remains, as risk-decisions in the mortgage industry are a self-fulfilling prophecy. Stuart (2003) explains "A pure example of a self-fulfilling prophecy… is one in which the concentration of mortgage loans in a given geographic area lowers the inherent risk of lending in that area" (p. 7). The converse is also true- by withholding loans from specific geographic areas, the inherent risk of lending in those areas increases or remains high.

Although discrimination and disinvestment continue to plague minority and working class neighborhoods, these communities have recently been recast from undesirable to underserved markets (Wyly, Cook, Hammel, Holloway and Hudson 2001). Political and public concern over access to affordable, decent housing has resulted in ideological shifts towards extending access to homeownership to include minorities and low-income households (Listokin

et al. 1998; Shlay 2006). Homeownership has become a key component of urban social and economic policy and urban renewal plans. Advocates claim that increased homeownership promotes neighborhood stability and revitalization (Stegman 1995).

The shift towards an advocacy of low-income homeownership occurred as a result of a convergence of a number of reasons. As Shlay (2006) explains, the shift towards low-income homeownership as a policy goal stemmed from a combination of a shift in the community reinvestment movement, the collapse of savings and loans in the 1980s and the political administration of the 1990s. A provision in the savings and loan bailout legislation amended the CRA and HMDA, allowing for a new wave of research on the persistence of discrimination in the mortgage market (Wyly *et al*. 2001). In addition, the Clinton administration designated increased low-income homeownership a part of the national housing agenda, partnering with housing advocacy groups across the country and devoting renewed enforcement efforts to established housing and banking laws (Shlay 2006).

These shifts towards the notion of expanding access to homeownership combined with a number of economic changes and technological advances in underwriting standards and risk-assessment capabilities during the 1990s. A vibrant economic expansion combined with low inflation and low interest rates in the 1990s. These forces resulted in reduced borrowing costs as well as increased competition and consolidation in the financial services sector (Wyly and Hammel 1999). The computerization of the lending industry and the automation of underwriting practices reduced the time and costs associated with underwriting (Lea 1996; Shlay 2006). Given the lower risk of lending during boom times, the down payment required on a conventional 30-year loan shrank from about 10 percent to a demand of only about 5 percent and permissible

household debt burdens were far higher than in previous years (Listokin et al. 1998; The

Reinvestment Fund 2005).

These concurrent forces of community activism, regulatory oversight and shifts in the

financial services sector and mortgage industry competition produced a dramatic increase in

lending to low- to moderate-income and minority borrowers. Between 1993 and 1997, mortgage

originations increased by 40 percent in predominantly minority neighborhoods and by 31 percent

in low-income neighborhoods, compared with a nationwide metropolitan increase of only 20

percent (Can, Bogdon and Tong 1999). In 1994 and 1995, blacks and Hispanics enjoyed double-

digit growth in lending rates. Canner, Passmore and Laderman (1999) attribute more than one-

third of the growth in the overall mortgage market between 1993 and 1998 to predominantly

minority census tracts. Such growth is attributed not only to low interest rates, but also to the

success of the CRA and Government Sponsored Enterprises (GSEs- which were created by

Congress and are meant to increase the availability of credit to targeted sectors of the economy

including housing).

Despite such growth, discrimination remains. A "vestigial effect" of the outlawed

discrimination practices (Denton 2006), the discrimination of today has transformed from the

overtly racist practices that characterized the past to a more subtle form of discrimination (Apgar

and Calder 2005). Instead of openly refusing to rent or sell to minority borrowers or denying

loans in minority communities as a result of a property's location, discrimination today comes in

the form of steering and information disclosure as well as in the form of a "dual mortgage

market" (Immergluck and Wiles 1999) in which prime lenders focus their lending activity in

higher-income neighborhoods, without making an effort to lend to qualified borrowers in lower-

income or predominantly minority communities. Apgar and Calder (2005) argue that the "lower-income lending and expanded outreach to minority consumers is linked to a dual mortgage delivery system, in which these types of borrowers are served with a different mix of products and by different types of lenders than commonly serve higher-income markets (p. 102)."

Stuart (2003) found that different neighborhoods are served by a varying combination of lenders and of loan product, largely determined by the racial composition and socioeconomic status of neighborhood residents. In researching Chicago's housing markets, Stuart (2003) saw that historically black submarkets had fewer branches of depository institutions per person than Hispanic, white or gentrifying submarkets. In addition, subprime lenders and mortgage banks making prime loans disproportionately served black submarkets; mortgage banks do not take deposits and are largely unregulated. Hispanic submarkets, on the other hand, were also more likely to be served by mortgage banks, but were not targeted by subprime lenders.[3] While this can be taken as evidence that subprime lenders are filling the gap where prime lenders are unwilling to lend, it also raises the possibility that traditional lenders undermarket prime mortgages in minority communities. Researchers have weighed these possibilities in an effort to understand the growth of the subprime market and its geographic concentration.

Subprime Lending: What it is and how it Works

While the subprime mortgage market has existed since the early 1980s, it was not until the mid-1990s that it began rapidly expanding (Sabry and Schoplocher 2007). Two primary types

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[3] While the Community Reinvestment Act (CRA) was intended to address this disparity by requiring lenders to originate loans in the neighborhoods in which they are located, it can not fully address such disparities because it does not address the lack of depository and prime lending institutions in historically underserved markets.

of loan product and lenders, conventional and government-insured, had segmented the mortgage market. Conventional lenders include banks, savings and loan associations, life insurance companies, and other lesser sources (pension funds, credit unions, etc.). Mortgage transactions involving conventional loans typically require a larger down payment, although it was minimized in recent years, and, historically the lender carries the burden of loss if the borrower defaults on the payment. Government-insured lenders, on the other hand, include mortgage bankers, brokers and mortgage services. Such loans typically require little to no down payment, but the maximum amount that can be borrowed, which varies by market, is typically modest. The federal government insures these loans so the lender carries no burden of loss if the borrower were to default. Government-insured loans include Federal Housing Association (FHA), Veteran's Association (VA) and Farmer's Home Administration (FmHA) loans.

Since the early 1990s, however, there has been a shift in the conventional segment of the mortgage market, as a sub-segment of the conventional market, subprime lending, has rapidly expanded. Such loans involve much higher interest rates than seen in the prime market. The higher cost of the loan is meant to compensate the lender for the additional risk involved in lending to those who are already defined as financially vulnerable. The justification of subprime lending is to extend credit to those who would not qualify for a prime loan by charging them more, often much more, for credit. The credit risk of a loan is purportedly judged by the features of the loan (term, interest rate, size of the down payment and loan-to-value (LTV) ratio), the financial characteristics of the borrower including payment-to-income (PTI) ratio, and the value of the property that serves as collateral (Canner et al. 1999).

There is no standard subprime loan; instead subprime loans are a mix of various loan products and terms. Most subprime loans are a hybrid of fixed and adjustable rate mortgages. Fixed- rate mortgages consist of constant "periodic payments at a 'note rate' (the rate the borrower pays) that is fixed at loan inception" (Sabry and Schoplfocher 2007, p. 3). The adjustable-rate mortgage (ARM) consists of varied note rates that typically increase over time, resetting at various pre-determined intervals (e.g. annually, semi-annually or monthly). Subprime loans typically blend these two types with an initial fixed rate, often called a "teaser" rate, for perhaps the first two or three years followed by the traditional ARM structure which incrementally adjusts the rate upwards.[4] Other subprime products include negatively amortizing mortgages, in which the borrower pays back less than the full amount of the interest to the lender and the remainder is added to the principle, or interest-only mortgages in which the borrower pays only the interest for some specified period of time which upon ending requires the borrower to pay down the principal as well as interest (Sabry and Schopflocher 2007). According to Demyanyk and Gopalan (2007) between 2004 and 2006, 45 percent of subprime mortgage loans were ARMs or hybrids, 25 percent were fixed-rate mortgages, 20 percent were interest only and 10 percent were negative amortizing.

Subprime lending rapidly expanded in the favorable economy of the early 1990s, with rates of expansion varying by loan type. A large portion of subprime lending's expansion was concentrated in refinance loans (Immergluck 2004) as subprime growth in the refinance market outpaced growth in the home purchase market. The period between 1993 and 1998 saw an

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[4] Common hybrid loans include a 2/28 or 3/27 since they are 30-year loans and either the first 2 or 3 years are at the initial teaser rate.

increase of 760 percent in subprime home purchase loans and an increase of 890 percent in subprime refinance loans. Corresponding increases in the prime market were only 38 percent and 2.5 percent respectively (Immergluck and Wiles 1999; Scheesele 1999). Indeed one of the ways in which the Department of Housing and Urban Development classifies lenders as specializing in subprime loans is to review the percent of their total originations that are refinance loans as subprime lenders generally originate a much higher share of their loans in the refinance market than prime lenders.

Much of the overall mortgage refinance market is driven by interest rates. Given that many homeowners use refinancing to lower their interest rates or monthly mortgage payments, when interest rates are low, refinance activity surges. Subprime refinance borrowers, on the other hand, often refinance not to obtain a lower interest rate, but refinance with cash out (i.e. refinancing their home for more than what is owed on their current mortgage and receiving the difference in cash) in order to convert their home equity into cash for current consumption. Unlike a home-equity loan, which is a separate loan on top of the current mortgage, cash out refinances replace the current mortgage. While cash out refinance mortgages can be used for debt consolidation and for paying off junior liens or other loans or buying out the equity of a co-owner, they can also be used to put cash in someone's pocket to be used for home improvements, children's education or any other personal purpose. As such, subprime refinancers are less sensitive to interest rates. Throughout the 1990s, the subprime market was the fastest growing segment of the refinance market and growth in subprime refinance originations increased by over 40 percent every year since 1993 (Scheesele 1999).

The subprime home purchase market, although still a smaller portion of subprime activity, has been expanding (Canner, Passmore and Laderman 1999). From 1993 to 2001, the number of home purchase loans reported by lenders specializing in subprime lending increased by 800 percent (Apgar and Calder 2005). While subprime borrowers in the refinance market are likely attracted by the ability to take cash out of their home, subprime home purchasers are likely more motivated by the simple desire to own a home. Such borrowers may have been previously turned down by the prime market because of limited or poor credit histories or may not even have attempted to obtain a prime loan out of an expectation of denial or inability to afford such a loan. With subprime home purchase loans, the down payment requirements are much smaller, with many making little to no down payment (Gramlich 2007). These differences in borrower motivation for applying for and originating the different loan types suggest that when analyzing lending patterns it is best to analyze home purchase loans separately from refinance loans.

Along with the rise of the subprime market, concerns among many housing advocates have shifted from "equal access to housing" to "equal access to fair housing" (Immergluck 2004). The concern is less about a lack of credit opportunities for minority borrowers and communities and has become a concern that these borrowers and communities are differentially served by different lenders than white borrowers and predominantly white neighborhoods. A number of researchers have pointed to the existence of a dual mortgage market by which different borrowers in different communities have access to different types of lenders serving different loan products (Apgar and Calder 2005; Immergluck and Wiles 1999). Researchers have raised concerns about discriminatory practices of subprime lenders and undertaken investigations focusing on the possibility that such lenders are targeting particular borrowers and

neighborhoods. The targeting of minority communities and a corresponding neglect by prime lenders may lead borrowers in these communities, even if they have good credit, to accept loans at higher interest rates and with larger fees than necessary. Apgar and Calder (2005) report that documenting the extent and impact of ongoing mortgage lending discrimination, however, has proven more difficult than proving its existence. This is because of the difficulty in teasing out risk and race (Bradford 2002). To begin to address these concerns, researchers have investigated who, at both the individual and neighborhood levels, obtains subprime loans.

Who Obtains Subprime Loans

In 2000, Alan Greenspan, then Chairman of the Federal Reserve Board, was quoted as saying that subprime lending represented the "democratization of credit" (Day 2000); subprime lending was lauded as the way to achieve the goal of extending homeownership to many who previously would not qualify for a mortgage. This characterization suggests that subprime lending represents an expansion of mortgage lending to previously underserved borrowers and communities. However, some have questioned this contention, pointing to unfair practices of predatory lenders, a subset of the subprime market that devised a number of abusive lending schemes,[5] and the possibility that even beyond the predatory lenders, some of the policies or the marketing strategies of the subprime market may increase the likelihood that specific groups of borrowers and even neighborhoods use the subprime market. Is it true that subprime lending

represents an inclusion of those previously precluded from the mortgage market or are some

borrowers and neighborhoods being unfairly targeted, paying more than perhaps warranted or

than they can afford for credit?

In August 2007, the New York Times reported that Countrywide Financial Corporation, a

major subprime lender that in mid-2008 ran into liquidity problems and was purchased by Bank

of America, had implemented policies that effectively tracked borrowers into the subprime

segment of the market, minimizing the likelihood of being "referred up" to a prime loan.

According to former employees, Countrywide implemented an incentive system for their brokers

and sales representatives in which the commission on a subprime loan was 0.5 percent of the

loan's value while the commission on a lower cost prime loan was only 0.2 percent of the loan's

value- a clear incentive to either steer a borrower who may qualify for a prime loan to the

subprime segment of the market or avoid referring them up to the prime market. In addition, "the

computer system in the company's subprime unit excluded borrowers' cash reserves, which had

the effect of steering them away from the lower-cost loans to those that were more expensive to

homeowners and more profitable to Countrywide" (Morgensen 2007).

Beyond anecdotal evidence, some studies have found that a portion of subprime loans

may be priced in excess of what is merited by the risk involved. A study using an industry survey

of mortgages priced as subprime found that almost 29 percent of subprime borrowers had credit

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[5] Researchers have had difficulty defining predatory lending as it encompasses a number of schemes (Renuart 2004). A thorough definition of predatory lending was put forth by Engel and McCoy (2002); according to them, predatory lending includes loan terms or practices that involve one or more of the following five categories of problems with loan origination: "(1) loans are structured to result in seriously disproportionate net harm to borrowers, (2) harmful rent seeking, (3) loans involving fraud or deceptive practices, (4) other forms of lack of transparency in loans that are not actionable as fraud, and (5) loans that require borrowers to waive meaningful legal redress" (Engel and McCoy 2002, 1260).

scores above 640, generally considered the point at which prime lenders become comfortable with lending to a borrower (Phillips-Patrick, Jones and LaRocca 2000). In another study, Freddie Mac examined 15,000 subprime mortgages originated by four financial institutions and found that between 10 and 35 percent of borrowers who obtained mortgages in the subprime market would likely have qualified for a conventional loan (Freddie Mac 1996). While this is evidence of duplicitous lending practices, to the extent that the borrowers who could have qualified for a prime loan but instead obtained a subprime loan are concentrated among minority or low-income borrowers, discrimination, more than just dishonesty, may be at play.

A number of previous studies have investigated the factors, at both the individual and neighborhood levels, that affect the allocation of loan type. Although analyzing loans with differing purposes, refinance or home purchase for example, that were applied for or originated in various years and in various communities, such studies have by and large found that subprime lending is concentrated among minority borrowers and within minority communities (Bradford 2002; Lax *et al.* 2004; Scheesselle 1999; Schill and Wachter 1993). Stein (2005), in analyzing the lending patterns of companies that made both subprime and prime loans in California in 2003, saw that black and Hispanic borrowers with the same or higher income than whites were between two and four times as likely as whites to obtain a subprime loan at each of the seven lending corporations included in the study and that minorities were more likely to see their applications for prime loans denied even after controlling for income.[6] Some of the lenders that

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[6] The 5 California cities included in the analysis were Fresno, Los Angeles, Oakland, Sacrament and San Diego. The 7 financial institutions included in the analysis are Citibank, Countrywide, H&R Block, HSBC, National City, Washington Mutual and Wells Fargo.

Stein investigated acknowledged that some borrowers who applied for a subprime loan should have been, but were not, "referred up" to a prime loan.

Researchers have found that, at the bivariate level, the race of a borrower affects the likelihood that they are a part of the subprime mortgage market. Scheessele (1999) in analyzing HMDA data found that although the rates of home purchase lending to black and Hispanic borrowers reached record highs in 1998, the types of loans these borrowers obtained differed substantially from white borrowers. The rates of prime home purchase loans for black borrowers remained below their 1994 levels and were only slightly higher than in 1994 for Hispanics in 1998. Scheessele found that the additional home purchase loans in 1998 were concentrated in FHA and subprime for blacks and FHA for Hispanics. He additionally found that similar racial disparities existed for refinance lending in 1998. Lax et al (2004), in analyzing data from a survey done for Freddie Mac by the Gallup Organization on refinance, home purchase and second liens mortgages originated in 1996 and 1997, found that black borrowers accounted for a disproportionately large share of subprime lending.

While investigating the relationship between race and subprime lending, a number of researchers have considered the relationship between economic indicators and subprime lending. Lax *et al.* (2004) in analyzing the study done by the Gallup Organization found that, at the bivariate level, lower-income borrowers were about twice as likely to obtain mortgages in the subprime as opposed to the prime sector of the mortgage market. A study by Scheessele (2002) found that despite a lack of a strong correlation between credit rating and income, subprime lending is more highly concentrated among lower-income borrowers.

Taking the analyses a step further, researchers have found that racial disparities exist regardless of income. Bradford (2002) used HMDA data from 2000 to analyze lending patterns of mortgage refinance loans in 331 metropolitan statistical areas and found significant racial disparities in subprime lending that increased with a borrower's income. Blacks at lower-income levels were 2.4 times as likely to obtain a subprime refinance loan as lower-income whites while blacks in upper-income levels were 3 times as likely to receive subprime refinance loans as upper-income whites. The corresponding rates for Hispanics were 1.4 and 2.2, respectively. Bradford found that such racial disparities existed throughout all regions of the U.S. but were largest in the Midwest and Great Plains.

Such disparities were also found by neighborhood income level. Between 1993 and 1998, Immergluck and Wiles (1999) found that refinance lending by subprime institutions increased by 30 percent in predominantly black neighborhoods in the Chicago metropolitan area, compared to a 2.5 percent increase in white neighborhoods. They additionally found that 58 percent of refinance applications in black neighborhoods were submitted to subprime lenders, compared to 10 percent in white neighborhoods. Scheessele (2002) in analyzing HMDA data from 2000 nationally, found that over half of all refinance loans made in neighborhoods where blacks comprised over 80 percent of the residents were subprime. A joint study conducted by the U.S. Department of the Treasury's National Predatory Task Force and the U.S. Department of Housing and Urban Development (2000), found that the frequency of subprime refinance originations in 1998 was 5 times higher in predominantly black neighborhoods than predominantly white neighborhoods. The joint study also found that the frequency of subprime refinance lending in 1998 was more than three times higher in low-income neighborhoods than

in upper-income neighborhoods nationwide and that borrowers in upper-income predominantly black neighborhoods were more than twice as likely to obtain a subprime refinance loan as borrowers in low-income predominantly white neighborhoods.

Conducting analyses at the neighborhood level, both Immergluck (2004) and Scheesele (1999) found that even after controlling for a number of neighborhood factors, the minority composition of a neighborhood was positively associated with subprime lending in the neighborhood. Immergluck (2004) found that whether a neighborhood is predominantly black explains the greatest amount of variation in subprime lending- going from an all white to an all black neighborhood, holding a number of other tract level variables constant, increased the likelihood of obtaining a subprime refinance loan by 40 percent. The magnitude of the effect of race was followed by neighborhood level of educational attainment and subsequently median home value. He concluded that "after holding race and property value constant, lower incomes will not increase the level of subprime lending, so that race, not income, is the stronger determinant of subprime patterns" (2004,p. 118).

Two theories have emerged from the studies above. Some researchers maintain that the concentration of subprime lending in low-income and minority neighborhoods and among low-income and minority borrowers is evidence of the market functioning effectively- that the higher rates of subprime lending in neighborhoods are really a function of the location of higher-risk borrowers as the higher cost of subprime loans is designed to offset the additional risk involved in such lending (Pennington-Cross *et al.* 2000). From this perspective the market for high-risk, high-cost lending is an efficient (if unfortunate) economic response to demand side forces and the spatial concentration of subprime lending is nothing more than a response tailored to the

places with large numbers of borrowers with credit histories that disqualify them from

mainstream, prime markets. Others argue, however, that the higher interest rates associated with

subprime loans cannot fully be explained by the additional risk associated with subprime

borrowers (Lax *et al.* 2004). The concentration of subprime lending is, in other words, rooted in

discriminatory lending practices, a continuation of the discrimination that has characterized the

mortgage market from its inception. From the institutional perspective, the inequalities in

housing finance are cause as much as they are effect; a segmented mortgage market maintains

and even reproduces uneven neighborhood development, and structures long-term class and race

inequality in wealth accumulation, further feeding the disparities in fair access to fair lending

(Newman and Wyly 2004).

Newman and Wyly (2004) lay out a set of arguments detailing the reasons why the

targeting of minority communities is profitable, including that charging hidden fees and unfair

rates is easiest in communities where borrowers have experienced or fear exclusion. In addition,

many predatory practices, such as fraudulent home repair schemes, can only be made profitable

in communities with the combination of aging homes and delayed maintenance, as is the case in

many minority communities where such conditions were exacerbated by a history of redlining

from prime lenders. In addition, identifying neighborhoods with a larger share of black residents

is likely easy for players in the real estate industry; it is not labor or cost intensive.

The studies discussed above including the multivariate analyses by Immergluck (2004)

and by Scheessele (1999), did not incorporate borrower credit information and therefore leave

open the possibility that, given the higher likelihood of limited or poor credit histories among

minority borrowers than white borrowers, the findings are actually driven by this omitted

variable. In other words, an alternative explanation for the concentration of subprime loans in these neighborhoods is the possibility that lending patterns are a result of demand side forces; that subprime loans are concentrated in low-income and minority neighborhoods precisely because low-income and minority borrowers are more likely to have flawed or limited credit histories and as such require subprime loans in order to obtain mortgages.

Some researchers have looked beyond income to investigate additional economic conditions that may affect subprime lending. To test the extent to which the concentration of subprime lending is evidence of the market functioning effectively with the concentration a result of the grouping of borrowers with low credit scores in need of subprime lending, researchers have investigated whether, once additional factors such as credit risk are accounted for, the association between race and loan type and income and loan type still exists.

Credit scores are proprietary information, not included in HMDA data, and therefore difficult and expensive to obtain. Few studies have been able to investigate the relationship between race and income and loan type while controlling for credit risk. Those that have included credit risk found mixed results. Lax et al (2004) conducted analyses of the likelihood that a loan origination is subprime as opposed to prime. They first entered a number of credit risk factors including Loan-to-value ratio by FICO score grouping, income ratio by payment ratio, product type (either fixed or adjustable rate mortgage) and loan purpose (either cash-out refinance, rate or term refinance, or home purchase). They find, not surprisingly, that risk matters- financially riskier borrowers were more likely to be in the subprime segment of the market. Next they ran a model that included the same variables, but added a number of borrower and neighborhood demographic variables. They found that although the coefficients for risk were

depressed slightly, their significance levels did not change. The demographic variables, by and large, including both individual and neighborhood race, were not statistically significant when controlling for risk (despite demonstrating a relationship at the bivariate level). While a few variables (education, age and a few variables about their experience with securing a loan) were statistically significant, the size of their effects on the likelihood of obtaining a subprime loan were on the whole much smaller than the size of the effects of the risk predictors. Risk, they concluded, is the largest contributor to the explanation of whether loans are going to end up in the prime or subprime markets.

Similarly, Pennington-Cross *et al.* (2000), in their analysis of home purchase lending, found that the neighborhood racial composition was not a significant predictor of subprime activity when controlling for credit risk. Pennington-Cross *et al.* (2000) used nationwide data from 1996 to analyze both individual and contextual factors associated with the likelihood that a borrower seeks a prime, subprime or FHA home purchase mortgage and include measures of individual borrower credit risk by linking data from a major national credit bureau to HMDA data. Results showed that households exhibiting characteristics of high credit risk, including a flawed credit history and high amounts of non-real estate debt, are more likely to choose a subprime loan than a prime or FHA loan, which they argue is evidence of the segmented credit market functioning effectively. While they found that when controlling for credit risk, subprime lending is not more common among low-income borrowers or low-income, predominantly minority neighborhoods, they also found that subprime home purchase loans are more likely to be chosen by minority borrowers than white borrowers. That is, although the neighborhood racial composition was not a significant predictor when controlling for credit risk, the race of the

borrower was. While only 2.4 percent of their sample obtained subprime home purchase loans, when calculating marginal probabilities, they found that blacks have a 0.8 percent higher probability of obtaining a subprime loan even after controlling for credit risk. This is a large increase on a small base. Unfortunately, Pennington-Cross and colleagues did not enter the variables into the model in stages. We therefore do not know to what extent the credit factors weaken the relationship between an individual's race and their likelihood of ending up in the subprime segment of the market. Contrary to Lax *et al.* (2004), however, Pennington-Cross *et al.* found statistically significant differences by race of the borrower- black homebuyers were more likely than white homebuyers to obtain subprime loans even when controlling for credit risk.

Focusing on credit risk at the neighborhood level, Calem, Gillen and Wachter (2004) found that when predicting the share of subprime refinance loans at the tract level, when including a full set of explanatory variables including the neighborhood risk and neighborhood demographic characteristics, neighborhood percent black remained statistically significant and substantively important for both Philadelphia and Chicago. Calem, Gillen and Wachter (2004) analyzed HMDA data from 1999 from both Chicago and Philadelphia and incorporated neighborhood residents' credit histories in their analysis. While unable to analyze credit risk at the individual level, they did construct two measures of credit risk characteristics of the neighborhoods based on individual credit ratings including: the proportion of individuals 18 years old or older with very low credit ratings and the proportion with no credit bureau rating. Unlike Pennington-Cross et al., when predicting the share of subprime refinance loans at the tract level, they find that their neighborhood risk measures account for about half of the association between the percentage of homeowners in the neighborhood who are black and the neighborhood

subprime share in Philadelphia and about two-fifths of the relationship in Chicago. When

including a full set of explanatory variables including the neighborhood risk, neighborhood

demographic characteristics and foreclosures rate, population turnover, percent of conventional

loans denied in the neighborhood and a variable that represents neighborhood risk in real estate

by measuring the tract's annualized median rent divided by the median house value, they found

that neighborhood percent black remained statistically significant and substantively important for

both Philadelphia and Chicago. All else equal, entirely black census tracts had a 19 percent

higher rate of subprime in Philadelphia, 17 percent higher in Chicago, than all white census

tracts. This finding stands in contrast to both Pennington-Cross *et al.* and Lax *et al.* who found

that neighborhood racial composition did not significantly predict subprime activity.

In sum, the results on whether race is a significant predictor of market segment after

taking into account credit risk factors are mixed. While all studies found that the

creditworthiness of the applicant was by far the most important predictor in determining the

segment of the market in which a borrower found him or herself, whether the borrower's race or

the racial composition of the neighborhood maintained a significant effect on subprime lending

after accounting for credit quality varied by study. At the individual level, while Lax *et al.* found

that borrower's race was not a significant predictor of subprime lending after partialling out the

effects of credit risk, Pennington-Cross *et al.* and Calem *et al.* both found blacks to have a higher

chance of borrowing in the subprime sector. At the neighborhood level, while Lax *et al.* and

Pennington-Cross *et al.* both found no effect of neighborhood racial composition, Calem *et al.*

found that even after controlling for credit risk, higher concentrations of subprime lending were

found in predominantly black communities. These inconsistent findings warrant concern over the

existence of a disparity between blacks and whites and beg further research. Given that these studies were able to control for a number of borrower credit risk factors, the finding that minorities and minority communities are more likely than whites to use a subprime loan is troubling, and is an indication that the higher cost of the loans is larger than the risk associated with the loan.

The Ramifications of Such a Concentration

The concentration of subprime lending among minority borrowers and minority neighborhoods warrants concern beyond that of borrowers paying more than necessary for credit. As Apgar and Calder (2005) explain "high-cost lending in the 1990s appears to be linked to a troubling rise in foreclosures, threatening not only to undo low-income homeownership gains but also to destabilize the already weak neighborhoods where these loans are concentrated (p. 103)." A recent study conducted by the Center for Responsible Lending found high foreclosure rates of subprime loans even over the period of increasing home values that characterized the early 2000s. They found that about one in every eight (13 percent) subprime loans originated in 2000 was foreclosed by May of 2005 (Schloemer at al. 2006). The Reinvestment Fund (2005) in analyzing the growing mortgage foreclosure rate in Pennsylvania found that while 10 percent of all loans made in Pennsylvania in 2002 were by subprime lenders, subprime lenders made fully 60 to 75 percent of their sample of loans in foreclosure.[7]

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[7] The reason subprime loans are associated with disproportionately high foreclosure rates goes beyond the riskier nature of the borrowers themselves (Schloemer et al. 2006). The loans include risky loan terms that increase the likelihood of default, including adjustable interest rates, balloon payment mortgages (a loan that does not fully amortize over the term of the loan leaving one large "balloon" payment at maturity) and prepayment penalties. Such risky loan terms combined with the failure of many lenders to adequately consider the ability of borrowers to afford the credit they were being granted.

When a home goes into foreclosure, the ramifications are felt not just for the individual or family who lost the home, but spread to the surrounding neighbors and the wider community. Foreclosures often result in abandoned, boarded up homes that in turn feed the physical deterioration of a community. The concentration of subprime lending magnifies the ramifications of these individual foreclosures. Indeed the cities of Baltimore, Maryland and Cleveland, Ohio have taken steps to sue lenders arguing that the lenders' irresponsible practices have resulted in large scale and devastating foreclosures in many of their neighborhoods. Such high rates of foreclosure, along with a rapid contraction of the mortgage credit market, likely contributed to the cycle of home price depreciation.

Immergluck and Smith (2006), in a study of Chicago, found that a foreclosure started on a home lowered the price of nearby single-family homes by 0.9 percent. Such downward pressure was cumulative; that is, each additional foreclosure lowered the price of nearby homes by an additional 0.9 percent. According to their best estimates, the effects were experienced for up to an eighth of a mile from the foreclosed property. The downward pressure on home prices as a result of a nearby foreclosure lasted for homes sold in the area within two years of the foreclosure.

The Center for Responsible Lending took Immergluck and Smith's (2006) findings one step further. For thousands of census tracts in metropolitan areas across the country, they employed HMDA data to identify the number of subprime loans originated in 2005 and 2006 and multiplied it by a predicted cumulative foreclosure rate for the metropolitan area in which the loan was originated to obtain the number of expected subprime foreclosures by census tract. Using housing unit densities and median home prices from Census data, they then employed

Immergluck and Smith's findings of the 0.9 percent decrease in home value within one-eighth of a mile to calculate the impact of foreclosures on nearby property values. All told, nationwide, they predict that fully 40.6 million homes neighboring subprime foreclosures in 2005 and 2006 will experience a resultant devaluation in house value; they call this the subprime "spillover" effect. They estimate the costs in nearby home values will total about $202 billion, about $5,000 per home on average.[8] In Pennsylvania, they estimate that 1.7 million homes near 2005 and 2006 foreclosures will experience devaluation that will total approximately $3.7 billion. In Philadelphia alone, they estimate a $1.9 billion loss.

