



Subprime Mortgage Segmentation in the American Urban System

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Abstract: Research and policy debates in the United States have focused on the dramatic growth of mortgage lending in the risky subprime sector, which serves consumers with weaker credit histories, and its concentration in racially and ethnically marginalized communities. Evidence linking the subprime boom to the proliferation of predatory abuses, however, is often dismissed as anecdotal or isolated in a few unique places. In this paper, we undertake a geographical analysis of the central justifications for deregulated risk-based pricing: the proposition that subprime credit serves those who would otherwise be excluded, and reduces exclusionary credit denials. Multivariate analyses of metropolitan- and individual-level processes across the U.S. urban system provide evidence suggesting that subprime mortgage segmentation exacerbates rather than reduces traditional inequalities of denial-based exclusion.

The Subprime ‘Meltdown’

In early 2007 the bills finally came due on America’s subprime lending boom. For years, the growth rates seemed ever more inexorable and impressive in the “subprime” or “B-and-C” market, which involves high-cost lending to consumers with credit histories too risky for the more inexpensive terms of prime, A-rated loans. By one estimate, total B-and-C home mortgage originations ballooned from \$65 billion in 1995 to \$332 billion in 2003 (Chomsisengphet and Pennington-Cross, 2006, p. 37), and over the years underwriting standards, marketing tactics, loan terms, and securitization strategies became ever more flexible, complex, and risky. In a climate of steadily rising home values, however, the fallout from even the riskiest practices could be masked behind quick distress resales (where debtors on the verge of default can avoid foreclosure but still lose their homes), such that the industry provided increasing profits for lenders and brokers, as well as the investment banks and investors involved in mortgage-backed securities traded on Wall Street. As long as the market seemed to be working, interpretations of subprime lending generated few points of consensus: the industry’s growth remained a battleground, with fairly well-defined trenches dividing conservative and liberal theoretical commitments. Conservative economists and industry partisans applauded the growth of the subprime lending as a benevolent case of risk-based pricing: access is made possible for those who would otherwise be excluded, with higher costs justified by the elevated risks of consumer default. Critical social scientists, legal scholars, and community activists viewed much of the subprime growth as a syndrome of “predatory” lending -- aggressively pushing borrowers into credit they do not need, and using deceptive practices to trick borrowers into high-cost credit that spins off large up-front fees -- all at the expense of sustainable homeownership and asset-building.

For years, conservatives and liberals have fought a vicious war over the appropriate interpretation of key empirical indicators. It is undisputed, for instance, that subprime lending is disproportionately concentrated among racially and ethnically marginalized *individuals* and *neighborhoods* -- especially African American communities. Nationwide, 54.7 percent of African American homebuyers received high-cost subprime loans in 2005, compared with 17.2 percent of Non-Hispanic Whites (*Origination News*, 2006, p. 81). For those on the Right, this

simply means the industry is serving minorities who have long been excluded from mainstream credit because of their lower incomes, worse credit, and more unstable employment histories. Analysts on the Left cite evidence that racial disparities persist after accounting for income and other factors, and charge that the subprime industry is based in large part on securities market innovations that have allowed lenders, brokers, and investors to profit from exploitation and discriminatory targeting of vulnerable homeowners and communities (Engel and McCoy, 2002; Howell, 2006; Renuart, 2004; Squires, 2004). Those on the Right counter that racial/ethnic differences in subprime credit reflect consumer choice, that disparities disappear when accounting for the credit histories of individual borrowers, and that unregulated competition will root out any lenders or brokers who engage in predatory behaviors. From the Left, researchers point out that virtually all of the studies purporting to show that credit history explains all disparities are based on proprietary data made available only to friendly, pro-industry researchers, and that many parts of the industry rely on sophisticated legal techniques that extract profits from unhealthy transactions (including foreclosures) while preventing market competition from eliminating predatory abuses. Those on the Right parry the blows by claiming that an inflammatory term like “predatory” cannot be defined, and that any attempt to impose regulations on such a poorly-defined problem will harm those consumers most in need of credit. For more than a decade, debate continued to dig the same trenches ever deeper into the battlefield (Ambrose and Pennington-Cross, 2000; Calem et al., 2004; Chomsisengphet and Pennington-Cross, 2006; Collins et al., 2005; Durkin and Staten, 2002; Dymski, 1999; Howell, 2006; Immergluck, 2004; Li et al., 2006; Squires, 2004).

Recently, however, the debate began to shift in important ways. When the long-running boom in U.S. housing prices began to falter in 2005 and 2006, subprime lending nevertheless soared: the industry loosened underwriting standards even further, and it became clear that the market could not be explained solely in terms of consumer demand; lenders were pushing hard to meet Wall Street’s earnings expectations and to find more borrowers in a falling market. Subprime borrowers accounted for 20 percent of all mortgage originations in 2005 and 2006, up from 8 percent in 2003; total subprime notes outstanding reached \$1.3 trillion in 2006, almost four times the figure from 2003 (Rushton, 2007). 1.2 million foreclosures were reported nationwide in 2006 -- an increase of 42 percent over the previous year. One federal agency estimated that more

than a million of the (mostly subprime) mortgages with low introductory “teaser” rates would reset to higher rates in 2007 alone, just as falling house prices would make it impossible for cash-strapped borrowers to sell or renegotiate to avoid default (Joint Economic Committee, 2007). As conditions worsened in 2007, a number of subprime lenders declared bankruptcy and investors pummeled the stocks of mainstream banking giants who had recently acquired subprime subsidiaries (Creswell and Bajaj, 2007; Sorkin, 2002; Tam, 2007). The by-lines from London, New York, Hong Kong, and other global stock exchanges began to take on an air of panic after the Dow Jones average slid 415 points on the last day of February: “Stock markets around the world plummeted yesterday in a wave of selling ...” “In America, the selling seemed to add to worries that a decline in the housing market, and problems in particular with loans to risky borrowers, could spill over.” (Norris and Peters, 2007, p. A1; see also Andrews, 2007a, 2007b).

Remarkably, in just a few months, the contentious “subprime/predatory” debate broke out from the cloistered seminars of research and measurement, and became for a brief period the focus of front-page, above-the-fold coverage of the fears of investors, financial analysts, and regulators in Washington, D.C., Wall Street, London, and other cities at the peak of the global-city hierarchy. And as subprime went prime time, the proliferation of sensational, shocking revelations threatened to drown out the prevailing policy consensus that deregulated markets are always the most efficient and equitable answer.¹ Just as Enron made it difficult to defend the virtues of dynamic market innovation in creative accounting techniques, the subprime crisis made it difficult to say that the market was doing fine when the Mortgage Bankers Association reported that the percentage of homes entering foreclosure in 2006 reached the highest figure ever recorded in the 37-year history of the statistic (Timmons and Werdigier, 2007, p. C1). Perhaps not surprisingly, the editorial page of the *Wall Street Journal* attacked when the U.S. Senate Banking Committee held hearings on what by then was widely described as a subprime

¹ A few of the more sensational Enron-style revelations included the stories about the flamboyant red Ferrari convertible driven by an executive at New Century, an aggressive lender focused on low-income homeowners (Creswell and Bajaj, 2007); the proliferation of sophisticated (and deceptive) loan products with ‘teaser’ introductory rates, like the hybrid adjustable-rate mortgage (quickly dubbed by critics as the HARM) and one creative firm’s NINJA: the no income, no job, no assets loan (Pearlstein, 2007, p. D1); lavish celebrity coverage of an asset-backed bond trader pictured in front of his yacht named the “Forward Carry,” who reaped millions betting on a subprime bond collapse in late 2006 (Bajaj, 2007); and the disclosure that even as the crisis was throwing millions of families into distress in mid-2007, troubled subprime lenders were being snapped up by deep-pocket investors like Cerberus Capital Management, which found time amidst its \$7.4 billion takeover of Chrysler to pick up Option One and several other familiar subprime nameplates (Bajaj and Creswell, 2007).

