SUBPRIME LENDING, THE HOUSING BUBBLE, AND FORECLOSURES IN LIMA, OHIO

THESIS

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The recent housing crisis has engendered much nascent scholarship examining the relationships between foreclosures (the effect) and neighborhood characteristics, lending practices, and house price changes (the potential causes). However, the literature suffers from two important shortfalls: its empirical grounding has been constrained to large metro areas, and no study has adopted a comprehensive approach that examines all three explanatory factors on foreclosure rates. In response, this thesis investigates the relationships among foreclosures, subprime lending, house price changes, and neighborhood characteristics in Allen County/Lima, Ohio, a small, Rust Belt MSA. A broad literature review examines the rise of subprime lending, the housing bubble, the recent surge in foreclosures, and the spatial aspects of each. Bivariate and multivariate analysis examines their relationships, and the multivariate analysis questions what additional explanation is given by the inclusion of housing market phenomena in the model. The thesis also investigates various policy proposals aimed at mitigating the damage of the foreclosure surge, and preventing the most egregious practices of subprime lenders.
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1.1 Statement of the Problem

The past ten years have witnessed a number of historically unique developments in the nation’s housing markets. The mortgage industry has seen the dramatic rise and fall of subprime lending, a form of high-cost financing legalized in the early 1980’s that only achieved wide-spread usage in the early part of this decade (Chomsisengphet & Pennington-Cross, 2006; Gramlich, 2007). Peaking in 2006, subprime lending volume has decreased in each of the following years (Shiller, 2008). Mirroring the fortunes of the subprime industry, house prices enjoyed an astronomical rise in the early portion of this decade, with prices in the twenty largest metro areas more than doubling (even after controlling for differences in the quality of newly-built homes) from January 2000 through their July 2006 peak (Standard & Poor's, 2009). Since then, prices have declined approximately 30% nationwide. Residential foreclosure rates, already increasing since the 1990’s (Kaplan & Sommers, 2009), quickened their rise (the second derivative) in 2006, surged in 2007 and 2008, with little abatement seen in the early months of 2009 (RealtyTrac, 2009).

While the housing downturn and foreclosure surge have deleteriously affected the entire country, its specific impacts, and the extent of these impacts, are spatially variegated at various scales. Taking house prices as an example, at the
metropolitan/region level, all 20 cities\(^1\) in the Case-Shiller Home Price Index, which exclusively measures the nation’s largest metros, have experienced some level of depreciation since their 2006 peaks. However, the amount of deterioration ranges from 50.8% (Phoenix) to 11.1% (Dallas) as of February 2009 (Standard & Poor’s, 2009). Data from the National Association of Realtors, which surveys a much broader range of cities, further supports the differentiated effects of the housing downturn, but also indicates that not all metros have witnessed decreases in residential house values. Prices have risen 20% in Elmira and Binghamton, New York (National Association of Realtors, 2008). Finer-grain, neighborhood-level analysis further supports spatial differentiation in the aftershocks of the housing bust. The Clintonville neighborhood of Columbus, Ohio, has seen steady prices and robust sales, while other areas (even of comparable socioeconomic status) of Ohio’s capital city have witnessed steep price declines and lackluster sales volume.\(^2\)

Despite its variegated effects, most coverage of the housing crisis has focused on larger, predominantly Sunbelt cities, with less attention given to smaller and medium-sized locales, particularly “Rust Belt” metros. These areas have struggled economically for decades, resulting in job losses, population out-migration, and high poverty levels; manufacturing-related maladies have fueled depressed housing values. Data from the National Association of Realtors confirms that, of the 161 MSA’s studied, the fifteen lowest home values are found in Rust Belt states of West Virginia, Ohio, Michigan, Minnesota, Indiana, and Illinois. Prices are calculated on repeat sales within each city’s Metropolitan Statistical Area (MSA), with the exception of New York City, where prices include the entire commuter shed.

\(^1\) Phoenix, Los Angeles, San Diego, San Francisco, Denver, Washington (D.C.), Miami, Tampa, Atlanta, Chicago, Boston, Detroit, Minneapolis, Charlotte, Las Vegas, New York City, Cleveland, Portland (Oregon), Dallas, and Seattle. Prices are calculated on repeat sales within each city’s Metropolitan Statistical Area (MSA), with the exception of New York City, where prices include the entire commuter shed.

\(^2\) Based on sales data provided by a local real estate agent.
Indiana, and Illinois (National Association of Realtors, 2008). Prior to the collapse of the housing bubble and the surge in foreclosures, these states had the highest mortgage default rates in the country; their foreclosure rates have remained high through the economic downturn, although media attention has often focused on other states, such as Arizona and Nevada, where the foreclosure rate has increased at a much stronger tempo (Brooks & Ford, 2007; Edmiston and Zalneraitis, 2007; Schiller & Hirsh, 2008).

From a planning perspective, middle-sized and smaller cities face special challenges in confronting the foreclosure crisis. With smaller budgets and fewer staff members, their planning departments must cope with fewer resources to address foreclosures and vacant housing. The budget shortfalls are exacerbated by the wide range and severe nature of the social ills affecting these cities, including high crime rates, large amounts of vacant property, and elevated poverty rates (Ackerman & Murray, 2004).

The research fills a number of lacunae in the subprime lending and foreclosure literature. Foremost, it investigates the patterns of subprime lending and foreclosures in a small city in the American Manufacturing Belt (AMB) – Lima, Ohio – in contrast to previous research in this vein, which has generally focused on much larger metros like Chicago (Immergluck & Smith, 2006), New Orleans (Baxter & Lauria, 2000; Lauria, Baxter, & Bordelon, 2004), Pittsburgh (Lord, 2005), Akron (Kaplan & Sommers, 2009), Baltimore-Washington (Wyly et al., 2006), and Newark, New Jersey (Newman & Wyly, 2004). Second, the broad literature review incorporates perspectives on subprime lending activity, the housing bubble, and foreclosure patterns. The union of these three

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topics is unique in the literature, as existing perspectives have generally examined two (at most) of the phenomena under study.⁴

Expanding the scale of analysis to include a smaller city is crucial given the nature of the subprime loan industry. While the larger subprime lenders (e.g., Washington Mutual [WaMu], Countrywide, Household) have received the lion’s share of (negative) publicity (cf. Brooks & Simon, 2007; Goodman & Morgenson, 2008; Wyly, Moos, Foxcroft, & Kabahizi, 2008), many subprime loans were originated by individual brokers acting in conjunction with non-bank financial entities (such as hedge funds and investment banks) or by small mortgage companies operating within a strict geographic area (Lord, 2005; Morgenson, 2007). One would suspect that lending strategies would vary across subprime actors, and with lenders employing different approaches, the landscapes of subprime lending (and ultimately foreclosure) would differ across cities. Examining subprime lending practices in a smaller, economically-depressed city without a heated real estate market might unearth interesting results, since it provides lenders with a ready supply of subprime borrowers but lacks the rapidly-increasing house prices that enticed many high-cost originators and brokers.

1.2 Research Questions and Design

This study adopts a comprehensive and intensive approach to investigating recent housing market dynamics in Allen County, Ohio. Topically expansive, it examines historical, theoretical, and empirical perspectives of subprime lending, house price dynamics, and mortgage foreclosures. It pairs this wide inquiry with a narrow empirical

⁴ Cf. Kaplan & Sommers (2009) for an investigation of subprime and foreclosures and Coleman IV et al. (2008) for perspectives on subprime lending and the housing bubble. I am aware of no academic study that examines the impact of the housing bubble on foreclosure rates.
bound: Allen County, Ohio, the sole county in the Lima Metropolitan Statistical Area (MSA).

To that end, the thesis aims to answer the following questions:

1. What are the spatial patterns of subprime lending, house price dynamics, and foreclosures in Allen County?

2. What are the relationships (bivariate) among these housing market phenomena and neighborhood characteristics in Allen County? What are the multivariate relationships between foreclosures (as a dependent variable) and subprime lending, house price dynamics, and neighborhood characteristics (as explanatory variables)? The multivariate modeling can answer a broader, conceptual question, namely *do these housing market phenomena influence the foreclosure rate, or are foreclosures merely defined by certain neighborhood characteristics?*

3. Do the results for (1) and (2) differ from previous studies that have, in general, examined larger cities?

4. What planning and policy implications can be derived from the research?

The conceptual model guiding the research is presented in Figure 1. The research agenda adopted here mirrors certain methodological approaches of previous inquiries into housing market dynamics. Other researchers have employed a number of analytical techniques to examine patterns of foreclosure and subprime lending. On the whole, these studies can be broken down into three themes: (i) broader perspectives, which investigate theoretical issues and nation-wide data without examination of specific cities/housing markets (Renuart, 2004; Brooks & Ford, 2007; Edmiston & Zalneraitis, 2007); (ii) multi-city studies, which detail foreclosure/subprime lending patterns across multiple cities
(Calem, Hershaff, & Wachter, 2004; Richter, 2008, Wyly et al., 2008); and (iii) single city analyses that intensively examine the subprime/foreclosure situation in one locale (Baxter & Lauria, 2000; Newman & Wyly, 2004; Immergluck & Smith, 2006; Wyly et al., 2006). Analytically, studies of type (i) are often constrained by their scale to simple geographic exploration, type (ii) research is similarly limited but often incorporates a quantative element, usually regression modeling, while type (iii) can combine spatial and quantiative approaches with qualitative, strategic informant interviews to provide “on the ground” context (cf. Lord, 2005).

![Figure 1. Conceptual Model.](image)

This study embraces the final analytical strategy and incorporates geographic, quantitative, and qualitative perspectives in the study of a single metro area. First, it conducts a quantitative and spatial exploratory analysis of Allen County property values,
subprime lending, and foreclosures. Property values will be examined from 2000 through 2008 at the block group level; due to data availability, subprime lending can only be studied from 2005-2008 at the Census tract scale. Foreclosure mapping occurs at the parcel level, with identification of individual foreclosures, and parcel-level events can be aggregated into blockgroup-scale foreclosure rates. Of itself, plotting foreclosures and foreclosure rates illustrates levels of neighborhood distress and thus inform foreclosure mitigation strategies (to be explored in a policy implications section). Foreclosure maps can also guide field work and strategic interviews, detailed below.

Second, both bivariate and multivariate relationships are explored through Pearson’s zero-order correlation coefficients (bivariate) and spatial lag regression modeling (multivariate) at the blockgroup level. This analysis identifies which neighborhood variables correlate with foreclosure rates and has proven popular across the foreclosure literature in a wide variety of settings (cf. Wyly et al, 2008; Kaplan & Sommers, 2009). It is particularly useful for identifying the central tendency of foreclosure, and thus lends itself to planning efforts that, by necessity, must stretch limited resources to accomplish the most good. Principal components analysis (PCA) allows for the compression of many socioeconomic status (SES) variables into a few factors – an important consolidation for model power and understanding, given the relatively low number (94) of cases (i.e., blockgroups). Spatial lag regression is employed instead of ordinary least squares (OLS) due to the high degree of spatial autocorrelation in foreclosure rates (Anselin, 1988; 2005).

Third, conducting strategic, IRB-approved key informant interviews with city and county officials, non-profit heads, local realtors, and neighborhood leaders allows the
research to gain a better understanding of “on-the-ground” issues pertaining to the topics under study. Informants include local politicians, community organizers, neighborhood leaders, bankers, journalists, and homeowners.

The thesis concludes with a robust section detailing policy implications and recommendations. Given the recent disbursement of $1.7 million in Neighborhood Stabilization Funds (NSF) to the City of Lima, the research can inform the city’s application of these funds (Rutz, 2009). Specifically, it can identify neighborhoods that have been adversely affected by foreclosures and foreclosure-related vacancies through its strategic interview and field reconnaissance activities. In these areas, the most advantageous course of action might be property acquisition, followed by either demolition or land banking. The location of foreclosure ‘hot-spots’ and their neighborhood correlates can also inform a broad range policy implications. For example, a high level of subprime lending and foreclosure in area where many African-Americans have recently purchased a home might guide the city/county to provide financial education to first-time home buyers (cf. Haurin and Morrow-Jones, 2006, for a discussion of racial disparities in real estate market knowledge). Elevated foreclosure levels in neighborhoods dominated by manufacturing employment would suggest that improved unemployment benefits could mitigate mortgage default, assuming that the area’s workers have been laid off in the recent economic downturn.