The high rates of foreclosure and the resultant harm to the community could be devastating for minority communities. Beyond the magnification of the effects of foreclosures as a result of the high concentrations of subprime loans in black communities, there is some evidence that foreclosures are even more damaging to predominantly minority neighborhoods than they are to largely white communities. The study by Immergluck and Smith (2006) found that when focusing only on low-income minority communities, the downward pressure on home values as a result of a neighboring foreclosure was more pronounced; each additional foreclosure in low-income and minority communities decreased a single-family home's value in the community by 1.4 percent. The larger decrease in home value was true even though such foreclosures are more likely taking place in vacant or blighted areas. This is a major cause for concern for these communities. The existence of the concentration of subprime lending in minority communities, regardless of the underlying cause, as well as the associated concentration

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[8] Such a loss in property values, they caution, is equally a loss in tax base to the surrounding community.

of foreclosures raises serious public policy questions and concerns about the fairness of housing accessibility.

The Focus of My Research

Given the above discussion, I set out two main goals for my research. First, I investigated the dual mortgage delivery system and the role it plays in the sorting of subprime lending across neighborhoods. Second, I looked into the ramifications of the concentration of subprime lending for neighborhoods both in the extent to which it propagates further subprime lending in the neighborhood as well as the economic ramifications for these neighborhoods.

While past research has consistently established a concentration of subprime lending among black borrowers and in predominantly minority neighborhoods, there is a lack of consensus over the extent to which this concentration exists beyond that merited by risk. In addition there are inconsistencies in the findings about the effects of race after controlling for economic factors including income and credit risk. While Lax *et al.* (2004) found that borrower's race was not a significant predictor of subprime lending at either the individual or neighborhood levels, Calem *et al.* (2004) found that both measures of race were significant predictors of mortgage market segment. Pennington-Cross *et al.* (2000) on the other hand found race to be a statistically significant factor at the individual level but found no effect of a measure of the level of residential racial segregation for a neighborhood. All of these studies investigate the effects of both individual and neighborhood level factors in one regression model. However including variables measured at both the individual and neighborhood levels in one regression model violates a major assumption of regression analyses- that error terms are normally distributed.

Because of the importance of neighborhood in mortgage market activity, it is important to consider the correlated errors of two borrowers living in the same neighborhood. Second it assumes that the effects of the coefficients are the same across contexts, failing to consider the effect of one variable might be different in different contexts. Hierarchical Linear Modeling is a technique specifically designed to analyze such clustered data. Using Hierarchical Linear Modeling (HLM) I was able to investigate all of these factors, including both individual and the neighborhood indicators, in one regression equation without violating this assumption of regression analyses.

Using HLM, my research approaches the understanding of the concentration of subprime lending by focusing on an investigation into the dual mortgage delivery system. I analyzed the distribution of loan type through the lens of the dual mortgage delivery system by looking into the effects of contextual and individual level characteristics on the likelihood of obtaining a subprime as opposed to a prime loan. To the extent that prime loans are undermarketed to minority and low-income borrowers and communities while subprime lenders set their sights on these borrowers and communities, the likelihood that many borrowers are paying more than necessary for credit is heightened. My need to classify subprime loans at the institution or lender level using the HUD Subprime Lender List, as I will explain further in Chapter 2, lends itself perfectly to the study of the dual mortgage delivery system. Because I classify all loans made by a given institution as prime or subprime, the analysis provides a look into the extent to which different types of lenders service different borrowers and neighborhoods.

I use HLM to look into the operations of the dual mortgage market on the individual level as well as the neighborhood level. To get a better sense of the levels at which the dual mortgage

market is working, I investigated the interaction between race at the individual and neighborhood levels. One of the useful features of HLM is its ability to estimate the effects of cross-level interactions- in this case, individuals and neighborhoods. Do blacks who are borrowing in predominantly black neighborhoods have the same likelihood of originating a subprime loan as blacks who are borrowing in a predominantly white neighborhood or does the effect of being black change depending on the neighborhood?

While the present study, like many others, suffers from a lack of available credit information, I do include a variable that serves as a measure of neighborhood risk that was employed by Calem *et al.* (2004) and found to be a statistically significant predictor of subprime lending. It is a measure of risk in real estate investment in the neighborhood. It is the ratio of the tract's annualized median rent divided by the median house value. A larger value for this variable is consistent with lower expected price appreciation or more uncertain future house prices and therefore indicates increased credit risk. Neighborhoods where rent prices are higher relative to home prices tend to have more uncertain future home values and are viewed as a riskier neighborhood for investment. It is not a perfect or complete measure of credit risk, but serves as some indication of the effects of neighborhood creditworthiness. It also serves to weaken the effects of additional explanatory variables given the importance of credit risk in determining mortgage market segment. Although the lack of credit information signals that the results should be interpreted with caution, I assess the validity of my models by employing predicted probabilities.

My second goal for this research is an investigation into the ramifications of high concentrations of subprime lending. Regardless of the underlying causes, the demonstrated

concentration of subprime lending by neighborhood raises questions about these neighborhoods'

futures. To accomplish my second goal, developing the understanding of the consequences of

increased capital flow in the form of subprime lending to these previously underserved

neighborhoods, I conducted two sets of analyses. I first investigated the consequences of

subprime lending through the lens of the self-fulfilling nature of the mortgage market. I asked- is

one of the consequences of subprime lending in a neighborhood additional subprime lending in

the future? Does a concentration of subprime lending beget further subprime lending? If different

lenders are serving different neighborhoods, the concentration of subprime lending in these

neighborhoods will expand over time. As such, I conducted an analysis entirely at the

neighborhood level, predicting later rates of subprime lending with earlier rates in the

neighborhood. I further controlled for neighborhood conditions to assess the extent to which they

contribute to an increase in subprime lending above and beyond what would be expected given

market forces.

Second, I sought to understand the extent to which earlier rates of subprime lending

affect a number of later neighborhood outcome measures. Given the high rates of foreclosure

associated with subprime lending and the damaging effects of foreclosure in communities,

especially minority communities, I looked to understand the consequences of the concentration

of subprime lending. Such consequences bear out regardless of whether the grouping of

subprime loans is a result of the concentration of risky borrowers or not. I weighed the effects of

subprime lending on a neighborhood by analyzing its effects on the following neighborhood

measures: the rate of black homeownership, the median household income and the median house

value of the neighborhood.

Conclusion and Hypotheses

In this chapter, I have discussed the interconnected roles of the advent of subprime lending and the dual mortgage delivery system, of racial discrimination in the history of housing and its connection to racial residential segregation. This dissertation further sheds light on the value of subprime lending and its role in the mortgage market and in the lives of minority borrowers and communities in recent years. Below I outline four hypotheses that I tested in this dissertation:

Hypothesis 1: Both the individual borrower's race and the neighborhood racial composition will have a statistically significant effect on the likelihood of obtaining a subprime loan.

Although findings on the effects of race at the individual and neighborhood levels have been mixed, I hypothesize that black borrowers will be significantly more likely to obtain subprime loans than prime loans, even when controlling for additional loan level characteristics as well as the neighborhood characteristics, including a measure of neighborhood risk. Although Lax *et al.* (2004) did not find an effect of being a black borrower on the likelihood of originating a subprime loan, both Calem *et al.* 2004 and found such an effect. While Lax *et al.* (2004) and Pennington-Cross *et al.* (2000) did not find a statistically significant effect of neighborhood race on market segment, Calem *et al.* (2004) did. I expect to find, similar to Calem *et al.* (2004) who also analyzed lending in Philadelphia in the early 2000s, a statistically significant effect at the neighborhood level with predominantly black neighborhoods increasing the likelihood of

obtaining a subprime loan. HLM will provide unique insight into these relationships as it is designed to accurately estimate the effects of variables in a nested data structure.

Hypothesis 2: The individual borrower's race will vary by the racial composition of the census tract in which the dwelling securing the loan is located.

Given the history of discrimination in the mortgage market, both with respect to individual borrower's race as well as the racial composition and segregation of the neighborhood (Denton 2006), I expect to find a statistically significant cross-level interaction between borrower's race and the racial composition of the neighborhood. I expect that the likelihood of obtaining a subprime loan for minority as opposed to white borrowers will differ by the racial composition of the neighborhood. I expect to find that the dual mortgage delivery system pointed to by Apgar and Calder (2005), Immergluck and Wiles (1999) and Stuart (2003) functions at both the individual as well as the neighborhood level- with different lenders serving different neighborhoods, but also at the individual level with different lenders serving different borrowers based on race.

Hypothesis 3: The rate of subprime lending in a neighborhood in earlier years will statistically significantly affect the rate of subprime lending in a neighborhood in a later year.

I expect that the higher rates of subprime loans in a neighborhood at an earlier time period will be statistically significantly related to higher rates of subprime lending in that same neighborhood at a later date. Given the concentration of borrowers with poor credit histories in

low-income and minority neighborhoods and the expansion of subprime lending throughout the 1990s as well as the previous findings that different lenders serve different neighborhoods (Apgar and Calder 2005; Immergluck and Wiles 1999) and the self-fulfilling nature of the mortgage market (Stuart 2003), I expect that neighborhoods with higher rates of subprime lending in 1992 and 1997 will have higher rates of subprime lending in 2002.

Hypothesis 4: Higher rates of subprime lending in a neighborhood will be statistically significantly related with higher rates of black homeownership as well as higher rates of neighborhood deterioration.

In investigating the ramifications of subprime lending for neighborhoods, I expect that higher rates of subprime lending in 1992 and 1997 will be associated with higher rates of neighborhood deterioration between 1990 and 2000. As subprime lending has been touted as a method for the expansion of homeownership to minority and low-income borrowers, I expect that higher rates of subprime lending in a neighborhood in 1992 and 1997 will lead to a larger increase in share of black homeownership and decrease in median income between 1990 and 2000. In addition, given the risky nature of subprime lending and the higher rates of foreclosure among subprime loans as well as the heightened impact of foreclosure in low-income minority communities (Immergluck and Smith 2006), I expect that higher rates of subprime lending in a neighborhood in 1992 and 1997 will lead to a larger decrease in the median house value.

CHAPTER 2

DATA AND METHODS

To conduct this research, I used data from three different sources. First, I used Home

Mortgage Disclosure Act (HMDA) data that is comprised of individual mortgage loan level data.

Second, in order to identify the loan applications from subprime lenders, I relied on the

Department of Housing and Urban Development's (HUD) annual list of subprime lenders.

Finally, I supplemented the HMDA data with U.S. Census data from 1990 and 2000.

Home Mortgage Disclosure Act Data

Born out of the struggle for fair housing, The Home Mortgage Disclosure Act (HMDA),

enacted in 1975, requires lending institutions covered by HMDA to maintain and report loan

registers to the Federal Financial Institutions Examination Council (FFIEC).[9] This regulation

applies to both depository and non-depository financial institutions, including banks, savings

associations, credit unions, and other mortgage lending institutions. The data reported by the

lending institutions are publicly available. For the year 2003 there were approximately 31 million

loan records from calendar year 2002 reported by 7,771 financial institutions under HMDA (see

FFIEC).[10]

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[9] See http://www.ffiec.gov/hmda/ for more information on the Home Mortgage Disclosure Act and the Federal Financial Examinations Council's oversight of the act.

[10] By way of comparison, there were there were approximately 34.1 million loan records reported in 2007 for calendar year 2006 reported 8,886 institutions. In 1998, 7,925 financial institutions reported approximately 16.4 million loan records for calendar year 1997.

Companies covered under HMDA are required to keep a Loan Application Register (LAR). Each time someone applies for a home mortgage at an institution covered by HMDA, the company is required to make a corresponding entry into the LAR. Lending institutions are required to provide information on each application including the dollar amount of the loan, the Census tract where the dwelling is located, and loan outcome.[11] Reporting institutions are also required to submit the type of loan as well as the purpose of the loan. The categories of loan type included conventional or government insured. Conventional loans include both prime and subprime; they are not distinguished. Government-insured loans include Federal Housing Administration (FHA) insured loans, Veterans Administration (VA) guaranteed loans, and Rural Housing Service (RHS) and Farm Service Agency (FSA) loans.[12] The purpose of the loan is a measure of the type of loan for which an application was submitted. This includes home purchase loans, home refinance loans, home improvement loans and multi-family loans.[13] I will only analyze home refinance and home purchase loans in the research at hand.

In my research, I employed HMDA data from 2003, 1998 and 1993. The year of HMDA data identifies the year in which the data were reported. Loan applications and originations are stored in the lenders LAR and reported in the subsequent year. As such, the loans in the 2003 HMDA data were actually originated in 2002; 1998 HMDA data include loans from 1997 and 1993 from 1992. I refer to the data sets as 2002, 1997 and 1992 to serve as a reminder of the year in which the loans were actually originated. Although both applications and originations are

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[11] Initially, HMDA only required the reporting of the geographic location of originated and purchased home loans, but in 1989, Congress expanded the data collection to include information about denied home loan applications as well.

[12] Rural Housing Services and the Farm Service Agency were both created in 1994 as a result of the Department of Agriculture Reorganization Act; these loans will therefore not be included in the 1993 data.

[13] Home equity lines of credit are often not included in HMDA data unless some part of the proceeds is intended for home improvement or home purchase.

reported, my work focuses on loan originations- that is loans that were approved by the lender and accepted by the borrowing. Loan originations are in essence actual loans. Analyzing loan applications could provide insight into the targeting strategies of lenders and evidence of the locations of borrowers who are excluded from the mortgage market as it includes loans that were denied. I analyze loan originations, however, because these are the people who actually took out a mortgage on a property. Those in the subprime sector are paying for a high cost loan that they may or may not be able to afford and could be in financial danger. Additionally, it is only through the concentration of actual loans and not just loan applications that the benefits and consequences of subprime lending for a neighborhood can be judged.

My work focuses on home refinance loans with the study of home purchase loans serving as a supplement. Previous research has demonstrated that these loans are distributed differently across markets and should therefore be considered separately. I therefore conduct separate analyses for these two types of lending. As mentioned in Chapter 1, refinancing accounts for the largest share of subprime lending, but home purchase loan applications have been steadily increasing their share of the subprime market.

Definition of Subprime Lending- HUD Subprime Lending List

As mentioned above, HMDA data prior to 2004 do not directly classify conventional loans as prime and subprime. To classify conventional loans by prime and subprime, I merged the HUD subprime list from the corresponding year to each year of HMDA data. Each loan application has a code that identifies the lending institution that is filing the application with the FFIEC. This code allows for linking the application to a list of lenders designated by HUD as specializing in subprime loans. All loans originated by these lenders are flagged as subprime.

Although this introduces measurement error, as discussed below, the identification of the loans at an institution level allows me to better investigate the dual mortgage delivery system and the extent to which different lenders are serving different individuals and neighborhoods with different loan types.

To compile its subprime lending list, HUD utilizes a number of indicators to identify subprime lending specialists. HUD reviews HMDA indicators, including origination rates and the percent of originations from refinance loans. Subprime lenders typically have lower origination rates than prime lenders; that is, subprime lenders generally deny higher percentages of applications than do prime lenders. Additionally, a larger percentage of subprime originations tend to come from refinance loans than is the case with prime lenders. As such, HUD employs both of these HMDA indicators to help identify subprime lenders. In addition, HUD undertakes a review of the lenders web sites and places telephone calls to the lenders in an effort to appropriately classify them.

There is a potential for measurement error as a result of classifying lending institutions as opposed to individual loan applications. This is due to the inability to classify lenders that originate both prime and subprime loans. Large lenders such as Chase Manhattan, Residential Funding, and IndyMac often reported the mortgages originated by their subprime divisions with the mortgage originations of their prime divisions. Measurement error may also occur as the result of the omission of smaller lenders that are not required to report under HMDA. HMDA data do not include lenders whose mortgage business accounts for less than 10 percent of their overall lending.

HUD has recently been able to assess the accuracy of the list as a result of a change in reporting with the 2004 HMDA data. Beginning in 2004, lenders were required to identify loans

in which the annualized percentage rate (APR) was 3 points higher than a comparable Treasury APR. This was meant to identify higher cost, subprime loans. HUD believes that the discrepancy in classification that arrives from the use of the HUD subprime lender list as opposed to the reporting of high cost loans to be small. HUD indicates on their website that after a review of the 2004 HMDA data, the identification of potential subprime lenders using the HUD indicators closely matches the identification of potential subprime lenders using the rate spread premium variable included in HMDA data in 2004. Indeed, even after the inclusion of the identification of high APR loans, HUD has continued to publish their list of lenders specializing in subprime loans because they believe there are a number of reasons the additional APR information does not sufficiently identify subprime loans.[14]

U.S. Census Data: 1990 and 2000

Additionally, I employed data from both the 1990 U.S. Census and the 2000 U.S. Census. Since the census tract of the dwelling securing the loan is included with HMDA data, I am able to link the HMDA data to census data. This allows me to include contextual variables in my model. A census tract is a subdivision of a county that is meant to be relatively homogeneous with respect to population characteristics, economic status, and living conditions. They generally contain between 1,000 and 8,000 people, with an optimum size of 4,000 people. The census tract serves as a measure of the surrounding community. Although designed to be stable from census to census, some tracts changed between 1990 and 2000. While the majority of tracts remained consistent from 1990 to 2000, some split, some merged and parts of one track were subsumed in

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[14] For a more thorough discussion of the reasons why HUD believes the APR information is not sufficient, see: http://www.huduser.org/datasets/manu.html

another. In order to keep my geographic subdivisions consistent from 1990 to 2000, I combined tracts that split, merged or changed shape.

The Census provides both a 100 percent data file based on the short form of the Census questionnaire that all households fill out and a Sample data file based on a long form of the questionnaire that only a select subset of the population completes. To conduct my analyses, I employed the Summary File 3- Sample Data set. This is because the short form only collects basic information like age, race, sex, Hispanic or Latino origin, tenure [whether a housing unit is owner- or renter-occupied], and vacancy status. A number of variables I was interested in including in my models were not a part of the 100-percent data. The summary file presents in-depth person and housing data.

Modeling Lending Outcomes and Their Consequences

This research contains three sets of analyses. In the first set, Chapter 3, I modeled the factors at both the borrower and neighborhood level that affect the type of loan a borrower obtains in Philadelphia County. In this set of analyses I interacted borrower's race with neighborhood race to investigate the ways in which the effect of being black changes by the racial composition of the tract. In the second set of analyses, Chapter 4, I replicated this analysis for three other locations in the United States- Baltimore City, Alameda County and San Francisco County. These comparative analyses allowed for an initial look into the ways in which the processes discovered in Philadelphia do and do not translate to other cities. In my final set of analyses, Chapter 5, I looked into the consequences of subprime lending for Philadelphia's neighborhoods. In this set of analyses, I model the effects of earlier years of subprime lending in

a neighborhood on a number of different neighborhood indicators to consider the effects of concentrations of subprime lending at the neighborhood level.

Analyzing the Interaction between Individual and Neighborhood Race

The outcome of my first set of analyses is the likelihood that a loan origination is subprime. As mentioned above, subprime lending is identified at the institution level- all loans originated by an institution that specializes in subprime lending are therefore identified as subprime. I modeled only conventional loans, i.e. the likelihood that a loan is subprime as opposed to prime. As such, the reference category is prime. I exclude government backed loans as they are of a different nature than both prime and subprime given the government's shouldering the burden of default as well as the conditions required to qualify for the loan are truly of a different nature from prime and subprime.

As discussed in Chapter 1, in studying the workings of the mortgage market, especially in metropolitan areas, it is essential to not only consider the individual borrower's characteristics but to account for the demographic characteristics of the neighborhood that surrounds the dwelling securing the loan as well. This is because lenders likely emphasize neighborhood factors in determining the creditworthiness of a loan. Processes that occur at the neighborhood level affect the processes occurring at the borrower level. As such, analyses need to include both individual and neighborhood level factors in an analysis of the mortgage market. The most appropriate method to use when analyzing data of a multilevel structure is multi-level modeling. Employing multilevel statistical analyses allow for the discovery of relationships working at both individual and neighborhood levels. Multilevel modeling avoids the need to either disaggregate all neighborhood level variables to the individual and violate the assumption of independence or

aggregate the borrower information up to the neighborhood level losing all within-neighborhood information and likely distorting the findings. While my outcome variable is at the individual level, my independent variables are at both the individual and the neighborhood level. Using multi-level modeling allows me to partial out individual effects as well as contextual effects at the same time while avoiding issues resulting from the clustering and non-random assignment of individuals in neighborhoods.

The term multi-level modeling is often used interchangeably with Hierarchical Linear Modeling (HLM). The models are estimated with HLM version 6.03 (Raudenbush *et al.* 2005). Level 1 is the borrower characteristics and Level 2 includes the neighborhood characteristics of the dwelling that is securing the loan. With HLM, the Level 1 predictors become outcome variables of level 2 predictors; as such the Level 1 parameters are not directly estimated, but are indirectly estimated with the Level 2 predictors. Because my outcome measure is dichotomous, I conduct a generalized hierarchical linear model or HGLM using Bernouli's logistic regression (Raudenbush and Bryk 2002). The variables I included in my models are as follows:

Dependent Variable: Subprime [Prime is reference category]

Independent Variables:

Individual Borrower and Loan Level- from HMDA data

Applicant Race

Black
Hispanic
Other
Race Not Provided
[White is reference category]

Presence of Co-applicant

[No Co-applicant is reference category]

Applicant's Income

Neighborhood Characteristics- from 2000 U.S. Census Data

        Proportion Black
        Proportion Hispanic
        Median House Value
        Median Household Income
        Proportion Employed
        Proportion College Educated
        Tract Risk- (Annualized Median Rent / Median House Value)

The models I present start with the foundation of an unconditional model that includes no Level 1 or Level 2 predictors. The purpose of this model is to assess the extent of variation across neighborhoods. This step is required to ensure that differences in the likelihood of obtaining a subprime loan exist at the neighborhood level. After building the model up from the Level 1 predictors, I ultimately employed a mixed-effects model that includes both random intercepts and slopes- that is, both the intercepts and slopes vary across neighborhoods. Such a model estimates a cross-level interaction in which a neighborhood level characteristic influences a borrower level relationship. In my analyses I interacted individual race with neighborhood race to obtain a better understanding of the levels at which the dual mortgage market is working- are different neighborhoods served by different lenders and are minority borrowers more likely to obtain a subprime loan regardless of the racial composition of the neighborhood in which they reside or are purchasing a home? To accomplish this interaction, I first allowed the effect of being a black borrower (i.e. the slope for black borrowers) to vary across neighborhoods. To assess the effect of the racial composition of the neighborhood, I predict the slope for black borrowers with the percent of residents in a neighborhood that are black. In other words, this

model allowed me to ask, does a black borrower have a different experience in a white as opposed to a black neighborhood?

Considering This Interaction between the Individual and the Neighborhood in Other Markets

Mortgage markets vary widely across the United States. Some were hit quite hard by the recent popping of the housing bubble- housing prices falling, undergoing seriously high rates of foreclosure and with large percentages of their homeowners "underwater" or owing more on their home than they could sell it for. To assess the extent to which the processes in Philadelphia are similar and different to other markets around the country, I replicated these analyses in three other areas- Baltimore City, Maryland, and Alameda and San Francisco Counties in California.

I have selected these areas for a number of reasons. First, Baltimore City, like Philadelphia, is a city that experienced drastic population loss and disinvestment in the second half of the 1900s. Indeed, the U.S. Census ranked Baltimore as one of the cities in the United States that underwent one of the highest rates of population loss between 1990 and 2000. Recent attempts at revitalization have brought pockets of reinvestment and gentrification to the city, but the city still suffers from high crime rates (one of the highest crime rates in the nation), concentrated poverty and an ailing public school system. The analyses in Baltimore focus on the city of Baltimore, which although surrounded by Baltimore County, is an independent city; it does not belong to a county. The analyses in Baltimore serve to test the findings in Philadelphia, to see if similar processes are occurring in two cities that are in a number of ways similar.

To provide a contrast to these two east coast cities, I analyzed two counties on the west coast, San Francisco and Alameda. Slightly larger than Baltimore, San Francisco is a city that stands in stark contrast to both Baltimore and Philadelphia. It is like Philadelphia in that the city

and County are co-terminus (i.e. share the same borders), but unlike both Philadelphia and Baltimore in that it has been fairly successful in adapting to a loss of industry to make tourism the foundation of its economy. Housing prices in the county have soared, with home prices among the highest in the nation. Alameda County, across the bay from San Francisco, has benefited from the strong San Francisco Bay Area economy of the 1990s. The county contains the city of Oakland and over the last decade, the city gained population. Indeed, Oakland saw a rise in households with incomes in the top quintile nationwide and in the proportion of its residents with a college degree and most of the city's neighborhoods gained residents (Brookings 2003). Oakland, California is unique in that it is both a suburb of San Francisco and a city as well. Because San Francisco is so affluent, the inclusion of Oakland provided a good contrast to the affluence.

Conducting my analysis in four cities with different housing markets and experiences over the past decade allowed me to better understand the characteristics and processes that affect lending activity at a localized level.

Analyzing the Consequences of the Concentration of Subprime Lending

In Chapter 5, I further investigated the concentration of subprime lending and its consequences. Focusing my attention back on Philadelphia, I conducted analyses solely at the neighborhood level. I first considered the self-fulfilling nature of the mortgage market as described by Stuart (2003) and look into the possibility that subprime lending in a neighborhood begets further subprime lending. Using the earlier years of lending data, 1993 and 1998, I modeled the extent to which the rate of subprime originations in a neighborhood increases the rate of further subprime lending in the neighborhood. In this analysis, I controlled for baseline

measures of the neighborhood's characteristics in 1990 to determine the extent to which an earlier rate of subprime lending predicts later rates above and beyond neighborhood conditions.

The analyses were conducted at the census tract level and I conducted separate analyses for refinance and home purchase lending. My dependent variable was the rate of subprime originations in 2002. The percentage of subprime lending is out of all loans in the neighborhood, including both prime and government-insured. I included government-insured loans in the denominator of this percentage to ensure that I incorporated the full mortgage market activity in the neighborhood at each point in time in my analyses. Whereas in the previous analyses, I was interested in the factors that made an individual more likely to obtain a subprime loan, in this analysis I am more concerned about the consequences of this type of lending and as such need to situate it in the full extent of capital investment occurring in the neighborhood. In this analysis, I included the following variables:

Dependent Variables: 2002 Rate of Originations that were Subprime

Independent Variables:

From HMDA data

1997 Rate of Originations that were Subprime
1992 Rate of Originations that were Subprime

1990 Neighborhood Characteristics- 1990 U.S. Census

Median Household Income
Proportion Black
Proportion Hispanic
Proportion Employed
Proportion College Educated
Proportion Vacant
Tract Risk

This first set of analyses investigates the influence of the rates of previous subprime lending as well as neighborhood characteristics and measures of neighborhood growth and decline on a later rate of subprime lending. In the second set of analyses, I considered the effects of the earlier rates of subprime lending on neighborhoods conditions. I modeled the impact of earlier rates of subprime lending at the tract level on a number of different tract-level characteristics. I weighed the positive and negative effects that the concentration of subprime lending has on the neighborhoods.

To conduct these analyses, I employed lagged dependent variable analyses using Ordinary Least Squares (OLS) regression analysis. That is, the models include a measure of the dependent variable at an earlier time period. My dependent variables were the proportion of homeowners in the tract that are black, the median house value and the median household income. These are all measured in 2000. The independent variables included in the models include a measure of the dependent variable in 1990. As such the models control for the value of the dependent variable at 1990 and are essentially a measure of change in the dependent variable from 1990 to 2000. Because of this set-up, these models are conservative measures; statistically significant predictors are effects that are above and beyond what is expected by market forces.

The three models for this set of analyses are structured as follows:

Dependent Variables: 2000 Proportion Black Homeowners
2000 Median House Value
1999 Median Income

Independent Variables:

From HMDA data

1997 Share of Refinance Originations Subprime
1992 Share of Refinance Originations Subprime

1997 Share of Home Purchase Originations Subprime
1992 Share of Home Purchase Originations Subprime

From 1990 U.S. Census Data

1990 Proportion Black Homeowners
1990 Median House Value
1989 Median Household Income
1990 Tract Risk
1990 Proportion Black
1990 Proportion Hispanic
1990 Proportion Employed
1990 Proportion College Educated

Due to issues with multicolinearity, some variables are not included in some of the models- for example, median house value cannot be included with the median household income, nor can the percent of black residents with the percent of black homeowners. While the first set of analyses in this chapter looked at the influence of subprime lending on later subprime lending in the neighborhood, this set of analyses set forth an investigation into the ramifications at the neighborhood level of the rate of riskier, high cost lending in the neighborhood. While defaulting on both refinance and home purchase loans can result in foreclosure, rates of subprime refinance lending in a neighborhood may have a stronger effect on neighborhood outcomes than rates of home purchase lending because refinance lending constitutes the majority of subprime lending; the highest rates of subprime refinance lending in a neighborhood tend to be much higher than the highest rates of home purchase lending.

Conclusion

There is a debate over the extent to which subprime lending is a reinvention of the traditional redlining practices, shifting concerns from access for all to housing to access for all to fair housing. Are the lines of neighborhood division no longer an indication of where not to lend

but where to lend high cost, risky loans without regard for the ability to repay? I employ the same data as many previous researchers and contribute to this discussion through my use of hierarchical linear modeling that allows for a look at the operations of the dual mortgage market on both the individual and neighborhood levels.

In addition, I move beyond the discussion of the causes of the concentration of subprime lending to consider the benefits and consequences of subprime lending in the form of further subprime lending as well as other neighborhood economic outcomes. While more work has been done on the concentration of subprime lending, less has been done to evaluate how this increased investment in many previously underserved communities affects these communities. I employ data from earlier years of subprime lending to assess the benefits and consequences of this relatively new form of lending. .

CHAPTER 3

THE DUAL MORTGAGE MARKET IN PHILADELPHIA

What causes the grouping of subprime mortgages in lower income, predominantly minority neighborhoods? Is it the existence of a dual mortgage delivery system in which subprime lenders serve minority borrowers and communities, those previously excluded from the mortgage market, while prime lenders continue to focus their lending efforts on higher income, white borrowers? Do individual borrower characteristics alone serve to segment borrowers into prime and subprime mortgage markets or do neighborhood characteristics play a role in the segmentation as well?