meltdown: the *Journal* editors argued that the wave of bankruptcies of subprime lenders was a sign that the industry had been charging too little to compensate for the credit risks of their consumers.² Yet on the other side of the newsroom, the *Journal* published a surprisingly intimate, horrifying account of the wave of foreclosures sweeping through a Black middle-class neighborhood on West Outer Drive in Detroit -- a story that conservatives could easily have dismissed as a liberal anecdote, if it had not appeared in the pages of the most conservative major newspaper in America (Whitehouse, 2007). The *Journal* correspondent described the fate of several homeowners facing foreclosure on their subprime loans, and suggested: "In addition to putting families into homes, subprime mortgages and the brokers who peddle them are helping to take families out of homes in which they've lived for years, eroding the benefits that proponents on Wall Street and in Congress have long touted. ... In 2006 alone, subprime investors from all over the world injected more than a billion dollars into 22 Zip codes in Detroit, where home values were falling, unemployment was rising and the foreclosure rate was already the nation's highest." The *Journal's* vivid portrait of families in a Detroit neighborhood seemed to summarize a decade of specialized academic research, in ways that challenge the very foundations of consumer sovereignty. The subprime boom was not driven by any sudden exogenous increase in consumer demand, but by supply-side changes in how subprime notes could be sold on Wall Street. "Suddenly, mortgage lenders saw places like West Outer Drive as attractive targets for new business, because so many families either owned their homes outright or owned much less on their mortgages than their homes were worth." The new industry structure encouraged hard-sell tactics to push credit on more and more borrowers, regardless of their ability to repay. "Unscrupulous players had little reason to worry about whether or not people could afford the loans: the more contracts they could sign, the more money they stood to make." (Whitehouse, 2007).

In this paper we seek to engage this evolving terrain of interpretation, as theories of risk-based pricing seem increasingly at odds with systemic market failures encouraging behaviors that are indisputably bad (whether or not we call them predatory). Our specific purpose is to analyze the

² This conventional wisdom conveniently ignores the fact that consumer delinquency is only one element of lender risk: the others include prepayment (which happens when other lenders and brokers get a borrower to refinance, in the process earning another round of fees and charges) and the changing tolerance of investors who provide credit to the lenders. And while bankruptcy shelters companies as they reorganize, personal bankruptcy laws in the U.S. have made it much more difficult for consumers to discharge their debts.

geography of racial-ethnic disparities in subprime lending, and to do so in a way that helps us to understand *where* subprime credit appears to serve the needs of those who would otherwise be excluded from mainstream credit -- and where subprime credit appears to exacerbate exclusion and inequality. Our geographical approach is closely aligned with Massey and Meegan's (1985) conceptualization of extensive research -- examining a few phenomena quantitatively across many places, as opposed to intensive, qualitative case studies of many different phenomena in a single locality. We seek to map some of the dynamics of subprime lending across the entire U.S. urban system, with more than three hundred local housing markets. Our approach is designed to respond to the common criticism of vivid portraits of family and neighborhood distress: skeptics commonly use geography to dismiss accounts like the *Wall Street Journal's* diagnosis of the unfolding crisis in Detroit. Detroit, the skeptics will say, is a unique (basket)case. Perhaps it is, but Detroit and hundreds of other unique cases are tightly woven into an entire urban system of homeownership, racial-ethnic inequalities, and mortgage market segmentation (Sugrue, 2005; cf. Dymski, 1999; Immergluck, 2004). When viewed from Wall Street or Washington, many of these cities are mundane, ordinary places that are easily overlooked, like the "black holes" ignored by the top-of-the-hierarchy bias of globalization and world-cities research (Short, 2004; cf. Knox and Taylor, 1995; Sassen, 2002; Taylor, 2003). What would the landscape of subprime mortgage lending look like if we understood it as one aspect of cities as systems within systems of cities (Berry, 1964)? What would the map look like if we produced something like Berry's (1972) *City Classification Handbook* for subprime credit flows?

Our analytical narrative proceeds in five parts. First, we review the contentious debate over how to define and identify predatory lending. Since opponents of anti-predatory legislation have ensured that public data cannot be used to measure the problem, we propose an alternative approach based on the simple idea of the burden of proof: racial-geographic disparities in subprime lending cannot be taken as *prima facie* evidence of discrimination or predatory behavior, but the *burden of proof shifts where these disparities persist after accounting for demand-side, borrower characteristics*. Second, we describe the extent of subprime lending in the U.S. urban system, and its relation to urban and regional inequalities of race and ethnicity. Third, we analyze the relation between subprime availability and traditional exclusion throughout the urban system. Fourth, we refine the analysis with models that control for the

qualifications of individual homeowners and homebuyers. Finally, we summarize our findings and the implications for analysis and action.

Subprime, Predatory, and Politics

Ever since the term “predatory” was applied to mortgage lending practices (Zuckoff, 1992), the label has been both polarizing and popular. It conveys the simple essence of processes that are often quite complex (we may not understand precisely how the predator catches his prey, but we know that blood is spilled when he does) and so journalists, organizers, and researchers sympathetic to the community reinvestment movement deploy the term frequently (Joint Economic Committee, 2007; Lee, 2007; Relman et al., 2004; Renuart, 2004; Squires, 2004). Yet not all subprime lending is predatory: subprime refers to a specific niche that can be defined by the industry’s own criteria (Chomsisengphet and Pennington-Cross, 2006; Li et al., 2006; Quercia et al., 2004; Scheeselle, 2006). Predatory, by contrast, is often used in press accounts and advocacy campaigns in ways that mix causes, consequences, intentions, and judgments -- such that the term becomes a pliable, chaotic concept.³ To address this problem, Engel and McCoy (2002) developed a clear set of criteria defining predatory lending as a syndrome involving at least one of five distinct processes: 1) lending designed “to result in seriously disproportionate net harm to borrowers,” 2) harmful “rent-seeking,” i.e., using market power to charge rates and fees well beyond those justified by competitive market conditions, 3) using deception and illegal fraud to consummate loan transactions, 4) engaging in other forms of deception that are not explicitly prohibited by law, and 5) forcing or tricking borrowers into giving up meaningful legal protections, e.g., mandatory arbitration clauses. Engel and McCoy’s (2002) definition distills the wide range of dozens of different abuses of borrowers down to their fundamental economic and legal essence -- so that attorneys, regulators, and legislators can identify appropriate strategies for litigation or regulation. But applying this definition requires close-range, in-depth analysis of individual loan documents or internal company practices; and every single time anyone invests in this kind of intensive research, conservatives respond by dismissing the resulting evidence of predatory behavior as anecdotal -- a single bad broker, a few bad people in one lender, or the understandable quirks of a few basket-case housing markets like

³ We are grateful to one of the anonymous referees for this turn of phrase.

Detroit. When confronted with evidence from intensive research, in other words, conservatives demand that predatory lending be measured with extensive research methods across the entire market, in a standardized quantitative way across many different institutions, borrowers, and places.