1.3 Outline of the Thesis

The thesis proceeds as follows. Chapter 2 reviews the relevant literature, tracing the origins of the subprime lending industry and the concomitant restructuring in the financial services industry, the housing bubble that inflated in the early years of this
decade, the recent surge in foreclosure rates, and proposed policy/planning remedies to the current downturn in the housing market. This chapter invokes a number of theoretical perspectives, including the subprime segmentation/reverse redlining hypothesis, the inner-city spatial fix, and behavioral economics. Chapter 3 details the data used in the study and provides an in-depth description of the methodology. Chapter 4 presents study results, and the thesis concludes with Chapter 5’s conclusions, policy implications, and proposed directions for future research.
CHAPTER 2
REVIEW OF SELECTED LITERATURE

This chapter presents a review of relevant literature, delineated among the major topics of inquiry. The first section considers the rise of subprime lending, from its nationwide legalization in 1980 through its rapid increase (and subsequent decline) in the early years of the new millennium. It also reviews aspects of the restructuring in the financial services industry that accompanied the expansion of subprime lending volume, in particular the consolidation of mortgage originators, the rise of private securitization, and the widespread adoption and growing influence of quantitative risk models. Attention then turns to the real estate market developments over the past decade, commonly referred to as the “housing bubble.” These years saw, in many markets, unprecedented increases in house values, followed by an equally unprecedented decrease (Shiller, 2008). Next, the review considers the recent increase in foreclosure rates by investigating the foreclosures and their geography. The chapter concludes with a review of the policy debate directed toward reducing foreclosure incidence, preventing another housing bubble, and eliminating the most deplorable practices in the subprime lending industry (Eggert, 2004).

2.1 Subprime Lending and Financial Services Restructuring

2.1.1 Defining Subprime
Subprime lending refers to the menagerie of high-cost mortgage products given to borrowers of (generally) lesser creditworthiness (Renuart, 2004; Chomsisengphet & Pennington-Cross, 2006; Brooks & Ford, 2007). In this sense, subprime refers to the demanders of credit – i.e., home buyers – and their below-average credit scores.\(^5\) Subprime loans are generally characterized by at least one (and possibly all) of three features:

1. Higher interest rates than conventional, or “prime,” loans. While regulators have not quantified where subprime lending begins – i.e., at some percentage points above prime – scholars have generally agreed that subprime begins at about three percentage points above prime (Lax, Manti, Raca, & Zorn, 2004; White, 2004).\(^6\)

2. Complicated loan agreements. Most prime loans are fully-amortizing, fixed-rate mortgages of either a 15- or 30-year term. In contrast, subprime loans can either have a fixed interest rate or carry an adjustable rate, where the borrower pays a lower “teaser” rate for the first years of the mortgage that later resets to a much higher interest rate. Additionally, subprime loans may be interest only, where the payments only meet the interest; negative amortization, where the payments do not cover the full interest; or balloon payment, where a large “lump sum” is due at the final month of the loan term (Renuart, 2004). Often, these characteristics are combined within one loan. For example, an adjustable rate mortgage might be

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\(^5\) Confusion often arises here because prime lending can refer to both the creditworthiness of the borrower and the interest rate carried by mortgages to these borrowers.

\(^6\) This distinction is largely data driven. Under recent changes to the Home Mortgage Disclosure Act (HMDA), the rate spread of a loan (the number of percentage points above prime) is only reported for individual mortgages if it exceeds three percentage points. However, such an arbitrary distinction might not be as detrimental as it appears on the surface. White (2004) reports that mortgage rates do not exist as a continuum; instead, subprime rates begin a few points above prime (in other words, few, if any, mortgage products carry interest rates one to three points greater than prime).
interest-only for the initial two-year term with a balloon payment due at the final mortgage payment.

3. Higher transaction fees including those for document preparation, closing costs, and appraisals (Chomsisengphet & Pennington-Cross, 2006). Subprime loans are also more likely to contain pre-payment penalties, which are assessed if the buyer repays the mortgage before a specified date (Farris & Richardson, 2004). Lenders argue that these fees augment profits if a buyer sells the house or refinances (thus repaying the mortgage) before or shortly after the loan resets.

Prior to any discussion of high-cost lending, it is necessary to differentiate ‘subprime,’ which the American Dialect Society voted as 2007’s “Word of the Year,” from “predatory,” another commonly-used term in the mortgage literature (Renuart, 2004; American Dialect Society, 2008). Numerous debates surrounding subprime lending have centered on semantics, as scholars have struggled to untangle the relationship between ‘subprime’ and ‘predatory’ lending (Wyly et al., 2008). In general, subprime is an industry-defined term that encompasses loans that carry a higher cost due to the lesser creditworthiness of the borrower (Gramlich, 2007). To contrast, activists and advocates often utilize ‘predatory’ to describe the most egregious abuses of lending, in particular the extension of mortgage credit to buyers who obviously cannot repay it (Renuart, 2004). Predatory lending thus forms a certain segment of the subprime industry⁷, but the two are not synonymous, and a considerable debate has considered what proportion of the subprime business was predatory in nature (Morgenson, 2007a).

⁷ Theoretically, predatory lending could be considered ‘prime’ if the interest rates and/or costs aligned with those of the prime industry. However, the practices of the subprime industry (in particular, high fees relative to loan amount) allow for greater profits in the predatory loan business, where revenues primarily derive from fees due at signing (Renuart, 2004).
Going forward, this thesis concerns itself with the broader ‘subprime’ definition, with the recognition that at least some portion of the subprime market was predatory in nature.\textsuperscript{8}

\subsection{A Brief History of Subprime Lending}

With an astronomical rise, subprime lending grew from non-existent in 1980 to a $332 billion industry in 2003 (Chomsisengphet \& Pennington-Cross, 2006). Governmental restrictions on such lending, embodied in state usury laws, were eliminated in 1980’s Depository Institutions Deregulation and Monetary Control Act (DIDMCA) (Shiller, 2008). This wide-ranging statute prohibited state caps on mortgage interest rates, and originators could subsequently lend to less-qualified buyers, as higher fees compensated for these loans’ higher default levels. DIDMCA also fueled the ascent of subprime lending by eliminating the competitive advantages enjoyed by Savings and Loan institutions (S&L’s). The Act repealed Regulation Q, which had placed interest rate ceilings on savings accounts and allowed S&L’s to pay higher rates on savings than commercial banks (Curry \& Shibut, 2000). With the Garn-St. Germain Act of 1982, S&L’s gained the ability to invest in riskier assets, while their capital requirements were reduced, fueling a decade-long binge of questionable investments, particularly in real estate (and most especially in high-rise commercial real estate). By the early 1990’s, over 1,000 S&L institutions, holding nearly $4 billion in assets, had failed.

The collapse of the S&L industry created a void in low-cost mortgage financing, and subprime-only lenders quickly arose to alleviate this gap (Lord, 2005; Brooks \& Ford, 2007). With advances in financial technology, these new lenders were able to securitize mortgages, thus allowing them to continue lending without a deposit base.

\textsuperscript{8} The adjective ‘high-cost’ is used as a synonym for subprime.
of payments for a large, up-front outlay. With a small amount of start-up capital, these new lending-only outfits could originate mortgages, sell them as securities in the secondary market, and lend the proceeds as new mortgages, thus creating a cycle of capital recirculation that did not require deposit-taking (Mozilo, 2003). The expansion of the secondary market, particularly to international customers (including foreign governments), ensured a ready market for mortgage-backed securities.

The impetus behind the subprime lending boom also came from governmental programs to expand homeownership, particularly for low-income and minority buyers. While incentives for homeownership date to the Great Depression, government support for homeownership appears to have increased markedly over the past two decades. The Community Reinvestment Act was strengthened in 1994 and overhauled in 1995, thus inducing banks to extend more mortgage capital to inner-city neighborhoods (Bernanke, 2007). In 1992, Congress mandated Fannie Mae and Freddie Mac, the government-sponsored entities that operate in the secondary mortgage market, meet specific quotas in purchasing loans to low-income and underserved areas. Congress again expanded the GSE’s ability to purchase riskier subprime loans in 1999 and 2005, reasoning that these mortgages would be predominantly given to low-income households (Holmes, 1999; Browning, 2008). Concurrent to these developments was the move away from project-based public housing toward a private ownership model, as embodied in HUD’s HOPE VI and Moving to Opportunity (MTO) programs.

The push toward increased government support of homeownership has been cited as part of a larger initiative toward expanding the ‘ownership society’ to low-income and

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minority cohorts (White House, 2004; Newman & Wyly, 2004). Policy makers often draped subprime lending with the patina of democratizing finance and expanding the homeownership market to lower-income, predominantly minority households. In 2005 remarks, Federal Reserve Board Chair Alan Greenspan noted that “Improved access to credit for consumers, and especially these more-recent development, has had significant benefits . . . Home ownership is at a record high, and the number of home mortgage loans to low- and moderate-income and minority families has risen rapidly over the past five years” (Greenspan, 2005). The relevant data supported Mr. Greenspan’s remarks: the African-American homeownership rate increased by 7.2 percentage points between 1994 and 2004, while the Hispanic rate grew by 8.5 percentage points from 1994 through 2006 (Joint Center for Housing Studies, 2008).10 Minority homeownership rates were catching up to those for Caucasians, which registered an increase of six percentage points (1994-2004) and 5.8 percentage points (1994-2006), respectively.

Researchers have highly debated the role of the state, particularly the Community Reinvestment Act (CRA), in fomenting the binge of subprime lending. Critics of the CRA have argued that it represents an untoward extension of federal bureaucracy into the mortgage market and mandates lenders to extend risky credit to unqualified buyers (cf. Barr, 2005, for a summary of CRA criticisms). However, critics of government intervention fail to distinguish between unregulated lending, which accounted for 80% of all subprime loans, and state-mandated low-income mortgages (Barr, 2008). Empirical examination of government-backed low-income lending programs yields a more variegated picture than that presented by CRA critics. Quercia and Ratcliffe (2008)

10 The African-American homeownership rate peaked in 2004 and has declined since; the Hispanic homeownership rate peaked in 2006 and has remained steady (cf. FIGURE) (Joint Center for Housing Studies, 2008)
demonstrate that the lending programs of various affordable housing non-profits, working with both large financial agencies and state regulators, have a default rate that is significantly lower than subprime loans to comparable buyers, and only slightly above the default rate for prime loans to considerably more creditworthy borrowers.

2.1.3 Financial Services Restructuring

Increases in subprime lending volume were concomitant with a restructuring in the financial services industry that embraced (i) widespread and multi-scalar quantification of risk, (ii) mortgage securitization by private firms (and not the government-sponsored enterprises [GSE’s], Fannie Mae and Freddie Mac), and (iii) high-cost lending by mainline financial institutions (Shiller, 2003; Coleman IV et al., 2008; Nocera, 2009). Advanced risk models employing quantitative data altered how banks perceived questionable loans. Private mortgage securitizers could bundle any loan they could, and were not subject to the congressionally-mandated standards of the GSE’s. Subprime lending, once the domain of a few small institutions, was embraced by the financial world at large, and consolidation in the mortgage industry put the capital and reputation of multi-national banks behind high-cost loans.