This chapter investigates the existence of a dual mortgage delivery system as defined by race in Philadelphia in the early 2000s, a system that serves to segment borrowers into prime and subprime mortgages. Further, the analyses in this chapter investigate the ways in which the dual mortgage market is at work in Philadelphia. Is it the profile of the borrowers themselves or the neighborhood in which they live that serves to segment borrowers into the prime and subprime markets? For example, in 2002, was an individual's race more influential in determining their likelihood of originating a subprime loan or was the racial composition of the neighborhood in which they live more important? Finally, is a black borrower equally likely to obtain a subprime loan regardless of the neighborhood in which he lives or is there an interaction between the impact of an individual's race and his neighborhood's racial composition?

I used Hierarchical Linear Modeling (HLM) to tease apart the impact of a borrower's characteristics from the effects of the neighborhood's characteristics on a borrower's likelihood of originating a subprime loan. The use of HLM allowed for a simultaneous look at the relative

contributions of individual and neighborhood factors in determining the likelihood that a loan origination is subprime. Focusing on race, I also use the HLM analysis to look at the ways in which an individual's race interacts with the racial composition of the neighborhood. This allows for an understanding of the extent to which subprime lenders have a higher likelihood of serving minority borrowers beyond targeted lending efforts in minority communities. Do black borrowers have the same likelihood of originating a subprime loan when borrowing in a predominantly black neighborhood as they do when borrowing in a predominantly white neighborhood?

In this chapter, I first look at the growth in subprime lending in Philadelphia between 1992 and 2002.[15] Second, I assess the importance of race and income in the subprime lending market by analyzing the rate of subprime lending by the racial composition and median income of neighborhoods in Philadelphia. Focusing on the aggregate of borrowers in neighborhoods, however, overlooks the variation of individuals that live in neighborhoods. I therefore use HLM to pull apart the effects of individual and neighborhood race on the likelihood of originating a subprime loan. In investigating the existence of the dual mortgage delivery system, I investigate the effects of individual and neighborhood race and look at the ways in which the likelihood of originating a subprime loan differs for black borrowers across the racial composition of the neighborhoods in which they live. I calculate predicted probabilities that demonstrate the validity of my models and further shed light on the bifurcation of the mortgage market by race and ethnicity that exists in Philadelphia.

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[15] Although I employ HMDA data from 1993, 1998 and 2003, because the data represents loan applications and originations made in the previous year, I refer to the year in which the loan applications were actually submitted and the loans originated.

Subprime Lending in Philadelphia

While subprime lending expanded to become a sizable segment of the home purchase

market in the early- to mid-2000s, the bulk of subprime activity has been and remains

concentrated in the refinance market. As such, I focus my research on refinance lending; I

present the analyses for home purchase lending in appendices to this chapter. Additionally,

census tracts with very few overall loans could be misleadingly perceived as having a high share

of subprime loans despite having low mortgage activity overall. I therefore exclude

neighborhoods with fewer than 15 loan applications or originations from the respective analyses.

Finally, while applications, including those that were ultimately rejected, provide some insight

into the marketing or targeting strategies of subprime lenders, it is in the actual origination of

loans where the concerns over the dual mortgage market and the effects of subprime lending,

either good or bad, can be felt. As such, I only include applications that resulted in a loan

origination in my analyses.

Table 3.1 presents the characteristics of Philadelphia's conventional refinance borrowers

in 2002 and the neighborhoods in which they lived.[16] In Philadelphia, subprime lenders

originated 14.1 percent of the conventional refinance loans in 2002.[17] While whites make up

about 48 percent of the heads of households in Philadelphia (according to the 2000 U.S. Census),

fully 58 percent of refinance borrowers were white in 2002. Conversely, the percentage of

refinance borrowers that identified as black and Hispanic were much smaller than each group's

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[16] See Appendix A (Table A.1) for the home purchase loan distributions.
[17] The distributions in Table 3.1 are of the loans included in the HLM analysis. HLM requires the exclusion of any records with missing data. Some of these loans were corporations or non-individual entities for which information such as race and gender do not exist. There were 4,473 refinance loan originations excluded from the analyses (12.3% of the data). The majority of cases were excluded as a result of missing the applicant's income.

Table 3.1: Borrower and Census Tract Characteristics of
Loan Applications and Originations for Philadelphia in 2002

	2002 Refinance Originations
Individual Loan Level	
Subprime	13.9 %
Income $50,000 or over	63.3
White	58.0
Black	13.1
Hispanic	2.9
Other	5.2
Race Not Specified	20.8
Male	58.2
Female	32.3
Sex Not Specified	9.5
With Co-applicant	40.3
Census Tract Level	
Average Percent Black	23.5
Average Percent Hispanic	4.7
Average Percent Housing Units Vacant	7.1
Average Percent Age 16+ Employed	92.5
Average Percent College Educated	24.9
Average Median Income	$39,445.84
Average Median House Value	$97,490.58
Valid N	31,012

share of the Philadelphia population; while blacks comprise about 40 percent of Philadelphia's

heads of households and Hispanics about 6 percent, blacks made up only 13.1 percent of

refinance borrowers in Philadelphia in 2002 and Hispanics only 2.9 percent. Borrowers in the

"Other" race category include American Indian and Alaska natives, Asian and Pacific Islanders

as well as those who identified themselves as "Other" and only account for a small portion (5.2

percent) of refinance originations. The second largest group of refinance borrowers (20.8

percent) did not specify their race on their loan application. Just less than two-thirds of

conventional refinance borrowers, about 63 percent, had incomes above $50,000. Table 3.1 also

shows that the average conventional refinance borrower lived in a tract that was about 23.5

percent black and 4.7 percent Hispanic[18] and had a median income of just $39,446.

If subprime borrowers target minority and lower-income communities that are

predominantly comprised of such borrowers, the neighborhoods will see the largest rates of

subprime lending Similarly, if prime lenders undermarket prime loans to minority and lower-

income borrowers, prime lending will be at its lowest in minority and lower-income

communities. In Table 3.2, I present the distribution of prime and subprime lending by

neighborhood racial composition in Philadelphia. Given that the large majority of tracts in

Philadelphia have fewer than 20 percent Hispanic residents and few are predominantly Hispanic,

I focus on the relationship between black and white and subprime.

There is a strong, positive relationship between the percent of residents in the

neighborhood who are black and the percent of subprime lending in a neighborhood (Table

3.2).[19] As the percent of residents in a neighborhood that are black increases, there is a dramatic

increase in the percent of refinance originations that are subprime (with a corresponding decrease

in the percent that are prime). Conversely, while neighborhoods in which fewer than 20 percent

of residents are white have a high rate of subprime lending, the lowest rate of subprime refinance

originations is found in neighborhoods where more than 80 percent of residents are white.

Although there is no category of neighborhood racial composition where the rate of subprime

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[18] See Appendix A (Table A.2) for the prime and subprime home purchase loan rates by the neighborhood percent black.

[19] In order to facilitate comparisons between the 1990 U.S. Census tracts and the 2000 U.S. Census tracts, I combined a number of census tracts- those that had changed, split or merged between the two censuses were combined.

Table 3.2: Percent Prime and Subprime Refinance Originations by Census Tract Racial Composition in Philadelphia

Percent Black	2002				1997				1992		
	Originations	Prime	Subprime		Originations	Prime	Subprime		Originations	Prime	Subprime
Less than 20%	21,627	90.0%	10.0%		8,254	84.7%	15.3%		10,738	98.3%	1.7%
20 to 39%	2,013	87.7%	12.3%		922	77.2%	22.8%		778	98.7%	1.3%
40 to 59%	2,150	82.6%	17.4%		658	79.2%	20.8%		571	87.0%	13.0%
50 to 79%	1,732	78.2%	21.8%		665	65.0%	35.0%		355	96.3%	3.7%
80% or More	3,490	67.2%	32.8%		4,195	57.7%	42.3%		669	85.9%	14.1%
Total	31,012	86.1%	13.9%		14,694	75.4%	24.6%		13,111	97.2%	2.8%

Percent White	2002				1997				1992		
	Originations	Prime	Subprime		Originations	Prime	Subprime		Originations	Prime	Subprime
Less than 20%	4,761	70.1%	29.9%		4,581	57.5%	42.5%		687	86.0%	14.0%
20 to 39%	2,170	80.7%	19.3%		720	70.6%	29.4%		513	84.8%	15.2%
40 to 59%	3,127	86.0%	14.0%		970	75.3%	24.7%		817	97.7%	2.3%
50 to 79%	4,589	90.3%	9.7%		1,360	81.0%	19.0%		1,394	97.9%	2.1%
80% or More	16,365	90.3%	9.7%		7,063	86.4%	13.6%		9,700	98.5%	1.5%
Total	31,012	86.1%	13.9%		14,694	75.4%	24.6%		13,111	97.2%	2.8%

Subprime Ratio of Predominantly Black to Predominantly White Tracts	3.39	3.11	9.40

lending exceeds 50 percent, there were fully 3.4 times as many subprime loans in predominantly

black neighborhoods, those with 80 percent or more black residents, than in predominantly white

neighborhoods (80 percent or more white residents). I include three years of lending data, 2002,

1997 and 1992, to demonstrate the consistency and strength of this relationship over time.[20]

Since the early days of subprime mortgage lending, Philadelphia's largely black neighborhoods

have seen a higher concentration of subprime lender activity than neighborhoods with fewer

black residents.

Table 3.3 presents the distribution of lending rates for prime and subprime loans by tract

median income for refinance originations.[21] There is a negative relationship between the income

of the tract and the likelihood of a loan having been originated by a subprime lender; tracts with

higher median incomes have lower rates of refinance originations that are by subprime lenders

than tracts with lower median incomes. The rate of subprime lender activity in the lowest income

tracts is 5.7 times higher than the tracts with the highest income in 2002.

At this bivariate level, there is a strong effect of both race and income on the

concentration of subprime lending. However, it does not demonstrate a relationship between race

or income and subprime lending after taking into account additional individual and neighborhood

characteristics that affect mortgage market outcomes. In addition, such an analysis obscures the

effect of individual race or income on the likelihood that the loan he or she originates is a

subprime loan. While this analysis demonstrates that borrowers living in neighborhoods in which

80 percent of the residents are black and in tracts where the median income is less than $30,000

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[20] I used data from the 1990 U.S. Census for the 1992 and 1997 lending analyses and data from the 2000 U.S. Census for the 2002 lending analyses.

[21] See Appendix A (Table A.3) for the prime and subprime home purchase loan rates by the tract median income categories.

have a much higher likelihood of originating a subprime loan, it says nothing of the variation in

the likelihood of subprime lending for the borrowers who live in these neighborhoods; not all

borrowers in minority, low-income high subprime neighborhoods originate subprime loans.

Obviously not all residents living in a predominantly black neighborhood are of the same race.

Do black and white borrowers have a different chance of subprime when borrowing on homes in

the same neighborhood? And do lower- and higher-income borrowers have the same likelihood

of subprime when borrowing on homes in the same neighborhood?

Table 3.3: Refinance Originations Percent Subprime by Census Tract Median Household Income in Philadelphia

	2002 Refinance Originations				1997 Refinance Originations		
Median Income	Originations	Prime	**Subprime**		Originations	Prime	**Subprime**
Less than $30,000	6,647	78.2%	**21.8%**		8,695	68.8%	**31.2%**
$30,000 to $49,999	19,504	87.6%	**12.4%**		5,682	84.2%	**15.8%**
$50,000 to $69,999	3,942	89.7%	**10.3%**		282	95.7%	**4.3%**
$70,000 or More	919	96.2%	**3.8%**		35	97.1%	**2.9%**
Total	31,012	86.1%	**13.9%**		14,694	75.4%	**24.6%**

Ratio of Lowest Income to Highest Income Tracts	**5.74**	**7.26**

	1992 Refinance Originations		
Median Income	Originations	Prime	**Subprime**
Less than $30,000	5,630	97.2%	**2.8%**
$30,000 to $49,999	7,013	97.1%	**2.9%**
$50,000 to $69,999	413	99.0%	**1.0%**
$70,000 or More	55	92.7%	**7.3%**
Total	13,111	97.2%	**2.8%**

Ratio of Lowest Income to Highest Income Tracts	**2.80**

In order to more thoroughly investigate the question of the levels at which race is

working, I looked into the impact of race across neighborhoods. Do all black borrowers and all

white borrowers have the same likelihood of subprime regardless of the characteristics of the neighborhood in which they live? Does a white borrower living in a tract that is 80 percent or more black have the same likelihood of originating a subprime refinance loan as a white borrower living in a tract that is less than 20 percent black? Or does the white borrower in the largely black neighborhood have a likelihood of subprime origination closer to that of their black neighbors? Does a black resident in a neighborhood in which fewer than 20 percent of the residents are black have the same likelihood of originating a subprime loan as their white neighbors or do they have a higher likelihood of subprime than their white neighbors?

The Effects of Individual and Neighborhood Characteristics on the Likelihood of Subprime Refinance Origination: A Multi-level Multivariate Analysis

To answer these questions about the interaction between individual and neighborhood race, as well as to control for the additional economic factors that affect mortgage market outcomes, I conduct a multi-level, multivariate analysis of refinance lending in Philadelphia in 2002. The dependent variable has two categories, subprime and prime with prime serving as the reference category. For these analyses, I employ Hierarchical Generalized Linear Modeling (HGLM) as appropriate with a binary outcome measure. The models are estimated with HLM version 6.03 (Raudenbush *et al.* 2005) using Bernouli's logistic regression (Raudenbush and Bryk 2002). The results, like logistic regression, are interpreted as the likelihood that a loan is subprime as opposed to prime.

Descriptions of the dual mortgage market discuss the disparity in lenders and loan types between different types of borrowers as well as different neighborhoods. As such, I analyze the workings of the dual mortgage market at both the individual and the neighborhood level-

assessing both individual and neighborhood effects on the likelihood that a borrower originates a loan from a subprime lender. The use of HLM allows for the inclusion of both borrower and census tract characteristics in the same model without violating the basic assumptions of multivariate regression. While the concentration of subprime lending may be a result of the self-selection of higher-risk borrowers into the same neighborhoods or it could be a result of strategic targeting of such neighborhoods on the part of subprime lenders working in neighborhoods that have been underserved by prime borrowers, HLM is a valuable tool in the study of the mortgage market as it allows for a simultaneous investigation of individual and neighborhood characteristics that have both proven to be of import when analyzing mortgage market outcomes. It will provide some insight into the extent to which it is the individual characteristics that explain the variation in the concentration of subprime lending across neighborhoods as opposed to the neighborhood characteristics that contribute to the variation.

In addition, HLM allows for a unique insight into the dual mortgage delivery system because HLM allows for cross-level interactions. Such an interaction allows for a more comprehensive analysis of the ways that the dual mortgage delivery system is at work. It allows me to answer the questions about differences between black borrowers in largely white neighborhoods and black borrowers in largely black neighborhoods in their likelihood of finding themselves in the subprime segment of the mortgage market. As such, my analysis includes an interaction between individual race and neighborhood racial composition. This allows for a look at the disparity in the likelihood of obtaining a subprime loan between borrowers of different races in the same neighborhood and the way in which that disparity changes as the racial composition of the neighborhood changes. I analyze the extent to which the effect of being a black borrower as opposed to a white borrower varies by the percent of residents in the

neighborhood that are black. In other words, I analyze the extent to which the effect of being

black on the likelihood of obtaining a subprime loan differs by the racial composition of the

neighborhood- are blacks in black neighborhoods more likely to obtain a subprime mortgage

than blacks in predominantly white neighborhoods?

Although I am able to control for a borrower's race and income, I am unable to control

for other variables that lenders consider when evaluating the creditworthiness of a borrower.

Such omitted variables include credit rating and information on borrower's assets. While blacks

are more likely to have poor or limited credit histories than white borrowers, blacks tend to have

fewer assets than whites- term the racial asset gap (Conley 1999). The omission of these two

variables will most likely result in an overestimate of the effect of individual race. The inclusion

of these variables would help to understand why black borrowers are more likely to find

themselves in the subprime market. However, even without including these variables, a finding

that black borrowers are more likely that white borrowers to originate subprime loans is cause

enough for concern given the problems we know are associated with subprime loans, in

particular the high foreclosure rate among subprime loans. I discuss this point further as I present

the findings of the analyses.

The first step in conducting a multilevel analysis is to establish the need for such an

analysis by running unconditional models to obtain a measure of the between-tract variation. If

there is no variation across neighborhoods, census tract level predictors will have no effect on the

variation in subprime lending and there is no point to employing HLM. Unconditional models

include only the dependent variable with no predictors. I present the tract level (Level 2)

variance components for the unconditional analysis of refinance originations in Table 3.4a. There

is a statistically significant between-tract variation. This is an indication that there are differences

between census tracts in the likelihood that a borrower would obtain a subprime as opposed to a prime loan beyond what would exist from noise or chance. In other words, as theoretically expected, the neighborhood surrounding the home matters.

The analysis includes four models. Model 1 is an ANCOVA analysis; it includes only borrower-level predictors. Model 2 removes the level-1 predictors and includes only level-2 predictors, i.e., the tract-level variables. Model 3 is an 'intercept-as-outcome' model, as set forth by Raudenbush and Bryk (2002), in which the intercept is estimated by the tract-level variables; as such, while the slopes of the Level 1 predictors are the same across neighborhoods, each neighborhood has its own intercept. Model 4 is an "intercept- and slope-as-outcome" model in which the same estimate of the intercept is performed and the tract percent black is used to predict the within- tract effect or slope for black residents.

Each model produces its own random effects or level-2 variance component. As I discuss each analysis, I will assess this tract level variance component. After predictors are entered, it serves as an indication of the remaining unexplained between-tract variation. The extent to which it decreases from this base level variation is an indication of the extent to which the specified models explained the between-tract variation in loan type. If the variance component remains statistically significant after entering predictors, unexplained variation between tracts remains.

Table 3.4 presents the multivariate models for refinance originations in Philadelphia.[22] Model 1 presents the results of the analysis when only the individual level predictors are entered

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[22] See Appendix A (Table A.4) for the comparable HLM analyses of home purchase lending.

into the model.[23] The effect of individual income was minimal; as an applicant's income increases the likelihood that a loan origination is subprime decreases only minimally. Black borrowers, as expected, are more likely than white borrowers to find themselves in the subprime segment of the refinance market. All else equal, the odds of a refinance origination from a subprime lender as opposed to a prime loan are nearly twice as high (1.990 times as high) for blacks as whites. In fact, each race group has a statistically significant, higher likelihood of originating a subprime refinance loan as opposed to a prime loan than whites. Those whose race was not provided on the loan application had the highest odds that an origination was subprime as opposed to prime (2.668 times as high) relative to whites, all else equal.[24] While it is impossible to know the race of the applicants who fall into this category, an expansion of reporting in this "race not specified" category has occurred in largely black neighborhoods.[25] In 2002, fully 95 percent of refinance applications that did not specify the applicant's race were submitted in predominantly black neighborhoods. It therefore seems likely that many of those

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[23] I first ran this and all models including the applicant's gender. However, males and females never statistically significantly differed in their likelihood of obtaining a subprime loan. I present the results of the models excluding gender to simplify the presentation and to avoid a model specification error by including extraneous variables. Indeed, after excluding gender from the analysis, the remaining coefficients changed little as did the unexplained variance at Level 2.

[24] As detailed by Wyly and Holloway (2002), applicants are asked to indicate their race or ethnicity. If the applicant indicates that they would prefer not to complete the information, lenders taking the application in person or through an electronic medium with a video component are required to fill-in the information to the best of their ability by visual assessment of the applicant's race or by surname. Such information is not filled in by applications taken entirely over the telephone (unless specified by the applicant) or by non-person entities such as corporations.

[25] In 1992, 74 percent of applications submitted without specifying the race of the applicant were submitted in neighborhoods with 80 percent or more black residents. By 1997, 84 percent of such applications were in predominantly black neighborhoods.

Table 3.4: Predicting Likelihood of Subprime Refinance Originations in 2002 with Borrower and Neighborhood Characteristics
(Dependent Variable is Binary Subprime Originations, 1 = Subprime; Standard Errors are in Parentheses)

Model for Tract Subprime	Model 1 ANCOVA Coefficient		Odds Ratio	Model 2 Level 2 Only Coefficient		Odds Ratio	Model 3 Intercept-as-Outcome Coefficient		Odds Ratio	Model 4 Slope-as-Outcome Coefficient		Odds Ratio
Tract Level (Intercept)												
Intercept	-160.960	***	0.200	-1.996	***	0.136	-1.9261	***	0.146	-1.9185	***	0.147
	(005.77)			(0.096)			(0.092)			(0.091)		
Proportion Black				1.350	***	3.856	0.9582	***	2.607	1.1448	***	3.142
				(0.067)			(0.082)			(0.087)		
Proportion College or More				-1.902	***	0.149	-1.308467	***	0.270	-1.323015	***	0.266
				(0.166)			(0.173)			(0.170)		
Tract Risk				2.325	**	10.229	2.064457	**	7.881	1.554131	**	4.7310
				(0.797)			(0.657)			(0.630)		
Borrower Level												
Applicant's Income (In Thousands)	-0.006	***	0.994				-0.0057	***	0.994	-0.0057	***	0.994
	(0.001)						(0.001)			(0.001)		
Black	0.688	***	1.990				0.5205	***	1.683			
	(0.067)						(0.076)					
Hispanic	0.324	**	1.382				0.2883	**	1.334	0.2969	**	1.346
	(0.100)						(0.111)			(0.109)		
Other	0.328	***	1.388				0.2737	**	1.315	0.2496	**	1.283
	(0.084)						(0.097)			(0.095)		
Race Not Provided	0.981	***	2.668				0.9454	***	2.574	0.9105	***	2.485
	(0.039)						(0.046)			(0.045)		
Co-applicant	-0.156	***	0.855				-0.1439	**	0.866	-0.1373	**	0.872
	(0.039)						(0.045)			(0.044)		
Model for Black Borrower Slope												
Black										0.9873	***	2.6839
										(0.110)		
Tract Proportion Black										-0.7476	***	0.4735
										(0.159)		

***p<0.001, **p<0.01, *p<0.05

not specifying their race are minority borrowers, and in Philadelphia at least, many are likely

black borrowers.

The level-2 variance component, provided in Table 3.4a,t provides insight into the extent

to which the variation across neighborhoods is a result of the grouping of similar types of

individuals as opposed to a result of neighborhood characteristics. As it measures the variation

across neighborhoods, a reduction in the level-2 variance component after having only entered

individual characteristics is an indication that the similarity of the individuals in the

neighborhood was accounting for the variation across neighborhoods and not some function of

the neighborhood characteristics.

Although the level-2 variance component decreased in size from the unconditional

model, it remains relatively large and statistically significant. This demonstrates that it is not the

self-selecting of individuals with similar characteristics that explains the large variation in

subprime lending rates. There are important contributing factors at the neighborhood level.

**Table 3.4a. Level 2 Variance Components for the
Unconditional Model and the HLM Models in Table 3.4**

Random Effects	Variance Component		Df
Unconditional Model			
Subprime	0.5908	***	df = 254
Model 1 ANCOVA			
Subprime	0.2499	***	df = 251
Model 2 Level 2 Only			
Subprime	0.0500	***	df = 248
Model 3 Intercept-as-Outcome			
Subprime	0.0342	***	df = 248
Model 4 Intercept- and Slope-as-Outcome			
Subprime	0.0591	***	df = 229
Black Slope	0.1224	**	df = 231

***p<0.001, **p<0.01, *p<0.05

Model 2 includes only the neighborhood level predictors. The odds ratios show that the stability of the housing market in the neighborhood has the largest effect on the likelihood of subprime followed by the percent of black residents when controlling for these neighborhood level predictors. The large reduction in the level-2 variance component- from 0.5908 with the unconditional model to 0.05 with only the level-2 predictors included in the model- highlights the importance of such neighborhood predictors in explaining the variation of subprime refinance activity across neighborhoods. This suggests that the neighborhood characteristics explain a much larger portion of the variation in the likelihood of subprime across neighborhoods than the individual borrower characteristics. In other words, it is more than simply the grouping of individuals that is responsible for the variation in rates of subprime lending across neighborhoods. Characteristics of the neighborhoods themselves play a major role in the variation in rates of subprime lending across neighborhoods.

In Model 3, the intercept-as-outcome model, I include both the individual level and census tract level predictors to look at the effect of the neighborhood racial composition. In comparing Model 1 to Model 3, there is little change in the individual variables either in magnitude of the effect or level of statistical significance. This is an indication that the effects of the individual characteristics are not even partially mediated by the neighborhoods in which refinance borrowers live. In other words, regardless of neighborhood, individual borrower characteristics directly affect the likelihood that the loan they originate is subprime as opposed to prime.

At the neighborhood level, both race and tract risk matter but income does not.[26] Despite the observed relationship at the bivariate level in Table 3.3, median household income was not a statistically significant predictor of subprime lending after controlling for the other variables in the model. Since the remaining coefficients changed little when I removed median income from the model, I exclude it to present the most parsimonious model. As was the case with previous research, the neighborhood risk measure has the largest effect on the likelihood that a refinance origination is subprime. Given that higher values on this measure signify a more unstable housing market and higher risk of investing in the neighborhood I expected, and indeed find, a positive relationship between risk and likelihood of subprime. Despite the significant and sizable impact of neighborhood risk, tract percent black does have a statistically significant effect on the likelihood of subprime. As expected, as the percentage of a tract's residents that are black increases, the odds that a refinance loan is subprime as opposed to prime are higher.[27]

Consistent with previous research, education is a significant predictor of the likelihood of subprime. The percent of residents in a tract with a college degree negatively affects the likelihood that a borrower originates a subprime loan. Borrowers who live in tracts in which a higher percentage of their neighbors have college degrees are themselves less likely to originate a subprime loan. Finally, the level-2 variance component for this model has been reduced to

[26] I built this and subsequent analyses to exclude the tract level variables that did not have a statistically significant effect on the likelihood of subprime. I first ran the analyses including median house value, median income, percent of the residents that identified as Hispanic, the employment rate, the vacancy rate of homes, and the rate of subprime lending in the tract in 1992. Due to a high correlation between median house value and median household income, I ran two separate analyses, one that included income and one that included house value. Although not presented in the table, median house value did have a statistically significant effect on the likelihood of subprime although the effect was minimal; as median home value increases, the odds of subprime are only slightly lower than the odds of prime. Given that the coefficients of the variables that remained in the model changed little when I removed these additional non-significant contextual variables, I excluded them from the analyses.

0.0342, a small reduction from the variance component in Model 2. It remains statistically

significant indicating remaining unexplained variation across neighborhoods beyond what would

be expected by chance.

In Model 4, I allow the slope for the variable for black borrowers to vary and predict its

slope with the proportion of residents in the tract that are black. This will indicate whether the

effect of being a black borrower on the likelihood of obtaining a subprime loan differs by the

racial composition of the tract and by how much. It will answer the question- Is a black

borrowers equally likely to originate a subprime refinance loan in a predominantly black

neighborhood as they are in a predominantly white neighborhood, all else equal?

The bottom portion of Model 4 in Table 3.4 shows that the effect of being a black

borrower on the likelihood that a refinance loan is subprime does differ across census tracts. The

likelihood of black borrowers obtaining a subprime loan is always higher than white borrowers,

but the size of this increased likelihood varies across neighborhoods. Because theories of the

dual mortgage delivery system point to the importance of both individual and neighborhood race

in the types of lenders and loan products they are serviced by, I looked to the proportion of black

residents in the tract securing the loan in an attempt to explain the variation in the black-white

disparity by census tract. To what extent does the effect of individual race vary by the racial

composition of the tract? I used the proportion of residents in the tract that are black as a

predictor of the slope of the individual black dummy variable in order to answer this question.

The equation for this model is as follows:

Black Effect = 0.9873 – 0.7476(Tract Percent Black)

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[27] The percent of black residents and the percent of residents with a college degree were included in the model as
proportions. As such, with each 1 percent increase in the percent of residents that are black, a refinance loan in

The slope of the effect of being a black borrower is equal to 0.9873 minus the product of 0.7476 and the proportion of residents in the tract that are black. This means that although blacks are always more likely than whites to obtain subprime loans regardless of the racial composition of their neighborhoods, the impact of being black decreases as the percentage of neighborhood residents that are black increases. Therefore, the increased likelihood of blacks as compared to whites of obtaining a subprime refinance loan is greatest in predominantly white neighborhoods. In other words, blacks and whites have much more different likelihoods of subprime in largely white neighborhoods and have more similar likelihoods of subprime in largely black neighborhoods.

Examples help to interpret these coefficients. In a tract where 95 percent of the residents are black, the log odds of subprime for a black borrower would be equal to 0.9873 – 0.7476(0.95) = 0.277 higher than for a white person borrowing in the predominantly black tract. I convert the log odds to odds ratios to interpret these effects; in this case the odds ratio of subprime to prime equals 1.319. This means that in tracts where blacks make up 95 percent of the residents, the odds that a black borrower is in the subprime segment are 1.319 times the odds of subprime for a white borrower in the same predominantly black census tract.

Now consider a tract in which only 5 percent of the residents are black; the odds that a black borrower obtains a subprime as opposed to a prime loan are 2.585 times as high for blacks as the odds for whites. As such, even holding applicant's income, among the other variables in the model, constant, blacks living in largely white tracts in Philadelphia are 2.5 times more likely than their white neighbors to find themselves in the subprime segment of the market when refinancing their homes. In considering a racially mixed neighborhood where 50 percent of

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Philadelphia is 1.009 times as likely to be subprime as prime, all else equal.

residents are black, the log odds for a black borrower would equal 0.973 – 0.7476(0.5) = 0.5992 or an odds ratio of 1.847.

These findings suggest that it is not the grouping of similar individuals in a neighborhood that explains the concentration of subprime lending. Not only are subprime lenders targeting black neighborhoods, as has been suspected given the high concentration of subprime lending in minority communities, but that even black borrowers living in predominantly white neighborhoods find themselves more likely to obtain their loan from the subprime segment of the mortgage market. Somehow even black borrowers who are living outside of predominantly minority communities with their history of neglect on behalf of mortgage lenders are much more likely to obtain a high cost subprime mortgage. Black borrowers in white neighborhoods are much more likely to refinance with a subprime loan their white neighbors. Although still large, the relative likelihoods between black and white borrowers in a neighborhood that is more racially mixed is noticeably smaller than between blacks and whites in a neighborhood in which very few of the residents are black. This may be a reflection of the higher likelihood that black borrowers have troubled credit histories.