For those with vested interests in arguing that predatory lending does not exist, it is a convenient fact that systematic, extensive data cannot be used to measure the phenomenon. Industry lobbyists have fought hard to make sure the data are never made public. The most extensive public data source on home loans comes from the Home Mortgage Disclosure Act (HMDA), which every year requires most lenders doing business in any of the metropolitan areas of the U.S. to report a few pieces of information on every loan application they receive (including whether they approve or deny the request) (FFIEC, annual). HMDA is uniquely rooted in civil rights legislation of the 1970s, and so it also includes individuals' responses to questions asking them to identify their race, ethnicity and gender. But the financial information in HMDA is very limited in comparison to the detailed databases that lenders compile, and which they occasionally share with pro-industry researchers. In particular, HMDA provides no direct measure of applicant creditworthiness. When the regulatory provisions of HMDA were revised a few years ago to identify certain high-cost loans -- to help improve the empirical definition of "subprime" - many academic researchers and community reinvestment advocates submitted formal comments asking not only for new data fields that would help identify abusive loan terms, but also for a key variable that would exonerate lenders from charges of discriminatory predation if indeed they were innocent: applicant credit history. But the industry's written comments argued against any new disclosures. Immergluck (2004, p. 219) was absolutely correct when he predicted the terms of public debate when the newly released data exposed severe racial and ethnic disparities: "...lenders will dismiss disparities as due primarily to differentials in credit history, without having to offer any evidence in this regard. ... banks argued against including such data in HMDA, but later they will almost certainly argue that, without such data, the pricing data cannot be interpreted."

If we cannot identify predatory loans in HMDA, but if we must use HMDA because it is the only source of extensive, quantitative data with information on race/ethnicity that can rebut the

dismissive notion of isolated bad apples, what can we do? We approach this dilemma in two ways. First, we avoid the impossible task of using public data to classify loans as predatory. Instead, we shift the focus to the central claims of risk-based pricing; the legitimacy of the subprime sector hinges on this economic and regulatory doctrine (Chomsisengphet and Pennington-Cross, 2006; Collins et al., 2005; Durkin and Staten, 2002; Stiglitz and Weiss, 1981). Risk-based pricing begins from the simple idea that credit markets operate most efficiently when lenders are able to set equilibrium risk-adjusted prices for all of the credit they extend. Yet when lenders have insufficient or imperfect information about the true repayment intentions of borrowers, a problem of adverse selection plagues the market: raising the cost of credit deters low-risk borrowers with good intentions, but has no deterrent effect for risky, irresponsible consumers. This problem of ‘asymmetric’ information -- a lender can never really know as much as a borrower about the person’s true intentions to honor the debt -- renders the most important tool of economics (the price mechanism) impotent, or worse, dangerous. As long as lenders cannot accurately separate good and bad applicants, they will protect themselves by setting qualification standards too high and rationing credit on supply rather than price -- such that credit demand persistently exceeds supply (Stiglitz and Weiss, 1981).

The historical consensus among economists is that credit rationing was a pervasive feature of the U.S. housing finance system through the 1980s, and that the calculus of risk and asymmetric information -- and not racial-ethnic discrimination -- explained the problem of “redlining” that starved minorities of credit. The contemporary corollary is that credit rationing has been dramatically eased by advances in consumer credit reporting, credit scoring algorithms, and increasingly sophisticated models of delinquency, default, and prepayment (see Collins et al., 2005; Durkin and Staten, 2002; Pennington-Cross et al., 2000). All of these innovations have helped to reduce the problems of asymmetric information, the consensus holds, resulting in a more efficient and more equitable market. Lenders who specialized in higher-cost, risk-adjusted credit are able to serve borrowers who would otherwise be unable to obtain credit. Mainstream lenders who avoid the specialized marketing and underwriting innovations of the subprime sector, the argument goes, remain trapped in the old credit-rationing regime: they loan to clearly low-risk A-rated borrowers, but they cannot distinguish good B-and-C prospects from the truly risky ones. So they reject them all, regardless of the profits to be made. Subprime specialists,

meanwhile, are able to separate good from bad, and so they serve precisely those kinds of B-and-C borrowers turned away by mainstream banks. Since there is no public information that mirrors the internal risk-modeling systems used by subprime specialists, then we should be unable to distinguish between these different pools of borrowers when we use the limited public data on income, loan amount, and the like. Borrowers who receive high-cost credit from subprime specialists should be indistinguishable from those denied by mainstream, prime lenders. We test this hypothesis by a) analyzing whether subprime lending reduces mortgage exclusion and denial in different cities across the U.S., and b) testing for differences between individual borrowers rejected by prime lenders and those served by subprime specialists.

The second element of our approach is based on the simple ideas of circumstantial evidence and the burden of proof. We make no presumption that subprime credit is inherently predatory, but we also reject the *laissez-faire* assumption that all subprime transactions are inherently Pareto-optimal expressions of fully informed consumer choice. We use a simple multivariate regression approach to model the segmentation of racially and ethnically marginalized borrowers into subprime credit in different cities across the U.S. urban system. If racial-ethnic and geographic disparities persist after accounting for borrower characteristics, then we contend that the burden of proof shifts, and requires subprime advocates to provide further justification -- backed up by publicly disclosed data -- for credit market inequalities. In this sense, our approach is similar to then-New York Attorney General Eliot Spitzer's attempt to get internal underwriting data from several large lenders under his jurisdiction that had alarmingly high racial disparities in their HMDA records (Parker, 2005; Stein, 2005). Our approach is also similar to the statistical analyses of HMDA routinely performed by staff at the Federal Reserve Board, who found sufficient statistical significance in the racial disparities of 200 institutions to refer them for further regulatory examination based on the 2004 HMDA, and 270 lenders based on the 2005 data (*Origination News*, 2006, p. 81).

Measuring the U.S. Subprime Urban System

To evaluate the claim that risk-based pricing explains the geography of subprime lending, we assembled a database that includes information on many different *places* as well as *individuals* applying for home loans. At the heart of the database are the loan application records from the 2004 HMDA files,⁴ which for the first time included indicators for high-cost, “rate-spread” loans: loans where the annual percentage rate is more than three percentage points higher than the reported yield on Treasury securities of comparable maturity for first-lien obligations, and five percent for subordinate liens.⁵ The database includes all applications filed across several hundred metropolitan areas, and excludes multifamily records, applications submitted before the new 2004 requirements took effect,⁶ and records without valid geographical identifiers. We use various subsets of this database to analyze the geography of lending flows, and the effects of borrower characteristics on lending outcomes.⁷ And to analyze the relations between lending trends and the characteristics of metropolitan regions, we created a different subset that matches records to metropolitan area characteristics from the 2000 U.S. Census of Population and Housing.⁸

⁴ HMDA records are released annually, and so the 2004 records are not the most recent available. We focus on 2004 because it is the first year of the crescendo of the subprime boom that ran into trouble during 2006 and 2007; moreover, the 2004 records capture the last full year of credit activity prior to the devastation of a number of Gulf Coast housing markets in Hurricane Katrina in September, 2005. Analysis of 2004 subprime activity offers a conservative, best-case scenario, and under-estimates the risky practices that spread through the market in 2006 (Joint Economic Committee, 2007).

⁵ The APR used to identify rate-spread loans “captures not just the contract-based interest rate on a loan, but also points and fees that a consumer pays up-front reflected as an interest rate. The APR is generally accepted as a good measure of loan price.” (FDIC, 2005, p. 4).

⁶ Applications received late in the year often wait until early the next year for a final decision. For the new reporting requirements that took effect January 1, 2004, these prior-year applications are identified with a specific flag indicating that, for example, rate-spread information was not required.

⁷ The main database includes approximately 21.3 million applications. Because of the prohibitive time required to perform iterative procedures such as maximum likelihood estimation, our loan-level models (Tables 3 through 6) are estimated on random samples of all applications. This approach has negligible effects on the practical significance of the model parameters, although increasing the number of records used for model estimation does make it easier for parameters to pass tests of statistical significance.