Technological advances in computers provided for the development of increasingly-sophisticated risk management models (Nocera, 2009). These models existed at multiple scales: the firm, the department/division, and the individual loan. Firm-wide risk management models quantified the risk present in the company’s entire loan portfolio, estimating default rates on a wide variety of securities. The most popular model, Value at Risk (VaR), used probabilities to quantify, in an exact dollar amount, the risk in a firm’s portfolio. This dollar amount could then be held as a capital reserve.
against losses. Individual loan models also employed probabilities to measure the amount of risk that a buyer presented, with riskier buyers paying a higher interest rate. This principle of *risk-based pricing* has long been used in the finance industry (White, 2004). Similarly, these models could be applied to a mortgage-backed security (MBS), a bond obligation comprised of mortgages. Instead of quantifying the risk of a single loan, models could be expanded to assess the default probabilities of thousands of mortgages (Osinski, 2009). The quantification of risk contributed to a mindset among originators and the finance industry at large that *any* risk could be quantified and priced.

The secondary mortgage market has functioned since the Great Depression to provide liquidity to loan originators (Shiller, 2008). It entails the *purchase* of individual loans from originators, some of which are *bundled* into securities and sold to other financial institutions, while others are *held* by their secondary purchaser. From its creation until the early 2000’s, the secondary market was dominated by the two government-sponsored entities (GSE’s), the Federal National Mortgage Association (Fannie Mae) and (later) the Federal Home Loan Mortgage Association (Freddie Mac). The public-private governance of the GSE’s ensured that the federal government played an instrumental role in the nation’s mortgage market. Congress set the requirements for loans that the GSE’s could purchase from originators. In practice, these requirements mandated that GSE-purchased loans confirm to rather-conservative guidelines (Coleman IV, LaCour-Little, & Vandell, 2008).

However, as Coleman *et al.* show, the proportion of secondary market volume passing through the GSE’s significantly declined leading into 2004, while the proportion of securitization by private-market entities dramatically rose during this period. This
period is concomitant with three important developments: (i) political scandals surrounding the GSE’s, which likely contributed to their declining market-share, (ii) a dramatic increase in the rise of subprime lending volumes, and (iii) the most notorious subprime lending practices (Wyly et al., 2008).

In practice, private securitization allowed, and even implicitly encouraged, lenders to originate risky mortgages. Subprime loans, which could now be sold more easily into the secondary market, were often accompanied by exorbitant fees, paid to the lender (Morgenson, 2007). Mortgages were often packaged by the hundreds into securities, so the importance of an individual loan to a security’s value was minimal. Originators had little incentive to embrace strict underwriting standards, since they realized profits through fees charged at closing and not the repayment stream (Kiff & Mills, 2007). Further, the division of a security into tranches, progressively riskier ‘slices’ of an obligation which, individually, were over-collateralized, gave investors the illusion that an appropriate level of risk could be accepted, managed, and priced accordingly (Edmiston & Zalneraitis, 2007; Salmon, 2007).

One should note that the primary disadvantage of securitization lay in its application, not its theoretical underpinnings. Securitization allows originators to spread the risk associated with lending to a variety of non-originating institutions, including hedge funds, pension funds, and sovereign wealth funds (Shiller, 2003). It eliminates the binary outcome associated with mortgage lending – a 0 if the borrower defaults, a 1 if the loan is repaid – and replaces it with multiple outcomes contingent on the decisions of hundreds, if not thousands, of borrowers. Due to the law of large numbers, the mortgage outcomes (default vs. repay) are vastly easier to quantify and model for thousands of
borrowers than for a single homeowner. The secondary mortgage market, where securitization occurs, has been credited with making homeownership affordable for a wide swath of American in the postwar era (Bernanke, 2007). Similar accolades fell upon the private securitization market in the early part of this decade, prior to the current housing meltdown (Greenspan, 2005).

Ultimately, the growth of securitization, particularly by private firms shifted the metric of competition among lenders. Previously, mortgage originators had largely competed on the basis of underwriting, ensuring that potential borrowers had the income, job security, and credit history to meet monthly payments. Since banks kept some loans on their balance sheets, financial institutions strenuously avoided providing mortgages to anyone who could default. Those loans sold into the secondary market invariably went to one of the GSE’s, which maintained strict standards regarding which loans they could purchase. With the expansion of the secondary market, and the lack of standards in the private securitization industry, the mortgage industry became a fee-based business where banks competed on originating the most, but not necessarily the best, loans.

The potential for abuse and fraud in such a fee-based system is great. Instead of ensuring that borrowers can meet the monthly payments, bankers now existed in a “churn” environment, where they must originate the most loans to maximize profits. The best example of financial innovation in this ‘churn’ system is the NINJA loan, a mortgage to an individual with no income, no job, and no assets (Scheiber, 2007). From an underwriting perspective, it is impossible to justify such a loan – how can you evaluate, much less quantify, the ability of someone to repay such a loan? However,
when mortgage lenders can insert a toxic loan into a much larger security and quickly sell it in the secondary market, the characteristics of individual mortgages are minimized.

Contemporary with shifts in the secondary market was a sweeping period of consolidation among originators. Before the early 2000’s, subprime lending was primarily the providence of a few small, specialized, and often-suspect financial institutions. The majority of these lenders solely originated subprime loans, as mainline banks avoided high-cost mortgages and the veneer of predatory lending. While some subprime lenders, including Golden West Financial, Novastar Financial, New Century Financial, Household International, the Associates, and Countrywide, became large, publicly-traded companies, the majority were smaller outfits the specialized in local markets (Chomsisengphet & Pennington-Cross, 2006). Beginning in the late 90’s and early 2000’s, a number of large commercial banks – notably HSBC, Citigroup, National City, and Wachovia – began to purchase and integrate subprime lenders into their real estate divisions (Wyly, Atia, & Hammel, 2004; Lord, 2005). Consolidation of the previously-marginal subprime firms into the more prestigious mainline banks gave subprime lending the veneer of normalcy, and might have made prospective homebuyers more amenable to subprime instruments (White, 2004; Lord, 2005; Wyly et al., 2008). Additionally, large financial firms could achieve economies of scale and scope by offering subprime products to complement their (existing) prime lending business.

2.1.4 Geography and Conceptual Frameworks of Subprime Lending

Subprime lending rates vary substantially across space. At the metropolitan level, the highest subprime concentrations have been found in economically depressed areas.

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areas that experienced high levels of house price appreciation and residential construction in the early 2000’s (Miami, Las Vegas), and blue-collar cities that have recently been targeted by construction companies as new bedroom communities (Stockton, San Bernardino, Bakersfield) (Brook & Ford, 2007). Figure 4 contains several metro areas with particularly high rates of subprime lending. At the local/neighborhood level, while the geography of subprime lending is highly variegated, the greatest concentrations of high-cost lending have been found in poorer, inner-city, and African-American neighborhoods (Brooks & Ford, 2007). Newman and Wyly (2004) found that the largest concentrations of subprime capital in Newark, New Jersey, were in the city’s most socioeconomically-disadvantaged areas. Calem, Hershaff, and Wachter (2004) find that the percentage of African-American population is the strongest single predictor of subprime lending activity – greater so than either income or education.

### Debt Trouble
Selected metropolitan areas with high proportions of new high-rate mortgages, 2004-2006

<table>
<thead>
<tr>
<th>Metropolitan Statistical Area</th>
<th>Number of high-rate loans</th>
<th>High-rate loan volume, in billions</th>
<th>All loan volume, in billions</th>
<th>Percentage high-rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>McAllen-Edinburg-Mission, Texas</td>
<td>17,511</td>
<td>$1.41</td>
<td>$3.61</td>
<td>39.1%</td>
</tr>
<tr>
<td>Detroit-Livonia-Dearborn, Mich.</td>
<td>112,183</td>
<td>9.84</td>
<td>30.64</td>
<td>32.1</td>
</tr>
<tr>
<td>Miami-Miami Beach-Kendall, Fla.</td>
<td>170,938</td>
<td>29.32</td>
<td>92.78</td>
<td>31.6</td>
</tr>
<tr>
<td>Bakersfield, Calif.</td>
<td>53,881</td>
<td>8.10</td>
<td>26.75</td>
<td>30.2</td>
</tr>
<tr>
<td>Ocala, Fla.</td>
<td>15,085</td>
<td>1.67</td>
<td>6.21</td>
<td>27.0</td>
</tr>
<tr>
<td>Stockton, Calif.</td>
<td>46,447</td>
<td>10.66</td>
<td>40.63</td>
<td>26.2</td>
</tr>
<tr>
<td>Cape Coral-Fort Myers, Fla.</td>
<td>52,106</td>
<td>8.50</td>
<td>33.17</td>
<td>25.6</td>
</tr>
<tr>
<td>Lewiston-Auburn, Maine</td>
<td>3,843</td>
<td>0.40</td>
<td>1.71</td>
<td>23.8</td>
</tr>
<tr>
<td>Las Vegas-Paradise, Nev.</td>
<td>149,892</td>
<td>25.70</td>
<td>109.44</td>
<td>23.4</td>
</tr>
<tr>
<td>Tacoma, Wash.</td>
<td>42,335</td>
<td>6.07</td>
<td>27.97</td>
<td>21.7</td>
</tr>
</tbody>
</table>

Source: Home Mortgage Disclosure Act data

Figure 2. Subprime Lending for Selected Metros (from Brooks & Ford, 2007).
Two relevant theoretical perspectives have arisen to address spatial aspects of subprime lending. The first of these, the subprime segmentation thesis, posits that subprime lending represents only the latest innovation to enrich the global capitalist class at the expense of the poor. It ties the geography of subprime lending, and its manifestation as a predominantly inner-city phenomenon, with previous arguments linking race and mortgage finance. Second, the inner-city spatial fix framework extends Harvey’s (1972) circuits of capital thesis to the subprime debate, adopting a critical and historicist perspective to subprime lending expansion.

The bifurcation of the mortgage industry between its prime and subprime components begot, as some critical scholars have termed it, segmentation between more affluent and Caucasian borrowers, who have access to low-cost prime mortgages, and poorer, African-American borrowers, who are relegated to high-cost subprime loans (Newman & Wyly, 2004; Wyly, Atia, Foxcroft, Hammel, & Phillips-Watts, 2006; Wyly, Moos, Foxcroft, & Kabahizi, 2008). This generally critical perspective empirically grounds itself in the high rates of subprime lending observed in inner-city neighborhoods, where subprime loans frequently comprise more than half (and sometimes nearly all) of the total lending volume. One must wonder why the most vulnerable home buyers purchased houses with complex and expensive mortgage instruments.12

The principle of reverse redlining underlies the segmentation hypothesis. In contrast to the postwar period, when banks purposely adopted spatial discrimination

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12 Most critical theorists allege that these buyers were steered to subprime loans, but in the absence of a wide-ranging investigation, I believe that they are inferring a process from a pattern (cf. Wyly et al. 2006; 2008 for a discussion of steering; Renuart (2004), Lord (2005) and Goodman & Morgenson (2007) provide anecdotal accounts of the practice).
patterns that refused to provide mortgages in black-majority or black-transitioning neighborhoods (a process known as redlining), reverse redlining views financial institutions as flooding minority areas with credit, albeit at unsustainable rates (Wyly, Atia, Foxcroft, Hammel, & Phillips-Watts, 2006; Wyly, Moos, Foxcroft, & Kabahizi, 2008). Segmentation and reverse redlining are predicated on banks’ continued discriminatory practices, a point supported by Holloway (1998) but refuted by Brown and Chung (2008).

Critical scholars often expand their argument against subprime lending practices into a larger critique of risk-based pricing, the principal undergirding most financial transactions where riskier borrowers are charged greater fees and higher interest rates (White, 2004; Langley, 2008). These perspectives view risk-based pricing as regressive, unjust, and predatory in nature, since it advantages the wealthy over the poor (regressive), fails to improve social equity or reduce socioeconomic inequality (unjust), and often provides the borrower with a mortgage that he/she cannot afford (predatory).