Table 3.5 presents predicted probabilities that I calculated using Model 4 from Table 3.4 for black and white borrowers of higher and lower incomes and higher and lower percentages of neighborhood residents that are black. The predicted probabilities are for borrowers with co-applicants and the neighborhood education and tract risk measure are the average for all of Philadelphia and remain constant in each model. The probabilities demonstrate the increased likelihood of black borrowers originating a subprime loan- even for borrowers with higher incomes living in neighborhoods with few black residents. Such a black borrower has a 15.7

percent chance of originating a subprime loan compared to a 6.7 percent chance for a white

borrower with the same income living in the same neighborhood. The importance of the

**Table 3.5: Example Predicted Probabilities for Black and White Borrowers
with a Co-applicant**

Borrower Income	Percent of Neighborhood Residents Black	Predicted Probabilities- Borrowers with Co-applicants	
		Black Borrower	White Borrower
$100,000 annually	5 percent	13.9%	5.9%
$25,000 annually	5 percent	19.8%	8.7%
$100,000 annually	75 percent	17.6%	12.2%
$25,000 annually	75 percent	24.6%	17.6%

neighborhood racial composition is evident when looking at the probabilities of white borrowers

receiving subprime loans; a white borrower living in a neighborhood with a large black

population has a higher probability of originating a subprime loan than white borrowers living in

neighborhoods with a small black population regardless of income. Finally, the interaction

between a black borrower's race and the racial composition of their neighborhood is also clear in

these predicted probabilities. Black borrowers in neighborhoods with few black residents have a

much higher probability of obtaining a subprime loan than their white neighbors with the same

incomes. Additionally, higher income black borrowers living in a neighborhood with a large

black population have a nearly equal probability of originating a subprime loan as the low

income black borrowers in a neighborhood with few black residents.

The analyses confirm Hypothesis 1 and Hypothesis 2. I found that blacks were more

likely than whites, holding other individual and neighborhood factors constant, to originate a

loan with the subprime segment of the mortgage market. In addition, although individual income only had a small negative effect and neighborhood income no effect at all, the tract risk measure affected the likelihood of subprime lending in the expected direction. Borrowers living in neighborhoods with more uncertain future house prices had a higher likelihood of subprime lending. And race maintained its impact on subprime lending even after controlling for this risk measure.

The analysis shows that the neighborhood in which a refinance loan is originated plays an important part in determining whether or not the loan is originated from the subprime or prime segment of the mortgage market. It is not sufficient to dismiss the concentration of subprime lending as the grouping of high-risk borrowers most in need of high cost loans. The explanation for the concentration of subprime lending by neighborhood is more complex. I found support for the dual mortgage delivery system pointed to by Apgar and Calder (2005), Immergluck and Wiles (1999) and Stuart (2003), among others, and demonstrated that it functions at both the individual as well as the neighborhood level- with different lenders serving different neighborhoods, but also with different lenders serving different borrowers. Black borrowers were more likely than white borrowers to be served by subprime lenders as opposed to prime lenders and borrowers in black neighborhoods were more likely than borrowers in neighborhoods with few black residents to be served by a subprime lender as well. In addition, blacks refinancing their homes in largely white neighborhoods were even more likely to refinance with a subprime loan as compared to their white neighbors than blacks living in largely black neighborhoods. This demonstrates that it is not only that subprime lenders are filling in the gap by lending in neighborhoods that prime lenders are not willing to lend or in which prime lenders undermarket

their services, but that even in white neighborhoods blacks are more likely to be served by

different lenders, in this case higher cost lenders, than their white neighbors.

Subprime Lending in Philadelphia's Neighborhoods

The small reduction in the Level-2 variance from the unconditional model to Model 1 in

Table 3.4 leads me to conclude that the concentration of subprime lending within neighborhoods

has less to do with the grouping of individuals with similar profiles and more to do with the

characteristics of the neighborhoods themselves. My inability to control for individual credit

rating as well as asset levels and additional factors used by lenders to assess the risk of a loan,

however, results in the need to interpret my results with caution. Although I am unable to assess

the extent of the impact of the omitted variables, it is clear that there remains unexplained

variation between tracts, given the statistically significant Level-2 variance components from the

Model 4 analysis. In addition, given the relationship between race and credit rating and wealth, I

expect that the exclusion of these important variables likely leads to an inflation of the impact of

being a black borrower as opposed to a white borrower. In other words, more of the increased

likelihood of subprime is being attributed to the borrower's race than would be the case if I could

control for their credit rating and asset worth. To assess the ability of the model to accurately

predict levels of subprime lending, I calculate predicted probabilities, apply them to the racial

composition of refinance borrowers in the neighborhood and compare that to the actual levels of

subprime lending in Philadelphia's neighborhoods.

First, I calculated predicted probabilities for each of the different race categories using

Model 4, the model that includes the cross-level interaction. I calculated these predicted

probabilities for a number of Philadelphia's neighborhoods.[28] To do so, I used a mixture of

HMDA and census data. I calculated the predicted probabilities for borrowers with a co-

applicant for all race groups. Given that the presence of a co-applicant suppresses the likelihood

of obtaining a subprime loan and that only about a quarter of borrowers had a co-applicant (See

Table 3.1), I expect my predicted estimates of subprime lending to be slight underestimates. For

applicant's income, I entered the average of the incomes reported in HMDA for the applicants

that secured a loan in a given neighborhood into the equation. I used census data, combining the

tracts that comprise a given neighborhood, and entered those values into the equation for the

neighborhood level variables.

Once I calculated the predicted probabilities for each race group by neighborhood, I

multiplied the predicted probability for the race group by the share of the neighborhood's

refinance borrowers in the race group using the HMDA data. I then summed the five estimates of

the percent of subprime refinance borrowers distributed across each race group- white, black,

Hispanic, other and race not provided- to get a neighborhood share of subprime. Comparing this

share to the actual share of conventional lending that is subprime for each neighborhood will

give me a sense of the validity of my models and will further demonstrate the importance of race

on the likelihood of ending up in the subprime segment of the mortgage market.

Table 3.6 presents the actual shares of subprime lending as well as the predicted

probabilities for each of the neighborhoods that I subdivided as well as the predicted probability

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[28] The Philadelphia City Planning Commission has set forth a breakdown of Philadelphia into 12 sections called
Planning Analysis Zones. Because lending patterns are more localized than the size of the zones, I have broken most
of the zones down into smaller sections in alignment with many Philadelphia neighborhoods. The neighborhoods are
a composite of census tracts. To delineate the neighborhoods, I employed neighborhood divisions also set forth by
the Philadelphia Planning Commission, using the commission's neighborhood maps to match them to census tracts.
Although there were three smaller zones that I did not break down, within most zones, I limited the total number of

for each race group by neighborhood using the equation from Model 4.[29] The equation is listed at

the top of the table.[30] By and large, the model underestimates the percent of conventional

refinance originations that are subprime in the neighborhoods, as expected. Of the 32

Philadelphia neighborhoods, the percent subprime was underestimated in 25 and overestimated

in 7 neighborhoods, although the size of the discrepancy between the predicted probability and

the share of conventional refinance lending that was subprime was typically modest. The largest

underestimate was 7.9 percent in the Mantua/Mill Creek section of West Philadelphia while the

largest overestimate was 8.6 percent in the central section of lower north Philadelphia. This

suggests that Mantua/Mill Creek saw a higher than expected rate of subprime lending while the

lower North Philadelphia section of the city experienced a lower than expected rate of subprime

loan originations in 2002.

   To estimate the degree to which the model varied in its predicted share from the actual

share, I calculated the average deviation of the predicted share from the actual share across all

neighborhoods. To do so, I took the square root of the mean squared difference between the

actual and the predicted share across neighborhoods, the standard deviation of the predicted from

neighborhoods by combining more than one. As such, they are not perfect representations of Philadelphia's
neighborhoods, but serve to provide a look at the more localized variation in subprime lending within Philadelphia.
[29] Appendix B presents the shares of refinance lending that are subprime for each neighborhood for all three years-
1992, 1997 and 2002.
[30] Appendix A.5 presents the rates of subprime home purchase lending for each neighborhood for 1997 and 2002; it
does not include 1992 because the number of subprime originations was so small. Appendix A.6 presents the
predicted probabilities using the HLM home purchase analyses for the neighborhoods.

Table 3.6. Predicted Probabilities for Refinance Originations Calculated from HLM Logistic Regression Analysis

Subprime = [-1.919 + 1.145(Proportion Black) - 1.323(Proportion College) + 1.554(Tract Risk)] - 0.006(Average Income) + [0.987 - 0.748*Percent Black](Black) + 0.297(Hispanic) + 0.25(Other) + 0.911(Race Not Provided) - 0.138(Co-applicant)

Neighborhood	Actual 2002 Subprime	Predicted Subprime	Predicted Probabilities- Borrowers with Co-applicants					Difference (Actual – Predicted)
			Black	White	Hispanic	Other Race	Race Not Specified	
Center City	3.4%	3.4%	6.3%	2.6%	3.5%	3.3%	6.2%	0.0%
South Philadelphia								
Bella Vista/ Queen's Village	8.8%	10.9%	14.2%	8.1%	10.6%	10.1%	17.9%	-2.1%
Grays Ferry / Point Breeze	27.5%	24.2%	25.2%	17.8%	22.6%	21.8%	35.0%	3.3%
Remaining South Philadelphia	14.5%	12.1%	19.9%	9.5%	12.3%	11.8%	20.6%	2.4%
South West Philadelphia								
Kingsessing/Upper South West	35.6%	32.6%	28.4%	23.1%	28.8%	27.8%	42.7%	3.0%
Middle South West/Blue Bell	26.6%	25.7%	25.6%	17.0%	21.7%	20.9%	33.8%	0.9%
Elmwood / Hedgerow / Meadows	21.6%	20.1%	20.8%	12.8%	16.5%	15.9%	26.8%	1.5%
West Philadelphia								
Overbrook / Haddington	28.4%	25.8%	24.3%	18.2%	23.0%	22.2%	35.5%	2.6%
University City	9.3%	7.1%	7.4%	69.1%	1.9%	6.8%	14.8%	2.2%
Wynnefield	21.7%	17.3%	17.5%	11.4%	14.7%	14.2%	24.2%	4.4%
Cobbs Creek	26.9%	24.9%	23.5%	17.9%	22.7%	21.9%	35.1%	2.0%
Mantua/Mill Creek	33.9%	26.0%	22.0%	17.5%	22.2%	21.4%	34.5%	7.9%
Roxborough/ Manayunk	9.5%	7.8%	14.0%	6.0%	7.9%	7.6%	13.7%	1.7%
Germantown/ Chestnut Hill								
East Germantown	30.0%	28.9%	25.6%	20.2%	25.4%	24.5%	38.6%	1.1%
Chestnut Hill	4.9%	3.3%	5.8%	2.5%	3.3%	3.2%	6.0%	1.6%
Mt. Airy	15.9%	11.6%	12.7%	8.1%	10.6%	10.1%	17.9%	4.3%
East Falls / West Central Germantown	13.7%	13.2%	15.4%	9.6%	12.6%	12.1%	21.0%	0.5%

Table 3.6 Continued. Predicted Probabilities for Refinance Originations Calculated from HLM Logistic Regression Analysis

Neighborhood	Actual 2002 Subprime	Predicted Subprime	Black	White	Hispanic	Other Race	Race Not Specified	Difference (Actual – Predicted)
		Predicted Probabilities- Borrowers with Co-applicants						
Olney/Oak Lane								
Olney / East Oak Lane	21.1%	20.0%	21.4%	12.7%	16.4%	15.7%	26.6%	1.1%
Ivy Hill / Cedarbrook / West Oak Lane	33.1%	29.6%	26.2%	21.2%	26.5%	25.6%	40.0%	3.5%
Logan / Fern Rock / Juniata Park	35.0%	28.4%	26.4%	18.6%	23.5%	22.6%	36.2%	6.6%
Upper North Philadelphia								
Upper North West of Broad	36.3%	35.7%	31.5%	25.7%	31.8%	30.8%	46.2%	0.6%
Upper North East of Broad	24.1%	23.3%	27.3%	15.3%	19.5%	18.8%	30.9%	0.8%
Lower North Philadelphia								
Northern Liberties	12.9%	10.3%	14.9%	7.2%	9.5%	9.1%	16.2%	2.6%
Lower North All Else	16.7%	25.3%	26.3%	19.2%	24.3%	23.4%	37.2%	-8.6%
Fairmount	5.8%	7.1%	11.4%	5.5%	7.2%	6.9%	12.5%	-1.3%
Bridesburg/ Kensington/ Richmond	17.8%	13.6%	22.4%	10.3%	13.4%	12.9%	22.2%	4.2%
Near North East								
Fox Chase	8.2%	8.5%	15.8%	6.6%	8.7%	8.4%	15.0%	-0.3%
North of Roosevelt Blvd (Minus Fox Chase)	12.1%	11.6%	18.7%	8.5%	11.1%	10.6%	18.7%	0.5%
South of Roosevelt Blvd	11.9%	11.9%	19.7%	9.1%	11.9%	11.4%	19.9%	0.0%
Far North East								
North of Roosevelt Blvd	7.3%	7.9%	15.0%	6.3%	8.3%	7.9%	14.3%	-0.6%
South of Roosevelt Blvd (Minus Parkwood)	10.6%	10.5%	18.0%	8.3%	10.8%	10.4%	18.3%	0.1%
Parkwood	13.3%	10.4%	18.9%	8.2%	10.8%	10.3%	18.2%	2.9%

the actual. For Model 3, the root mean squared difference was 3.2 percent.[31] This serves as an indication that the model, although omitting key variables, predicts the percent of conventional refinance lending that is subprime relatively well.

The predicted probabilities not only demonstrate that the models come close to estimating the level of subprime lending in the neighborhoods, but also further elucidate the importance of race at both the individual and neighborhood level and the way in which they interact. Looking at the predicted probabilities, the varying likelihood of originating a subprime loan depending on the neighborhood in which black borrowers live becomes clear. Neighborhoods in Philadelphia with a high percentage of black residents see a high concentration of subprime lending, but white borrowers in these neighborhoods face a similar, although slightly smaller, likelihood of subprime to blacks. On the other hand, neighborhoods in Philadelphia with a small black population see less subprime lending overall, but black borrowers face a much higher likelihood of subprime than their white neighbors.

The neighborhoods with the lowest rates of subprime lending also have smaller black populations. As shown in Table 3.6, the Center City neighborhood had one of the lowest rates of refinance originations by subprime lenders in Philadelphia. In 2002, the rate of subprime lending in Center City was 3.4 percent- 9 percent lower than the city overall. According to the 2000 U.S. Census, Center City Philadelphia was 8.4 percent black in 2000. The model estimates that while only 2.6 percent of white refinance borrowers originate subprime loans in Center City, 6.3 percent of black refinance borrowers originate subprime loans, nearly 2.5 times the rate of white

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[31] In comparing this measure of the model's error across all models, I see that Model 3 does serve as a better predictor of the likelihood of subprime than the other models. The root mean squared difference was 12.2 percent for Model 1 and 8.6 percent for Model 2. Allowing the effect of being a black borrower to vary and predicting it with the neighborhood percent black decreases the model's error from 8.6 percent to 3.2 percent.

borrowers. Chestnut Hill also has one of the lowest rates of subprime lender refinance activity at 4.9 percent; the model predicted 3.3 percent. In Chestnut Hill, while 14.6 percent of residents are black, according to the 2000 U.S. Census, only 4.7 percent of refinance borrowers in 2002 were black. As with Center City, the model estimates that black refinance borrowers in Chestnut Hill were much more likely than their white neighbors to find themselves in the subprime segment of the market- about 2.3 times as likely as whites according to the predicted probabilities. Similarly, in Fox Chase, a neighborhood in Near North East Philly in which 2.4 percent of residents are black, the likelihood of subprime for black borrowers was 2.4 times as high as for white borrowers in the neighborhood.

In the more racially mixed neighborhoods, the disparity between black and white borrowers narrows. In Bella Vista/Queen's Village in the South Philadelphia section of the city, for example, while 47 percent of residents are black, only 8.8 percent of refinance originations were part of the subprime segment of the market, a comparable share to the predominantly white Fox Chase. The reinvestment in and growth of Center City is spilling over into a number of proximate neighborhoods including Bella Vista. In Bella Vista/Queen's Village, the disparity between black and white refinance borrowers in their likelihood of obtaining a subprime origination is smaller than in Fox Chase, only 1.8 times as high for blacks as whites. As such, in the more racially mixed neighborhood of Bella Vista/Queen's Village the likelihood of obtaining a subprime refinance loan for black residents is smaller than the likelihood of obtaining a subprime refinance loan for black borrowers in Fox Chase.

Cobbs Creek and Wynnefield in West Philadelphia are both predominantly black neighborhoods- 87 percent of residents in Cobbs Creek are black while 65 percent of residents in Wynnefield are black. Wynnefield is considerably more middle-class than Cobbs Creek. Cobbs

Creek has lower median incomes (between $22,077 and $29,041 from 2000 U.S. Census) than the middle-class Wynnefield (between $28,507 to $53,047). In 2002 Cobbs Creek had a higher rate of refinance originations by subprime lenders than did Wynnefield, although both had rates higher than the city overall. In Cobbs Creek, the lower-income neighborhood with 87 percent black residents, the model estimates that 23.5 percent of black borrowers obtained subprime loans while 17.9 percent of white borrowers obtained subprime loans. The model estimates that a smaller share of black borrowers obtained subprime loans in the more middle-class Wynnefield neighborhood with its smaller share of black residents than Cobbs Creek. In Wynnefield, while an estimated 17.5 percent of black residents originated subprime refinance loans, only 11 percent of white borrowers originate subprime refinance loans.

Two other predominantly black neighborhoods, Kingsessing /Upper South West and East Germantown, had two of the highest rates of subprime refinance lending activity in 2002 at 35.6 percent and 30 percent, respectively. In Kingsessing/Upper South West, 95 percent of residents are black according to the 2000 U.S. Census and the median income is less than $35,000. According to the model, 28.4 percent of black borrowers in this neighborhood originate a loan in the subprime segment of the mortgage market while 23.1 percent of white borrowers originate a loan in the subprime segment. Similarly in East Germantown, white refinance borrowers in the neighborhood have a 20 percent chance that their refinance origination will be in the subprime segment of the market, black borrowers have a 25 percent chance of subprime. In East Germantown, located in the northwestern section of the city, 91 percent of residents are black while 50 percent of refinance borrowers are black. Black borrowers in these two neighborhoods have a high likelihood of finding themselves in the subprime segment of the market, but, by

comparison to neighborhoods with fewer black residents, the disparity between black and white

borrowers is small.

Finally, to the extent that borrowers in the race not specified category are minority

borrowers, the findings in this category shed further light on the likelihood of minority borrowers

to originate refinance loans in the subprime segment. While the equation shows that those whose

race was not provided on the application are the most likely to obtain a subprime loan relative to

whites, the predicted probabilities show that depending on the percentage of the residents in the

neighborhood that are black, this may not always be the case. As a result of allowing the effect of

being a black borrower to vary by neighborhood, the predicted probabilities for blacks in some

cases are as high as or higher than those whose race was not provided. In Overbrook /

Haddington, a neighborhood in which 82 percent of residents are black, for example, the

disparity in the likelihood of subprime is small between blacks and whites, 12.3 percent for

blacks and 10.3 percent for whites, while the disparity between black and race not provided is

large- the probability of subprime for those whose race is not provided is 21.3 percent. In Fox

Chase, on the other hand, the disparity between black and white borrowers is large while the

disparity between black and race not provided is smaller. The likelihood for black borrowers in

Fox Chase to find themselves in the subprime segment is 15.8 percent and for whites it is less

than half that, about 6.6 percent. Those whose race was not provided on the loan application had

a subprime likelihood of 15 percent in 2002. As discussed above, Fox Chase is a neighborhood

with a small black presence. To the extent that borrowers whose race was not provided are

minority borrowers, the comparable likelihood between blacks and those whose race is not

provided is further evidence of the vast differences between white borrowers and minorities in

predominantly white neighborhoods in their likelihood to be served by subprime as opposed to prime lenders.

Home Purchase Lending

Appendix A presents the corresponding tables for the analyses of Home Purchase loans in Philadelphia in 2002. By and large the findings for home purchase lending confirm the findings observed with refinance lending; the tables are therefore only presented in Appendix A. At the individual level, and consistent with refinance lending, a borrower's income has a small, statistically significant effect on the likelihood of originating a subprime home purchase loan. Those whose race is not provided have the largest odds of subprime compared to prime relative to whites, followed by blacks, then Hispanics. At the neighborhood level, the tract proportion black has a statistically significant, sizable effect on the likelihood that a home purchase origination is subprime.

As with refinance originations, the effect of being a black borrower varies across neighborhoods and is predicted by the percent of a neighborhood's residents that are black. These findings indicate that even holding applicant's income, among the other variables in the model, constant, blacks purchasing a home in largely white neighborhoods in Philadelphia are more likely than white borrowers purchasing a home in that same neighborhood to originate a subprime loan. Blacks who purchase a home in a predominantly white neighborhood are much more likely than their white neighbors, holding other individual and neighborhood indicators constant, to find themselves in the subprime segment of the mortgage market.

Although home purchase lending became an important and sizable part of the story of subprime lending, it accounted for a much smaller share of subprime loans than did refinance

lending. It is for this reason, and because the results do not present a drastically different story than the findings for refinance lending, that I focus my discussion on refinance loans. The results of the home purchase analyses do not drastically alter my conclusions as they pertain to my key findings. The analyses of home purchase lending presented in Appendix A bolster the findings about the importance of neighborhood characteristics, including neighborhood racial composition, and further demonstrates the varying likelihood of subprime loans for black borrowers depending on the racial composition of the neighborhood in which they are borrowing.

One major difference between the results of the refinance analyses and the results of home purchase analyses is the relationship between tract risk and likelihood of subprime. With refinance lending, higher instability in the housing market was associated with a higher risk of subprime lending in Philadelphia. With home purchase loans, however, there was no relationship between tract risk and subprime in Model 2. When allowing the slope for black borrowers to vary across neighborhoods, however, the effect of tract risk became significant at the 0.05 level and the effect was negative. That is, borrowers in neighborhoods with higher instability were associated with a lower likelihood of originating a subprime home purchase loan. I am not sure what is behind this relationship. It could be that the rate of subprime home purchase loans was still relatively small in 2002 and this relationship would be in the opposite direction with later years of subprime lending. Further investigations into the relationship between subprime home purchase lending and neighborhood risk measures are needed.

Discussion

The results discussed in this chapter provide insight into the distribution of subprime lending in Philadelphia County in 2002, the influence of both individual and neighborhood characteristics in the concentration of subprime lending and the difficulty black borrowers face in the mortgage market regardless of the neighborhood in which they live. The results demonstrate that black borrowers and those borrowing in predominantly black neighborhoods are more likely to originate subprime loans, confirming my first hypothesis. The results in this chapter also demonstrate that the dual mortgage market as defined by race is at work in the Philadelphia housing market, confirming my second hypothesis. The results do not support the theory that it is the grouping of residents with similar, high-risk profiles in neighborhoods but rather the characteristics of the neighborhoods that heavily influences the concentration of subprime lending.

Although income had little effect, the tract risk measure, specifically the uncertainty of future home prices, has the largest effect on the likelihood that a refinance loan origination is subprime in Philadelphia. However, even after taking this neighborhood risk measure into account, race matters. Indeed both the borrower's race and the racial composition of the neighborhood influence the segmentation of the mortgage market. The neighborhood racial composition has the second largest impact on the likelihood of subprime lending.

While previous research has pointed to the importance of race in determining the likelihood that a borrower originates a loan in the subprime segment of the market, the results presented in this chapter make clear that black borrowers face different likelihoods of obtaining a subprime loan depending on the neighborhood in which they live. For black borrowers it is not

the case that a house is a house is a house- it very much matters where their house is located. Black borrowers in predominantly white neighborhoods face a likelihood of obtaining a subprime loan that is much higher, nearly double, their white neighbors' likelihood of subprime, holding all else constant. In some neighborhoods, (for example Bridesburg/Kensington) the likelihood of black borrowers obtaining a subprime loan in predominantly white neighborhoods approaches the rate of black borrowers in predominantly black neighborhoods. Their white neighbors in these predominantly white neighborhoods, on the other hand, have a drastically lower likelihood of obtaining a subprime loan.

Black borrowers in predominantly black neighborhoods on the other hand see their white neighbors face similar likelihoods of subprime lending as they do. While black and white borrowers in these neighborhoods face a similar likelihood of subprime, there are few white borrowers in these neighborhoods and they tend to have the highest concentrations of subprime loans. As such, borrowers in these neighborhoods face a high likelihood of obtaining a subprime loan and see the same for their neighbors, resulting in high concentrations of risky, high cost lending. As a result, no matter where black borrowers reside, they find themselves facing a high likelihood of subprime- either overall or by comparison to their white neighbors. Such high probabilities of subprime for black borrowers call into question the notion that the market is functioning effectively with risk warranting the cost of the loan.

My use of hierarchical modeling, which lends itself nicely to the study of mortgage markets given the importance of context, facilitated this investigation into the ways in which the dual mortgage market is functioning in Philadelphia. The results demonstrate that the dual mortgage market not only sees different lenders serving neighborhoods based on the racial composition of the neighborhood, but the dual mortgage market also works at the individual

level, with minority borrowers more likely to be served by subprime lenders regardless of the neighborhood in which they live. Even in white neighborhoods, different lenders serve black borrowers than the lenders that are serving their white neighbors. By and large, subprime lenders serve black borrowers and neighborhoods while prime lenders serve white borrowers and communities. It is not only the case that prime loans are undermarketed in black neighborhoods, the results show that prime loans are undermarketed to black borrowers, regardless of neighborhood, as well.

What emerges from these findings, as I hypothesized in Chapter 1, is the importance of both individual and neighborhood level race in the workings of the dual mortgage market in Philadelphia and the way that the two interact. The results show little support for the theory that the concentration of subprime lending is evidence of the market functioning effectively, a simple reflection of the grouping of those most in need of subprime loans into neighborhoods. Results instead point to the importance of race and a concentration of subprime lending in black communities and among black borrowers regardless of the racial composition of their neighborhood. The findings highlight the difficulties that black borrowers even in largely white neighborhoods face in the mortgage market.

The results presented in this chapter are a case study of Philadelphia. Before turning to an investigation of the ramifications of this concentration, I replicate these analyses for three other locations- Baltimore city, Maryland and San Francisco and Alameda Counties in California- each with very different demographic compositions and mortgage markets, to assess the extent to which the workings of the dual mortgage market in Philadelphia are a reflection of mortgage market processes in other areas of the country.

CHAPTER 4

COMPARING MORTGAGE MARKET PROCESSES:

BALTIMORE, SAN FRANCISCO AND ALAMEDA

In Philadelphia, the sorting of subprime refinance lending across neighborhoods with

high concentrations in predominantly African-American census tracts was partly a function of

the grouping of similar types of people in a neighborhood, but more importantly a result of

neighborhood characteristics including the racial composition, the tract risk of lending, and the

education level of the neighborhood. Indeed black borrowers had a varying likelihood of

originating a subprime loan depending on the racial composition of the neighborhood in which

they lived. These findings suggest the existence of a dual mortgage market with subprime

borrowers being much more likely to serve black neighborhoods but also black borrowers

regardless of the neighborhood in Philadelphia in which they live. To test the extent to which

these findings speak to lending process in areas outside of Philadelphia, I compare the results

from Philadelphia to three other locations- one city that is more similar in racial composition and

cost of living to Philadelphia and two areas on the West Coast that present a contrast to

Philadelphia in terms of race and housing values as well as the typical income of residents. The

analyses in this chapter serve to assess the extent to which the processes at work in the refinance

market in Philadelphia are present in other similar and different areas in the United States.[32]

In this chapter, I conduct the same Hierarchical Linear Modeling (HLM) analysis on

2003 Home Mortgage Disclosure Act (HMDA) data from three other areas and compare my

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[32] The corresponding analyses for home purchase lending are contained in Appendix B to this dissertation. There is a brief description of the findings for home purchase lending near the end of this chapter.

findings to the results from Chapter 3 on the city of Philadelphia. I selected one city with a similar profile to Philadelphia, Baltimore city, to serve as a comparison. Baltimore, Maryland, although it is a much smaller city than Philadelphia, it is similar in that it is an east-coast city with a large African-American population. The value of housing and the average income of residents in these two cities are comparable.

To present a contrast to these two mid-Atlantic East Coast cities, I analyze lending patterns in two West Coast cities- San Francisco and Oakland in California. San Francisco and Oakland are more similar to each other than they are to either Philadelphia or Baltimore. San Francisco and Oakland, located in Alameda County, are different from Philadelphia and Baltimore, not just geographically, but also demographically. Both San Francisco and its neighboring county Alameda have very high costs of living. Housing is expensive and incomes are generally larger than in Philadelphia or Baltimore. While all four areas are minority majority areas, San Francisco and Alameda County have a smaller black population than Philadelphia and Baltimore but have larger Asian and Hispanic populations.

Like Philadelphia and Baltimore, the city and county of San Francisco are a consolidated city-county, in other words, their borders are co-terminus. Oakland, on the other hand is located in Alameda County which also includes many suburban areas. To present yet another contrast, I analyze lending patterns in the county in which Oakland is located, Alameda County. In order to present another contrast to Philadelphia, I analyze lending patterns in Alameda County. Including suburban areas in my analysis of the city of Oakland, allows me to see if analyzing a city and its' immediate suburbs presents different findings than the three analyses of cities.

The similarities and differences between these four areas will provide a test of the findings for Philadelphia discussed in Chapter 3. While Baltimore, more similar in racial composition, home value and income will provide a nice comparison for Philadelphia, the more affluent San Francisco and Alameda with a different racial composition than the two east coast cities and drastically higher median home values will provide a nice contrast. It may be the case that like in predominantly white neighborhoods in Philadelphia, black borrowers and black communities in these two cities with smaller black populations may face higher likelihoods of subprime. On the other hand, given the higher cost of living in San Francisco and Alameda, subprime lending might be more spread across all races of borrowers as more borrowers in these two cities, including young urban professionals, may struggle to afford to live in the area and may not easily qualify for a prime loan. The extent to which the lending processes for each of these areas with different housing markets and demographic profiles are similar to the processes found to be at work in Philadelphia are an indication that the findings in Chapter 3 are not unique to Philadelphia.

Borrower and Neighborhood Profiles for Refinance Originations in Philadelphia, Baltimore, San Francisco and Alameda

Table 4.1 presents borrower and neighborhood profiles of the conventional refinance loans originated in each of the areas in 2002 that are included in the analyses in this chapter. As with Chapter 3, the percent of loans that were originated by a lender that specializes in subprime loans is a portion of conventional loans, not all loans. That is, the analyses do not include government-insured loans. I present the profile for Philadelphia, previously shown in Chapter 3, for comparison.