⁸ This step required excluding 57 metropolitan areas that can be identified in new metropolitan area definitions implemented in 2003 and used for the 2004 HMDA, but impossible to match to metropolitan summaries of the 2000 Census data.

The Subprime Urban Hierarchy

For a first glance at the U.S. subprime urban system, consider three simple analyses of the database. The first is a simple tabulation of the proportion of all approved, conventional single-family loans that exceed the rate-spread threshold (Table 1). The highest subprime market shares do highlight a few familiar icons of urban distress -- Detroit does indeed make the list -- but most of the entries are places that are almost completely ignored by the housing and lending literatures. In the home purchase market, the nation's capital for subprime lending is McAllen, Texas, where 42.1 percent of all homebuyers received rate-spread loans. "Many areas of the United States look for distinctiveness in ways that portray them as 'Number One,'" begins a report from researchers at the University of Texas - Pan American, but this region earns first-class status on a suite of troubling benchmarks: highest unemployment, lowest per capita income, highest volume of border drug seizures, greatest concentration of poor, informal enclaves (*colonias*) housing the nation's largest population of migrant farm workers (Richardson and Pagan, 2002, p. 2). In the home improvement market, the peak of the subprime hierarchy is Dothan, Alabama, once cited in passing by Reynolds Farley as a place so poor, with such a low cost of living, that anyone there lucky enough to have an income at the federal poverty level could actually expect a reasonable standard of living (cited in Jennings, 1994, p. 12). In the refinance market, the subprime global city is Hinesville-Fort Stewart, Georgia, a town half an hour southwest of Savannah that is home to the Army's largest installation east of the Mississippi; service members and their families account for about two-thirds of Hinesville's population (Surrin, 2007).

TABLE 1 ABOUT HERE

An American Subprime Dilemma

When we consider the entire list, however, some familiar elements of American regional geography appear. For our second simple analysis, we summed the loan records to create about a dozen simple indicators of each metropolitan mortgage market; we then used a simple principal

components analysis and cluster analysis⁹ to classify all of the nation's metropolitan areas in the spirit of the classical ecology literature (Berry and Kasarda, 1977).

The results distill the nation's 387 metropolitan areas into ten distinct types, revealing many fascinating urban and regional dimensions of housing and credit circumstances. Here we focus on just one: a group of thirty metropolitan areas where three of ten loan requests are denied, and the population of those who do receive loans is split mostly along the traditional American division between Non-Hispanic Whites and Non-Hispanic African Americans. This group of metropolitan areas has the nation's highest prevalence of subprime lending -- 25 percent of purchase loans, 31 percent for renovation loans, and 30 percent for refinance loans. Moreover, despite the fact that our analysis is based solely on simple credit indicators -- and includes no variables for regional location or context -- the result maps out the deep, sedimented histories identified sixty years ago as the *American Dilemma* (Myrdal, 1944, especially Volume II, pp. 605-638). The pattern is inescapably American, geographical, historical, and contemporary (see Figure 1). This is today's home-financing legacy of the Black Belt that was created across the U.S. South in the Reconstruction era. On the periphery, of course, we find exceptions and curiosities. To the west, Lawton Oklahoma gets much of its racial and ethnic diversity from the enlistees at Fort Sill, home of the Army's Field Artillery units, on a base that is the last of the forts built across the southern plains to fight the 'Indian Wars' a century ago. To the north, Detroit is among the largest of the industrial destinations for the Great Migration of southern rural African Americans forced off their land by agricultural mechanization after the First World War.

FIGURE 1 ABOUT HERE

But at the center of the Black Belt, just beyond the southern reach of the Appalachian piedmont, equidistant from the Virginia and Carolina upland towns and the Mississippi floodplain settlements to the west, is Albany, Georgia. Today, 32 percent of conventional mortgage applications here are rejected. Among those who do get loans, one quarter receive rate-spread

⁹ The principal components analysis yielded four eigenvectors accounting for 73 percent of total variance, which we used (in unrotated form) as input to a non-hierarchical, nearest-centroid sorting algorithm. The result captured about seven-tenths of the variance in the four components by grouping the nation's 387 metropolitan areas into ten clusters.

credit for home purchases, and the high-cost share rises to 34 percent in the refinance market and 38 percent for home improvement loans. If one reads the headlines describing controversies over payday lending and the battles over lending regulations in the Georgia legislature (Schanze, 2003, Unger, 2003), one sees the present-day version of the antebellum residue described by W.E.B. Dubois when he did part of the fieldwork for *The Souls of Black Folk* near Albany. Describing a precarious sharecropping system that would soon be plowed under in the Cotton Kingdom, the Egypt of the Confederacy, Du Bois (2003 [1903], p. 92) observed, “It is a beautiful land, this Dougherty County ... but a pall of debt hangs over the beautiful land; the merchants are in debt to the wholesalers, the planters are in debt to the merchants, the tenants owe the planters, and laborers bow and bend beneath the burden of it all.”

We could sketch this kind of geographical vignette for any of the hundreds of metropolitan areas across the U.S., or for any of the more than 52 thousand urban and suburban neighborhoods that it is possible to identify in the database. But a third simple analysis reveals that most of these vignettes would probably reveal different pieces of the same puzzle: those places with the highest loan denial rates have the highest shares of high-cost subprime lending (Figure 2). More than half of the variation in subprime lending across all metropolitan areas can be explained by variations in denial rates -- and *vice versa*. The figure is even higher if we set aside the unique case of metropolitan areas in Puerto Rico, where even with deep poverty and a high homeownership rate, few households have mortgages. Subprime credit is not as competitive here in the face of generous government subsidies for down payments as well as (for low-income owners) ongoing monthly payment assistance (Hibernia Southcoast Capital, 2004, pp. 18-19).¹⁰ Overall, the pattern attests to a tight correlation, and it underscores the fundamental analytical dilemma: if subprime lending is the optimal risk-based pricing solution to the old problems of credit rationing and exclusion of a generation ago, then why don't we see lower denial rates in places with a lot of subprime activity? Is the segmentation of areas with higher African American populations the result of legitimate risk factors in the local market, including borrower characteristics that disqualify many from prime, mainstream credit? Does the risk-based pricing

¹⁰ Ironically, the Island's largest bank, Banco Popular ran into severe financial troubles not because of local conditions in Puerto Rico, but because of a poorly-timed acquisition of a subprime lender on the U.S. mainland (Reuters, 2007; Cervantes and Shimkus, 2007). In a further irony, Banco Popular has extensive anti-predatory lending education programs.

of subprime lending expand opportunity, reducing the problems of exclusionary denial after accounting for local market conditions and risk factors?

FIGURE 2 ABOUT HERE

Modeling Metropolitan Credit Flows

One way to answer these questions is to model the relations between denial and subprime market share portrayed in Figure 2 -- while controlling for economic and demographic variations across different metropolitan housing markets. We matched the HMDA aggregations to 2000 Census data on a standard suite of measures of mortgage demand and market risk, along with other variables that might help to disentangle interrelated socioeconomic processes (e.g., racial and income inequalities).¹¹ We also created a unique risk measure: HMDA provides no direct information on applicant credit risk, but certain lenders are required to report at least one reason when they reject applications. 'Credit history' is one of the nine options that underwriters can choose, and so we created a variable measuring the proportion of all denied applications where credit history was cited as a factor; this index captures the collective verdict of the many underwriters scrutinizing the qualifications of applicants in each metropolitan market.¹²

Risk-based pricing implies that subprime lending should be greatest in underserved areas with lower incomes and worse credit -- and that after controlling for these factors, subprime share will reduce market exclusion. OLS regression models provide only tepid support for these propositions (Table 2). The models are able to account for four-fifths of the variance in metropolitan subprime share, with fairly robust tolerance diagnostics.¹³ Consistent with the risk-based pricing thesis, subprime shares rise in areas with lower per capita incomes and higher denial rates. But even after accounting for credit risk and housing market conditions, subprime

¹¹ For this stage of the analysis, we excluded metropolitan areas in Puerto Rico, and metropolitan areas that could not be identified in 2000 Census summaries.