While segmentation appears robust from a theoretical standpoint, the empirics of the subprime market (particularly nationwide) do not always show the rigid segmentation that Newman and Wyly (2004) and Wyly et al. (2006; 2008) propose.13 Brooks and Simon (2007) document that nearly half of all subprime loans were taken out by buyers who, on the basis of their credit score, could have qualified for prime credit. The obvious qualification here is that their analysis was predicated on the buyer’s credit score. These borrowers might have utilized subprime products to purchase a more-expensive house than their income would have allowed, and were thus forced to take out a subprime loan.

13 Newman and Wyly (2004) support their segmentation argument through subprime lending patterns in Essex County, New Jersey (home to Newark), while the Wyly et al. papers examine the Baltimore and Washington, D.C. metros.
Wyly, Atia, and Hammel’s *inner-city spatial* fix provides a broader, more theoretical, and more spatial perspective on subprime lending (2004). They draw from Harvey’s (1972) *circuits of capital* hypothesis, which posits that once profits in the first circuit – productive activities like manufacturing – begin to decline, capital shifts to activities that enhance productivity, such as infrastructure and real estate. Recently, they argue, capital began shifting to residential construction and home purchases during the economic downturn following the bust of the ‘dot-com bubble’ and the September 11th attacks. Previous examples of capital shifting include the office tower boom in the 1980’s (following the recession of 1981-2) and the real estate boom following the post-World War I recession of 1917-1921 (Galbraith, 1954; Feagin, 1987). Importantly, subprime segmentation hypothesis can be seen as an integral part of the inner-city spatial fix, but the latter framework provides a more theoretical and spatial perspective. The circuits of capital hypothesis has relevancy to the recent housing boom and bust, to which the discussion now turns.

2.2 Real Estate Volatility and the Housing Bubble

2.2.1 A Brief History of the Housing Bubble

The increase in residential house prices from 1997 through 2006, commonly referred to as the “housing bubble,” saw unprecedented rises in real estate prices relative to inflation (Shiller, 2005; 2008; S&P, 2009). The housing bubble was widespread: all cities in the Case-Shiller house price index saw at least a 20% increase from January 2000 to their respective peaks; nine cities (Phoenix, Los Angeles, San Diego, San Francisco, Las Vegas, Washington, Tampa, and New York City) saw increases greater than 100%. Even the most economically-disadvantaged cities – Cleveland and Detroit –
saw price increases. Table 1 and Figure 5 contain relevant house price statistics, including historical data, derived from the Case-Shiller index. Figure 7 shows the recent price dynamics for all cities in the index. Figure 8 relates historical shifts in house prices for selected cities, demonstrating that prices gradually increased from 1987 through (approximately) January 2000, with significant increases seen from September 2001 to mid-2006, and that prices dramatically fell from 2007 to the present.

<table>
<thead>
<tr>
<th>City</th>
<th>Region</th>
<th>Appreciation Jan-00 to Max</th>
<th>Change from Max to Feb-09</th>
<th>Change from Jan-00 to Feb-09</th>
</tr>
</thead>
<tbody>
<tr>
<td>Phoenix</td>
<td>West</td>
<td>127.4%</td>
<td>-50.8%</td>
<td>11.9%</td>
</tr>
<tr>
<td>Los Angeles</td>
<td>West</td>
<td>173.9%</td>
<td>-40.4%</td>
<td>63.2%</td>
</tr>
<tr>
<td>San Diego</td>
<td>West</td>
<td>150.3%</td>
<td>-41.4%</td>
<td>46.8%</td>
</tr>
<tr>
<td>San Francisco</td>
<td>West</td>
<td>118.4%</td>
<td>-44.9%</td>
<td>20.4%</td>
</tr>
<tr>
<td>Denver</td>
<td>West</td>
<td>40.3%</td>
<td>-14.3%</td>
<td>20.2%</td>
</tr>
<tr>
<td>Portland</td>
<td>West</td>
<td>86.5%</td>
<td>-19.1%</td>
<td>50.9%</td>
</tr>
<tr>
<td>Seattle</td>
<td>West</td>
<td>92.3%</td>
<td>-20.9%</td>
<td>52.1%</td>
</tr>
<tr>
<td>Las Vegas</td>
<td>West</td>
<td>134.8%</td>
<td>-48.4%</td>
<td>21.1%</td>
</tr>
<tr>
<td>Washington DC</td>
<td>South</td>
<td>151.1%</td>
<td>-33.1%</td>
<td>68.0%</td>
</tr>
<tr>
<td>Miami</td>
<td>South</td>
<td>180.9%</td>
<td>-45.1%</td>
<td>54.3%</td>
</tr>
<tr>
<td>Tampa</td>
<td>South</td>
<td>138.1%</td>
<td>-39.0%</td>
<td>45.3%</td>
</tr>
<tr>
<td>Atlanta</td>
<td>South</td>
<td>36.5%</td>
<td>-21.9%</td>
<td>6.7%</td>
</tr>
<tr>
<td>Charlotte</td>
<td>South</td>
<td>35.9%</td>
<td>-12.5%</td>
<td>18.9%</td>
</tr>
<tr>
<td>Dallas</td>
<td>South</td>
<td>26.5%</td>
<td>-11.1%</td>
<td>12.4%</td>
</tr>
<tr>
<td>Chicago</td>
<td>Midwest</td>
<td>68.6%</td>
<td>-25.1%</td>
<td>26.3%</td>
</tr>
<tr>
<td>Detroit</td>
<td>Midwest</td>
<td>27.1%</td>
<td>-41.3%</td>
<td>-25.4%</td>
</tr>
<tr>
<td>Minneapolis</td>
<td>Midwest</td>
<td>71.1%</td>
<td>-32.0%</td>
<td>16.4%</td>
</tr>
<tr>
<td>Cleveland</td>
<td>Midwest</td>
<td>23.5%</td>
<td>-20.8%</td>
<td>-2.2%</td>
</tr>
<tr>
<td>Boston</td>
<td>Northeast</td>
<td>82.5%</td>
<td>-18.5%</td>
<td>48.8%</td>
</tr>
<tr>
<td>New York</td>
<td>Northeast</td>
<td>115.8%</td>
<td>-17.5%</td>
<td>78.2%</td>
</tr>
<tr>
<td>10-city Composite</td>
<td></td>
<td>126.3%</td>
<td>-31.6%</td>
<td>54.7%</td>
</tr>
<tr>
<td>20-city Composite</td>
<td></td>
<td>106.5%</td>
<td>-30.7%</td>
<td>43.2%</td>
</tr>
</tbody>
</table>

*Table 1. House Price Dynamics for Cities in the Case-Shiller Index (Source: S&P, 2009).*

25

In the midst of the boom, scholars and journalists proposed numerous rationalizations of the rapidly-increasing home prices. They point to the fact that interest rates were at historically low levels in 2003 and remained low through 2004 (Brooks & Simon, 2007). Others argued that the country’s increasing population, including substantial increases in immigration, was outstripping supply. Other justifications included rising incomes and increases in construction costs (cf. Shiller, 2008).

Particularly relevant to the thesis is the relationship between subprime lending and the rapid house price appreciation over the past ten years. While a number of non-academic works have implied a causal relationship between the increasing volume of subprime lending and the dramatic rise in housing values over the past ten years, researchers have
not yet definitively concluded on what relationship (if any) existed between the two phenomena (Brooks & Ford, 2007; Gerardi, Rosen, & Willen, 2007). From a strict neoclassical perspective, one could reason that subprime lending would allow low-income and low-credit score borrowers – those unable to move into homeownership under the previous lending regime of 30-year fixed rate mortgages – to transfer from the rental market to homeownership, increasing demand for owner-occupied housing and thus driving up prices. Also, subprime lending could increase housing consumption for current homeowners, allowing buyers to purchase a larger home than what was possible under previous lending standards.

2.2.2 The Housing Bubble through a Behavioral Economics Framework

One perspective on the housing boom is bubble psychology, a unique framework that incorporates aspects of psychology into economics and finance. In doing so, it investigates the determinants and role of individual and collective thinking (i.e., the ‘mob mentality’) to challenge concepts of perfect rationality in market participants and perfect operation of market mechanisms (De Bondt, 2003). The application of bubble psychology here is worthwhile because it is decidedly people-focused, and highlights the role of individual actors and their collective participation in determining a market.

Bubbles are fueled by widely-held perceptions that ‘tell a good story’ about rapidly-increasing prices, despite the lack of fundamental change in price-setting factors. Shiller (2001) terms these perceptions as precipitating factors and amplification mechanisms. They include technological advances that are believed to result in broad structural changes, cultural shifts that purportedly change consumer taste, and regulatory adjustments favoring a certain sector of the economy (Shiller, 2001; De Bondt, 2003).
These changes are usually encompassed by a phrase commonly heard during bubbles that *something fundamental about the market has changed*. For the late 1990’s stock market bubble, which saw the NASDAQ composite increase seven-fold over five years, Shiller (2001) cites the rise of the internet, and the widespread belief that the world-wide-web could revolutionize commerce, as the axiomatic technological innovation fueling the boom. Its ascent was complemented by government policy encouraging stock ownership, including reduced capital gains taxes and tax-preferred retirement plans (401(k)’s, IRA’s, etc.), as well as a cultural shift toward greater acceptance of gambling. Amplification of the bubble was provided by twenty-four hour news programs and topic-specific television shows that focused public attention on the rapidly inflating bubble.

Feedback mechanisms amplify these precipitating factors and propel the bubble to dizzying heights, ultimately creating what Shiller calls *naturally occurring Ponzi schemes* (2001). Although prices in a bubble reach unprecedented levels, investors continue to exhibit high confidence levels and undiminished expectations about the future, driving prices even higher. Despite the high quoted prices – whether seen in stock prices or home appraisals – these represent *unrealized gains*, and widespread ebullience encourages investors to leave profits ‘on the table’ for fear of missing even more spectacular increases. Only those who withdraw their investments prior to the bubble’s bursting actually benefit from the bubble; by the nature of supply and demand, however, this population is restrictedly small.

Shiller’s bubble psychology framework translates well to the housing boom that began (slowly) following the early 1990’s recession but steeply accelerated in the new millennium. Again, technological innovation underpinned the boom’s origins, with the
dramatic rise of international mortgage securitization and quantitative risk-management models (Shiller, 2001; 2003; Nocera, 2009). Securitization allowed mortgage originators to shift debts off their balance sheets quickly and separated the lender and holder of the obligation at increasing levels of remoteness – two factors that encouraged risky lending practices. Overcollateralization gave investors the illusion that risk could be spread so thin that it became virtually non-existent (Gramlich, 2007). Quantitative risk models gave purchasers of mortgage-backed securities (MBS) the illusion that any uncertainty could be accurately priced and thus accepted (Nocera, 2009).

Cultural shifts accompanied the housing bubble and helped spur it to dizzying heights. Numerous television programs were chartered that specifically focused on flipping – the process of buying a distressed property, quickly conducting minor, primarily cosmetic renovations, and selling the home for a significant profit. These shows included how-to programs that taught prospective flippers the ‘tools of the trade,’ including what renovation techniques provided the most bang for the buck;\footnote{Including *My House is Worth What?* and *Nationwide Open House*, among other programs on Home and Garden Television (HGTV).} documentaries that profiled successful flippers, with considerably less attention paid to those who had met financial ruin in flipping;\footnote{Such as *Flip That House* on the A&E network, as well as *Flipping Out* on Bravo, which provided a comical perspective on the renovation industry by profiling an obsessive-compulsive flipper.} and a litany of late night infomercials advertising get-rich-quick seminars taught by professional housing speculators.