Overall, as discussed above, the lending profiles for Baltimore and Philadelphia are more similar to each other than either is to Alameda and San Francisco. Although the number of loan originations in Baltimore was about half as many as in Philadelphia, the rates of subprime loans were similar between Philadelphia and Baltimore, with Baltimore having a slightly higher percentage of subprime lending than Philadelphia. The two west coast counties, on the other hand, saw higher numbers of refinance originations but lower rates of subprime lending than either east coast city. The rate of subprime lending in San Francisco was the lowest of the four areas, although it had the second most refinance originations. Alameda County had the highest number of refinance originations in 2002 nearly three times as many as San Francisco, but the second smallest rate of subprime lending of the four areas, about half the rate of subprime lending in the two east coast cities.

All four areas are minority-majority areas; that is, whites make up less than 50 percent of the residents. In Philadelphia and Baltimore, however, more than half of the refinance borrowers are white while the borrowers in Alameda County and in San Francisco are less than 50 percent white. In Alameda and San Francisco, the Other race category represents a large portion of borrowers- both counties have a large Asian population, the group that largely comprises the Other race category. Philadelphia and Baltimore had higher percentages of refinance borrowers who did not specify their race, while the rates of such borrowers were comparable in the two west coast areas, about 13 percent. In Baltimore city, as in Philadelphia, the non-white borrowers are largely split into two groups- blacks and those whose race is not provided. As discussed in Chapter 3, the race not specified group of borrowers is more heavily concentrated in predominantly black neighborhoods suggesting a higher likelihood that these borrowers are minority borrowers. This is true for all four areas analyzed; in Philadelphia, Baltimore, San

Francisco and Alameda as the percent of residents in a tract that are black increases, the percent

of applications in which the applicant's race was not specified also increases.

Table 4.1 Borrower and Census Tract Characteristics of Subprime Loan Originations in 2002 Across the Cities of Philadelphia, Baltimore and San Francisco and Alameda County[1]

	Philadelphia	Baltimore	San Francisco	Alameda
Individual Loan Level				
Subprime	13.9%	14.6%	3.5%	7.1%
White	58.0	56.8	46.8	43.1
Black	13.1	20.4	2.8	6.2
Hispanic	2.9	1.3	5.2	8.7
Other	5.2	3.1	31.6	29.0
Race Not Specified	20.8	18.4	13.5	13.0
Male	58.2	57.5	69.5	69.5
Female	32.3	33.9	25.0	25.0
Sex Not Specified	9.5	8.6	5.5	5.5
With Co-applicant	40.3	36.1	61.6	61.6
Income $50,000 or over	63.3	63.4	91.0	89.5
Census Tract Level				
Average Percent Black	23.5	38.0	7.1	10.9
Average Percent Hispanic	4.7	2.3	13.0	16.0
Average Percent Housing Units Vacant	7.1	10.4	3.9	2.5
Average Percent Employed	92.5	92.8	95.7	95.2
Average Percent College Educated	24.9	31.6	46.3	38.1
Average Median Income	$ 39,445.84	$ 40,416.75	$ 65,626.77	$ 71,058.29
Average Median House Value	$ 97,490.58	$ 103,387.53	$ 499,380.80	$ 337,855.03
Valid N	31,012	12,266	39,716	116,053

[1] Alameda County includes the city of Oakland and its suburbs.

Source: HMDA Data 2003

The average refinance borrower in Baltimore lives in a tract that is 38 percent black, higher than in Philadelphia. The average subprime borrowers in Alameda and San Francisco counties lived in tracts with lower percentages of black residents, about 11 percent in Alameda and 7 percent in San Francisco. The percent of Hispanic residents was much higher in the

neighborhoods of the average refinance borrower in both west coast counties than either Philadelphia or Baltimore.

The patterns for income across all four counties are similar at the individual and neighborhood levels. Borrowers in Philadelphia and Baltimore have lower incomes than San Francisco and Alameda. While the percent of borrowers making over $50,000 was in the low 60s for both Baltimore and Philadelphia, closer to 90 percent made over $50,000 in Alameda and San Francisco. The average borrowers in Philadelphia and Baltimore lived in neighborhoods with a median income of around $40,000. In both Alameda and San Francisco, the average borrower lived in a neighborhood with a median income in the mid-$60,000 range.

Similar to income, the median home values in Philadelphia and Baltimore were much lower than those of San Francisco and Alameda. The average borrower in Philadelphia and Baltimore lived in neighborhoods with median home values around $100,000. In Alameda, the median house value in the neighborhood of the average refinance borrower was around $338,000 while San Francisco's median home value was much higher with the average refinance borrower living in a neighborhood with a median house value of just under a half a million dollars.

The average borrower in Baltimore originated a loan in a neighborhood in which just over 10 percent of the homes were vacant, a higher percent vacant than the neighborhood of the average borrower in each of the other areas. The percentage of employed residents in the average borrower's neighborhood is comparable across all four areas, but slightly higher in the two west coast cities than the two east coast cities. The percent of college educated residents in the average borrower's neighborhood is at its lowest in Philadelphia and highest in San Francisco-nearly double the percentage of residents in the average subprime borrower's neighborhood in San Francisco has a college degree compared to Philadelphia.

The diversity in the demographics and neighborhood characteristics of the borrowers in these areas demonstrate the abilities of each area to serve as comparisons and contrasts to Philadelphia. I first present the analyses for Baltimore city, the city most like Philadelphia, to assess the extent to which the findings in Philadelphia are replicated in a city with a similar demographic profile. I then present the analyses for San Francisco and Alameda to assess the extent to which the findings for Philadelphia represent the mortgage market processes of two counties on the opposite side of the country with very different histories, demographics and experiences. After reviewing the findings for all three analyses, I compare likelihoods of subprime lending for black and white borrowers across all four areas that I analyzed. Will the dual mortgage delivery system work similarly in the two cities with larger black populations, lower incomes and home values as it does in two cities with a smaller share of black residents but larger percentages of Asian and Hispanic borrowers and with higher median incomes and much higher median home values?

Baltimore City

Baltimore city underwent one of the highest rates of population loss between 1990 and 2000, losing 84,860 people, fully 11.5 percent of the 1990 population. Recent attempts at revitalization have brought pockets of reinvestment and gentrification to the city, but the city still suffers from high crime rates (one of the highest in the nation) and concentrated poverty. I focus my analyses on the city of Baltimore, which although surrounded by Baltimore County, is an independent city; it does not belong to a county. In Baltimore city, as of the 2000 U.S. Census, 63.8 percent of residents were black.

In Table 4.2, I present only the full Model 4 analyses for each area in order to streamline the discussion, but include the changes in the Level-2 variance components for each stage of the model as presented in Chapter 3, including the unconditional model, in Table 4.2a. Table 4.2 presents the results for the HLM analysis predicting the likelihood that a refinance borrower in Baltimore originated a subprime as opposed to a prime loan by using individual and neighborhood level predictors and interacting individual race with the racial composition of the neighborhood.[33]

In Baltimore, the grouping of individuals by neighborhood explains a similar amount of the variation in rates of subprime lending across neighborhoods than was the case in Philadelphia. Just over half of the unexplained neighborhood level variance was explained by the individual characteristics. Since the Level-2 variance component represents just that, the variance in the dependent variable across neighborhoods, a change in the unexplained variance from the unconditional model to the model with only individual characteristics represents the impact of the clustering of like individuals into neighborhoods. The change in the Level-2 variance component between the unconditional model, with no variables entered, and the ANCOVA model with only Level-1 variables entered, presented in Table 4.2a, demonstrates the importance of individual characteristics in explaining the variation across neighborhoods in subprime lending. It is indeed the case that the grouping of similar individuals in neighborhoods explains some of the concentration of subprime lending.

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[33] See Appending B, Table B.1 for the corresponding analysis of home purchase lending. The tract percent black did not explain any of the variation in the effect of being a black borrower across neighborhoods.

Table 4.2 Predicting the Likelihood of Subprime Refinance Originations in 2002 in Baltimore City
(HLM Analysis with Dependent Variable as Subprime =1, Prime = 0; Standard Errors in Parentheses)

	Slope-as-Outcome		
Fixed Effects	Coefficient		Odds Ratio
Model for Tract Subprime			
Tract Level (Intercept)			
Intercept	-1.804	***	0.165
	(0.215)		
Proportion Black	0.652	***	1.920
	(0.144)		
Proportion of Age 25+ College or More	-1.937	***	0.144
	(0.264)		
Tract Risk	-0.009		0.992
	(1.708)		
Borrower Level			
Applicant's Income (In Thousands)	-0.005	***	0.995
	(0.001)		
Hispanic	0.950	**	2.586
	(0.299)		
Other	1.415	***	4.116
	(0.135)		
Race Not Provided	1.337	***	3.806
	(0.083)		
Co-applicant	-0.054		0.947
	(0.071)		
Model for Black Borrower Slope			
Black	1.710	***	5.568
	(0.224)		
Tract Proportion Black	-1.245	***	0.288
	(0.280)		
***p<0.001, **p<0.01, *p<0.05			
Source: HMDA Data 2003			

Looking at the unexplained variance for Model 2 shows that entering only the neighborhood

level predictors explains even more of the level 2 variance from the unconditional model. This

reinforces the finding that although the grouping of individuals in neighborhoods explains some of the variation in subprime lending across neighborhoods, the neighborhoods themselves are more important in understanding the variation in rates of subprime lending across neighborhoods.

Table 4.2a. Level 2 Variance Components for the Unconditional Model and the HLM Models in Table 4.2

Random Effects	Variance Component		Df
Unconditional Model			
Subprime	0.5109	***	df = 100
Model 1 ANCOVA			
Subprime	0.2260	***	df = 100
Model 2 Level 2 Only			
Subprime	0.1073	***	df = 97
Model 3 Intercept-as-Outcome			
Subprime	0.0517	***	df = 94
Model 4 Intercept- and Slope-as-Outcome			
Subprime	0.0949	***	df = 93
Black Slope	0.1891	***	df = 95
***p<0.001, **p<0.01, *p<0.05			

As in Philadelphia, race matters at both the individual and neighborhood levels in Baltimore city.[34] At the neighborhood level, all borrowers refinancing their mortgages in neighborhoods with larger black populations have a higher likelihood of originating a subprime loan. At the individual level, being a black borrower in Baltimore city has the largest impact of the variables in the model on the likelihood of obtaining a subprime loan. The effect is even more drastic than that observed in Philadelphia. In addition, the findings observed in

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[34] Appendix B, Table B.2 presents the predicted probabilities for refinance lending by neighborhoods in Baltimore. The home purchase predicted probabilities are presented in Table B.3. The models closely predict the actual rates of subprime lending in 2002 in Baltimore city's neighborhoods.

Philadelphia when allowing the slope of individual race to vary hold true in Baltimore. Not only are black borrowers more likely than their white neighbors to obtain subprime loans, but the effect of being a black borrower relative to a white borrower on the likelihood of obtaining a subprime loan varies by neighborhood. In particular, the effect varies by the percent of residents in the neighborhood that are black. The equation for the effect of being a black borrower relative to a white borrower is as follows:

Black effect= 1.7102 – 1.2448(Tract Proportion Black)

Although black borrowers in Baltimore are always more likely than white borrowers in Baltimore to obtain subprime loans regardless of the racial composition of their neighborhoods, the impact of being a black borrower compared to a white borrower increases as the percentage of neighborhood residents that are black decreases. In a tract with a smaller black population, where only 5 percent of residents are black for example, the odds that a black borrower is in the subprime segment of the refinance market, all else in the model equal, are 4.29 times as high as the odds of her white neighbor. In a neighborhood where half of the residents are black, the odds of subprime for a black borrower are 3.55 times as high as the odds of subprime for a white borrower.

At the other extreme, a neighborhood in which nearly all residents, 95 percent, are black, the odds of subprime for a black borrower is 2.94 times higher than the odds for a white borrower in the same neighborhood. Even in a nearly all black neighborhood in Baltimore, blacks are almost three times more likely to refinance their home mortgages in the subprime segment of the market than their white neighbors. Black borrowers in Baltimore, regardless of the neighborhood in which they live, face incredibly high odds of refinancing their home in the subprime segment of the mortgage market.

San Francisco

Slightly larger than Baltimore, San Francisco is a city that stands in contrast to both Baltimore and Philadelphia. Housing prices in the city have soared, with home prices among the highest in the nation. San Francisco, like the two east coast cities, is a minority-majority city; non-Hispanic whites comprise about 43.6 percent of the population. Unlike Philadelphia and Baltimore, however, the black population in San Francisco is small; only about 7.4 percent of San Francisco's residents are black. San Francisco has a large Asian population. As seen in Table 4.1, only 2.8 percent of refinance borrowers in San Francisco are black and the average refinance borrower lives in a neighborhood that is 7.1 percent black and 13 percent Hispanic. Similarly, only 1.6 percent of home purchase borrowers in 2002 in San Francisco were black. The average home purchase borrower lived in a neighborhood that was 8.5 percent black and 14.2 percent Hispanic.

In Table 4.3, I present the results for the HLM analysis predicting the likelihood that a refinance loan in San Francisco is subprime as opposed to prime.[35] The inclusion of the borrower characteristics in Model 1 did decrease the Level-2 variance component as presented in Table 4.3a, but the drop in unexplained variance was not as large as was observed in Philadelphia and Baltimore. When including only the tract level variables, the unexplained level 2 variance component is nearly as small as the model that includes both the Level 1 and Level 2 predictors. Again, as in the other two areas but even more so in San Francisco, although the self selection of individuals in San Francisco's neighborhoods explains some of the variation in rates of subprime

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[35] Appendix B, Table B.4 presents the home purchase loan analysis for San Francisco. The slope for being a black borrower did not vary by neighborhood, nor did the slope for Hispanic borrowers vary by neighborhood.

Table 4.3 Predicting the Likelihood of Subprime Refinance Originations in 2002 in San Francisco
(HLM Analysis with Dependent Variable as Subprime =1, Prime = 0;
Standard Errors in Parentheses)

	Slope-as-Outcome		
	Coefficient		Odds Ratio
Model for Tract Subprime			
Tract Level (Intercept)			
Intercept	-2.025	***	0.132
	(0.1701)		
Proportion Black	0.981	***	2.667
	(0.260)		
Proportion of Age 25+ College or More	-3.623	***	0.027
	(0.265)		
Tract Risk	1.239		3.454
	(2.432)		
Borrower Level			
Applicant's Income (In Thousands)	-0.001		0.999
	(0.0004)		
Hispanic	0.995	***	2.704
	(0.139)		
Other	-0.326	***	0.722
	(0.100)		
Race Not Provided	0.744	***	2.104
	(0.090)		
Co-applicant	-0.384	***	0.681
	(0.064)		
Model for Black Borrower Slope			
Black	1.672	***	5.321
	(0.214)		
Tract Proportion Black	-0.333		0.717
	(1.057)		
***p<0.001, **p<0.01, *p<0.05			
Source: HMDA Data 2003			

lending across neighborhoods, the characteristics of the neighborhoods themselves play a large role in the varying rates of subprime lending across neighborhoods.

Despite the small black population, the percentage of residents that are black in a borrower's census tract did affect the likelihood of obtaining a subprime loan with borrowers facing a higher likelihood of subprime if their refinancing a home in a neighborhood with a

larger black population. Table 4.3 also demonstrates the influence of a borrower's race. Blacks,

Hispanics and those whose race was not provided on the application are all more likely than

white borrowers to originate a subprime refinance loan while those in the Other race category, a

category largely comprised of Asian borrowers, are actually less likely than whites to originate a

subprime refinance loan. This is interesting given the larger Asian population in San Francisco.

This was not true in Baltimore or Philadelphia.

Table 4.3a. Level 2 Variance Components for the
Unconditional Model and the HLM Models in Table 4.3

Random Effects	Variance Component		Df
Unconditional Model			
Subprime	0.7486	***	df = 113
Model 1 ANCOVA			
Subprime	0.5358	***	df = 113
Model 2 Level 2 Only			
Subprime	0.0660	***	df = 110
Model 3 Intercept-as-Outcome			
Subprime	0.0627	***	df = 110
Model 4 Intercept- and Slope-as-Outcome			
Subprime	0.0329	**	df = 82
Black Slope	0.3833	**	df = 84

As with the analyses for Baltimore and Philadelphia, I allowed the effect of being a black

borrower to vary by census tract.[36] The effect of being a black borrower does vary across census

tracts, but it is not significantly affected by the percent of residents in the tract that are black. The

odds of subprime for a black borrower relative to a white borrower does change by

neighborhood, but the share of the black population in the neighborhood does not affect this

variation. It is not clear what neighborhood characteristic causes the variation in the likelihood

that a black borrower originates a subprime loan across neighborhoods. Given the larger

Hispanic population in San Francisco, I conducted an analysis in which I allowed the slope for

Hispanic borrowers to vary across neighborhoods, but found that the likelihood of Hispanic

borrowers obtaining a subprime loan did not vary by neighborhood.

Alameda County

Alameda County is located east of San Francisco County across the San Francisco Bay

and as mentioned above includes the city of Oakland as well as some of its surrounding suburbs.

Alameda County has benefited from the strong San Francisco Bay Area economy of the 1990s.

Indeed, Oakland saw a rise in households with incomes in the top quintile nationwide and in the

proportion of its residents with a college degree; in addition most of the city's neighborhoods

gained residents (Brookings 2003). Unlike Baltimore, the city of Oakland gained population over

the last decade. According to the U.S. Census in 2000, 40 percent of Alameda residents were

non-Hispanic white, 20 percent were Asian, 19 percent were Hispanic and 14.5 percent were

black. In 2002, 7.1 percent of conventional refinance originations and 22.6 of conventional home

purchase originations were made by lenders that specialize in subprime loans. I analyze lending

patterns in Alameda County not only because the racial composition presents a contrast to

Philadelphia and Baltimore, but also because it includes both urban and suburban areas,

presenting a contrast to the cities in this study.

Table 4.4 presents the results of the HLM analysis for the refinance loans in Alameda

County. As with the other areas, race at both the individual and neighborhood levels significantly

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[36] Appendix B, Tables B.5 and B.6 present the predicted probabilities of subprime lending for refinance and home purchase loans, respectively, for San Francisco. Again the predicted probabilities demonstrate the ability of the model to fairly accurately predict the rates of subprime lending in San Francisco's communities in 2002.

**Table 4.4 Predicting the Likelihood of Subprime Refinance
Originations in 2002 in Alameda County**
(HLM Analysis with Dependent Variable as Subprime =1, Prime = 0;
Standard Errors in Parentheses)

Fixed Effects	Slope-as-Outcome		
	Coefficient		Odds Ratio
Model for Tract Subprime			
Tract Level (Intercept)			
Intercept	-2.365	***	0.094
	(0.157)		
Proportion Black	1.486	***	4.421
	(0.111)		
Proportion of College or More	-2.540	***	0.079
	(0.157)		
Tract Risk	10.813	***	49679.60
	(2.912)		
Borrower Level			
Applicant's Income (In Thousands)	-0.001	***	0.999
	(0.0003)		
Other	-0.315	***	0.729
	(0.067)		
Race Not Provided	0.775	***	2.170
	(0.034)		
Co-applicant	-0.187	***	0.830
	(0.033)		
Model for Black Borrower Slope			
Black	1.223	***	3.397
	(0.086)		
Tract Proportion Black	-0.781	***	0.458
	(0.208)		
Model for Hispanic Borrower Slope			
Hispanic	0.775	***	2.172
	(0.082)		
Tract Proportion Hispanic	-0.652	*	0.521
	(0.260)		

***p<0.001, **p<0.01, *p<0.05

Source: HMDA Data 2003

affects the likelihood of originating a subprime refinance loan.[37] The decrease in the level-2

variance component from the Unconditional Model to Model 1, presented in Table 4.4a, is on par

with San Francisco; about a third of the variation in subprime lending across neighborhoods is

explained by the grouping of individuals in neighborhoods. Again, in looking at Model 2 in

which only the Level 2 predictors are entered, the amount of unexplained variation that remains

is close to the amount when Level 1 and Level 2 predictors are entered into the model. As with

the other areas, the unexplained variance in Models 1 and 2 are an indication that the grouping of

similar individuals in neighborhoods does matter, but neighborhood characteristics explain much

more of the between neighborhood variation in rates of subprime lending.

Table 4.4a. Level 2 Variance Components for the
Unconditional Model and the HLM Models in Table 4.4

Random Effects	Variance Component		Df
Unconditional Model			
Subprime	0.9777	***	df = 178
Model 1 ANCOVA			
Subprime	0.6095	***	df = 178
Model 2 Level 2 Only			
Subprime	0.0592	***	df = 175
Model 3 Intercept-as-Outcome			
Subprime	0.0384	***	df = 175
Full Model Intercept- and Slope-as-Outcome			
Subprime	0.0690	***	df = 168
Black Slope	0.1634	***	df = 170
Hispanic Slope	0.1281	***	df = 170
***p<0.001, **p<0.01, *p<0.05			

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[37] Appendix B, Table B.7 presents the results for home purchase lending in Alameda County. As with refinance lending, the effect of black and Hispanic borrowers on the likelihood of originating a subprime refinance loan did vary by neighborhood, although the variation in the black effect was not explained by the percent of tract residents that were black. The Hispanic composition of the neighborhood did significantly explain the variation in the likelihood of Hispanic borrowers to originate subprime loans compared to their white neighbors across census tracts.

The size of the black population in Alameda county, 14.5 percent, is nearly twice the size of the black population in San Francisco, but still much smaller than either Philadelphia or Baltimore. Consistent with the other areas, the percent of tract residents that are black has a positive relationship with the likelihood that a borrower originates a subprime loan. At the individual level, the findings are similar to San Francisco refinance lending in that black, Hispanic and those whose race was not provided on the application are all more likely than white borrowers to originate subprime refinance loans while those in the Other race category are less likely than white borrowers to originate subprime loans.

As with the other analyses, I allowed to slope for black borrowers to vary by neighborhood. In addition, because the Hispanic population in Alameda is larger than the black population, I allowed the variable for Hispanic borrowers to vary by neighborhood. In Alameda, the likelihood of obtaining a subprime refinance loan for both black and Hispanic borrowers varies by tract. This varying effect for Hispanics was not true in San Francisco, despite the fact that it also has a larger Hispanic population than black population. As was the case in Baltimore and Philadelphia, but not San Francisco, the effect of being a black borrower relative to a white borrower varies by the percent of residents in the neighborhood that are black.[38] The equation for this effect is as follows:

Black effect= 1.2230 – 0.7815(Tract Proportion Black)

For example, the average refinance borrower in Alameda County lives in a neighborhood that is 10.9 percent black (See Table 4.1). In such a census tract, the odds that a black refinance

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[38] Appendix B, Tables B.8 and B.9 present the predicted probabilities for communities in Alameda County. The city of Oakland has the highest or second highest rate of subprime lending, next to Hayward- a suburb of Oakland. The model in Alameda also was fairly accurate in predicting the actual rates of subprime lending in 2002.

borrower originates a subprime loan are over 3 times as high as the odds of subprime for a white refinance borrower in that same census tract.

Similarly, the effect of being a Hispanic borrower relative to a white borrower varies by the percent of residents in the neighborhood that are Hispanic; as the percent of residents in a neighborhood that are Hispanic increases, the relative odds of subprime for Hispanic borrowers compared to white borrowers decreases. The equation for Hispanic borrowers is as follows:

Hispanic effect= 0.7755 – 0.6516(Tract Proportion Hispanic)

In a neighborhood in which 16 percent of residents are Hispanic, as is the case for the average refinance borrower in Alameda county, the odds that a Hispanic borrower is in the subprime segment are nearly 2 times the odds of subprime for a white borrower in the same census tract.

The presence of the suburban areas of Alameda did not alter the lending patterns found in Alameda County. Black and Hispanic borrowers in Alameda County face higher likelihoods of refinancing their homes with a loan from the subprime segment of the mortgage market than their white neighbors.

Comparing Predicted Probabilities across all Four Areas

In order to better understand the similarities and differences in likelihoods of subprime lending for black and white borrowers, I calculated predicted probabilities for three different neighborhood racial compositions with regard to black residents- 5 percent, 50 percent and 95 percent black- for each of the four areas. The values for the other variables in the regression equation are the average for each area. Table 4.5 presents the percent of black and white residents in the neighborhoods that the models estimate would originate subprime refinance loans. The table demonstrates that in all four areas and with each neighborhood racial

composition, blacks are more likely than white borrowers to originate subprime refinance loans, holding all other variables in the model constant. In addition, as the percent of black residents in the neighborhood increases, the ratio of the percent of black to the percent of white residents that will originate a subprime loan decreases. This is also true for all four areas.

In three of the four areas, the likelihood that a borrower originates a subprime loan increases as the percent of residents in the neighborhood who are black increases- in other words, borrowers are more likely to originate a subprime loan in predominantly black neighborhoods than they are in neighborhoods with fewer black residents, regardless of race. This is true in Philadelphia, San Francisco and Alameda County. However, in Baltimore, the city with the largest percentage of black residents, this was not the case for black borrowers. The model estimates that a larger percentage of black borrowers in neighborhoods with few black residents

Table 4.5 Comparing Predicted Probabilities for Black and White Borrowers Across the Areas in Neighborhoods with Varying Percent Black Residents and Average Values for All Other Variables in the Regression Equations

Percent of Neighborhood Residents Black	Philadelphia		Baltimore		San Francisco		Alameda	
	Black Borrower	White Borrower	Black Borrower	White Borrower	Black Borrower	White Borrower	Black Borrower	White Borrower
5 percent	19.4%	8.5%	30.3%	7.7%	8.5%	1.7%	12.2%	4.1%
50 percent	22.3%	13.5%	25.0%	10.1%	11.0%	2.7%	16.1%	7.7%
95 percent	25.6%	20.7%	20.3%	13.1%	14.2%	4.1%	20.8%	14.0%

are likely to originate subprime loans than the percentage of black borrowers originating subprime loans in largely black neighborhoods. In looking at Table 4.2, this is a result of the

sizable effect that the proportion of black residents has on being a black borrower when the effect of being black is allowed to vary across neighborhoods. As the percent of residents in a neighborhood increases, the log odds that a black compared to a white borrower originates a subprime loan decreases by so much that blacks living in largely white neighborhoods not only have a higher likelihood of originating a subprime loan than their white neighbors, but also have a higher likelihood of subprime than blacks borrowing in largely black neighborhoods, all else equal, according to the model. It would be interesting to see if and how this relationship changes if I were able to control for credit rating and borrower assets. Certainly this is a finding that requires further investigation.

In all four areas, the model estimates that blacks living in predominantly white neighborhoods have an even higher likelihood of subprime compared to their white neighbors than blacks living in predominantly black neighborhoods. It is also the case that the largest ratio of black rates of subprime to white rates of subprime occurs in the city with the smallest black population, San Francisco. In San Francisco, in a neighborhood that is 5 percent black, holding all else equal, blacks are 4.9 times more likely to originate a subprime loan than their white neighbors and are 3.5 times more likely in a neighborhood that is 95 percent black. However, this comparison between the within city and across city processes breaks down as Baltimore city is the city with the second largest differences between blacks and whites in their likelihood of subprime. Philadelphia actually has the smallest ratio of black rates of subprime to white rates of subprime. Further research is needed to explore the meaning behind these differences across areas. While the directions of the processes are the same across areas, the magnitude of the effects of certain variables differs by city.

The table demonstrates that in all four areas, regardless of the racial composition, the cost of living or the average value of a home, blacks are more likely than whites to originate subprime loans and white borrowers face a higher likelihood of subprime as the percentage of black residents in their neighborhood increases. In addition, in all but one of the areas black borrowers have a higher likelihood of originating a subprime loan in neighborhoods with a larger black population than they do in neighborhoods with a smaller black population.

Analyzing Home Purchase Loans

The tables presenting the home purchase analyses are presented in Appendix B. As with refinance loans, race at both the individual and neighborhood levels statistically significantly predicts the likelihood of obtaining a subprime home purchase loan in Baltimore and San Francisco but only increases the likelihood of subprime at the individual level in Alameda. The percent of tract residents that are black does not statistically significantly affect the likelihood of originating a subprime home purchase loan in Alameda.

The findings regarding the variation in the likelihood of black borrowers originating a subprime loan across neighborhoods are different than the results of the refinance analyses. The likelihood that a black borrower obtains a subprime home purchase loan varies by neighborhood in Baltimore and Alameda, but does not in San Francisco. However, unlike with refinance loans, the percent of residents in the tract that are black does not explain any of the variation in the effect of black borrowers by census tract in either Baltimore or Alameda. That is to say, the effect of being a black borrower on the likelihood of obtaining a subprime home purchase loan

does differ by neighborhood, however this difference is not affected by the percent of residents in the neighborhood that are black.

While these differences do not change my conclusions regarding refinance lending, they do raise the possibility that different processes are at work with refinance lending than home purchase lending. As mentioned previously, subprime home purchase lending made up a smaller share of the subprime market than did refinance lending. More research is needed to investigate this difference and to see if this relationship changed over time as subprime lending grew to become a larger percentage of home purchase lending.

Discussion

The results discussed in this chapter verify a number of the findings from the analyses of the Philadelphia lending data. The findings from this chapter, similar to the findings in Chapter 3, support the existence of a dual mortgage market with different lenders serving different borrowers and neighborhoods. The grouping of similar individuals in neighborhoods does explain some of the concentration of subprime lending, but each of the analyses in this chapter as well as in Chapter 3 demonstrate the importance of taking into account the neighborhood in an explanation of the variation in rates of subprime lending across neighborhoods. It is not just that similar types of borrowers with similar incomes and credit ratings self select into the same neighborhoods.

In Chapter 1 I hypothesized that borrowers in black neighborhoods would be more likely to obtain subprime loans as opposed to prime loans. The results in this chapter further support this hypothesis. The size of the black population in a neighborhood, all else equal, increases the likelihood that a loan is subprime; subprime lenders are more likely to serve neighborhoods with

larger black communities. This is as true in Baltimore and Philadelphia, two cities with large

black populations, as it is true in San Francisco a city comprised of less than 10 percent black

residents. In all four areas black and Hispanic borrowers were much more likely than their white

neighbors to find themselves in the subprime segment of the mortgage market.

I also hypothesized that black borrowers would be more likely to obtain subprime loans

than white borrowers and that the impact of being a black borrower would vary across

neighborhoods. The results in this chapter further confirm this hypothesis. The impact of being a

black borrower on the likelihood of originating a loan with a subprime lender does vary by

neighborhood in all four areas. In addition, the impact of being a Hispanic borrower on the

likelihood of originating a subprime loan did vary by neighborhood in Alameda County.