¹² Denial reasons are required for lenders supervised by the Office of the Comptroller of the Currency, the Office of Thrift Supervision, and the National Credit Union Administration; our variable measures bad-credit denials at these lenders, as a share of all denials regardless of reason by these lenders, in each market. Denial reasons are optional for all other lenders (see OCC, 2004, p.4).

¹³ With only one exception, the tolerance values are all above the 0.20 threshold where multicollinearity begins to undermine the biased estimates for individual parameters. Even so, all of the tolerances indicate sufficient multicollinearity to reduce the squared semi-partial correlations, because so much of the 0.80 r-squared value for both models is accounted for by joint, overlapping variances of several predictors.

credit is not racially neutral. For Latinas and Latinos, subprime disparities can be explained in terms of demand-side factors; but for African Americans, racial credit inequalities cannot be so easily dismissed. Moreover, there is no evidence that subprime helps to reduce exclusionary denial. Credit risk performs as expected in the denial model, but even after accounting for credit and all other controls, the rate-spread measure remains the single most important factor explaining variations in metropolitan mortgage rejection rates. And even after controlling for all of these conditions, rejection rates are still significantly higher wherever more African Americans and Latinos live. The only encouraging hint is that after we account for the higher rejection rates of areas with more African Americans, we find that places with greater White-Black income inequality have slightly lower rejection rates. In sum, though, none of these model results support the hypothesis that subprime lending represents a racially neutral solution to the problem of mortgage exclusion.

TABLE 2 ABOUT HERE

Modeling Individual Segmentation

Our evidence suggests that at the metropolitan scale, exclusionary denial and inclusionary segmentation into subprime credit are two sides of the same coin. This evidence is consistent with the seeming paradox of a great deal of lending research, which continues to document the old redlining of minority rejection (implying that the financial services industry provides too little credit to some people and places) as well as the new racial disparities in the cost of credit (implying that some lenders aggressively push too much credit on bad terms) (Calem et al., 2004; Dymski, 1999; Holloway, 1998; Howell, 2006; Williams et al., 2005). Industry partisans maintain that subprime lenders have higher denial rates because they have brought new potential borrowers into the marketplace, and that even if market-wide disparities appear, risk-based pricing provides needed service to consumers who would otherwise be unable to qualify for traditional, prime loans. Testing this claim requires a) shifting from the aggregate scale to the level of individual borrowers, and b) measuring individual creditworthiness. Many years ago Abariotes et al. (1993) devised a technique to identify the distinctive profile of applicants in HMDA who are seen as too risky by underwriters (see also Holloway, 1998; Holloway and Wyly, 2001; Myers and Chan, 1995). The approach involves estimating a logistic regression on

a random sample of applications, predicting the likelihood of an applicant being rejected specifically for reasons of bad credit, as a function of the (unfortunately limited) financial information in the HMDA files. The parameters of the bad-credit model are then used to calculate, for each applicant in the database, a probability estimate measuring each individual's similarity to those who are viewed by underwriters as too risky. In addition to income, and estimated debt burden, we also include gender and race/ethnicity: these factors are illegal considerations in underwriting, but for thirty years, lending industry partisans have always claimed that racial differences in lending outcomes are the product of omitted variable bias (i.e., that legitimate but unmeasured risk factors correlated with race explain the disparities). Including gender and race/ethnicity captures as much of this bias as possible; it gives the benefit of the doubt to underwriters. If women and/or minorities have weaker credit profiles even after adjusting for income, then our approach will distill the effect into the credit instrument and create a conservative bias against finding racial discrimination when the credit measure is used in any other model. Our bad-credit model fits reasonably well, with tolerance values indicating no multicollinearity problems, and a good match between predicted and observed outcomes for the largest number of applications in the lower probability ranges (Table 3). Bad-credit denials are more likely for low-income applicants, and for those seeking renovation or refinance loans, subordinate liens, or unsecured loans. All else constant, Hispanics are 2.6 times more likely than Non-Hispanic Whites to be rejected on the basis of bad credit, and this ratio jumps to 3.4 for African Americans.

TABLE 3 ABOUT HERE

Controlling for the estimate of applicant credit risk helps us provide rigorous tests for the interrelated claims of risk-based pricing: a) subprime lenders serve borrowers who would otherwise be excluded, and b) the geography of segmentation, with its pronounced racial and ethnic disparities, is simply the result of demand-side factors.

Segmentation and Exclusion

If subprime lenders serve those who would otherwise face exclusion, then we should observe no systematic differences between two groups of applicants: those who applied and were rejected

by mainstream lenders, and those who succeeded in getting high-cost loans from specialized subprime firms (Scheeselle, 2006). From the perspective of the lending market as a whole, these two groups should be perfect substitutes -- with the main (unobservable) difference being the mistake of some consumers who did not realize they would not qualify at a prime lender. Empirical results do not support this expectation (Table 4, Model 1). A logistic model predicting differences between prime rejections and subprime approvals reveals stark, systematic differences in these populations. True, credit risk does matter, consistent with industry claims: increasing the value of the bad-credit measure by one standard deviation boosts the likelihood that a borrower will be doing business with a subprime lender by a factor of 1.3. But even after accounting for income, loan purpose, and a measure of credit risk that may itself capture the effects of racial discrimination, individual racial disparities persist: all else constant, African Americans are 1.5 times more likely than Non-Hispanic Whites to wind up with a high-cost loan at a subprime lender. Another way to interpret the results is to say that subprime lenders' clientele includes 1.5 times as many African Americans as we would expect if these companies simply served those excluded from mainstream credit. The inequalities remain unchanged if we consider that subprime lending approvals are slightly more likely than prime denials to be in metropolitan areas with elevated denial rates (Table 4, Model 2). Consumer choice may explain some of this disparity. But choice is not a magical, exogenous explanation: there is considerable qualitative and quantitative evidence that African Americans' greater 'choice' for subprime lenders stems in part from aggressive marketing schemes focused on minority neighborhoods (Engel and McCoy, 2002; Calem et al., 2004; Howell, 2006; Renuart, 2004; Squires, 2004).

TABLE 4 ABOUT HERE

Segmentation, Race, and Ethnicity

To test the claim of subprime neutrality, we narrow our focus to conventional loan applications approved and originated by all lenders. We then use a series of logit models to predict subprime selection as a function of borrower characteristics, and to determine whether racial and ethnic inequalities disappear when we account for the geography of credit rationing that risk-based pricing is believed to cure. Consider first the simple model with applicant profiles (Table 5, Model 1). Among all applicants who succeeded in getting loans, those who end up with rate-

spread loans tend to be lower-income consumers with weaker credit: the standardized odds ratio for the credit instrument is 1.42. This is no surprise. But note that the differences between purchase, home improvement, and refinance loans disappear when we control for credit, income, and other factors; and the income to loan amount ratio is positive, providing circumstantial evidence that the subprime sector is focused on borrowers with greater home equity. After adjusting for all other factors, African Americans and Native Americans are almost two times as likely as otherwise identical Non Hispanic Whites to end up with subprime credit. The disparity falls to 1.3 for Latinos and Latinas.