### 2.3 The Geography of Foreclosures

Like the phenomena previously discussed, the spatial distribution of foreclosures is highly variegated at different scales. At the state level, the highest foreclosure rates were previously seen in the American Manufacturing Belt (AMB), particularly states like

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14 Including *My House is Worth What?* and *Nationwide Open House*, among other programs on Home and Garden Television (HGTV).
15 Such as *Flip That House* on the A&E network, as well as *Flipping Out* on Bravo, which provided a comical perspective on the renovation industry by profiling an obsessive-compulsive flipper.
Ohio and Michigan (Edmiston & Zalneraitis, 2007). Over the past two years – since the onset of the ‘housing crisis’ – AMB foreclosure rates have increased marginally, and have been overtaken by those in Sunbelt states that experienced high levels of house price appreciation and residential construction (Kaplan & Sommers, 2009; RealtyTrac, 2009). Table 2 ranks the top ten (and bottom two, for comparison) states in terms of 2008 foreclosure rates, using housing units as a denominator.\(^{16}\) Nevada far outpaces the competition, with over 7% of housing units experiencing a foreclosure in 2008.

<table>
<thead>
<tr>
<th>Rank</th>
<th>State</th>
<th>Region</th>
<th>Foreclosure Filings as % of Housing Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Nevada</td>
<td>West</td>
<td>7.29</td>
</tr>
<tr>
<td>2</td>
<td>Florida</td>
<td>South</td>
<td>4.52</td>
</tr>
<tr>
<td>3</td>
<td>Arizona</td>
<td>West</td>
<td>4.49</td>
</tr>
<tr>
<td>4</td>
<td>California</td>
<td>West</td>
<td>3.97</td>
</tr>
<tr>
<td>5</td>
<td>Colorado</td>
<td>West</td>
<td>2.41</td>
</tr>
<tr>
<td>6</td>
<td>Michigan</td>
<td>Midwest</td>
<td>2.35</td>
</tr>
<tr>
<td>7</td>
<td>Ohio</td>
<td>Midwest</td>
<td>2.25</td>
</tr>
<tr>
<td>8</td>
<td>Georgia</td>
<td>South</td>
<td>2.20</td>
</tr>
<tr>
<td>9</td>
<td>Illinois</td>
<td>Midwest</td>
<td>1.91</td>
</tr>
<tr>
<td>10</td>
<td>New Jersey</td>
<td>Northeast</td>
<td>1.80</td>
</tr>
<tr>
<td>49</td>
<td>West Virginia</td>
<td>South</td>
<td>0.08</td>
</tr>
<tr>
<td>50</td>
<td>Vermont</td>
<td>Northeast</td>
<td>0.04</td>
</tr>
</tbody>
</table>


Considerable spatial variation in foreclosure rates exists at the metropolitan area scale as well. Table 3 lists the top 15 metros by 2008 foreclosure rate. With the exception of Detroit, all of these metros are located in the states of Nevada, California, Florida, or Arizona – four states that experienced considerable real estate investment over

\(^{16}\) Housing units consist of single-family homes, condominium units, and apartment units (i.e., not apartment buildings). A discussion of foreclosure rate denominators is found in Section XX.
the previous ten years. However, not all of the metro areas are known for seeing a boom in high-end residential construction. The California metros listed – Stockton, Riverside/San Bernardino, Bakersfield, Sacramento, Oakland, and San Diego – are all generally of a blue-collar character, and each (with the exceptions of Sacramento and San Diego) has seen an influx of long-distance, generally lower-middle class commuters in recent years (Brooks & Simon, 2007). In contrast, Miami has recently witnessed a surge in suburban and exurban construction (both at the high and low portions of the market) coupled with a boom in downtown, high-end condominium tower construction. Detroit, the only non-Sunbelt metro in the top 15 has seen a lengthy, secular economic decline exacerbated by the recent downturn in the automobile industry.

At the sub-local (neighborhood) level, the academic literature has established that foreclosures are most prevalent in socioeconomically disadvantaged areas. Baxter and Lauria (2000) found that the highest foreclosure rates in New Orleans were found in neighborhoods filtering from a lower-middle class white population to a lower-class African-American cohort. In this vein, Edmiston and Zalneraitis (2007) demonstrated that individual homeowners will almost certainly default if their house depreciates over 10% – a common occurrence in transitioning areas. More recent perspectives have largely echoed these findings. Li (2006) found that population engaged in service-sector employment was a strong predictor of foreclosure rates. Integrating housing finance variables with neighborhood characteristics, Kaplan & Sommers’ results showed that subprime lending, in addition to the usual suspects of neighborhood characteristics, demonstrated a strong relation to foreclosure incidence.
<table>
<thead>
<tr>
<th>Metro</th>
<th>State</th>
<th>Foreclosure Filings</th>
<th>Filings as % of Housing Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stockton</td>
<td>CA</td>
<td>21,127</td>
<td>9.45</td>
</tr>
<tr>
<td>Las Vegas/Paradise</td>
<td>NV</td>
<td>67,223</td>
<td>8.89</td>
</tr>
<tr>
<td>Riverside/San Bernardino</td>
<td>CA</td>
<td>112,284</td>
<td>8.02</td>
</tr>
<tr>
<td>Bakersfield</td>
<td>CA</td>
<td>16,208</td>
<td>6.17</td>
</tr>
<tr>
<td>Phoenix/Mesa</td>
<td>AZ</td>
<td>97,684</td>
<td>6.02</td>
</tr>
<tr>
<td>Fort Lauderdale</td>
<td>FL</td>
<td>47,987</td>
<td>5.95</td>
</tr>
<tr>
<td>Orlando</td>
<td>FL</td>
<td>46,843</td>
<td>5.48</td>
</tr>
<tr>
<td>Miami</td>
<td>FL</td>
<td>79,697</td>
<td>5.21</td>
</tr>
<tr>
<td>Sacramento</td>
<td>CA</td>
<td>39,876</td>
<td>5.2</td>
</tr>
<tr>
<td>Detroit/Livonia/Dearborn</td>
<td>MI</td>
<td>38,106</td>
<td>4.52</td>
</tr>
<tr>
<td>Sarasota/Bradenton/Venice</td>
<td>FL</td>
<td>17,256</td>
<td>4.5</td>
</tr>
<tr>
<td>Fresno</td>
<td>CA</td>
<td>12,571</td>
<td>4.2</td>
</tr>
<tr>
<td>Tampa/St. Petersburg/Clearwater</td>
<td>FL</td>
<td>53,630</td>
<td>4.14</td>
</tr>
<tr>
<td>Oakland</td>
<td>CA</td>
<td>38,797</td>
<td>4.09</td>
</tr>
<tr>
<td>San Diego</td>
<td>CA</td>
<td>44,931</td>
<td>3.99</td>
</tr>
</tbody>
</table>

Table 3. Foreclosure Filings and Foreclosure Rate (as % of housing units) for US Metros. Filings are total for 2008. Source: RealtyTrac, 2009.

2.4 Planning and Policy Perspectives

Policy analysts, politicians, academics, and others have proposed a number of policy responses and solutions to the subprime lending and foreclosure meltdown. These proposal range from strictly shifts in regulation (US Treasury, 2008) to more theoretical proposals that involve a complete transformation of the political economy complex (Wyly et al., 2008). In between these perspectives is a range of suggestions for shifts in regulation, consumer education, and mortgage industry structure. However, underlying most of the policy sphere is an intractable debate surrounding the nature of government regulation in a capitalist system. One side advocates for minimal regulation and
generally supports *laissez-faire* capitalism (cf. Dymski, 2006), while the other promotes strict regulation and a more socialist operation of the mortgage industry.

Perhaps the best illustration of this intractability lies in each camp’s forecast of lending if subprime mortgages were outlawed. The neoclassical proponents of the *efficiency pricing hypothesis*, which posits that subprime loans are priced accurately and in general has taken a more favorable view of the high-cost lending industry, argue that eliminating subprime would deleteriously affect more marginal homebuyers by denying them mortgage capital (Dymski, 2006; Gerardi, Rosen, & Willen, 2007). From this perspective, the high interest rates and fees charged by subprime originators adequately compensate for the elevated credit risk of the homebuyers, and prohibiting high-cost lending would foreclose these buyers’ financing options. In contrast, more critical commentators on subprime lending believe that the increased fees and higher interest rates more than compensate for the elevated risk profiles of subprime borrowers (White, 2004; Wyly et al., 2008). They argue that these charges represent harmful rent-seeking by subprime institutions at the expense of the poor. In their opinion, eliminating the (harmful) practices of the subprime lending industry would merely cause lower-cost lenders to fill the void.

Shiller (2001; 2008) has written extensively of his proposal for financial democracy, a wide-ranging policy program that would increase educational resources for consumers and the establishment of a vigilant financial watchdog (similar to the Consumer Product Safety Commission). His program is unique in that it appears to

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17 Undergirding this discussion is the assumption that the social equity of increasing homeownership exhibits increasing or constant returns to scale – i.e., that expanding homeownership is a good thing at all levels. While this assumption is certainly debatable, it is not discussed widely in the literature and is not considered here.
circumvent many of the intractable arguments underlying the policy response to subprime lending and foreclosures. The former aspect of his program calls for federal subsidies so that all individuals can see a trained financial advisor – a cross between Medicare and the Suze Orman show.\(^{18}\) Additionally, Shiller sees this educational program as overcoming buyer reluctance to try new financial products, like longer-amortizing mortgages. Here he references the success of the Home Owners’ Loan Corporation (HOLC), a New Deal agency that, among other things, pushed for banks to adopt 15- and 30-year, fully amortizing mortgages, instead of the 5-year balloon-payment loans popular at that time.

The other aspect of Shiller’s proposal – a financial products safety commission – is widely echoed. Harvard Law professor Elizabeth Warren (2007), in calling for such a commission, commented that

> It is impossible to buy a toaster that has a one-in-five chance of bursting into flames and burning down your house. But it is possible to refinance an existing home with a mortgage that has the same on-in-five chance of putting the family out on the street – and the mortgage won’t even carry a disclosure of that fact to the homeowner.\(^ {19}\)

Similarly, noted financial commentator and television personality Jim Cramer has argued that many recent financial innovations have no discernible benefit to consumers. In particular, he points to the SKF, a leveraged exchange-trade fund that markets itself as capable of astonishing returns (at a hefty fee) that it rarely returns (Cramer, 2009).

\(^{18}\) Ms. Orman hosts a popular radio and TV call-in show where she espouses relatively conservative advice in a no-nonsense matter.

\(^{19}\) While I applaud Warren’s insight, I believe that she misses an important aspect of agency here. Yes, it is impossible to buy a toaster that inherently has a one-in-five chance of burning down your house; however, one can easily buy a toaster that has a one-in-five chance of burning down your house \textit{if you use it in the bathtub} or \textit{if a surge of electricity comes through the lines}. Similarly, subprime mortgages, I would argue, do not have the same inherent risk of default, but can have higher default rates \textit{in practice} owing to a variety of factors both under and not under the control of the homeowner.
CHAPTER 3
STUDY AREA, DATA, AND METHODOLOGY

The thesis marshals a wide spectrum of data to examine the linkages among neighborhood characteristics, subprime lending, house price changes, and foreclosures, this chapter details relevant characteristics of the data prior to the analysis and results. First, background information on each dataset is provided, including its source, relevant characteristics, the scale of the data (parcel, blockgroup, Census tract, etc.) and whether any data clean-up was necessary. Second, the calculations for specific variables, including (i) percent subprime allocation, (ii) percent house price appreciation, (iii) percent house price depreciation, and (iv) foreclosure rate, are given. The chapter concludes with a discussion of the principal components analysis (PCA) undertaken to simplify the numerous neighborhood characteristics variables, and the spatial lag regression technique used in multivariate modeling.

3.1 Study Area

3.1.1 Lima, Ohio

The empirical research focuses exclusively on Allen County, Ohio, which forms the entirety of the Lima, Ohio, Metropolitan Statistical Area (MSA). Lima serves as the county’s seat and largest city; however, its population has fallen nearly 30% since its 1970 peak of 53,734 to its 2007 estimate of 37,936 (Forstall, 1995; US Census Bureau, 2008). In contrast, the county’s population has remained relatively steady at the level it
reached in 1970, but has slipped in recent years; the Census estimates the county’s 2007 population at 105,233. The sizable decline in the city’s inhabitants, coupled with a stable county population, suggests strong levels of suburbanization.