Although I hypothesized that the likelihood of obtaining a subprime loan would differ for

minority as opposed to white borrowers by the racial composition of the neighborhood, this was

not the case in all areas. In San Francisco, the varying effect of being a black borrower across

neighborhoods was not at all explained by the percent of residents in the neighborhood that are

black. In Alameda County, however, the tract percent Hispanic did significantly affect the

variation in the likelihood of subprime across tracts for Hispanic refinance borrowers.

Although the tract racial composition did not always explain some of the variation across

neighborhoods in the likelihood of obtaining a loan from a subprime lender, the impact of race at

the neighborhood level and the variation in the effects of race across neighborhoods supports the

existence of a dual mortgage market at both the individual and neighborhood levels. Given that

subprime loans in my data are originated by different lenders than the prime loans, the findings

support the argument that different lenders are serving different communities but also different

segments of the population regardless of the neighborhood in which they reside or are purchasing a home.

In the next chapter, I turn to an investigation into the effects of this dual mortgage delivery system. I focus back on Philadelphia and begin to assess the extent to which the concentration of subprime loans in neighborhoods affects the communities either positively or negatively. While some at the time the data analyzed was collected, in the early to mid 2000s, hailed subprime lending as the opening up of the mortgage market to previously underserved communities, others expressed concern that high rates of foreclosure in the subprime market do great harm to these communities with high concentrations of subprime and the black borrowers who were excluded from the mortgage market for so long. In the next chapter, I conduct a number of analyses, considering both sides of the argument.

CHAPTER 5

A LOOK AT THE EFFECTS OF SUBPRIME LOANS IN

PHILADELPHIA'S NEIGHBORHOODS

The evidence of the dual mortgage delivery system observed in Chapters 3 and 4 demonstrated that being a black borrower and borrowing in predominantly black neighborhoods increases the likelihood that a loan is subprime and contributes to high concentrations of subprime lending. While some of the concentration is due to the grouping of similar individuals in neighborhoods, it is clear that a neighborhood's characteristics affect its rate of subprime lending. Neighborhoods with a large black population are much more likely to have a high rate of subprime lending than neighborhoods with few black residents. What does this mean for these predominantly black neighborhoods? Is the expansion of the mortgage market to include subprime lending opening up opportunities for minority and low-income borrowers? If so, what does that mean for these communities? Is this investment in the neighborhood, in the form of subprime lending, harming the community? Are high rates of high cost subprime loans in predominantly minority neighborhoods drastically increasing foreclosure rates further depressing home values in these neighborhoods?

Recent news stories have pointed to disastrously high rates of foreclosures occurring in neighborhoods with high rates of subprime lending, e.g. a recent article about Cleveland in the New York Times (Kotlowitz 2009). As described in Chapter 1, a home foreclosure drags down the value of the neighboring homes and the depression effect is even greater in minority communities (Immergluck and Smith (2006). High concentrations of foreclosures could be devastating to not only those losing their homes but to the surrounding community. Given that

foreclosure rates have been so high it might seem obvious that a high concentration of subprime lending in a neighborhood can be nothing but dangerous. However the loans included in these analyses were made at the beginning stages of the expansion in subprime lending, when there were concerns over predatory lending, but the verdict on subprime lending was still out. Indeed many, including Alan Greenspan during his tenure as the Chairman of the Federal Reserve, argued that subprime lending represented of an opening of the credit market to previously underserved individuals. The terms of many of the subprime loans made in the late 1990s and early 2000s were likely less risky than the loans that were being made in the mid 2000s at the height of the housing bubble when mortgage-backed securities could not be created fast enough. At this date, it may seem tempting to eliminate subprime lending altogether given the damage to the housing market and the economy that has been done. However, if subprime lending did represent opportunities for homeownership to individuals who were previously excluded from the housing market, it is worth considering the benefits and consequences of subprime lending before determining the fate of the subprime segment of the mortgage market.

The research in this chapter endeavors to answer three questions about the effects of the dual mortgage delivery system. First, given the self-fulfilling nature of mortgage lending, I consider the extent to which the presence of subprime lending in a neighborhood begets further subprime lending. Is the very presence of subprime lending activity at an earlier time a contributing factor to later rates of subprime lending? Second, I consider the argument that subprime lending represents an opening up of homeownership opportunities to minority and low-income borrowers who were largely excluded from the mortgage market in decades past. Specifically, I ask, are higher rates of subprime lending activity in a neighborhood associated with higher rates of black homeownership and lower median incomes? Unlike Chapter 3, this

analysis does not include borrower characteristics and uses earlier rates of subprime lending to predict later rates. Finally, I look into the relationship between subprime lender activity in neighborhoods and a measure of neighborhood health. Although I do not have access to foreclosure data, the research mentioned above and reviewed in Chapter 1 points to the highly depressive effect foreclosures have not just on the home in foreclosure but the spillover depressive effect each foreclosure has on homes within about one-eighth of a mile of the foreclosed home. I therefore ask, do higher rates of subprime activity in 1992 and 1997 affect a neighborhood's median house value?

In this chapter, I return the focus to the city of Philadelphia. Since my investigation into the dual mortgage delivery system in Philadelphia showed that subprime lenders disproportionately serve black and Hispanic borrowers and predominantly black neighborhoods, any effects of subprime lending, either positive or negative, will disproportionately affect minorities and predominantly black census tracts in Philadelphia.[39] I concentrate these analyses on Philadelphia to better focus the findings and the discussion; the results from Chapter 4 led me to believe the dual mortgage market for refinance loans is functioning similarly in San Francisco and Alameda with their higher incomes and home values as it is in the lower-income, lower-home value cities of Baltimore and Philadelphia. In studying Philadelphia, I analyze the city with the second largest black population and the second highest rate of subprime refinance lending of the four areas. In both the size of its black population and rate of subprime lending, Philadelphia is just lower than Baltimore, but much higher than Alameda and San Francisco.

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[39] Since there are few census tracts with large concentrations of Hispanic residents, I did not analyze the effect of the tract percent Hispanic on the likelihood of subprime.

The Self-fulfilling Nature of the Mortgage Market

Having investigated the relationship between race, at both the individual and neighborhood levels, and rates of subprime lending, I consider an alternative hypothesis - the extent to which the concentration of subprime lending in a neighborhood is fed by earlier rates of subprime originations. Mortgage lending is a self-fulfilling prophecy (Stuart 2005). The existence of investment in the neighborhood in the form of home loans lowers the risk of lending, facilitating additional lending. Does the presence of higher risk, high cost lending in a neighborhood increase the risk of lending and further decrease the likelihood of prime lending in a neighborhood? Or is the opposite the case- does the increased capital investment in a community, even in the form of subprime lending, facilitate additional investment, ultimately lowering the risk of lending in the neighborhood and decreasing the rate of originations from subprime lenders? Does subprime lending in a neighborhood lead to higher or lower rates of subprime lending or does it have no effect?

To answer this question, I conducted a regression analysis predicting the proportion of loans originated in a neighborhood in 2002 that were made by lenders specializing in subprime loans. Unlike the previous chapters, in all analyses in this chapter the proportion of originations that are subprime is calculated as a proportion of all refinance originations including government-insured loans. This ensures that all lending activity that occurred in a census tract is accounted for in assessing the impact of subprime lending activity on communities. As with the previous chapter, I include only neighborhoods in which there were 15 or more loans originated in the analyses. This is because neighborhoods with very few overall loans could be misleadingly perceived as having a high share of subprime loans despite having low mortgage activity overall.

Figure 5.1 is a scatterplot depicting the relationship between subprime refinance lending in 1997 and 2002. The correlation coefficient is equal to 0.773. By and large, neighborhoods with high rates of subprime refinance lending in 1997 had high rates of subprime refinance lending in 2002. The correlation between 1992 and 1997 was moderately high (0.431), but the correlation between 1992 and 2002 was weak (0.253). These correlations are lower than I expected and likely have to do with the shifting nature of subprime loans over the decade. During the 1990s, subprime lending expanded as a result of more borrowers originating subprime loans but also as more lenders began to make subprime loans.

Figure 5.1 Subprime Refinance Originations in 1997 by 2002
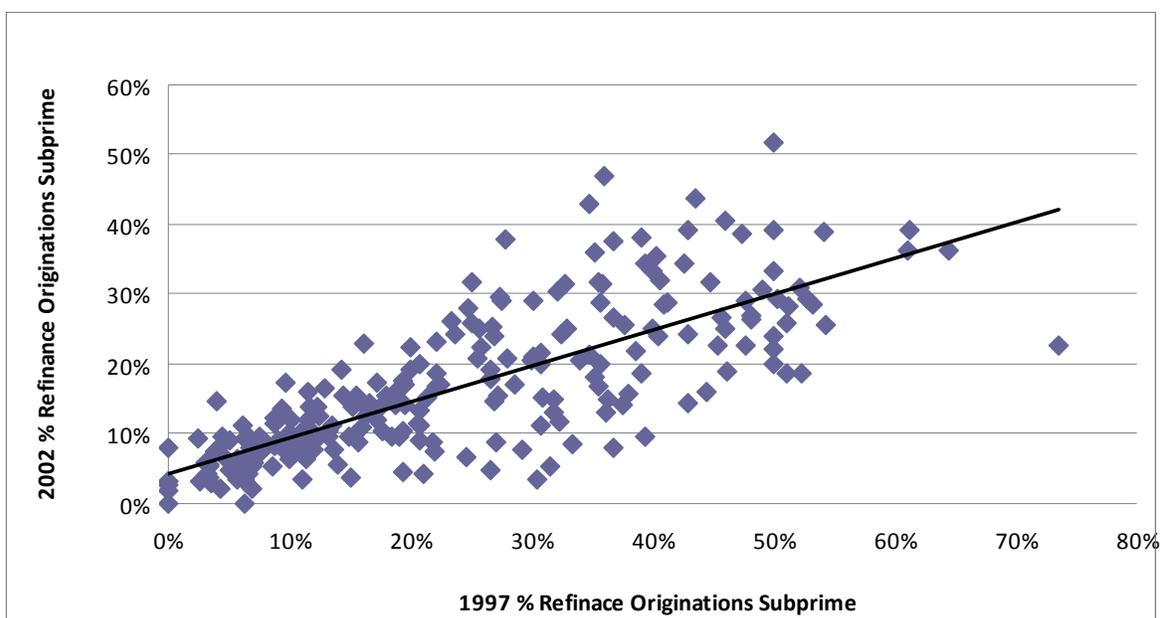
Table 5.1 presents this relationship in the form of a regression analysis. The dependent variable is the proportion of refinance originations in the tract that were made by subprime lenders in 2002. Model 1 includes past rates of subprime refinance originations from 1997 and 1992. In line with the correlations, the rate of subprime refinance lending in 1997 statistically significantly predicts the 2002 subprime rate, but the 1992 rate of subprime refinance lending

does not. The adjusted R^2 is an indication of the proportion of variation in the dependent variable that is explained by the independent variable, in other words, how successfully the independent variables explain the variation in rates of subprime lending. It is a measure of the goodness-of-fit of the model. Earlier rates of subprime lending explain about 32 percent of the variation of subprime lending across census tracts in 2002. On its own, earlier rates of subprime lending, explain a decent amount of later rates of subprime lending. The next step is to assess whether subprime lending directly affects later rates of subprime lending or if the relationship is explained away by other neighborhood conditions.

In Model 2, I control for other neighborhood factors such as race and socioeconomic factors like income, education, the rate of employment and the tract risk measure. The importance of earlier rates of subprime lending disappears when taking into account these neighborhood conditions. In Model 2, the size of the black community in a neighborhood, education and tract risk all significantly affect the rate of subprime lending in 2002, confirming the findings in Chapters 3 and 4. The combination of these factors explains just over half, about 54 percent, of the variation in neighborhood rate of subprime lending. The beta coefficient for the proportion of neighborhood residents that are black is the largest coefficient. Beta coefficients are standardized coefficients that indicate the size of the effect of an independent variable relative to the other independent variables in the model on the dependent variable. As such, neighborhood proportion black has the largest effect relative to the other independent variables in Model 2 on rates of subprime lending in 2002. The findings not only demonstrate the importance of neighborhood racial composition in understanding the rates of subprime lending, but show that after considering other neighborhood conditions, the relationship between earlier rates of subprime lending in a neighborhood and later rates disappears.

Table 5.1. Ordinary Least Squares Regression of 2002 Proportion Refinance Originations Subprime

	Model 1		Model 2	
	b	B	b	β
Intercept	0.078 ***		0.057	
	(0.009)		(0.109)	
1997 Share of Refinance Originations Subprime	0.357 ***	0.568	0.070	0.111
	(0.031)		(0.037)	
1992 Share of Refinance Originations Subprime	0.011	0.013	-0.052	0.063
	(0.040)		(0.034)	
Neighborhood Measures in 1990				
Median Household Income			6.34E-07	0.071
			(5.21E-07)	
Proportion Black			0.139 ***	0.493
			(0.018)	
Proportion Hispanic			-0.012	0.012
			(0.048)	
Proportion Employed			0.009	0.006
			(0.116)	
Proportion College			-0.106 **	0.172
			(0.040)	
Proportion Vacant			-0.053	0.035
			(0.083)	
Tract Risk			0.343 ***	0.225
			(0.099)	
Adjusted R^2	0.321		0.540	
n	298		298	
*p<0.05, **p<0.01, ***p<0.001				

I suspect the lack of a relationship between 1997 and 2002 lending after controlling for neighborhood characteristics is a function of two factors: 1) the relative newness of subprime lending in 1997 when it was in the early stages of its rapid expansion and 2) the further shifts in the mortgage market that were occurring in 2002 with the evolving nature of loan product and loan terms that came to characterize the unregulated subprime segment of the mortgage market.

During the period of study, subprime lending was rapidly expanding. In 2002 lenders were inventing new loan products and expanding into new markets in an effort to feed the demand for mortgage backed securities; there was money to be made in the securitization of home loans and new types of loans were being invented in order to bring more and more buyers into the market. The presence of subprime lending in 1997 is not enough to ensure subprime lending in 2002, the neighborhood conditions are more influential than the presence of subprime lending. Investment in a neighborhood in the form of subprime lending, at least during the period included in this study, does not ensure that future loans are more likely to be subprime.

The Effects of Subprime Lending on Communities

What do these high concentrations of subprime lending in minority neighborhoods mean for these communities? Is the investment beneficial or detrimental to the community? Does subprime lending contribute to an expansion of homeownership opportunities for minority borrowers who have a history of being discriminated against by the mortgage market? Does subprime lending contribute to the redefining of minority borrowers as underserved rather than undeserving? To consider these questions, I analyze the relationship between subprime activity in a neighborhood and the effect on minority homeownership. Does subprime lending activity, as many subprime advocates would argue, promote black homeownership?

I conducted a set of ordinary least squares (OLS) regression analyses at the census tract level. I model the proportion of homeowners in a neighborhood that are black in 2000 by using rates of subprime lending (refinance in 1997 and 1992 and home purchase in 1997) as my independent variables. To further isolate the effect of subprime activity, I control for a number of neighborhood characteristics in 1990, including the proportion of homeowners in 1990 that were

black. Thus the analysis employs a lagged dependent variable model. By taking into account the value of the dependent variable in 1990, the results are an indication of the change the neighborhood underwent between 1990 and 2000. Such models provide conservative estimates of the effects of the additional explanatory variables as much of the variation in the dependent variable at Time 2 (i.e. 2000) is explained by the measure at Time 1 (i.e. 1990). As such, statistically significant results point to change above what would be expected by market forces.

Although subprime activity is measured prior to the year in which the tract level characteristics that I am predicting were measured, it is difficult to determine cause and effect. Given the discriminatory history of mortgage lending in the United States and the self-fulfilling nature of the mortgage market it is difficult to definitively determine which came first in understanding neighborhood conditions and their relationship to mortgage lending. Are neighborhood conditions influencing the type of lending that is occurring in a neighborhood or is the type of lending affecting the neighborhood conditions? Is neglect in a neighborhood more likely because of the neighborhood conditions or are the neighborhood conditions a result of the disinvestment? As such, despite having rates of subprime lending measured at points in time earlier than my dependent variable, I am unable to definitively conclude that my independent variables predict my dependent variable. I therefore interpret the regression equations as illustrations of associations between the neighborhood characteristics and the proportion of loans that are subprime.

I conduct regression analyses to assess whether subprime activity in a tract is associated with a change in the proportion of homeowners who are black between 1990 and 2000. In Model 1 I enter the 1990 proportion of homeowners who are black and the rates of subprime activity. Next I add additional tract level control variables measured in 1990 to see if the relationship

between subprime lending and the share of black homeowners remains after controlling for a number of the tracts' demographic characteristics. High correlations between median house value and both median household income and percent college educated prevented the variables from being entered into the same model; correlations were greater than 0.8. In addition, median house value serves as the denominator in the calculation of the neighborhood risk measure. I therefore conducted separate analyses.

Table 5.2 presents the analysis that includes median household income, percent college educated, the percent employed, the percent Hispanic and the tract risk measure while Table 5.3 presents the results for median house value and therefore does not include median income and the percent college educated as a result of high correlations and the tract risk measure as median house value is used in its calculation. The number of cases in Model 1 in each analysis, despite including the same variables, is slightly different because there were more tracts with missing household income than missing house value. In both tables, Model 1 demonstrates that the share of refinance originations in 1997 that were subprime is statistically significant and is associated with an increase in shares of black homeowners in 2000.[40] The 1992 refinance origination rate and 1997 home purchase origination rate were not significant; I therefore removed them from the analysis. Neighborhoods with higher rates of subprime refinance originations in 1997 saw a larger increase in shares of homeowners who are black in 2000 than would be expected by market forces.

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[40] The rate of subprime refinance loans in 1992 was not significant. To present a parsimonious model, I removed it from the equation.

Table 5.2 Ordinary Least Squares Regression Predicting Percent of Household Owners in 2000 that are Black
(Model that Includes Median Household Income)

	Model 1		Model 2	
	b	β	b	B
Intercept	0.057 ***		-0.256 *	
	(0.01)		(0.119)	
Proportion Black Homeowners in 1990	0.908 ***	0.924	0.911 ***	0.945
	(0.017)		(0.021)	
1997 Share of Refinance Originations Subprime	0.097 *	0.044	0.147 ***	0.067
	(0.039)		(0.045)	
1990 Median Household Income			-1.81E-06 **	-0.058
			(6.20E-07)	
1990 Proportion Hispanic			-0.092	-0.029
			(0.055)	
1990 Proportion Employed			0.369 **	0.068
			(0.131)	
1990 Proportion College or More			0.064	0.029
			(0.043)	
1990 Tract Risk			0.068	0.013
			(0.122)	
Adjusted R^2	0.939		0.942	
N	305		305	

*p<0.05, **p<0.01, ***p<0.001

Model 2 in Table 5.2 presents the results for the analysis that includes median household income, percent college and neighborhood risk while the analysis in Model 2 of Table 5.3 includes median house value. In both models, the share of black homeowners in 1990 remains the largest predictor of the percent of homeowners in 2000. After taking into account the additional neighborhood conditions, the share of refinance lending remains statistically significant and associated with an increase in the share of black homeowners. Even after controlling for the additional tract level characteristics, neighborhoods with higher rates of

subprime refinance lending in 1997 have higher shares of black homeowners in 2000, above and

beyond what is expected from market forces. Increased investment in the neighborhood in the

form of subprime refinance lending is associated with higher shares of black homeowners.

However, subprime home purchase lending was not significant so we can not conclude that the

subprime activity is responsible for the greater than expected change in share of black

homeownership. In addition, it is unclear if the number of black homeowners increased or the

number of white homeowners decreased.

Table 5.3 Ordinary Least Squares Regression Predicting Percent of Household Owners in 2000 that are Black (Model that Includes Median House Value)

	Model 1		Model 2	
	b	B	b	β
Intercept	0.056 ***		-0.254 *	
	(0.010)		(0.112)	
Proportion Black Homeowners in 1990	0.902 ***	0.936	0.912 ***	0.946
	(0.017)		(0.020)	
1997 Share of Refinance Originations Subprime	0.111 **	0.051	0.134 **	0.062
	(0.039)		(0.044)	
1990 Proportion Hispanic			-0.071	-0.022
			(0.051)	
1990 Proportion Employed			0.363 **	0.068
			(0.119)	
1990 Median House Value			-3.226E-07 **	-0.050
			(1.19E-7)	
Adjusted R^2	0.939		0.942	
N	310		310	
*p<0.05, **p<0.01, ***p<0.001				

However, are increased shares of black homeowners necessarily a good thing? While

homeownership often represents a means to wealth accumulation and a sound financial

investment, this is not always the case. For many people, especially in the current housing

market, homeownership represents a debt they cannot afford and an obstacle to financial solvency. Is promoting minority homeownership by doling out high risk loans with poor terms and high costs really a benefit for minority communities and borrowers or will they do more harm than good? Are there severe consequences for these communities given that some of the borrowers may be obtaining loans that cost more than they can afford?

To investigate the role of subprime lending in neighborhood health, I conducted a series of regression analyses similar to the lagged dependent variable models employed to investigate the role that subprime lending over the 1990s played in shares of black homeowners. I use the rates of subprime lending to predict two different neighborhood traits in 2000. My dependent variables are median house value and median household income. I again conduct lagged dependent variable analyses so that the results are an indication of the change the neighborhood experienced between 1990 and 2000. The proportion subprime remains the proportion of all mortgage originations including government-insured and I continue to eliminate tracts with low mortgage market activity (fewer than 15 loans originated).

In Table 5.4, I present the analyses predicting the median house value in 2000. I expect, as a result of the disproportionately high rate of foreclosures in the subprime segment of the mortgage market and the depressive effect of foreclosures on home values in the neighborhood, as discussed in Chapter 1, that neighborhoods with a history of higher rates of subprime lending will see larger decreases in median house value. While declines in median house value would be a sign of neighborhood deterioration, an increase in neighborhood median house value would be a sign that the mortgage activity and investment in the neighborhood, even in the form of subprime loans, promote home values. In 2000, the housing market was just beginning the increase in home prices that characterized much of the early 2000s. Indeed, nearly 85 percent of

census tracts in Philadelphia underwent a positive change in median house value between 1990 and 2000.

Table 5.4 Ordinary Least Squares Regression of 2000 Median House Value

	Model 1			Model 2		
	b		**β**	**b**		**β**
Intercept	-10967.84	**		10250.18		
	(3863.91)			(25898.51)		
1990 Median House Value	1.21	***	0.99	1.24		1.018
	(0.026)			(0.027)	***	
1997 Share of Refinance Originations Subprime	28201.43	**	0.069	4770.39		0.012
	(8820.77)			(9989.34)		
1990 Proportion Black				16782.06		0.089
				(4683.08)	***	
1990 Proportion Hispanic				15585.02		0.026
				(11845.29)		
1990 Proportion Employed				-27883.16		-0.03
				(27306.47)		
Adjusted R^2	0.906			0.911		
N	310			310		
*p<0.05, **p<0.01, ***p<0.001						

As shown in Model 1 of Table 5.4, the 1997 share of refinance activity that was subprime was in fact associated with larger increases in median house value in 2000.[41] Since the measures of subprime activity were entered as proportions, a one percent increase in the proportion of refinance originations in 1997 that were subprime is associated with approximately a $282 increase in median house value between 1990 and 2000. In Model 2 I entered the additional

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[41] The measures of subprime refinance activity in 1992 and of subprime home purchase activity in 1997 were not significantly related to 2000 median house value and their removal from the analysis changed the results little.

baseline control measures.[42] Although the share of subprime refinance activity in 1997 was initially associated with higher median home values, the effect disappeared after controlling for the additional neighborhood measures. Taking into account other neighborhood measures, there is no relationship between the rate of subprime refinance lending in 1997 and the change in median house value between 1990 and 2000.

Table 5.5 presents the results predicting the median household income in 2000. In Model 1, the share of refinance originations that were subprime in 1997 is statistically significantly related to a decrease in a tract's median income between 1990 and 2000. With each percentage increase in share of subprime refinance originations in 1997, the neighborhood's median income decreased by about $47 between 1990 and 2000.[43] In Model 2, I take into account additional neighborhood controls to assess whether the relationship between subprime lending and decline in median income remains after controlling for additional neighborhood conditions in 1990. The share of refinance lending in 1997 that was subprime maintains its statistically significant, negative relationship with change in median income levels even after taking into account these additional baseline measures of the neighborhood. Indeed, the magnitude of the decline in median income increases slightly, from a depression effect of about $47 to about $54.

Although, seemingly small, this $54 decrease in median household income between 1990 and 2000 can represent a sizable decrease in median income. For example, a tract in which about 20 percent of the refinance originations were subprime in 1997 is associated with an approximately $1,647.63 decrease in the median income between 1990 and 2000. The highest

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[42] I did not enter median household income or the percent college educated because of high correlations between these variables and median house value. I also did not enter the tract risk because the median house value is the denominator in calculating this risk measure.

Table 5.5. Ordinary Least Squares Regression of 2000 Median Household Income

	Model 1			Model 2		
	b		β	b		B
Intercept	2351.88	*		24657.81	***	
	(1160.01)			(6974.19)		
Median Household Income in 1990	1.22	***	0.917	1.24	***	0.935
	(0.029)			(0.04)		
1997 Share of Refinance Originations Subprime	-4673.01	*	-0.05	-5385.49	*	-0.058
	(2043.20)			(2613.81)		
1990 Proportion Black				-336.83		-0.008
				(1265.55)		
1990 Proportion Hispanic				-1182.72		-0.009
				(3216.42)		
1990 Proportion Employed				-24691.73	***	0.106
				(7572.98)		
1990 Proportion College or More				3527.42		0.038
				(2519.57)		
1990 Tract Risk				-8545.35		-0.038
				(6976.36)		
Adjusted R^2	0.888			0.892		
N	305			305		
*p<0.05, **p<0.01, ***p<0.001						

rate of subprime lending observed in a neighborhood in 1997 was in Kingsessing / Upper Southwest Philadelphia at just over 50 percent. According to this model, a neighborhood in which 50 percent of refinance originations were subprime would see a decrease in median income of approximately $4,119.07 between 1990 and 2000, all else equal. Given that the overall median income in Philadelphia in 2000 according to the 2000 U.S. Census was $30,746, these are fairly large decreases. Again, it is clear that subprime refinance activity, which does not bring in new residents into the community, did not cause the decrease in median income; subprime

[43] In initially specifying the model, I included measures of subprime refinance in 1992 as well as subprime home purchase lending in 1997. As with the above analyses, I exclude them to present the most parsimonious model.

home purchase activity was not associated with a change in median income. The association between neighborhoods with high subprime activity even in the form of subprime and the decrease in median income does raise questions about what is happening in these neighborhoods.

The above analyses show an association between neighborhoods with high rates of subprime lending and neighborhoods with increases in shares of black homeownership and decreases in income. The effect of subprime lending activity on median house value, although larger than expected given market forces when not controlling for other neighborhood conditions, did not hold after taking such neighborhood conditions into account.

Discussion

The lack of clear findings for median house value may be a result of two factors related to timing. First, there is only a short time period between the measure of subprime activity and the measure of the outcome variable. As such, the negative ramifications related to an inability to repay a high cost loan have had little time to affect neighborhood conditions. Although the mortgage market in the United States and neighborhood conditions are dynamic, changes are typically slow to manifest. Perhaps because the time between the measure of subprime lending employed in my models and the measure of the outcome variable is short, the results do not present clear findings on the effects of subprime lending.

The lack of clear findings could also be a result of the type of subprime loans that were being granted during the time period covered by the study. It is likely that the most egregious, abusive and careless lending practices were just beginning to take hold in 2002. It is unclear when the lack of attention on the part of lenders to the ability of borrowers to repay a loan came into regular practice. While the refinance market was often accused of such failures even as early

as the late 1990s and early 2000s, especially with regard to predatory lending practices, predatory lending was believed to be a small portion of the subprime loans being made at the time. In addition, the home purchase segment of the subprime market came later to the practice of subprime lending and it only really began to expand in the early to mid 2000s. Given that predatory lending was believed to be a small portion of subprime lending at the time, it is likely that the subprime loans made in 1997 were less likely to be loans in which the borrowers provided no documentation as proof of their financial ability to repay the loan. Such loans were often called "No Doc" or "NINA" loans, with No Doc short for "no documentation" and NINA for "no income, no assets" as borrowers were not required to provide proof of their income or the value of their assets. NINA loans evolved into NINJA loans- "no income, no job or assets." While it is difficult to tell when such subprime loans became increasingly granted, their popularity likely expanded after the analyses at hand, shortly before the peak of the housing bubble of the mid-2000s, when investors were eating up more mortgage-backed securities and mortgage lenders were doing their best to keep up with demand.

Since my analyses rely on loans made in 1997, it is likely that a higher proportion of the lenders were still doing more to take into consideration the ability of borrowers to repay the loans. In this light, finding that higher rates of subprime loans were associated with higher proportions of black homeowners in a neighborhood and a lower of median income may be evidence that at one point in time, subprime lending did open up opportunities for lower income, minority borrowers. With more judicious lending habits, in other words, subprime loans being granted to borrowers with poor or limited credit histories who have demonstrated an ability to repay the loan and made efforts to fix their bad credit ratings, increased capital in neighborhoods in the form of subprime loans may be beneficial. However, it is difficult to say for certain as the

short time period between 1997 and 2000 may be too small a gap to really see detrimental effects of high rates of foreclosure resulting from subprime home purchase originations.

While the above analyses provide mixed results in terms of the consequences of a concentration of subprime lending in a neighborhood in the 1990s, the situation has only deteriorated. The loans included in my analyses, 1992 and 1997, were originated prior to the full expansion of subprime lending that corresponded to the United States' housing bubble in the early 2000s. In the final quarter of 2007, the Mortgage Bankers Association's (MBA) quarterly survey found that the rates of foreclosure starts and loans in the process of foreclosure were at an all-time high. The survey showed that while subprime adjustable rate mortgages (ARMs) represented 7 percent of outstanding loans in the fourth quarter of 2007, they represented 42 percent of the foreclosure starts in that same quarter. Prime ARMs, on the other hand, represented double the number of outstanding loans, but half the number of foreclosure starts as subprime ARMs.

Indeed Schloemer et al. (2007) predict that the rates of foreclosure are only going to continue to increase. Many borrowers find themselves "under water"- that is owing more on their mortgage than their house is now worth. With such a drop in home values, fewer borrowers who find themselves unable to make their mortgage payments will have the equity needed to refinance their home loan or sell their home to avoid foreclosure (Schloemer et al. 2007). Schloemer and colleagues go on to project that ultimately "15.4 percent of subprime loans originated between 1997 and the third quarter of 2006 will foreclose, and that the probability of foreclosure will double from a low of one in ten (9.8 percent) for loans originated in 2002 to a high of one in five (19.4 percent) for loans originated in 2005 and 2006" (Schloemer et al. 2007, p 15). Indeed the Obama administration has made stemming the rising tide of foreclosures a

priority, banking the recovery of the housing market on the ability of borrowers unable to make their mortgage payments to renegotiate their loan terms to avoid foreclosure. It is clear that future, ongoing research is needed to assess the damage being done to neighborhoods with such high concentrations of foreclosures and for the residents of such communities.