TABLE 5 ABOUT HERE

Racial disparities persist when we consider the role of subprime lending in serving those excluded from credit (Table 5, Model 2). In metropolitan areas with higher conventional denial rates, all else constant, individuals who are approved have a greater chance of ending up with subprime credit. Yet including this factor has negligible effects on racial and ethnic gaps: the odds ratio for African Americans dips from 1.75 to 1.72, while for Native Americans it edges up from 1.96 to 2.05. The evidence does not support the idea that subprime credit reduces exclusion; instead, the findings suggest that unequal subprime segmentation goes hand in hand with rejection and exclusion.

Yet if the evidence indicates that race and ethnicity matter, there are reminders of the importance of contextual, regional dimensions of America's racial geographies. Recall the cluster of cities and suburbs across the Black Belt (Figure 1), which stood out as statistically unique on a few key mortgage variables -- including the racial composition of homeowners and homebuyers. Measuring segmentation effects for these distinctive places reveals compelling evidence of localized, urban and regional financial regimes (Ashton, 2005; Dymski, 1999; Immergluck, 2004). These localized financial environments are clearly not separate from the regional geography of race in America, but they are not reducible to individual applicant race (Table 6). Even after accounting for income, credit risk, and the individual racialization of subprime selection, the Black Belt stands out: of the cluster's thirty metropolitan areas, not one shows segmentation effects that are significantly less than the nationwide comparison for similarly-qualified borrowers. All but four effects are significant and positive. In Jackson, Mississippi

and Pine Bluff, Arkansas, a homeowner or homebuyer is more than twice as likely to get subprime credit compared with otherwise identical borrowers in the rest of the nation. Disparities are slightly lower in Hinesville-Fort Stewart, Georgia, Decatur, Alabama, and across four separate metropolitan areas in Louisiana.

TABLE 6 ABOUT HERE

Conclusions

“That was plenty of greed to prey on the ignorance of consumers in this new, very complicated era. And it was the original mortgage brokers ... they sent those to the mortgage companies ... then sold those mortgages to larger financial services companies, who didn’t sit on them, like your friendly local bank, so you could talk to them. They packaged them, securitized them, divided them up. It was like a stew. Put the carrots, potatoes, peas, and meat in, put it through the blender, and divide it up. And that all went out to the investors, who were very glad, in an era of low interest rates, to get something that yielded more. So there’s a lot of incentive and greed along the chain all the way.”

Terry Savage, financial columnist
for the *Chicago Sun-Times*,
on “Debtor Nation: the Mortgage Mess” (CNN, 2007).

For more than a decade, subprime/predatory lending analysts have fought to a stalemate over the possibilities of definition and measurement, and whether documented cases of lending abuse in particular places can ever be taken as symptomatic of broader credit market processes. In this study, we used a geographical approach to move beyond the intractable dilemmas of uncontested classification and measurement. Regardless of what we call it -- efficient risk-based pricing or invitation to predatory abuse -- subprime mortgage lending is tightly bound up with the enduring racial-geographic inequalities of American housing. Our analysis of credit flows across all of the metropolitan areas of the U.S. urban system yields no evidence that subprime credit helps to reduce the traditional problems of unequal denial and exclusion; instead, the results suggest that subprime segmentation simply adds a new dimension to the old inequalities. Moreover,

geographical and racial disparities in segmentation persist after accounting for borrower characteristics -- not the 'ignorance' cited by Savage and others, but a measure of credit risk that itself captures certain aspects of disparate racial impact. The preponderance of evidence, across many different cities and suburbs throughout the nation, indicates that subprime segmentation cannot be dismissed as an isolated process, and that it exacerbates rather than eases old forms of credit rationing and exclusion. Although the database used in our study has critical limitations, its broad coverage of racial-ethnic variations in credit, and the consistent direction of the findings, merit a shift in the burden of proof: advocates of risk-based pricing who resist regulations on predatory lending have a responsibility to justify, with publicly released data, why African Americans are twice as likely as otherwise identically qualified Non Hispanic Whites to be slotted into the high-cost, high-risk subprime market -- and why subprime credit continues to cast a pall of debt over the beautiful lands of America's Black Belt.

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Figure 1. The Subprime Mortgage Black Belt.

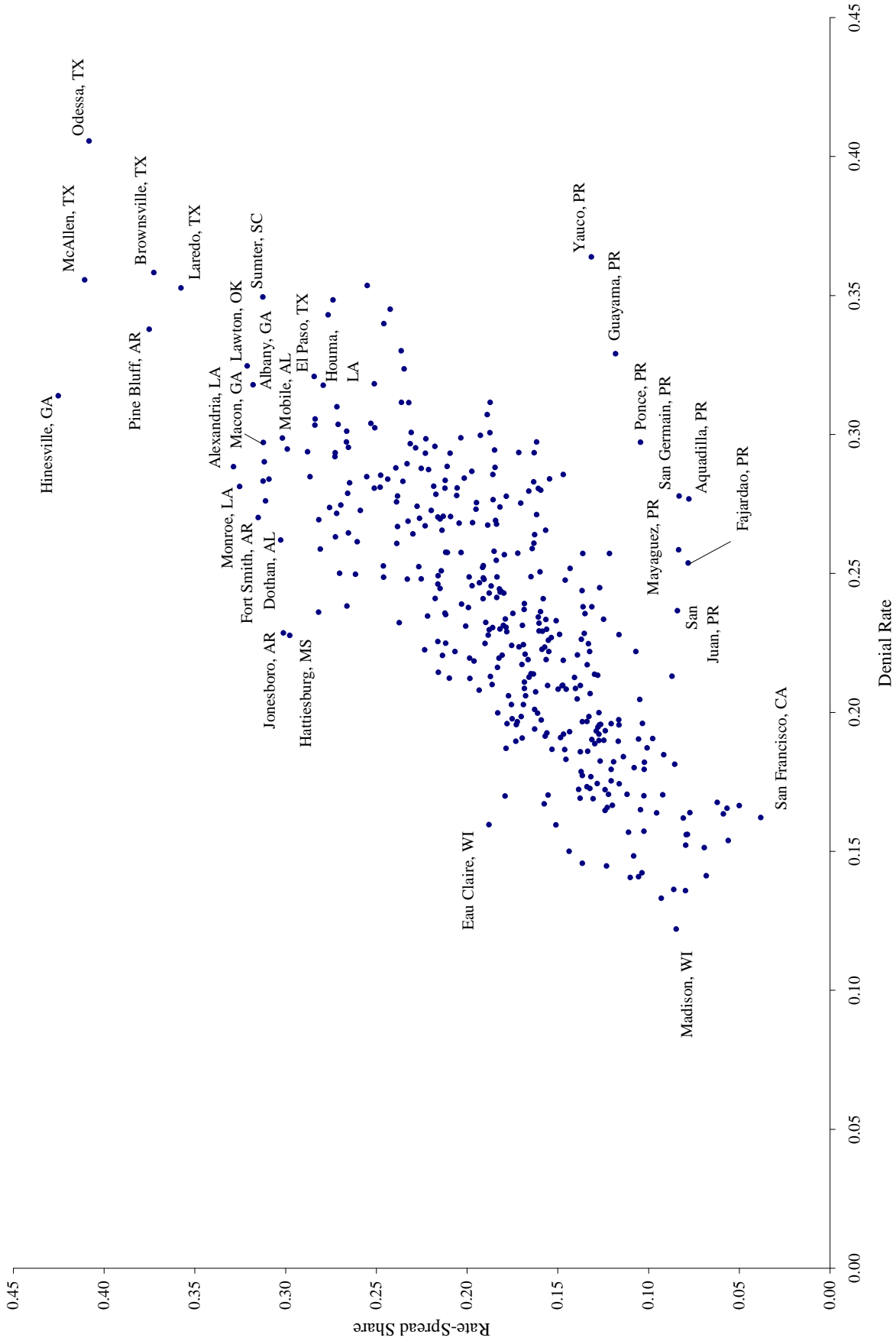


Figure 2. Metropolitan Subprime Market Share and Conventional Denial Rates, 2004.