Historically, Lima’s population has exhibited a high degree of racial/ethnic segregation. The south end – the area south of the Ottawa River – was a white, working-class district until the early postwar period, when the area saw a large influx of African-American population. Today, the south end is home to some of the city’s highest crime neighborhoods, its greatest concentration of single female-headed households, and the largest percentage of vacant and abandoned housing (Ackerman & Murray, 2004). Local politicians often employ the south end as a synecdoche for the city’s ills (Rutz, 2004). The north end of town has generally been of a higher socioeconomic character than its southern counterpart, with a more Caucasian population, generally of Irish descent. However, in recent years portions of the North End have seen substantial in-moving of lower-middle class African-Americans and an increase in rental properties. Lima’s east end has historically been, and largely remains, a white, working-class neighborhood. The city’s west end is similarly predominantly Caucasian, but its population is considerably more affluent. Figure 2 contains a reference map for Lima neighborhoods.
Lima/Allen County serves as an interesting laboratory for analysis because the area is highly variegated along housing, racial/ethnic, and income lines. Lima demographically resembles much larger metros, it suffers from many of the same social problems that plague much larger cities, and it has endured a lengthy period of economic decline. The city has lost 15,000 manufacturing jobs (40% of its total employment in that sector) since 1970 (Ackerman & Murray, 2004). The city also has a crime rate considerably higher than that seen in metros of a comparable size. Census data indicates a high degree of socioeconomic polarization. The neighborhoods surrounding the CBD
are substantially poorer than other areas in the county, and the city’s large African-American population is spatially concentrated south of downtown (US Census Bureau, 2008). Studying the entire county provides a perspective not only on Lima, but on its more affluent suburbs (primarily west of the city in American and Shawnee Townships), its less affluent suburbs (south and east of the city in Bath and Perry Townships), sparsely-populated rural areas, and several small towns (including Spencerville, Elida, Gomer, Cairo, and parts of Delphos and Bluffton). A reference map for the county’s political subdivisions can be found in Figure 3.

Figure 5. Political subdivisions in Allen County.
3.1.2 The Foreclosure Process in Ohio

A mortgage foreclosure – defined as the involuntary forfeiture of property due to failure to meet a contractual obligation secured by that property – is only the final act of an extended period of actions by both the borrower and the lender. Foreclosure processes can take anywhere from several weeks to several months, depending on the regulatory environment. At any point, the buyer, the lender, or both parties working together can terminate the foreclosure process. The buyer can become current on the mortgage (i.e., making the needed payments), sell the property to fulfill the mortgage obligation, or refinance into another mortgage. The lender can reduce payments or amortize missed payments, giving the borrower more time to become current. Or, if the value of the property is less than the outstanding balance of the mortgage, a condition that has become more pertinent due to the recent declines in house prices, the borrower and lender can agree to a ‘short sale’ where the property is sold for less than the mortgage balance (Hoak, 2009).

The first step in a foreclosure process occurs when the homeowner misses one scheduled payment, after which he/she is said to be delinquent on the mortgage (or in delinquency) (Quercia & Stegman, 1992). Falling behind by one payment incurs fees charged by the lender, which may amount to several hundreds of dollars, and negatively reinforces a borrower’s ability to meet further payments (Morgenson, 2007b). From the lender’s perspective, a delinquent borrower may still intend to continue mortgage payment. However, after the homeowner misses several consecutive payments – usually three – the lender will judge the borrower to be in default of the mortgage and now expects the borrower to not make further payments (Quercia & Stegman, 1992).
Since Ohio is a judicial foreclosure state, the lender must sue the borrower in probate court to foreclose on the property.\textsuperscript{20} If the court finds that the borrower has indeed failed to make the necessary payments, a judgment of default is issued against the homeowner. Default judgments will invoke the acceleration clause of a mortgage, which demands immediate payment of the entire mortgage, and not just the balance of missed payments and accumulated fees. The foreclosure then proceeds to the county sheriff’s office, at which point it enters the dataset used in this study. The sheriff’s office schedules and advertises a date of sale at least thirty days in advance (Li, 2006). Again, until the property is sold at a sheriff’s auction, the borrower and/or lender can prevent the foreclosure. Based on conversations with county officials, the foreclosure process often lasts nine months in larger counties (Cuyahoga, Franklin, and Hamilton), but can take significantly less in smaller counties.

3.2 Data

Subprime lending incidence derives from Loan Application Register (LAR) data from 2004 through 2007. This publicly-available dataset is collected by the Federal Financial Institutions Examination Council (FFIEC) through its authority under the Home Mortgage Disclosure Act (HMDA). Each data row represents a home purchase, home improvement, or refinancing loan application secured by the dwelling. The LAR provides information on the lender (institution name and regulator), the house (whether single-, multi-family, or manufactured, and its location at the state, MSA, county, and census tract levels), the borrower(s) (income, race, and ethnicity), the loan (amount,
purpose, type\textsuperscript{21}, rate spread\textsuperscript{22}, and HOEPA status), and borrower/lender actions (whether the loan was originated, denial reason(s), and secondary market purchaser).

For this study, subprime loans were defined as any originated loans that carry a rate spread greater than three percentage points over comparable Treasury bonds. This approach differs from the conventional method of defining subprime loans by institution, where researchers classify certain lenders (and every loan they originate) as “subprime” (Calem, Hershaff, & Wachter, 2004; Newman & Wyly, 2004; Kaplan & Sommers, 2009). However, because many institutions originate both prime and subprime loans, this methodology usually leads to a significant undercounting of subprime activity, as the large hybrid institutions are usually excluded from analysis. For example, Countrywide Financial, previously the largest mortgage originator in the U.S., originated both prime and subprime loans and was not included in HUD’s list; as a result, all of their loans would be excluded from such an analysis (HUD, 2007). The methodology employed here ameliorates this shortcoming by examining individual loans, and classifying subprime activity by a loan’s higher interest rate.

Changes in house prices are derived from a property transaction register maintained by the Allen County Auditor’s office. The dataset contains all property purchases in the county that have been electronically stored by the Auditor, and it includes virtually every transaction after 1982. In addition to purchase price, the register incorporates the date of purchase, type of transfer (plat, subdivide, merge, sale), location

\textsuperscript{21} Whether conventional, FHA-insured, or guaranteed by the Department of Veteran’s Affairs (VA) or Rural Housing Service (RHS).

\textsuperscript{22} Each loan’s rate spread is calculated as the difference between the annualized percentage rate (APR) and Treasury bonds of a comparable maturity (St. Louis Federal Reserve). The rate spread is only reported if it exceeds three percentage points. For adjustable-rate mortgages (ARM’s), the rate spread is calculated from the highest APR within the first seven years, and is generally reported as the APR of the first year after the loan resets from its initial ‘teaser’ rate. Rate spreads have only been included in LAR data since 2004.
of the property (parcel number and street address), appraised value at time of transaction, and a limited amount of information about the transferred property (acreage, square footage, land use, number of properties in the sale, year built). The original dataset comprises nearly 200,000 transactions.

The Allen County Sheriff’s Office provided records of foreclosure sheriff sales from January 1, 2005 through December 31, 2008. As Ohio is a judicial foreclosure state, foreclosure sales are handled by each county’s sheriff’s office. The data employed here captures each foreclosure when the probate court assigns the property to be sold at auction. At this point, the buyer can still agree to an alternative payment plan with the lender, sell the property at a “short sale,” or give the property to the lender without going through the sheriff’s auction process (deed in lieu of foreclosure). The dataset includes each property’s address, parcel number, appraisal amount, date of sheriff’s sale, purchaser and sale price (if applicable; if not, it lists “no bid no sale”), and whether the foreclosure was withdrawn prior to the sheriff’s auction. Properties that fail to sell are subsequently relisted with the relevant information.

Neighborhood characteristic data comes from the 2000 Census. This research employs socioeconomic and housing variables to assess the relationship between local attributes and subprime lending, house price changes, and residential foreclosure. While the methods demand a wide variety of socioeconomic data to ensure model coverage, the number of variables must be truncated to guarantee that the quantitative regression has

---

23 A real estate “short sale” denotes an agreement between the mortgagee and the mortgagor that allows the homeowner to sell the house for less than the outstanding value of the mortgage without the owner paying the difference to the mortgage holder (Hoak, 2009). Thus, it is different from an equity (stock) short sale, which allows an individual to borrow and sell shares in anticipation of a price decrease.
enough power to reach significance (in both a statistical and literal sense) (Tabachnik & Fidell, 2006). A list of variables used can be found in Table 4.

<table>
<thead>
<tr>
<th>Shorthand</th>
<th>Explanation</th>
<th>Source</th>
</tr>
</thead>
<tbody>
<tr>
<td>pWht0</td>
<td>Percent white population</td>
<td>Census 2000</td>
</tr>
<tr>
<td>pAA0</td>
<td>Percent black population</td>
<td>Census 2000</td>
</tr>
<tr>
<td>pOneRaceOther0</td>
<td>Percent population of one race, not white or black</td>
<td>Census 2000</td>
</tr>
<tr>
<td>pTwoRaces0</td>
<td>Percent population of two or more races</td>
<td>Census 2000</td>
</tr>
<tr>
<td>pHisp0</td>
<td>Percent Hispanic population</td>
<td>Census 2000</td>
</tr>
<tr>
<td>MedAge0</td>
<td>Median age of population</td>
<td>Census 2000</td>
</tr>
<tr>
<td>pManufacturing0</td>
<td>Percent of workers in manufacturing employment</td>
<td>Census 2000</td>
</tr>
<tr>
<td>pMgmtProfFIRE0</td>
<td>Percent of workers in managerial/professional employment, or in finance, insurance, or real estate sectors</td>
<td>Census 2000</td>
</tr>
<tr>
<td>pLowServices0</td>
<td>Percent of workers in other service sectors</td>
<td>Census 2000</td>
</tr>
<tr>
<td>pPublic0</td>
<td>Percent of workers in public employment</td>
<td>Census 2000</td>
</tr>
<tr>
<td>MedHHInc0</td>
<td>Median household income</td>
<td>Census 2000</td>
</tr>
<tr>
<td>pPoverty0</td>
<td>Percent of population living below the poverty line</td>
<td>Census 2000</td>
</tr>
<tr>
<td>pROU0</td>
<td>Percent of occupied housing units that are rentals</td>
<td>Census 2000</td>
</tr>
<tr>
<td>pVacHU0</td>
<td>Percent of all housing units that are vacant</td>
<td>Census 2000</td>
</tr>
</tbody>
</table>

Table 4. Variables Used for Neighborhood Characteristics.

3.3 Data Cleanup and Variable Calculations

In preparation for the analysis, four statistics must be calculated for each blockgroup: (i) the subprime lending rate, house price (ii) appreciation and (iii) depreciation, and (iv) foreclosure rate. Prior to their calculation, a number of data cleanup steps were necessary for each dataset. The discussion below details how each variable was calculated and the cleanup that preceded calculation.

Percent of subprime loans, measured in terms of loans with an interest rate more than three percentage points above prime, involved (i) summing number of subprime loans by blockgroup and (ii) dividing that amount by the number of originated loans. This technique improves upon the dominant subprime classification scheme, where loans
are delineated based upon their originator. As LAR data is reported at the census tract level, results must be transformed to the blockgroup scale. Here, I assume that each blockgroup within a tract has an identical subprime rate to the tract; for example, the three blockgroups in tract 101 were assigned subprime rates of 21.17%, the rate calculated for the entire tract.