The results discussed in the chapter provide insight into the role that subprime lending played in neighborhood change throughout the 1990s and the ability of that relationship to predict subprime lending rates in 2002. The presence of subprime lending in a neighborhood is a contributing factor to later rates of subprime lending in the neighborhood, but the relationship disappears when race, the education level of the neighborhood and the stability of the mortgage market are taken into account. While the higher rates of subprime refinance lending in 1997 were associated with a decrease in neighborhood median income in 2000, subprime lending was associated with positive changes with regard to median house value and percent of homeowners that are black in the neighborhood, although the effects of subprime lending on median house value disappeared after taking into account a number of additional neighborhood conditions. During the timing of the analysis, and even still today, the consequences of the concentration of subprime lending in a neighborhood have not yet fully played out.

CHAPTER 6

CONCLUSION: DISCUSSION, LIMITATIONS AND IMPLICATIONS

This dissertation explores the existence of a dual mortgage delivery system and the role that it plays in the sorting of subprime lending across neighborhoods in urban areas. In writing this dissertation I wanted to understand the causes behind the high concentrations of subprime lending in some predominantly minority, lower-income neighborhoods. Can the concentration of subprime lending in a neighborhood simply be a function of the self-selection of high risk borrowers into the same neighborhoods? Or do the characteristics of the neighborhood in which a borrower resides play a role in determining the likelihood that he or she originates a subprime loan? At the same time, I wanted to know how much of the concentration was due to income, as opposed to race.

I also wanted to know how these concentrations of high-risk loans affect the neighborhoods where they are located. Is the increased investment in these neighborhoods that were likely previously starved for investment beneficial to these communities even if the investment comes in the form of subprime lending? Or are these loans doing more harm than good? While it may be appealing to see subprime loans fade into the past given the news stories on the high foreclosure rates and the role it has played in the economic crisis, it is important to take a step back and consider the full story of subprime lending before making such a judgment. Is it the case that subprime lending is a cancer in the mortgage market that should be completely excised or is there some redeeming value in subprime lending? Did subprime lending serve to provide people who would have been denied a loan the opportunity to borrow? Did subprime lending open up the opportunity to borrow for people who would have been unable to obtain

credit? Is it possible that there is some redeeming value in subprime lending? To answer this question, I look to an earlier period of subprime lending. While the terms of subprime loans continued to evolve over the course of its, to date, nearly two decade history, I focus on the first decade of subprime lending. It is likely that the loans included in these analyses stop at the beginning stages of the rapid expansion of subprime lending that was used to feed the rapid turnover of home loans into mortgage-backed securities in the mid 2000s. I use the findings from this first decade of lending to weigh the benefits and consequences of subprime lending.

In Chapter 1 I reviewed the literature on subprime lending and the dual mortgage delivery system. While some researchers attribute the concentration of subprime lending to the grouping of individuals in need of subprime, higher cost loans as a result of a lower credit rating, others point to the dual mortgage market as an explanation for the variation in subprime lending across neighborhoods. Apgar and Calder (2005) and Immergluck and Wiles (1999) have argued that there is a bifurcated mortgage market that sorts borrowers by their race into different mortgage segments instead of by borrower creditworthiness, the supposed basis for the segmentation. In reviewing the literature on subprime lending, I identified a need for research that fully investigates these alternative explanations by considering the relative contributions of individual and neighborhood characteristics on the likelihood of subprime lending. I also identified a need for research that investigates the consequences of the concentration of subprime lending in neighborhoods. Finally, in Chapter 1 I proposed a number of hypotheses for my research that help contribute to this discussion.

In Chapter 2 I discussed the data that I used for my analyses and the analytical tools I used to conduct my research. I employed Home Mortgage Disclosure Act (HMDA) data, the data

most often employed when studying subprime lending. Indeed the very purpose of the act was to require the reporting of loan data from lenders specifically to allow for investigations into the extent to which lenders are serving communities' needs and to identify discriminatory practices. I identified subprime loans by categorizing as subprime all loans made by lenders that specialize in subprime loans according to the HUD Subprime Lender list. I employed Hierarchical Linear Modeling (HLM) a statistical method of analysis that allows for a simultaneous investigation into the effects of both individual and neighborhood level predictors on an individual level outcome, of particular import in the study of real estate; it perfectly serves the research question at hand. HLM additionally allows for a look at the impact of an interaction between individual and neighborhood level characteristics. Finally, I employed Ordinary Least Squares (OLS) regression to investigate the effects of earlier rates of subprime lending on later rates of subprime lending as well as Lagged Dependent variable models to investigate the neighborhood ramifications of subprime lending.

The findings in Chapter 3 lend support for the theory that a dual mortgage market is at work in Philadelphia with the market segmentation influenced by both individual and neighborhood race. A key finding in Chapter 3 was the importance of neighborhood characteristics in understanding the varying likelihood of originating a subprime loan by neighborhood. While the findings do point to the importance of individual characteristics in determining the market segment from which a loan is originated, the results show that the characteristics of the neighborhood in which a loan is originated heavily influences the likelihood that a loan is subprime in Philadelphia; with each percentage increase in the percentage of neighborhood residents that are black, the odds that a loan origination is subprime increase sharply. While borrower characteristics did explain some of the variation in subprime

lending across neighborhoods, neighborhood characteristics explained more of the variation in subprime lending across neighborhoods. This highlights the importance of the neighborhood's characteristics in fully understanding the concentration of subprime lending within certain neighborhoods. It is easier for the banks to segment and target neighborhoods than people.

The findings of previous researchers were inconsistent as to whether race at both the individual and neighborhood levels had a statistically significant effect on subprime lending. At the individual level, while Lax *et al.* (2004) found that borrower's race was not a significant predictor of subprime lending after partialling out the effects of credit risk, Pennington-Cross *et al.* (2000) and Calem *et al.* (2004) both found blacks to have a higher chance of borrowing in the subprime sector. At the neighborhood level, while Lax *et al.* and Pennington-Cross *et al.* both found no effect of neighborhood racial composition, Calem *et al.* found that even after controlling for credit risk, higher concentrations of subprime lending were found in predominantly black communities. Reviewing these studies led me to hypothesize that race would have an effect at both the individual and neighborhood levels.

Indeed, in Chapters 3 and 4 I found that across all four areas neighborhood racial composition as well as individual race did affect the likelihood that a refinance loan origination is subprime. Using HLM, I was able to include both individual and neighborhood level predictors in one regression equation; HLM is the best statistical analysis to use when the data are nested as they are in this case- individuals nested within neighborhoods. I found in all four areas, black borrowers were more likely than white borrowers to originate subprime loans. In addition, in all four areas, as the percent of residents in a neighborhood that are black increased, the likelihood that a refinance loan origination was subprime increased. In other words, race

mattered at both the individual and neighborhood levels in all four areas. Unlike the previous studies, however, I was not able to control for credit risk beyond the borrower's income and the tract risk measure of the ratio of the annualized median rent to the median house value. As such, it may be the case that including the omitted variables of credit score or assets at either the individual or neighborhood levels, the significance of race would disappear. However in all refinance analyses the effect is significant at the 99.9 percent confidence level. In addition, the calculation of the predicted probabilities and how closely they match the actual rates of subprime lend some comfort that the findings are wholly inaccurate. I discuss this point further below.

In further exploring the way in which the dual mortgage market works in Philadelphia, I found a statistically significant interaction between individual and neighborhood race; black borrowers, regardless of the neighborhood in which they live, are always more likely than white borrowers to originate a subprime loan. A black borrower's likelihood of subprime relative to white borrowers varies across Philadelphia's neighborhoods and is largest in predominantly white neighborhoods. This is true of both refinance and home purchase lending in Philadelphia. For black borrowers, then, it is not the case that a house is a house is a house. Blacks living in predominantly black neighborhoods see the heaviest concentrations of subprime lending in their communities. If they are not personally affected by losing their home to foreclosure, it is likely that their neighbors or a home down the street has been foreclosed upon. Blacks living in white neighborhoods on the other hand may experience lower rates of subprime lending in their immediate community but are personally much more likely than their white neighbors to originate a high cost, subprime loan. Given the high rates of foreclosure associated with subprime loans, as discussed in Schloemer *at al.* (2006) this may have negative consequences for the communities.

Interestingly, despite observing a relationship between tract median income and the rate of subprime lending in a neighborhood at the bivariate crosstab level, the multivariate analysis revealed a lack of importance of income. The tract median income did not have a statistically significant effect on the likelihood of originating either a refinance or a home purchase loan. That is to say, I did not find a higher likelihood of subprime lending in low income neighborhoods after controlling for the racial composition, college education rate and risk measure of the neighborhood as well as the borrower's race, income and presence of a co-applicant. This was in line with the findings of Immergluck (2004) who conducted an analysis of subprime lending at the neighborhood level in Chicago and found that neighborhood income had little impact on rates of subprime lending. At the individual level, a borrower's income did have a statistically significant effect on the likelihood of subprime even after controlling for a number of additional individual and neighborhood predictors for refinance loans. The findings indicate that a borrower's income does have an effect on the likelihood that his or her loan is subprime, but the median income of their neighborhood does not affect the likelihood that their loan is subprime after taking into account the other variables in the model. This is an indication that the racial composition of a neighborhood has more of an effect on whether a loan origination is subprime than the income level of the neighborhood. Neighborhood income is not a driving force behind where subprime lenders are focusing their lending efforts.

What emerges from these findings is the importance of race and the way in which its impact varies across neighborhoods in this reinvented mortgage delivery system that incorporates subprime lenders. The findings suggest that the mortgage market is indeed segmented by race and that is true for both an individual borrower's race and the racial composition of the neighborhood in which she is borrowing. Subprime lenders' activity is

focused in predominantly black neighborhoods in Philadelphia but also among minority borrowers. Black and Hispanic borrowers were more likely than white borrowers to originate subprime refinance and home purchase loans while borrowers of an Other race were more likely than white borrowers to originate refinance, but not home purchase loans. Indeed even black borrowers living in predominantly white neighborhoods with low rates of subprime lending are much more likely than their white neighbors to find themselves in the subprime segment of the mortgage market.

In Chapter 4, I took the findings from the analyses of Philadelphia's lending processes in Chapter 3 and compared them to three other areas in the United States- Baltimore city, Maryland, San Francisco, California and Alameda County California. Baltimore, much like Philadelphia, is a city with a large African American population and with median income and home values much lower than in San Francisco and Alameda County, California. Using these cities and county for comparison allowed me to investigate whether the dual mortgage market works the same in cities with a higher cost of living and higher home values as it does in cities with lower incomes and lower home values. In addition, I could compare the mortgage market processes in two cities with relatively small black populations but with larger Asian and Hispanic populations, to two cities with larger black populations.

The results in Chapter 4 indicate that the processes at work in Philadelphia were most often similar to the processes at work in the other three areas. The findings in Chapter 4 further support the hypothesis that the racial composition of the neighborhood in which a borrower lives influences the likelihood that the loan he or she receives is subprime. As the percentage of residents in the neighborhood that are black increases, all else equal, the likelihood that a loan is

subprime increases; subprime lenders are more likely to serve neighborhoods with larger black communities. This is as true in Baltimore and Philadelphia, two cities with large black populations, as it is true in Alameda County and in San Francisco, a city comprised of less than 10 percent black residents. It seems that whether in cities with a small black population or cities in which over half the residents are black, lenders use race, both the borrower race and the racial composition of the neighborhood in which they live, as shorthand for creditworthiness and for segmenting mortgage lending.

At the individual level, the results in this chapter further confirm the hypothesis that the effect of being a black borrower on your likelihood of originating a subprime loan changes across neighborhoods. This was true in all four areas. In addition, the impact of being a Hispanic borrower on the likelihood of originating a subprime loan did vary by neighborhood in Alameda County. Although I hypothesized that racial composition of the neighborhood would predict the variation in the likelihood of obtaining a subprime loan for minority as opposed to white borrowers, this was not the case in all areas. In San Francisco, unlike Philadelphia, the varying effect of being a black borrower across neighborhoods was not at all explained by the percent of residents in the neighborhood that are black. This may be because the rate of subprime lending in San Francisco is low, perhaps because the cost of housing is so high, that the variation in subprime lending is less systematic. In the other county with a smaller black population, Alameda County, however, the tract percent black did predict the variation in subprime lending across neighborhoods. Also in Alameda County, the tract percent Hispanic statistically significantly predicts the variation in the likelihood of subprime across tracts for Hispanic refinance borrowers. This is likely due to the city of Oakland in Alameda County, which is less

affluent than San Francisco and is therefore more like Philadelphia or Baltimore than San Francisco.

The impact of race at the neighborhood level and the variation in the effects of race across neighborhoods supports the existence of a dual mortgage market at both the individual and neighborhood levels in all four areas. Not only are black borrowers much more likely than white borrowers to obtain subprime loans, borrowers living in predominantly black neighborhoods in all four areas have an increased likelihood of originating a subprime loan. Further black borrowers living in predominantly white neighborhoods have a higher likelihood of subprime compared to their white neighbors than do black borrowers living in predominantly black neighborhoods. These provide further evidence that race is working at both the borrower and neighborhood levels to influence the likelihood that a borrower originates a subprime loan and the distribution of subprime lending across neighborhoods. While subprime lenders concentrate their lending activities in predominantly black neighborhoods, even black borrowers living in largely white neighborhoods, in three of the four areas studied, are more likely to borrow from the subprime segment of the market.

The mortgage lending processes across these four cities are largely the same; there is a dual mortgage market that appears to be tracking borrowers by race- both their individual race and the racial composition of their neighborhood. While I can not wholly rule out the possibility that controlling for individual credit scores may change the narrative of my findings, the evidence presented in this dissertation is strong enough to warrant concern that the nature of discrimination in the mortgage market has shifted from an inability for black borrowers to obtain credit to an inability for black borrowers to obtain the same lower cost credit as their white

neighbors. The predicted probabilities that demonstrate how closely the model predicts actual rates of subprime support the validity of the models.

In addition to wanting to learn more about the individual and neighborhood predictors of subprime lending and the forces behind its distribution across neighborhoods, I wanted to learn more about the effects of a high concentration of subprime lending for a neighborhood. Since subprime lending is often concentrated in minority neighborhoods, the very neighborhoods that as a result of practices like redlining had been previously starved for capital investment (Jackson 1985), I wanted to question the impact of increased investment in these neighborhoods even in the form of subprime lending. Is the increased investment beneficial to the neighborhood in terms of the increased cash flow to the neighborhoods and higher rates of homeowners to care for and look after their property and protect their investment? Or does subprime lending do further damage to the mortgage market in these already neglected neighborhoods?

In recent months there have been a number of articles and studies done on the high rate of foreclosures in the mortgage market in general and the subprime segment of the mortgage market in particular and the damage that has been caused in neighborhoods with high concentrations of subprime lending. Such neighborhoods have seen large shares of their homes in foreclosure which devastates the neighborhood by having many homes vacant and depresses the home values of the entire community. The studies by Immergluck and Smith (2006) and The Center for Responsible Lending (2006) on just how damaging foreclosures can be for the communities that surround them and how they are even more damaging in minority communities led me to believe that subprime lending would have negative consequences for neighborhoods by increasing the number of homes in foreclosure and as a result decreasing home values. These findings led me to

question the claims that were made in the earlier days of subprime lending when it was often

hailed as a pathway to an opening up of the mortgage market to previously underserved

communities. I wondered if such expansion should really be considered a benefit to these

communities.

While recent rates of foreclosure among subprime loans have reached unprecedented

proportions, rates of foreclosures among subprime loans were higher than those observed with

prime loans even in the earlier days of subprime lending. I wanted to look to the early days of

subprime lending, before the evolution in increasingly lax loan terms opened up the subprime

market to many who could not afford the homes they purchased. In the late 1990s and early

2000s, there was concern that the abusive subprime lenders were preying on individuals who

could not afford the loans they were being granted; this was called "predatory lending" and was

considered to be a subset of subprime lenders. By the mid 2000s, with the advent of NINA and

NINJA loans, stories abound of people being granted loans with terms they had little hope of

affording. Thus to weigh the benefits and consequences of subprime lending, I turn to the time

when predatory lending was a concern but was considered to be the practice of a subset of the

mortgage market. If there are any benefits to subprime lending, they would be more likely to

appear with these earlier loans that likely underwent a more rigorous lending process than later

subprime loans.

First I wanted to understand whether the presence of subprime lending in a neighborhood

was an important factor in determining later lending rates. Stuart (2003) describes the mortgage

market as a self-fulfilling prophecy, with the existence of lending lowering the risk of future

lending. This description of the mortgage market led me to investigate whether or not the

presence of subprime lending propagates further subprime lending. I used rates of subprime

lending in 1997 and 1992 to predict subprime lending in 2002. While the findings reaffirm the

importance of the racial composition of the neighborhood in affecting the likelihood that a loan

is subprime from Chapters 3 and 4, the findings do not support a relationship between earlier

rates of subprime lending and later rates. I found that earlier rates of subprime lending predict

later rates at the bivariate level, but once I controlled for neighborhood conditions the

relationship disappeared. In other words, neighborhood characteristics are a more important

predictor of subprime lending than an earlier presence of subprime loans. The subprime segment

of the mortgage market does not work on its own as a self-fulfilling prophecy. I suspect this is

the case because during the period of study, subprime lending was rapidly expanding. In 2002, at

the early period of the rapid rise in home values that is now attributed to the housing bubble,

lenders were inventing new loan products and expanding into new markets. I suspect the lack of

a relationship between 1997 and 2002 lending after controlling for neighborhood characteristics

is a function of two factors: 1) the relative newness of subprime lending in 1997 when it was in

the early stages of its rapid expansion and 2) the further shifts in the mortgage market that were

occurring in 2002 with the evolving nature of loan product and loan terms that came to

characterize the unregulated subprime segment of the mortgage market.

The findings further confirmed the importance of neighborhood racial composition in

affecting the rates of subprime lending in neighborhoods. I wanted to understand what these rates

of subprime lending meant for these communities. Was subprime lending opening up

opportunities for black and lower income individuals who had previously been unable to secure a

subprime loan? Did higher rates of subprime lending in a neighborhood result in lower home

values as a result of the higher foreclosure rates associated with subprime lending? Even in the

late 1990s foreclosure rates in the subprime segment of the mortgage market were higher than those found in the prime market.

I conducted a series of lagged-dependent variable regression models to assess the impact of subprime lending in a neighborhood. Conducting lagged-dependent variable analyses provides an indication of the change in the dependent variable above and beyond what would be expected by market forces as the model controls for a measure of the dependent variable at a point earlier in time, in this case 1990. This is important in these analyses because the housing market was growing over the 1990s; I needed to know what effects could be attributed to subprime lending as opposed to other market forces. I conducted three regression analyses and in each case, my dependent variable was a measure of a neighborhood characteristic from 2000. A limitation of this investigation is the short period of time between the measure of subprime lending and the outcome variables. The subprime loans in my models only had a few years to affect neighborhood conditions. As such the findings are really just the initial effects of subprime lending; further research is needed to consider the longer-term effects of subprime lending on neighborhoods. Even still, the results are interesting.

I first investigated whether higher rates of subprime lending in a neighborhood were associated with higher shares of black homeowners and found that higher rates of subprime refinance lending in a neighborhood in 1997 were associated with an even larger increase in shares of black homeowners than would be expected by market forces. I also investigated whether higher rates of subprime lending were associated with a change in neighborhood median income. The analysis showed that higher rates of subprime refinance lending were associated with a decrease in median income. Finally, I wanted to see if subprime lending had a negative

effect on house values because of the high foreclosure rates associated with subprime lending. Because I do not have access to foreclosure rate data, I used median house value as my dependent variable since studies have shown the depressive effect that foreclosures have on house values. While I initially found an association with subprime lending and a larger than expected decrease in median house value, a finding contrary to my hypothesis, this relationship disappeared after controlling for the additional neighborhood characteristics. It may be the case that the overall increase in Philadelphia housing values over the 1990s has weakened the predictive value of the subprime rate.

Overall, the findings showed an association between higher rates of refinance lending and a larger than expected increase in share of black homeownership and a larger than expected decrease in median income. Rates of home purchase lending were not significant. Although it is clear that refinance lending did not open up homeownership opportunities for black and low income borrowers, the association with these two outcome measures is of interest and raises questions about what is happening in these neighborhoods. The results did not show an association between home values and subprime lending after taking into account a number of additional neighborhood characteristics. This is likely a reflection of the very short time period between the 1997 rates of subprime lending and the measure of home values in 2000. One of the reasons subprime lending is associated with higher foreclosure rates is the Adjustable Rate Mortgage (ARM) and the resetting of interest rates after the initial teaser period, which is typically two years. Once their mortgages increase as a result of the higher interest rates, borrowers have an increasingly harder time keeping up with their payments and begin to lag further and further behind in their payment schedule. Given that there was only 3 years between my dependent and independent variables, interest rates for those originating ARM loans in 1997

had just reset and the measure of home values in 2000 may not have included sufficient time to capture borrowers' troubles.

Limitations of this Research

There are a number of limitations to this research. First, is a limitation of many quantitative analyses, the omission of additional, theoretically important variables. There are number of important variables that contribute to the decisions lenders make about a borrower's creditworthiness that I am unable to control for including individual credit rating and borrower's assets. It is likely that my estimates of the odds of subprime for black borrowers as compared to their white neighbors are inflated as a result of my inability to control for these two variables. Since blacks on average are more likely to have limited or marred credit histories and fewer assets than whites, some of their higher likelihood in originating a subprime loan is because black borrowers are more likely than white borrowers to be in need of a subprime loan. While my models would have benefited from the inclusion of these variables, the predicted probabilities and how closely they estimate the actual share of subprime lending in 2002 demonstrate the validity of my model. In addition, the differences between blacks and whites in their likelihood of subprime are large enough that controlling for these additional factors would likely not completely erase the observed effects. In my analyses in Chapter 5, the inclusion of foreclosure data would have provided for a more expansive look at the consequences of subprime lending as high foreclosure rates are the mechanism by which I expect subprime lending will decrease property values and damage neighborhoods.

A second limitation of the research at hand is the time period covered in the analyses. The mortgage market changed rapidly over the 2000s with many of the changes occurring after

the data that was included in the analyses. It is likely that at least some of the findings from the

2002 loans have changed shape in the years since. Recent accounts of subprime lending activity

have tended to describe an expansion of subprime lending beyond minority communities as the

thirst for high returns in the securities market called for an expansion in mortgage lending overall

and subprime lending in particular. To test the extent to which this is true, research that looks

into a relationship between subprime lending in 2002 and later years as the housing bubble

continued to expand is needed. The findings at hand should be held up against analyses of later

years of HMDA data for confirmation. In addition a reanalysis of the models presented in

Chapter 5 when the 2010 United States Census is available would provide additional evidence on

the consequences of subprime lending for neighborhoods without the limitation of the short time

period between the measures of subprime activity and the outcome measures.

Another limitation is the result of classifying loans at the lender level rather than at the

individual loan level as is possible with later years of HMDA data. As discussed in Chapter 2, to

compile its subprime lending list, HUD defines lenders as subprime if a low percentage of their

applications are originated (in other words they have a high denial rate) and if a large percentage

of their originations are refinance loans. Some prime loans were likely misclassified as subprime

simply because they were originated by lenders with a low loan approval rate or a high portion of

their business generated in the refinance market. While classifying loans at the lender level was

beneficial to analyzing a dual mortgage market in which different lenders are serving different

neighborhoods or borrowers, there is a risk of misclassifying loans. One alternate interpretation

of my findings may be that black borrowers or borrowers in predominantly black neighborhoods

are more likely to originate loans with these lenders classified as subprime, but that does not

necessarily mean that they are originating a subprime loan. Someone could make the argument

that while I found that black borrowers in predominantly white neighborhoods are more likely to originate subprime loans than their white neighbors, an alternate interpretation is that these borrowers are originating prime loans like their white neighbors, but are simply originating prime loans from different lenders than their white neighbors.

While this may explain some of the large disparity observed between black borrowers and white borrowers in predominantly white neighborhoods in their likelihood of subprime, the disparity is large enough that I do not believe it would explain away all of the higher likelihood of subprime for black borrowers. In addition, the measurement error works in the other direction. Large lenders such as Chase Manhattan, Residential Funding, and IndyMac often reported the mortgages originated by their subprime divisions with the mortgage originations of their prime divisions. It is necessary to keep this likelihood of misclassification of some number of the loans in mind when reading and interpreting the results of my study.

A fourth limitation is a result of the use of HLM for the analyses in Chapters 3 and 4. While HLM was instrumental in the analyses because of the ability to incorporate cross-level interaction effects, HLM does not allow for the inclusion of missing data in the records. I therefore excluded from the analyses a number of loans that were missing the borrower's income. Although it was not a large portion of the loans, it is unclear how their exclusion affected the results of the analyses. This limitation is mitigated by the inclusion of the race not provided category in HMDA data. This additional race category provided analytically meaningful results that further clarified the role of race in the mortgage markets of the four areas analyzed.

Implications of this Research

There are a number of policy implications for this research. Subprime lending has become a major topic of interest in the United States not only because of its contribution to the current economic woes of the country and the global economic community but also because many neighborhoods across the United States are experiencing high foreclosure rates that damage individual borrowers and communities and are suppressing home values across the country. The country is at a turning point in the narrative of the mortgage market overall and the subprime mortgage market in particular. It is a time when top-down decisions about the future of the mortgage market and the types of products that will be available are crucial for moving the country beyond the troubling housing market. It is a time in which the implications of such research could be most beneficial.

The findings point to the importance of place in the distribution of subprime market activity and the influence that neighborhood has on the likelihood that an individual borrower originates a subprime loan. Neighborhood characteristics including the racial composition of the neighborhood, the percent of residents with a college education and the ratio of median rent to median house value all significantly affected the likelihood that a borrower originates a subprime loan. The segmented mortgage market is not just differentially serving borrowers based on individual characteristics, but also tracks borrowers according to the neighborhood in which they reside. This serves as a reminder of the continued importance of place in the real estate market and the effect that it has on an individual's prospects for borrowing to refinance or purchase their home.

Another implication of this current research is a further elucidation of the limitations of the Home Mortgage Disclosure Act and the data it produces. One of the main goals of the Home

Mortgage Disclosure Act was to produce data that allows for investigations into the extent to which discrimination persists in the mortgage market; discrimination was outlawed with the Fair Housing Act of 1968. Reliance on HMDA data alone, however, can merely suggest the presence of discrimination. Critics of many studies based on HMDA data point out that minorities in this country tend to have lower credit ratings or more limited credit histories and fewer assets than whites. My inability to control for individual credit scores, therefore, does not allow me to entirely rule out the possibility that the differential likelihood of originating a subprime loan between blacks and whites is not a result of discrimination but merely a case of borrowers with poorer credit ratings obtaining subprime loans as intended by the subprime market, in other words evidence that the bifurcated market is functioning properly. By allowing for a more thorough data collection process on each loan applicant, The Federal Reserve Board, charged with implementing HMDA, can do more to fulfill its stated goal.

Finally, the results suggest that black and Hispanic borrowers find themselves much more likely to originate loans in the subprime segment of the mortgage market. While such lending may have opened up opportunities for borrowers previously excluded from the home mortgage market, the increased likelihood of subprime for black and Hispanic borrowers is large and likely more than could be merited by the poor or limited credit histories that they may have. This was true across all four locations that I analyzed and for both refinance and home purchase loans. As the United States government looks to solve the problems associated with the economic recession that was triggered by the high foreclosure rates of subprime loans, solutions that focus on the method of loan distribution should not be overlooked.

While it may be tempting to eliminate the subprime market altogether given the worldwide economic troubles that have grown out of such irresponsible lending practices, there

may be good reasons for continuing subprime loans, albeit in a modified, well-regulated form. While it may seem unfair that borrowers with poor or limited credit histories should be made to pay more for a loan, it is understandable that lenders need some incentive for taking on the additional risk. Borrowers who for whatever reason, including poor or limited credit histories, cannot qualify for a prime loan, but have demonstrated an ability to repay the loan should not be excluded from the opportunity to obtain credit. Instead of severely restricting credit to only the most qualified borrowers, steps toward reforming the subprime market should be taken. There is a need for regulations that would ensure that only borrowers who fail to qualify for a prime loan but have a demonstrated ability to manage and afford the higher cost of a subprime loan are granted such loans. Regulations must ensure that borrowers are not steered toward subprime loans or that lenders fail to "refer up" borrowers who could qualify for a prime loan. In other words borrowers should not pay more than necessary for credit. While such regulations are important for all borrowers regardless of race or income, the results of these analyses demonstrate that there is cause for additional concern in the case of minority borrowers and in minority neighborhoods. As lending practices are reformed, it is important to keep in mind the need to ensure that minority borrowers who are in the position to afford a home loan maintain the ability to get a loan, but increased care must be taken to ensure that they obtain the ability to do so on fair terms.