Source: FFIEC (2005).

Table 1. Metropolitan Areas with Greatest Share of Rate-Spread Mortgage Loans, 2004.

Home Purchase

McAllen-Edinburg-Pharr, Texas	42.1
Odessa, Texas	40.9
Hinesville-Fort Stewart, Georgia	39.9
Laredo, Texas	39.4
Alexandria, Louisiana	37.4
Detroit-Livonia-Dearborn, Michigan	37.1
Pine Bluff, Arkansas	36.5
Jackson, Mississippi	34.8
Brownsville-Harlingen, Texas	33.6
Sumter, South Carolina	32.0

Home Improvement

Dothan, Alabama	46.6
Greenville, North Carolina	44.8
Tuscaloosa, Alabama	44.1
Odessa, Texas	40.5
Valdosta, Georgia	39.8
Kennewick-Richland-Pasco, Washington	38.2
Macon, Georgia	38.1
Athens-Clarke County, Georgia	38.1
Rocky Mount, North Carolina	37.8
Albany, Georgia	37.8

Refinance

Hinesville-Fort Stewart, Georgia	45.6
McAllen-Edinburg-Pharr, Texas	41.8
Brownsville-Harlingen, Texas	41.2
Odessa, Texas	40.9
Pine Bluff, Arkansas	39.4
Laredo, Texas	37.9
Lawton, Oklahoma	35.8
Fort Smith, Arkansas-Oklahoma	35.0
San Angelo, Texas	34.7
El Paso, Texas	34.3

Data Source : FFIEC (2005).

Table 2. Metropolitan Subprime Segmentation and Mortgage Denial.

Label	Subprime Segmentation				Denial			
	Standardized Coefficient	Semi-partial Corr Type II	Partial Corr Type II	Tolerance	Standardized Coefficient	Semi-partial Corr Type II	Partial Corr Type II	Tolerance
Total population (log)	-0.0016	0.000	0.000	0.475	0.1094 **	0.006	0.031	0.490
Non-Hispanic Black share	0.2851 ***	0.026	0.119	0.317	0.1859 ***	0.010	0.052	0.295
Non-Hispanic Native American share	-0.0094	0.000	0.000	0.838	-0.0030	0.000	0.000	0.838
Hispanic share	0.0561	0.001	0.005	0.283	0.1795 ***	0.010	0.049	0.296
Share of foreign-born population arrived 1995-2000	0.0541	0.002	0.009	0.585	-0.0251	0.000	0.002	0.581
Share of labor force in armed forces	-0.0310	0.000	0.002	0.385	-0.0032	0.000	0.000	0.384
Per capita income, 1999	-0.3539 ***	0.037	0.162	0.295	-0.0450	0.001	0.003	0.248
Ratio, White to Black per capita income	0.0580	0.002	0.010	0.595	-0.1277 ***	0.010	0.052	0.621
Ratio, White to Hispanic per capita income	-0.0016	0.000	0.000	0.434	0.0315	0.000	0.002	0.435
Homeownership rate	0.1309 ***	0.007	0.034	0.396	0.0870 *	0.003	0.016	0.389
Percentage of owner occupied housing units built before 1950	-0.0100	0.000	0.000	0.254	0.1111 *	0.003	0.017	0.258
Median gross rent as share of household income	-0.1558 ***	0.013	0.063	0.527	0.0753 *	0.003	0.015	0.501
Share of owner occupied housing units with no mortgage	-0.0808	0.001	0.007	0.198	0.1719 **	0.006	0.032	0.203
Share of mortgaged units with a second mortgage	-0.3183 ***	0.032	0.142	0.312	0.0565	0.001	0.005	0.269
FHA share of conventional single family loans	-0.0423	0.001	0.003	0.285	0.2140 ***	0.014	0.071	0.305
Home improvement loans as share of conventional single family loans	-0.0918 *	0.003	0.015	0.352	0.0432	0.001	0.004	0.348
Refinance loans as share of conventional single family loans	0.0728 *	0.003	0.014	0.500	0.0703 *	0.002	0.013	0.500
Mobile home loans as share of all mortgages	-0.0540	0.001	0.005	0.347	0.2007 ***	0.015	0.076	0.374
Bad-credit denials as share of all denials at required reporters	0.0408	0.000	0.002	0.251	0.1790 ***	0.008	0.044	0.262
Conventional denial rate	0.3657 ***	0.028	0.129	0.212				
Rate-spread share					0.3530 ***	0.027	0.129	0.219
Number of observations	322				322			
Adjusted R-squared	0.80				0.80			

*Coefficient significant at P<0.05; **P<0.01; P<0.001.

Table 3. Bad-Credit Denial Model.

Parameter	Parameter Estimate	Odds Ratio	Tolerance
Intercept	2.8283 *		
Applicant income (ln)	-0.648 ***	0.640	0.79
Ratio of income to loan amount (ln)	0.068	1.065	0.44
Owner-occupied	0.3746	1.454	0.87
Second lien	0.7055 **	2.025	0.53
No lien	1.2908 **	3.636	0.67
Pre-approval requested	-1.2935	0.274	0.92
OTS-regulated lender	0.1283	1.137	0.94
NCUA-regulated lender	-1.6482 ***	0.192	0.90
Home improvement	1.5578 ***	4.749	0.58
Refinance	0.8303 ***	2.294	0.78
Demographic information missing	0.2281	1.256	0.94
Female primary applicant	0.2228	1.250	0.93
Hispanic	0.9605 ***	2.613	0.96
Native American or Alaskan Native	1.0673	2.908	0.99
Asian or Pacific Islander	-0.0424	0.958	0.95
African American	1.2276 ***	3.413	0.94
Number of observations	3,872		
Nagelkerke max-R ²	0.19		
Percent concordant	77.2		

Detailed Model Fit Diagnostics

Probability range	Number of applications	Average model-implied probability	Actual share denied for bad credit
0.1 - 4.9%	1,949	0.027	0.028
5.0 - 9.9%	1,015	0.069	0.071
10.0 - 14.9%	377	0.122	0.101
15.0 - 19.9%	204	0.172	0.196
20.0 - 24.9%	116	0.225	0.207
25.0 - 29.9%	60	0.272	0.283
30.0 - 34.9%	36	0.326	0.167
35.0 - 39.9%	35	0.374	0.400
40.0 - 44.9%	26	0.420	0.423
45.0 - 49.9%	15	0.477	0.467
50.0 - 54.9%	10	0.528	0.900
55.0 - 59.9%	15	0.572	0.733
60.0 - 64.9%	7	0.620	0.571
65.0 - 69.9%	2	0.693	0.500
70.0 - 74.9%	2	0.719	0.500
75.0 - 79.9%	2	0.787	1.000
80.0 - 84.9%	1	0.832	1.000
85.0 - 89.9%	-	-	-
90.0 - 94.9%	-	-	-
95.0 - 99.9%	-	-	-

Notes: The dependent variable is: application rejected by lending institution, with at least one of the stated reasons cited as "credit history."

Models estimated on a random sample of all loan applications. Odds ratios for income, and loan ratio report the change in odds with an increase of one standard deviation in the respective predictor.

*Coefficient significant at P<0.05; **P<0.01; ***P<0.001.

Table 4. Modeling Differences between Subprime Approvals and Prime Rejections.