Measuring changes in house prices over numerous geographic areas necessitates the usage of a simple metric that can also convey price change data, normalized across different housing values. In a more pointed analysis, where the purpose of the research would be explicitly measuring change in house prices, one would likely construct a hedonic model with dummy variables for individual years. Shifts in dummy variable values would thus approximate changes in valuation over time, as the descriptive characteristics of the property, such as square footage, acreages, number of bedrooms, location, and year built, would be controlled through inclusion as dependent variables. However, calculating a separate hedonic model for each blockgroup in each year (2000 through 2008) would prove overwhelming for this study.24

To simplify the analysis, this study uses percentage changes in price per square foot as an indicator of house prices. Price per square foot (P/SF) normalizes prices across a heterogeneous housing stock, and measuring shifts in prices through percentage change in P/SF controls for price differentials across blockgroups. First, unnecessary transactions were eliminated. All sales prior to January 1, 2000, were deleted to establish the time frame of the research. To determine a value of single family house prices, sales of non-residential and apartment residential properties were excluded. Sales of multiple

24 More precisely, if pursued, this would require the computation of 846 separate models (94 block groups x 9 years).
properties within a single transfer were not considered, as the data does not allow for controlling of geographic variability in the transferred properties. Any incomplete records were eliminated, as were any transactions under $10,000, as one would believe that these sales are atypical and not appropriate for analysis. Post-cleanup, the dataset contains over 17,000 entries.

Following data cleanup, the price per square foot of living space was calculated for each purchase; these figures were then aggregated into blockgroup averages by year and calculated as “rolling averages” over two year periods (2000-2001, 2001-2002, etc.). Rolling averages, in contrast to single-year figures, allow more transactions to be incorporated into each value, improving robustness. Each rolling average contains a minimum of eight transactions. The average of 2000 and 2001 values was deemed a base value, the maximum and minimum values (of the rolling averages) for subsequent years were found for each blockgroup, and the percent change was calculated for each area for both the minimum and the maximum. Since many researchers have found that only substantial shifts in property values influence buyer behavior (foreclosure rates in particular), while smaller changes do not, the minimum and maximum percent change values below 10% magnitude were recoded as zero change (Edmiston & Zalneraitis, 2007; Coleman IV, LaCour-Little, & Vandell, 2008).

Like the home purchase data, the foreclosure data required substantial clean-up prior to analysis. If multiple properties are listed on a mortgage, they enter the sheriff’s data as a single foreclosure; for this analysis, I separated these and calculated each parcel (and not each entry) as a single foreclosure. A brief scan of the data suggests that most of these multiple-property listings are the result of excessive subdivision – for example, a
house and the small vacant lot next door. A finer analysis might examine each property individually and make a judgment about what “counts,” but here I take each parcel as an individual foreclosure.

Another problematic aspect of the foreclosure data is that certain parcels appear frequently throughout the data, and often in quick succession – for example, 1413 Oakland Parkway appears eight times in the four years of data. Re-appearances are primarily the result of two events – either the sale is withdrawn before the sheriff’s auction (which generally indicates that the buyer has developed a “work-out plan” with the lender), or the property fails to sell at auction (commonly known as a “no bid no sale”). A withdrawal also might indicate that the bank has agreed to a “short sale,” or that the buyer has given over the house to the lender prior to the sheriff’s auction (legally known as a “deed in lieu of foreclosure”). Many withdrawn properties reappear quickly in the dataset If the property does not sell, it is rescheduled to appear at a later date, generally around six months after the first auction. For the purpose of calculating a foreclosure rate, a property’s reappearance is not considered if it occurs within nine months of the previous listing. The nine month timeframe eliminates all no bid/no sale reappearances, and appears to remove most of the frequently-occurring re-listings.25

The denominator for the foreclosure rate is all residential properties within the blockgroup. Previous foreclosure rate calculations have generally used either the number of mortgages or the number of housing units as the denominator (Calem, Hershaff, & Wachter, 2004). Table 5 lists the popular methods of calculating a foreclosure rate and the advantages and disadvantages of each. Here, I find that the primary disadvantage of

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25 Generally, if a withdrawn property does not relist within nine months, it will not relist for more than a year after the initial appearance on the foreclosure data.
using residential properties – that it fails to include condominiums, which generally have a mortgage but are not listed as separate properties – is minimal, given the small number of condo units in Allen County. Use of residential properties as a denominator in more urban counties, which likely have many high-rise condominiums in their downtown cores, might not be appropriate.

<table>
<thead>
<tr>
<th>Denominator</th>
<th>Availability</th>
<th>Advantages</th>
<th>Disadvantages</th>
<th>Effect</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total housing units</td>
<td>Census</td>
<td>Includes houses and condos; data are easily available and free</td>
<td>Includes every rental unit</td>
<td>Underestimates foreclosure rate</td>
</tr>
<tr>
<td>Owner-occupied units</td>
<td>Census</td>
<td>Includes houses and condos; data are easily available and free</td>
<td>Does not include rental units or vacant properties</td>
<td>Overestimates foreclosure rate</td>
</tr>
<tr>
<td>Residential Properties</td>
<td>County Auditor (in Ohio)</td>
<td>Includes houses, rental properties, and vacant properties; data are free</td>
<td>Does not include condos; data are more difficult to obtain</td>
<td>Underestimates foreclosure rate</td>
</tr>
<tr>
<td>Mortgages</td>
<td>Private firms</td>
<td>Includes all mortgages</td>
<td>Data only available through private firms and is often expensive</td>
<td>Correct foreclosure rate</td>
</tr>
</tbody>
</table>

*Table 5. Common Denominators Used in Foreclosure Studies.*

**3.4 Principal Components Analysis**

To simplify the analysis, principal components analysis (PCA) was undertaken to compress the neighborhood characteristics data. A list of variables entered into the analysis, with explanations for each, can be found in Table 4. Another advantage of PCA is that it allows inclusion of variables that might exhibit multicollinearity among themselves. As the neighborhood factors primarily consist of racial/ethnic, occupational, and income-related variables, one would expect high levels of multicollinearity in the data set.
One concern with applying PCA is the relatively small number of observations – only 94 blockgroups exist in Allen County, and one must be excluded (since it’s a state prison). Tabachnik and Fiddell (2005) claim that fifty observations is “very poor” for PCA, and one hundred is still “poor.” However, I believe that the benefits of PCA – analysis simplification and inclusion of more variables – outweigh the possible disadvantages.26

Relevant information for the PCA calculation can be found in Tables 6 and 7, and maps of factor scores are found in Figure 6. Fourteen neighborhood characteristics variables entered into the analysis, and all had high extraction amounts, except for non-black, one-race minority percentage (pOneRaceOther). Four components had eigenvalues greater than one, with the first factor accounting for nearly 50% of the total variance. The extracted factors include the following:

- **Factor 1** primarily distinguishes along racial and economic means lines, including non-whites, especially African-Americans (high, positive loadings), from whites (high, negative loadings), median household income (- loadings), poverty (+), renter-occupied housing (+), and vacant housing (+). In total, this factor differentiates between stereotypically black (+) and white (-) neighborhoods.

- **Factor 2** exhibits high loadings for low services workforce (+) and higher services (-), as well as Hispanic population (+) and household income (-). I consider this variable to capture the *Hispanic* (+) (that is, lower income service workers) segment of the population.

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26 To ensure the robustness of the principal components, I ran the regression with the individual neighborhood characteristic variables instead of the components. The explanatory power (adjusted \( R^2 \)) of the model was very similar (.654 vs. .628 for components), but only two individual neighborhood characteristic variables achieved significance at \( p < .05 \). Most of the variables exhibited \( p \) values between .2 and .3, suggesting some (but not much) relation to the dependent variable.
- *Factor 3* distinguishes manufacturing (-) from higher service occupations (+) with higher incomes (+). In general, this variable can be considered an indicator of *white collar workforce* (+) vs. *blue collar workforce* (-).

- *Factor 4* shows high loadings for public workforce (+) and older population (+). No other variables show a particularly high loading.

<table>
<thead>
<tr>
<th>Variable</th>
<th>Initial</th>
<th>Extraction</th>
</tr>
</thead>
<tbody>
<tr>
<td>pWht0</td>
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<td>.887</td>
</tr>
<tr>
<td>pAA0</td>
<td>1.000</td>
<td>.860</td>
</tr>
<tr>
<td>pOneRaceOther0</td>
<td>1.000</td>
<td>.385</td>
</tr>
<tr>
<td>pTwoRaces0</td>
<td>1.000</td>
<td>.649</td>
</tr>
<tr>
<td>pHisp0</td>
<td>1.000</td>
<td>.657</td>
</tr>
<tr>
<td>MedAge0</td>
<td>1.000</td>
<td>.527</td>
</tr>
<tr>
<td>pManufacturing0</td>
<td>1.000</td>
<td>.921</td>
</tr>
<tr>
<td>pMgmtProfFIRE0</td>
<td>1.000</td>
<td>.946</td>
</tr>
<tr>
<td>pLowServices0</td>
<td>1.000</td>
<td>.912</td>
</tr>
<tr>
<td>pPublic0</td>
<td>1.000</td>
<td>.865</td>
</tr>
<tr>
<td>MedHHInc0</td>
<td>1.000</td>
<td>.771</td>
</tr>
<tr>
<td>pPoverty0</td>
<td>1.000</td>
<td>.899</td>
</tr>
<tr>
<td>pROU0</td>
<td>1.000</td>
<td>.787</td>
</tr>
<tr>
<td>pVacHU0</td>
<td>1.000</td>
<td>.800</td>
</tr>
</tbody>
</table>

*Table 6. Communalities in PCA Extraction of Neighborhood Characteristics Variables.*
<table>
<thead>
<tr>
<th>Component</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
</tr>
</thead>
<tbody>
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<td>pWht0</td>
<td>-.935</td>
<td>.063</td>
<td>.038</td>
<td>-.083</td>
</tr>
<tr>
<td>pAA0</td>
<td>.913</td>
<td>-.094</td>
<td>-.056</td>
<td>.119</td>
</tr>
<tr>
<td>pOneRaceOther0</td>
<td>.513</td>
<td>.221</td>
<td>.173</td>
<td>-.208</td>
</tr>
<tr>
<td>pTwoRaces0</td>
<td>.755</td>
<td>.164</td>
<td>.053</td>
<td>-.222</td>
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<td>pHisp0</td>
<td>.712</td>
<td>.333</td>
<td>.048</td>
<td>-.193</td>
</tr>
<tr>
<td>MedAge0</td>
<td>-.525</td>
<td>-.160</td>
<td>.279</td>
<td>.384</td>
</tr>
<tr>
<td>pManufacturing0</td>
<td>.061</td>
<td>-.162</td>
<td>-.940</td>
<td>-.090</td>
</tr>
<tr>
<td>pMgmtProfFIRE0</td>
<td>-.208</td>
<td>-.652</td>
<td>.676</td>
<td>-.144</td>
</tr>
<tr>
<td>pLowServices0</td>
<td>.122</td>
<td>.926</td>
<td>.127</td>
<td>-.153</td>
</tr>
<tr>
<td>pPublic0</td>
<td>.077</td>
<td>-.061</td>
<td>.014</td>
<td>.925</td>
</tr>
<tr>
<td>MedHHInc0</td>
<td>-.770</td>
<td>-.286</td>
<td>.281</td>
<td>-.134</td>
</tr>
<tr>
<td>pPoverty0</td>
<td>.925</td>
<td>.004</td>
<td>-.209</td>
<td>.016</td>
</tr>
<tr>
<td>pROU0</td>
<td>.848</td>
<td>.246</td>
<td>-.070</td>
<td>.060</td>
</tr>
<tr>
<td>pVacHU0</td>
<td>.870</td>
<td>.115</td>
<td>-.170</td>
<td>.019</td>
</tr>
</tbody>
</table>

*Table 7. Rotated component matrix.*
Figure 6. Factor Scores by Blockgroup.
3.5 Regression Modeling

Prior to conducting regression analysis, which will examine the multivariate relationships among the topics of analysis, a choice must be made between ordinary least squares (OLS), spatial lag, and spatial error models. Spatial autocorrelation in the variables – which, given previous studies, is expected – can corrupt an OLS analysis. However, the deleterious effects of spatial autocorrelation can be eliminated by judicious use of spatial regression models, specifically the spatial lag and spatial error models.