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APPENDIX A

Table A.1: Descriptive Statistics of Data for Analyses

	2002 Home Purchase	
	Originations	Applications
Individual Loan Level		
Subprime	8.4%	15.7%
Income $50,000 or over	53.5	51.5
White	55.1	48.9
Black	14.6	18.2
Hispanic	5.1	4.9
Other	12.8	11.7
Race Not Specified	12.4	16.3
Male	60.2	58.0
Female	34.6	34.6
Sex Not Specified	5.2	7.4
With Coapplicant	28.0	25.0
Census Tract Level		
Average Percent Black	21.6	27.4
Average Percent Hispanic	6.1	6.4
Average Percent Housing Units Vacant	7.5	8.3
Average Percent Age 16+ Employed	92.1	91.2
Average Percent Age 25+ College Educated	22.4	21.0
Average Median Income	$36,800.17	$35,482.94
Average Median House Value	$87,651.98	$82,502.18
Valid N	13,141	20,404

Table A.2: Home Purchase Origination Percent Subprime by Census Tract
Racial Composition in Philadelphia

Percent Black	2002			1997		
	Originations	Prime	**Subprime**	Originations	Prime	**Subprime**
Less than 20%	9,499	93.5%	**6.5%**	5,623	94.0%	**6.0%**
20 to 39%	783	91.8%	**8.2%**	451	88.9%	**11.1%**
40 to 59%	1,064	86.4%	**13.6%**	377	91.8%	**8.2%**
50 to 79%	806	90.1%	**9.9%**	253	87.7%	**12.3%**
80% or More	989	79.3%	**20.7%**	383	79.6%	**20.4%**
Total	13,141	92.6%	**7.4%**	7,087	91.6%	**8.4%**

Percent White	2002			1997		
	Originations	Prime	**Subprime**	Originations	Prime	**Subprime**
Less than 20%	1,696	83.8%	**16.2%**	493	81.3%	**18.7%**
20 to 39%	1,057	90.4%	**9.6%**	291	88.3%	**11.7%**
40 to 59%	1,613	89.1%	**10.9%**	540	89.8%	**10.2%**
50 to 79%	2,679	94.3%	**5.7%**	920	90.8%	**9.2%**
80% or More	6,096	93.4%	**6.6%**	4,843	94.6%	**5.4%**
Total	13,141	92.6%	**7.4%**	7,087	91.6%	**8.4%**

Subprime Ratio of Predominantly Black to Predominantly White Tracts	**3.14**	**3.78**

Table A.3: Home Purchase Originations Percent Subprime by Census Tract Median Household Income in Philadelphia

Median Income	2002 Home Purchase Originations			1997 Home Purchase Originations		
	Originations	Prime	**Subprime**	Originations	Prime	**Subprime**
Less than $30,000	3,290	88.7%	**11.3%**	3,860	90.5%	**9.5%**
$30,000 to $49,999	8,643	92.3%	**7.7%**	2,943	94.7%	**5.3%**
$50,000 to $69,999	1,006	93.7%	**6.3%**	284	99.3%	**0.7%**
$70,000 or More	202	97.5%	**2.5%**	0		
Total	13,141	92.6%	**7.4%**	7,087	91.6%	**8.4%**

Ratio of Lowest Income to Highest Income Tracts	4.52			13.57		

Table A.4. 2002 Home Purchase Originations Logistic Regression Predicting Likelihood of Subprime

Fixed Effects	Model 1 ANCOVA Coefficient		Odds Ratio	Model 2 Intercept-as-Outcome Coefficient		Odds Ratio	Model 3 Slope-as-Outcome Coefficient		Odds Ratio
Model for Tract Subprime									
Tract Level (Intercept)									
Intercept	-2.398953	***	0.091	-1.83548	***	0.160	-1.8170	***	0.163
	(0.089865)			(0.217883)			(0.203496)		
Proportion Black				0.8764	***	2.402	1.1895	***	3.285
				(0.130892)			(0.162205)		
Proportion of College or More				-2.6246	***	0.072	-2.656574	***	0.070
				(0.372697)			(0.346089)		
Tract Risk				-3.714795		0.024	-4.460342	*	0.012
				(1.933638)			(1.804636)		
Borrower Level									
Applicant's Income (In Thousands)	-0.002112	**	0.998	-0.001298		0.999	-0.0013		0.999
	(0.000779)			(0.000873)			(0.000798)		
Black	0.680435	***	1.975	0.472995	***	1.605			
	(0.119085)			(0.131871)					
Hispanic	0.334015	*	1.397	0.249919		1.284	0.2341		1.264
	(0.143447)			(0.149502)			(0.146004)		
Other	-0.340353	**	0.712	-0.409582	***	0.664	-0.4445	***	0.641
	(0.113267)			(0.123711)			(0.115435)		
Race Not Provided	0.997266	***	2.711	0.930555	***	2.536	0.8632	***	2.371
	(0.086293)			(0.095748)			(0.093802)		
Co-applicant	-0.467498	***	0.627	-0.449684	***	0.638	-0.4435	***	0.642
	(0.087943)			(0.097575)			(0.089315)		
Model for Black Borrower Slope									
Intercept							0.9322	***	2.540
							(0.147521)		
Neighborhood Proportion Black							-0.8876	**	0.41
							(0.278208)		

***p<0.001, **p<0.01, *p<0.05

Table A.4a. Level 2 Variance Components for the
Unconditional Model and the HLM Models in Table A.4

Random Effects	Variance Component		Df
Unconditional Model			
Subprime	0.5055	***	197
Model 1 ANCOVA			
Subprime	0.2547	***	197
Model 2 Intercept-as-Outcome			
Subprime	0.1015	***	194
Model 3 Intercept- and Slope-as-Outcome			
Subprime	0.1628	***	168
Black Slope	0.3574	***	170
***p<0.001, **p<0.01, *p<0.05			

Table A.5: Share of Subprime Home Purchase Originations for Select Neighborhoods in Philadelphia

Neighborhood	1997		2002	
	Loan Originations	Percent Subprime	Loan Originations	Percent Subprime
Center City	814	1.1%	722	1.8%
South Philadelphia	1,354	4.9%	1,926	6.1%
Bella Vista/ Queen's Village / SW Center City	288	3.1%	399	4.8%
Grays Ferry / Point Breeze	152	11.8%	211	4.7%
Remaining South Philadelphia	914	4.4%	1,316	6.7%
South West Philadelphia	619	12.3%	600	16.8%
Kingsessing/Upper South West	51	17.6%	66	15.2%
Middle South West/Blue Bell	337	12.5%	276	17.4%
Elmwood / Hedgerow / Meadows	231	10.8%	258	16.7%
West Philadelphia	1,155	9.2%	1,173	12.4%
Overbrook / Haddington	629	9.9%	528	14.6%
University City	69	13.0%	75	6.7%
Wynnefield	153	5.2%	190	12.6%
Cobbs Creek	254	8.7%	338	9.5%
Mantua/Mill Creek	50	10.0%	42	16.7%
Roxborough/ Manayunk	504	2.4%	831	5.2%
Germantown/ Chestnut Hill	798	6.8%	966	6.9%
East Germantown	109	13.8%	163	11.0%
Chestnut Hill	135	0.0%	109	0.0%
Mt. Airy	283	5.7%	351	4.8%
East Falls / West Central Germantown	271	8.5%	343	9.3%

Table A.5 Continued. Share of Subprime Home Purchase Originations for Select Neighborhoods in Philadelphia

Neighborhood	1997		2002	
	Loan Originations	Percent Subprime	Loan Originations	Percent Subprime
Olney/Oak Lane	1,281	8.9%	1,401	10.9%
Olney / East Oak Lane	656	5.8%	614	10.3%
Ivy Hill / Cedarbrook / West Oak Lane	356	10.1%	472	12.9%
Logan / Fern Rock / Juniata Park	269	14.9%	315	9.2%
Upper North Philadelphia	218	8.7%	205	5.9%
Upper North West of Broad	95	12.6%	87	11.5%
Upper North East of Broad	123	5.7%	118	1.7%
Lower North Philadelphia	544	5.7%	999	3.7%
Northern Liberties	55	7.3%	96	8.3%
Fairmount	246	3.3%	375	3.5%
Lower North All Else	243	7.8%	528	3.0%
Bridesburg/ Kensington/ Richmond	1,056	2.5%	1,254	5.3%
Near North East	3,065	3.6%	4,889	6.7%
Fox Chase	149	2.0%	223	5.8%
North of Roosevelt Blvd (Minus Fox Chase)	1,624	3.6%	2,380	6.3%
South of Roosevelt Blvd	1,292	3.6%	2,286	7.3%
Far North East	1,686	3.2%	2,438	5.1%
North of Roosevelt Blvd	734	3.8%	1,068	4.9%
South of Roosevelt Blvd (Minus Parkwood)	792	2.5%	1,139	4.5%
Parkwood	160	3.8%	231	9.5%
All Philadelphia	**13,094**	**5.2%**	**17,404**	**6.9%**

Table A.6. Predicted Probabilities for Home Purchase Originations Calculated from HLM Logistic Regression Analysis

Subprime = [-1.817 + 1.19(Percent Black) - 2.657(Percent College) - 4.46(Tract Risk)] - 0.001(Average Income) + [0.932 - 0.888*Percent Black](Black) + 0.234(Hispanic) - 0.445(Other) + 0.863(Race Not Provided) - 0.444(Co-applicant)

Neighborhood	Actual 2002 Subprime	Predicted Subprime	Black	White	Hispanic	Other Race	Race Not Specified	Difference (Actual – Predicted)
		Predicted Probabilities- Purchasers with Co-applicants						
Center City	1.7%	1.5%	2.8%	1.2%	1.5%	0.8%	2.8%	0.2%
South Philadelphia								
Bella Vista/ Queen's Village	4.9%	6.3%	8.5%	5.2%	6.5%	3.4%	11.6%	-1.4%
Grays Ferry / Point Breeze	4.4%	6.8%	8.5%	6.5%	8.1%	4.3%	14.2%	-2.4%
Remaining South Philadelphia	7.8%	5.8%	11.0%	5.3%	6.6%	3.5%	11.8%	2.0%
South West Philadelphia								
Kingsessing/Upper South West	18.8%	14.8%	12.1%	11.2%	13.8%	7.5%	23.0%	4.0%
Middle South West/Blue Bell	29.5%	11.5%	12.7%	9.1%	11.2%	6.0%	19.2%	18.0%
Elmwood / Hedgerow / Meadows	23.9%	11.6%	12.1%	8.1%	10.0%	5.3%	17.2%	12.3%
West Philadelphia								
Overbrook / Haddington	19.8%	13.2%	12.3%	10.3%	12.6%	6.8%	21.3%	6.6%
University City	5.8%	3.5%	5.4%	2.7%	3.4%	1.8%	6.2%	2.3%
Wynnefield	14.0%	8.6%	8.4%	6.1%	7.5%	4.0%	13.2%	5.4%
Cobbs Creek	12.0%	12.5%	12.2%	10.6%	13.0%	7.1%	21.9%	-0.5%
Roxborough/ Manayunk	5.5%	3.3%	6.4%	2.8%	3.5%	1.8%	6.3%	2.2%
Germantown/ Chestnut Hill								
East Germantown	22.1%	13.6%	12.1%	10.8%	13.3%	7.2%	22.3%	8.5%
Chestnut Hill	0.0%	2.1%	3.6%	1.7%	2.1%	1.1%	3.9%	-2.1%
Mt. Airy	6.1%	5.3%	5.8%	4.1%	5.2%	2.7%	9.3%	0.8%
East Falls / West Central Germantown	10.8%	7.1%	8.5%	5.9%	7.4%	3.9%	13.0%	3.7%

Table A.6 Continued. Predicted Probabilities for Home Purchase Originations Calculated from HLM Logistic Regression Analysis

Neighborhood	Actual 2002 Subprime	Predicted Subprime	Black	White	Hispanic	Other Race	Race Not Specified	Difference (Actual – Predicted)
Olney/Oak Lane								
Olney / East Oak Lane	14.9%	10.6%	12.6%	8.0%	9.9%	5.3%	17.1%	4.3%
Ivy Hill / Cedarbrook / West Oak Lane	19.8%	15.7%	13.8%	12.8%	15.6%	8.6%	25.7%	4.1%
Logan / Fern Rock / Juniata Park	18.0%	14.4%	13.1%	10.1%	12.4%	6.7%	21.0%	3.6%
Upper North Philadelphia								
Upper North West of Broad	17.6%	14.6%	12.4%	11.4%	14.0%	7.6%	23.4%	3.0%
Upper North East of Broad	0.0%	7.9%	10.5%	5.9%	7.3%	3.8%	12.9%	-7.9%
Lower North Philadelphia								
Northern Liberties	9.0%	3.8%	5.8%	2.9%	3.7%	1.9%	6.7%	5.2%
Fairmount	3.7%	3.1%	5.0%	2.5%	3.2%	1.6%	5.8%	0.6%
Lower North All Else	7.1%	14.7%	14.2%	11.5%	14.1%	7.7%	23.5%	-7.6%
Bridesburg/ Kensington/ Richmond	7.7%	6.4%	11.2%	5.1%	6.4%	3.3%	11.3%	1.3%
Near North East								
Fox Chase	6.6%	4.7%	9.4%	4.0%	5.0%	2.6%	9.0%	1.9%
North of Roosevelt Blvd (Minus Fox Chase)	7.9%	6.0%	10.7%	4.9%	6.1%	3.2%	10.9%	1.9%
South of Roosevelt Blvd	10.0%	6.5%	11.0%	5.2%	6.4%	3.4%	11.4%	3.5%
Far North East								
North of Roosevelt Blvd	5.3%	5.8%	11.2%	4.9%	6.1%	3.2%	10.9%	-0.5%
South of Roosevelt Blvd (Minus Parkwood)	5.3%	4.2%	8.9%	3.8%	4.8%	2.5%	8.6%	1.1%
Parkwood	12.4%	6.2%	11.4%	5.4%	6.7%	3.5%	11.9%	6.2%

Predicted Probabilities- Purchasers with Co-applicants

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Table A.7: Share of Subprime Refinance Originations for Select Neighborhoods in Philadelphia

Neighborhood	1992 Loan Originations	1992 Percent Subprime	1997 Loan Originations	1997 Percent Subprime	2002 Loan Originations	2002 Percent Subprime
Center City	1,011	1.0%	671	4.8%	2,099	3.1%
South Philadelphia	1,613	1.5%	1,815	20.6%	4,411	12.7%
Bella Vista/ Queen's Village	350	0.9%	307	12.1%	1,097	8.0%
Grays Ferry / Point Breeze	121	1.7%	317	36.9%	319	23.2%
Remaining South Philadelphia	1,142	1.7%	1,191	18.5%	2,995	13.4%
South West Philadelphia	373	4.3%	854	37.7%	844	21.3%
Kingsessing/Upper South West	33	3.0%	359	51.0%	154	32.5%
Middle South West/Blue Bell	129	7.0%	260	33.5%	291	21.3%
Elmwood / Hedgerow / Meadows	211	2.8%	235	22.1%	399	16.8%
West Philadelphia	890	8.2%	1,890	33.9%	2,575	21.2%
Overbrook / Haddington	425	8.9%	735	33.9%	1,068	21.8%
University City	68	4.4%	86	16.3%	213	8.5%
Wynnefield	196	6.1%	343	29.7%	493	18.7%
Cobbs Creek	169	3.6%	579	36.1%	685	24.5%
Mantua/Mill Creek	32	43.8%	147	45.6%	116	30.2%
Roxborough/ Manayunk	1,028	1.8%	726	10.1%	2,400	8.4%
Germantown/ Chestnut Hill	1,277	2.3%	1,378	22.7%	2,973	13.1%
East Germantown	109	3.7%	322	37.0%	342	25.4%
Chestnut Hill	270	2.6%	187	3.2%	541	4.4%
Mt. Airy	535	2.4%	474	18.1%	1,208	14.2%
East Falls / West Central Germantown	363	1.7%	395	25.8%	882	12.1%

Table A.7 Continued: Share of Subprime Refinance Originations for Select Neighborhoods in Philadelphia

Neighborhood	1992 Loan Originations	1992 Percent Subprime	1997 Loan Originations	1997 Percent Subprime	2002 Loan Originations	2002 Percent Subprime
Olney/Oak Lane	1,026	6.4%	2,099	36.5%	2,981	23.3%
Olney / East Oak Lane	464	3.4%	561	29.4%	1,065	15.9%
Ivy Hill / Cedarbrook / West Oak Lane	430	9.1%	1,025	36.8%	1,382	27.7%
Logan / Fern Rock / Juniata Park	132	8.3%	513	43.9%	534	26.8%
Upper North Philadelphia	98	18.4%	620	45.3%	365	28.8%
Upper North West of Broad	53	17.0%	335	44.5%	180	30.6%
Upper North East of Broad	45	20.0%	285	46.3%	185	27.0%
Lower North Philadelphia	581	13.1%	793	26.6%	1,634	9.7%
Northern Liberties	128	52.3%	65	16.9%	207	12.6%
Fairmount	330	0.6%	290	7.6%	938	5.1%
Lower North All Else	123	5.7%	438	40.6%	489	17.4%
Bridesburg/ Kensington/ Richmond	604	1.0%	665	25.0%	1,312	15.7%
Near North East	4,232	1.3%	2,531	14.7%	7,500	9.6%
Fox Chase	321	0.6%	183	8.2%	716	7.3%
North of Roosevelt Blvd (Minus Fox Chase)	2,053	1.4%	1,147	11.6%	3,627	10.0%
South of Roosevelt Blvd	1,858	1.2%	1,201	18.6%	3,157	9.7%
Far North East	3,565	1.3%	2,302	9.5%	7,389	8.5%
North of Roosevelt Blvd	1,474	1.0%	966	8.1%	3,101	6.6%
South of Roosevelt Blvd (Minus Parkwood)	1,727	1.5%	1,085	10.3%	3,470	9.4%
Parkwood	364	1.9%	251	11.6%	818	12.1%
All Philadelphia	**16,298**	**2.8%**	**16,344**	**23.1%**	**36,483**	**12.2%**

APPENDIX B

Table B.1 Predicting the Likelihood of Subprime Home Purchase Originations in 2002 in Baltimore City (HLM Analysis with Dependent Variable as Subprime =1, Prime = 0; Standard Errors are in Parentheses)

	Slope-as-Outcome		
Fixed Effects	Coefficient		Odds Ratio
Model for Tract Subprime			
Tract Level (Intercept)			
Intercept	-2.570	***	0.077
	(0.338)		
Proportion Black	0.961	***	2.613
	(0.233)		
Proportion of Age 25+ College or More	-2.059	***	0.128
	(0.484)		
Tract Risk	-2.756		0.06
	(2.588)		
Borrower Level			
Applicant's Income (In Thousands)	-0.001		0.999
	(0.001)		
Black			
Hispanic	0.568		1.764
	(0.476)		
Other	0.709	**	2.031
	(0.259)		
Race Not Provided	0.909	***	2.481
	(0.166)		
Co-applicant	-0.175		0.839
	(0.157)		
Model for Black Borrower Slope			
Black	1.477	***	4.381
	(0.262)		
Tract Proportion Black	-0.419		0.658
	(0.355)		

Table B.2 Percentages of Subprime Refinance Loans by Race and Ethnicity Predicted by the HLM Analysis for Baltimore Neighborhoods

	Actual 2002 Subprime	Predicted Subprime	Predicted Probabilities- Purchasers with Co-applicants					Difference (Actual – Predicted)
			Black	White	Hispanic	Other Race	Race Not Specified	
Center	10.8%	15.1%	19.7%	9.3%	20.9%	29.6%	28.0%	-4.3%
East	14.5%	22.9%	21.8%	13.8%	29.3%	39.8%	37.9%	-8.3%
North	9.6%	10.9%	18.6%	6.4%	15.1%	22.1%	20.8%	-1.3%
NorthEast	22.4%	20.7%	23.7%	11.1%	24.3%	33.9%	32.1%	1.8%
NorthWest	17.6%	20.3%	21.5%	11.6%	25.3%	35.0%	33.2%	-2.7%
South	10.9%	14.3%	23.8%	9.4%	21.1%	29.8%	28.2%	-3.4%
SouthEast	9.3%	12.0%	26.2%	7.9%	18.3%	26.2%	24.7%	-2.7%
SouthWest	24.7%	23.0%	24.2%	12.8%	27.6%	37.8%	35.9%	1.7%
West	26.6%	29.5%	24.9%	16.8%	34.3%	45.4%	43.4%	-3.0%

Table B.3 Percentages of Subprime Home Purchase Loans by Race and Ethnicity Predicted by the HLM Analysis for Baltimore Neighborhoods

| | Actual 2002 Subprime | Predicted Probabilities- Purchasers with Co-applicants | | | | | | Difference (Actual – Predicted) |
		Predicted Subprime	Black	White	Hispanic	Other Race	Race Not Specified	
Center	10.68%	11.5%	20.3%	7.2%	12.0%	13.6%	16.1%	-0.8%
East	14.29%	19.1%	29.0%	12.1%	19.5%	21.8%	25.5%	-4.8%
North	4.55%	7.4%	16.6%	5.1%	8.7%	9.8%	11.8%	-2.9%
NorthEast	15.06%	17.1%	23.2%	8.3%	13.8%	15.5%	18.3%	-2.0%
NorthWest	13.80%	16.0%	23.4%	8.8%	14.6%	16.4%	19.3%	-2.2%
South	5.02%	10.2%	21.7%	7.2%	12.0%	13.6%	16.1%	-5.2%
SouthEast	4.89%	7.3%	18.4%	5.4%	9.1%	10.3%	12.4%	-2.4%
SouthWest	18.03%	17.3%	25.3%	9.6%	15.8%	17.7%	20.8%	0.8%
West	25%	26.2%	29.2%	12.4%	20.0%	22.3%	26.0%	-1.2%

Table B.4 Predicting the Likelihood of Subprime Home Purchase Originations in 2002 in San Francisco (HLM Analysis with Dependent Variable as Subprime =1, Prime = 0; Standard Errors in Parentheses)

	Intercept-as-Outcome	
Fixed Effects	Coefficient	Odds Ratio
Model for Tract Subprime		
Tract Level (Intercept)		
Intercept	-1.378 ***	0.252
	(0.227)	
Proportion Black	1.563 **	4.775
	(0.581)	
Proportion College or More	-3.222 ***	0.040
	(0.450)	
Tract Risk	-1.228	0.29
	(1.581)	
Borrower Level		
Applicant's Income (In Thousands)	0.000	1.000
	(0.001)	
Black	1.305 ***	3.687
	(0.204)	
Hispanic	1.473 ***	4.361
	(0.150)	
Other	0.049	1.050
	(0.125)	
Race Not Provided	0.603 ***	1.828
	(0.148)	
Co-applicant	-0.199	0.819
	(0.108)	
Model for Black Borrower Slope		
Black		
Tract Proportion Black		

Table B.5 Percentages of Subprime Refinance Loans by Race and Ethnicity Predicted by the HLM Analysis for San Francisco County Subdivisions

	Actual 2002 Subprime	Predicted Subprime	Black	White	Hispanic	Other Race	Race Not Specified	Difference (Actual – Predicted)
			Predicted Probabilities- Purchasers with Co-applicants					
Central	1.7%	1.4%	5.8%	1.2%	3.1%	0.8%	2.4%	0.3%
Central East	3.4%	4.1%	14.7%	3.2%	8.2%	2.3%	6.5%	-0.7%
Central North	2.2%	3.0%	10.5%	2.3%	6.0%	1.7%	4.7%	-0.8%
Central West	1.9%	2.3%	11.0%	2.3%	5.9%	1.6%	4.6%	-0.4%
North	0.8%	0.9%	3.7%	0.8%	2.1%	0.6%	1.6%	-0.1%
NorthEast	1.0%	3.1%	11.9%	2.6%	6.7%	1.9%	5.3%	-2.1%
North West	1.5%	2.1%	9.6%	2.0%	5.2%	1.5%	4.1%	-0.6%
South East	9.5%	8.7%	24.8%	6.0%	14.7%	4.4%	11.8%	0.8%
South West	7.1%	5.7%	17.7%	4.0%	10.1%	2.9%	8.0%	1.4%
Twin Peaks	2.1%	2.4%	9.7%	2.0%	5.3%	1.5%	4.1%	-0.3%

Table B.6 Percentages of Subprime Home Purchase Loans by Race and Ethnicity Predicted by the HLM Analysis for San Francisco County Subdivisions

	Actual 2002 Subprime	Predicted Subprime	Predicted Probabilities- Purchasers with Co-applicants					Difference (Actual – Predicted)
			Black	White	Hispanic	Other Race	Race Not Specified	
Central	4.0%	4.4%	12.1%	3.6%	14.0%	3.8%	6.4%	-0.4%
Central East	7.5%	10.9%	25.9%	8.7%	29.2%	9.0%	14.8%	-3.4%
Central North	8.4%	8.4%	21.9%	7.1%	24.9%	7.4%	12.2%	0.0%
Central West	4.4%	7.1%	19.7%	6.2%	22.4%	6.5%	10.8%	-2.7%
North	2.5%	3.0%	8.5%	2.5%	9.9%	2.6%	4.4%	-0.5%
NorthEast	5.4%	8.8%	22.1%	7.1%	25.1%	7.5%	12.3%	-3.4%
North West	3.5%	6.4%	18.1%	5.6%	20.7%	5.9%	9.8%	-2.9%
South East	25.1%	24.4%	40.1%	15.4%	44.2%	16.0%	25.0%	0.7%
South West	16.6%	15.7%	31.5%	11.1%	35.2%	11.6%	18.6%	0.9%
Twin Peaks	5.7%	7.4%	18.5%	5.8%	21.2%	6.1%	10.1%	-1.7%

Table B.7 Predicting the Likelihood of Subprime Home Purchase Originations in 2002 in Alameda County (HLM Analysis with Dependent Variable as Subprime =1, Prime = 0; Standard Errors in Parentheses)

	Black Slope-as-Outcome		
Fixed Effects	Coefficient		Odds Ratio
Model for Tract Subprime			
Tract Level (Intercept)			
Intercept	-0.718	*	0.488
	(0.305)		
Proportion Black	0.213		1.237
	(0.165)		
Proportion College or More	-3.072	***	0.046
	(0.312)		
Tract Risk	1.907		6.73
	(5.821)		
Borrower Level			
Applicant's Income (In Thousands)	-0.00001		1.000
	(0.0004)		
Other	-0.023		0.978
	(0.678)		
Race Not Provided	0.602	***	1.826
	(0.079)		
Coapplicant	-0.116	***	0.891
	(0.033)		
Model for Black Borrower Slope			
Black	1.064	***	2.8991
	(0.132)		
Tract Proportion Black	0.510		1.6646
	(0.332)		
Model for Hispanic Borrower Slope			
Hispanic	1.002	***	2.7238
	(0.102)		
Tract Percent Hispanic	0.770	*	2.1596
	(0.346)		

Table B.8 Percentages of Subprime Refinance Loans by Race and Ethnicity Predicted by the HLM Analysis for Alameda County Subdivisions

	Actual 2002 Subprime	Predicted Subprime	Predicted Probabilities- Purchasers with Co-applicants					Difference (Actual – Predicted)
			Black	White	Hispanic	Other Race	Race Not Specified	
Alameda	3.9%	4.0%	10.4%	3.4%	7.2%	2.5%	7.2%	-0.1%
Berkeley	3.8%	3.5%	8.1%	2.8%	5.8%	2.0%	5.8%	0.3%
Fremont	4.5%	4.11%	11.7%	3.8%	8.0%	2.8%	8.0%	0.4%
Hayward	9.6%	7.2%	15.3%	5.4%	11.1%	4.0%	11.1%	2.4%
Livermore	3.7%	4.3%	11.4%	3.7%	7.7%	2.7%	7.7%	-0.6%
Oakland	12.3%	9.1%	14.5%	6.1%	12.4%	4.5%	12.4%	3.2%

**Table B.9 Percentages of Subprime Home Purchase Loans by Race and Ethnicity
Predicted by the HLM Analysis for Alameda County Subdivisions**

| | **Actual 2002 Subprime** | **Predicted Subprime** | **Predicted Probabilities- Purchasers with Co-applicants** | | | | | **Difference (Actual – Predicted)** |
			Black	White	Hispanic	Other Race	Race Not Specified	
Alameda	11.6%	17.1%	34.3%	14.9%	32.2%	14.6%	24.2%	-5.5%
Berkeley	8.6%	13.5%	27.7%	11.1%	25.3%	10.9%	18.5%	-4.9%
Fremont	19.2%	19.6%	37.82%	17.08%	35.94%	16.76%	27.33%	-0.4%
Hayward	32.6%	28.7%	46.9%	22.5%	44.1%	22.1%	34.6%	3.9%
Livermore	13.1%	19.1%	37.4%	16.9%	35.6%	16.6%	27.1%	-6.0%
Oakland	28.5%	29.1%	46.9%	20.4%	41.2%	20.1%	31.9%	-0.7%

APPENDIX C

Figure C.1 Subprime Home Purchase Originations in 1997 by 2002
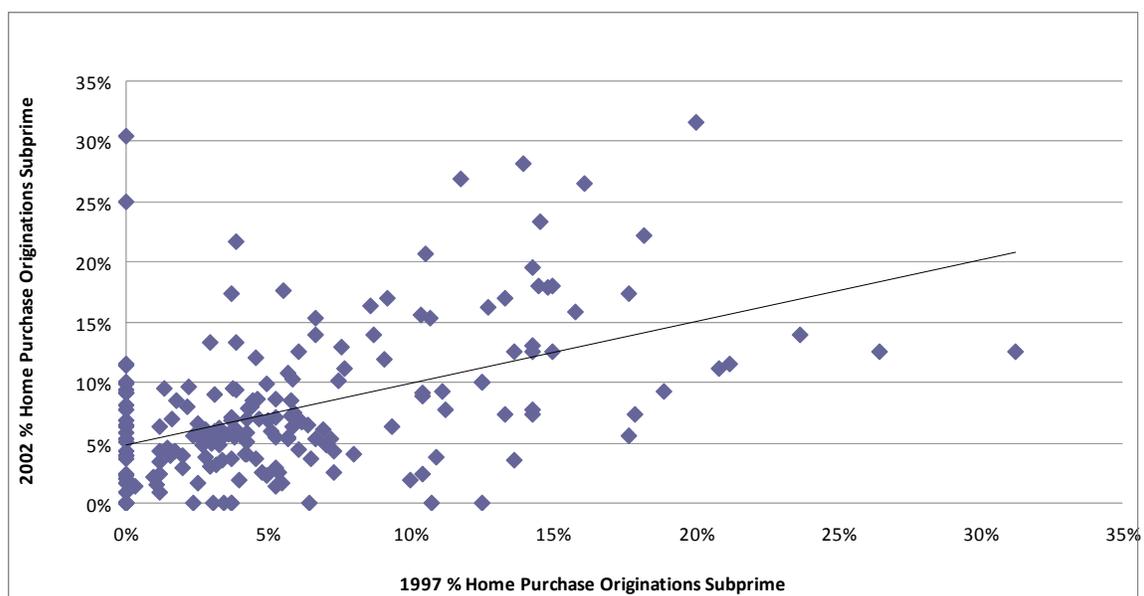
Table C.1. Ordinary Least Squares Regression of 2002 Proportion Home Purchase Originations Subprime

	Model 1		Model 2	
	B	**B**	**B**	**B**
Intercept	0.059 ***		-0.239 *	
	(0.006)		(0.115)	
1997 Share of Home Purchase Originations Subprime	0.286 ***	0.291	0.122	0.125
	(0.055)		(0.063)	
Neighborhood Measures in 1990				
Median Household Income			-8.04E-08	-0.012
			(5.21E-07)	
Proportion Black			0.085 ***	0.403
			(0.018)	
Proportion Hispanic			-0.026	-0.039
			(0.046)	
Proportion Employed			0.314 *	0.253
			(0.123)	
Proportion College			-0.029	-0.063
			(0.040)	
Proportion Vacant			-0.102	-0.088
			(0.083)	
Tract Risk			0.112	0.100
			(0.106)	
Adjusted R^2	0.082		0.167	
N	297		297	
*p<0.05, **p<0.01, ***p<0.001				