Parameter	Model 1		Model 2	
	Parameter	Odds	Parameter	Odds
	Estimate	Ratio	Estimate	Ratio
Intercept	-3.5073 ***		-4.0383 ***	
Applicant income (ln)	0.2542 ***	1.170	0.2876 ***	1.197
Ratio of income to loan amount (ln)	-0.1322 *	0.880	-0.1657 **	0.852
Owner-occupied	-0.1005	0.904	-0.1065	0.899
Second lien	0.9645 ***	2.623	1.0148 ***	2.759
No lien	-13.1117	0.000	-13.0443	0.000
Pre-approval requested	-0.5809 **	0.559	-0.5778 **	0.561
OCC-regulated lender	-3.9423 ***	0.019	-3.9498 ***	0.019
OTS-regulated lender	-2.7502 ***	0.064	-2.7447 ***	0.064
FDIC-regulated lender	-1.1516 ***	0.316	-1.146 ***	0.318
HUD-regulated lender	1.6152 ***	5.029	1.6167 ***	5.036
Home improvement	-1.4125 ***	0.244	-1.4134 ***	0.243
Refinance	0.2658 ***	1.304	0.2644 ***	1.303
Demographic information missing	-0.6558 ***	0.519	-0.654 ***	0.520
Female primary applicant	0.2534 ***	1.288	0.255 ***	1.290
Hispanic	0.392 **	1.480	0.3933 **	1.482
Native American or Alaskan Native	-0.5644	0.569	-0.5634	0.569
Asian or Pacific Islander	-0.2001	0.819	-0.1849	0.831
African American	0.4161 **	1.516	0.4091 **	1.505
Credit history instrument	2.3447 *	1.298	2.3784 *	1.303
Metropolitan conventional denial rate			1.3089	1.056
Number of observations	6,552		6,552	
Nagelkerke max-R ²	0.52		0.52	
Percent concordant	87.1		87.1	

Notes: The dependent variable separates a) rate-spread originations by lending institutions specializing in subprime marketing (Scheeselle, 2006) from b) applications rejected by non-subprime specialists.

Models estimated on a random sample of all loan applications. Odds ratios for income, loan ratio, credit history instrument, and denial rate report the change in odds with an increase of one standard deviation in the respective predictor.

*Coefficient significant at $P < 0.10$; ** $P < 0.05$; *** $P < 0.01$.

Table 5. Subprime Segmentation Models.

Parameter	Model 1		Model 2	
	Parameter	Odds	Parameter	Odds
	Estimate	Ratio	Estimate	Ratio
Intercept	2.9328 ***		0.9834	
Applicant income (ln)	-0.6951 ***	0.647	-0.5771 ***	0.696
Ratio of income to loan amount (ln)	0.6208 ***	1.663	0.48 ***	1.482
Owner-occupied	-0.1322	0.876	-0.1665 *	0.847
Second lien	0.2342 **	1.264	0.4587 ***	1.582
No lien	-17.32	0.000	-16.963	0.000
Pre-approval requested	-0.5613 ***	0.570	-0.5768 ***	0.562
OCC-regulated lender	-1.4981 ***	0.224	-1.5096 ***	0.221
OTS-regulated lender	-1.3065 ***	0.271	-1.2675 ***	0.282
FDIC-regulated lender	-0.7392 ***	0.477	-0.6938 ***	0.500
HUD-regulated lender	0.958 ***	2.606	0.9698 ***	2.638
Home improvement	-0.8937 ***	0.409	-0.8052 ***	0.447
Refinance	-0.0092	0.991	0.0251	1.025
Demographic information missing	0.1274 *	1.136	0.1437 **	1.155
Female primary applicant	0.165 ***	1.179	0.1783 ***	1.195
Hispanic	0.2967 ***	1.345	0.3265 ***	1.386
Native American or Alaskan Native	0.6711 *	1.956	0.7179 *	2.050
Asian or Pacific Islander	-0.1718	0.842	-0.1041	0.901
African American	0.5621 ***	1.754	0.5435 ***	1.722
Credit history instrument	5.4335 ***	1.421	5.3298 ***	1.411
Metropolitan conventional denial rate			5.3652 ***	1.237
Number of observations	22,154		22,154	
Nagelkerke max-rescaled R ²	0.28		0.28	
Percent concordant	80.5		80.8	

Note: odds ratios for income, loan ratio, and credit history instrument report the change in odds with a one standard deviation change in the predictor. Models estimated with a random sample of all applications approved and originated as conventional loans.

*Parameter significant at P<0.05; **P<0.01; ***P<0.001.

Table 6. Subprime Segmentation in the Black Belt.

	Parameter Estimate	Odds Ratio
Intercept	4.6835 ***	108.2
Applicant income (ln)	-0.8992 ***	0.570
Ratio of income to loan amount (ln)	0.7706 ***	1.840
Owner-occupied	-0.1425 ***	0.867
Second lien	-0.4738 ***	0.623
No lien	-18.4976	0.000
Pre-approval requested	-0.4004 ***	0.670
OCC-regulated lender	-1.3722 ***	0.254
OTS-regulated lender	-0.9456 ***	0.388
FDIC-regulated lender	-0.283 ***	0.753
HUD-regulated lender	0.93 ***	2.534
Home improvement	-0.2408 ***	0.786
Refinance	0.0304 *	1.031
Demographic information missing	0.2964 ***	1.345
Female primary applicant	0.0997 ***	1.105
Hispanic	0.2501 ***	1.284
Native American or Alaskan Native	0.0238	1.024
Asian or Pacific Islander	-0.3797 ***	0.684
African American	0.7483 ***	2.113
Credit history instrument	4.1957 ***	1.408
Montgomery, Alabama	0.0594	1.061
Shreveport-Bossier City, Louisiana	0.4509 ***	1.570
Monroe, Louisiana	0.5273 ***	1.694
Alexandria, Louisiana	0.6273 ***	1.873
Rocky Mount, North Carolina	0.1941 ***	1.214
Augusta, Georgia-South Carolina	0.1591 ***	1.172
Sumter, South Carolina	0.3975 ***	1.488
Danville, Virginia	-0.1021	0.903
Florence, South Carolina	0.3954 ***	1.485
Warner Robbins, Georgia	-0.0326	0.968
Columbus, Georgia-Alabama	0.1874 ***	1.206
Columbia, South Carolina	0.0996 **	1.105
Jackson, Mississippi	0.7047 ***	2.023
Birmingham, Alabama	0.2934 ***	1.341
Tuscaloosa, Alabama	0.0346	1.035
Albany, Georgia	0.3403 ***	1.405
Burlington, North Carolina	0.2983 ***	1.348
Baton Rouge, Louisiana	0.4241 ***	1.528
Mobile, Alabama	0.3522 ***	1.422
Jackson, Tennessee	0.1751 **	1.191
Dothan, Alabama	0.3609 ***	1.435
Decatur, Alabama	0.4141 ***	1.513
Macon, Georgia	0.1726 ***	1.188
Lawton, Oklahoma	0.3837 ***	1.468
Fayetteville, North Carolina	0.1853 ***	1.204
Goldsboro, North Carolina	0.2352 ***	1.265
Pine Bluff, Arkansas	0.7971 ***	2.219
Memphis, Tennessee-Mississippi-Arkansas	0.3988 ***	1.490
Hinesville - Fort Stewart, Georgia	0.5949 ***	1.813
Detroit, Michigan	0.3882 ***	1.474
Number of observations	291,606	
Nagelkerke max-rescaled R ²	0.33	
Percent concordant	80.8	

Note: odds ratios for income, loan ratio, and credit history instrument report the change in odds with a one standard deviation change in the predictor. Models estimated with all observations for Black-Belt metros and a random sample of applications in all other metropolitan areas.

*Parameter significant at P<0.05; **P<0.01; ***P<0.001.