Anselin (2005: 197-200) details a specific course of action for choosing the correct model. First, a base OLS model should be specified. Lagrange Multipliers (LM)\textsuperscript{27} can be calculated from the model specification: LM-lag, robust LM-Lag, LM-error, and LM-SARMA.\textsuperscript{28} If either LM-lag or LM-error is significant – that is, they reject the null hypothesis – a spatial model should likely be employed. One significant value for LM-lag or LM-error signifies which model to use; for example, if LM-lag is significant (and LM-error is not), then a spatial lag model should be adopted. If both are significant, attention then turns to their robust counterparts; a significant value for either denotes the appropriate model. If both original LM statistics and both robust values are significant, Anselin suggests that “more serious misspecification problems are likely present” (200).

Following the tests proposed by Anselin, a ‘base’ OLS regression was first specified with the square root of the foreclosure rate as the dependent variable and the four neighborhood characteristics factors as the independent variables. For spatial dependence diagnostics, all three Lagrange Multipliers are significant at $\alpha = .99$,

\textsuperscript{27} Calculation of Lagrange Multipliers is discussed in Anselin, 1988.
\textsuperscript{28} The LM-SARMA statistic tests for higher-order spatial relationships. Its significance generally confirms the rejection of the null (no autocorrelation) hypothesis.
suggesting spatial effects (Anselin, 2005). Robust versions of each multiplier have lower values (which is expected), and the higher of the two – the lag multiplier – only achieves significance at $\alpha = .85$. While the alpha value for the robust lag multiplier is not ideal, the highly significant values for the non-robust multipliers, coupled with a highly significant value for both the LM-SARMA multiplier and Global Moran scatterplot\textsuperscript{29}, suggests that a spatial model should be used and OLS avoided. The misspecification issues that Anselin references might be due to the relatively low number of observations, or the fact that the base model fails to include subprime percentage. Based on the results of the LM multipliers, the regression analyses will employ spatial lag models. The specification for the spatial lag model is

$$Y = \beta X + \rho Wy + v$$

Where:

$Y$ is the dependent variable

$X$ is the matrix of independent variables with coefficient $\beta$

$Wy$ is the dependent variable $y$ multiplied by the spatial weights matrix $W$ with spatial weight coefficient $\rho$.

$v$ is an error term.

In short, a spatial lag regression takes into account both a spatial weight, and it allows the dependent variable to vary in calculating the spatial weight. Two measures of fit are relevant for spatial lag models. First is a pseudo-$r^2$ that, while not directly comparable to OLS $r^2$, does provide an easily-interpretable measure of fit. The second

\textsuperscript{29} A global Moran scatterplot was constructed for the dependent variable (square root of the foreclosure rate) and its spatially-lagged form based on a queen contiguity matrix (cf. Anselin, 2005: 53, 129-134). The plot and randomization can be found in Figure XX, and with pseudo-significance at $\alpha = .999$, suggests a high degree of spatial autocorrelation in the variable.
The diagnostic is log likelihood, increases in which (toward 0) indicate improved fit of the model.
CHAPTER 4
RESULTS AND ANALYSIS

This penultimate chapter details the results of the exploratory (quantitative and spatial), bivariate, and multivariate analyses. First, it describes the results of descriptive and spatial analyses, including maps of subprime lending rates, shifts in normalized house prices (and the spatial dimensions of these shifts), and maps of both foreclosure incidence and foreclosure rates. Then, it relates the results of bivariate Pearson’s correlations, presented in a correlation matrix. The chapter concludes with the results of four nested spatial lag models.

4.1 Descriptive and Spatial Analysis

Levels of subprime lending in Allen County vary across space and time (cf. Figure 7). By year, 2005 witnesses the highest level of subprime activity, with high-cost lending decreasing slightly in 2006 and dramatically in the 2007 data. Despite yearly swings, the spatial extent of overall subprime lending (Figure 16, bottom right) is remarkably tidy, particularly from a concentric zone or sector theory perspective. The highest concentration of subprime is in the most economically-disadvantaged neighborhoods south and east of downtown Lima, with lesser amounts in the slightly more prosperous areas north and west of downtown. Subprime lending continues to decrease as one moves outward from the Lima CBD, with the lowest concentrations in the well-to-do suburbs in American and Shawnee Townships.
Figure 7. **Subprime lending as Percentage of Total Lending, 2005-7.**

House price values, normalized by square footage and averaged across each year, are reported in Table 8. These results indicate that Lima’s residential real estate values increased modestly from 2000 through 2006, and have decreased slightly since then. The
amount of appreciation from 2000-6, 21.82%, is slightly less than any value seen in the 20-city Case–Shiller Index, but approaches amounts seen in Cleveland (23.5%), Dallas (26.5%), and Detroit (27.1%). However, Case-Shiller values are calculated on a monthly basis, while Lima’s prices were figured on a yearly average; thus, the comparison is not perfect. The amount of post-2006 depreciation in Lima, 5.45%, is substantially less (in magnitude) than values seen in the Case-Shiller index, but again, differences in calculation exist across the averages.

<table>
<thead>
<tr>
<th>Year</th>
<th>Avg price/sqft</th>
<th>Number of sales</th>
<th>Stdev in price</th>
<th>Change from prev year</th>
<th>Change from 2000</th>
<th>Change from peak</th>
</tr>
</thead>
<tbody>
<tr>
<td>2000</td>
<td>47.6830</td>
<td>1918</td>
<td>25.37</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2001</td>
<td>51.2063</td>
<td>1792</td>
<td>24.81</td>
<td>7.39%</td>
<td>7.39%</td>
<td></td>
</tr>
<tr>
<td>2002</td>
<td>50.3424</td>
<td>1860</td>
<td>27.07</td>
<td>-1.69%</td>
<td>5.58%</td>
<td></td>
</tr>
<tr>
<td>2003</td>
<td>52.5203</td>
<td>1991</td>
<td>27.17</td>
<td>4.33%</td>
<td>10.14%</td>
<td></td>
</tr>
<tr>
<td>2004</td>
<td>55.3452</td>
<td>2345</td>
<td>28.28</td>
<td>5.38%</td>
<td>16.07%</td>
<td></td>
</tr>
<tr>
<td>2005</td>
<td>56.5413</td>
<td>2201</td>
<td>30.12</td>
<td>2.16%</td>
<td>18.58%</td>
<td></td>
</tr>
<tr>
<td>2006</td>
<td>58.0871</td>
<td>2088</td>
<td>30.02</td>
<td>2.73%</td>
<td>21.82%</td>
<td></td>
</tr>
<tr>
<td>2007</td>
<td>56.3419</td>
<td>1957</td>
<td>31.57</td>
<td>-3.00%</td>
<td>18.16%</td>
<td>-3.00%</td>
</tr>
<tr>
<td>2008</td>
<td>54.9210</td>
<td>1458</td>
<td>39.60</td>
<td>-2.52%</td>
<td>15.18%</td>
<td>-5.45%</td>
</tr>
</tbody>
</table>

*Table 8. Aggregated Allen County House Price Sales Data.*

The geography of house price changes differs across space (cf. Figure 8). Overall, levels of appreciation are highest in the suburban and exurban areas, particularly northeast of Lima. The lowest levels of appreciation are primarily found in the area immediately east and south of downtown Lima, but can also be found in the western, exurban portions of the county between Lima and Delphos. The highest levels of depreciation are located in downtown Lima and the neighborhoods immediately surrounding it, but also in several exurban and suburban blockgroups. Several
blockgroups, particularly suburban and exurban ones but also including nearly all of Delphos and Bluffton, have seen no depreciation since their 2000-2001 price levels.

Maps of foreclosures by year can be found in Figure 9, and the overall foreclosure rate can be found in Figure 10. The spatial extent of foreclosures largely corroborates the existing research: they are concentrated in the socioeconomically depressed areas surrounding downtown Lima, with lesser concentrations in the outlying cities – Delphos, Bluffton, Spencerville, Fort Shawnee, and Cairo. However, one should note that these are also where houses are concentrated, and the intervening areas are sparsely-populated.
Figure 8. Allen County House Price Changes. Calculations given in Section 3.2.
Figure 9. Allen County Foreclosures by Year, 2005-8.
To account for the spatially-uneven distribution of dwelling units, examination now turns to the foreclosure rate. As mentioned in Section 3.2, foreclosure rates were calculated at the blockgroup level with the number of residential properties serving as the denominator. As expected from the literature review, the highest foreclosure rates are found in the neighborhoods surrounding downtown Lima, with lower rates in the more affluent suburbs to the city’s northwest and southwest. However, foreclosure rates seem to be particularly high immediately west of downtown, which is generally considered more well-to-do than other near-downtown neighborhoods. Also, the rate of foreclosure is appreciably lower immediately to the east of downtown, an area defined by a lower
socioeconomic character (cf. Ackerman and Murray, 2004). Turning to areas outside Lima, higher rates are found in outlying cities and villages, and exurban/rural areas witness lower foreclosure incidence. However, some suburban and exurban areas, notably north, northeast, and southeast of Lima, see higher foreclosure rates than other suburban blockgroups. This is particularly surprising to the north of Lima, which is home to a more affluent population, and which sees considerably lower foreclosure rates immediately to its west. These variegated patterns of foreclosure suggest that factors outside of simple socioeconomic economic factors are influencing foreclosure rates. These more complicated relationships are tackled in the multivariate regression modeling discussed in Section 4.3. In the next section, bivariate correlations are calculated to quantify more simple relationships among the topics under study.

### 4.2 Pearson’s Correlations

Table 9 contains a correlation matrix between neighborhood characteristics (and factor scores) and the real estate dynamics under study. Examining the bivariate relationships allow the quantification of the relationships proposed through the cartographic analysis: that subprime lending and foreclosures are most prevalent in predominantly minority, poorer, inner-city neighborhoods; that house price appreciation is highly differentiated across neighborhoods with little spatial or socioeconomic dependence; and that house price depreciation is concentrated in both poorer, inner-city areas but with elevated price falls in some suburban and rural tracts.
Table 9. Pearson’s Correlations. * denotes significance at $p < .05$, ** for $p < .01$ (two-tailed).

A number of significant bivariate relationships exist between subprime lending and socioeconomic factors, and these correlations largely mirror those observed in previous studies. Subprime lending percentage is highly and positively related to a variety of variables denoting areas of lower socioeconomic status, including minority population, percent rental housing, and percent vacant properties. It carries positive relationships with manufacturing and lower-level service employment, and a negative correlation with managerial/professional/FIRE (finance, insurance, and real estate) workers. This observation also likely signifies a negative correlation with educational
levels, since blockgroups most likely to have a substantial well-educated population (with a high percentage of managerial and professional employees) exhibit a negative relationship with subprime lending.

Turning to the correlations associated with house price dynamics, our attention shifts from neighborhood characteristics to other real estate market phenomena, specifically subprime lending (for appreciation) and foreclosures (for depreciation). The relationships between neighborhood characteristics and house price changes have been extensively studied, largely under the house/neighborhood filtering paradigm, and as such are not germane to the analysis here.

From the conceptual model and literature review, we expect a positive correlation between subprime lending and house price appreciation. Coleman IV et al. (208) find a positive, significant relationship between high cost loans, particularly in the period 2004-2006, when private market securitizers supplanted the GSE’s in the secondary market, and increases in residential sales prices. Their data includes lending volumes and real estate prices across the twenty MSA’s included in the Case-Shiller index. Other, less academic perspectives have reasoned that subprime lending fueled the housing boom by expanding the pool of potential homeowners and by allowing buyers to purchase more expensive homes (relative to their income). However, the Allen County data does not reveal a significant relationship between subprime and percent appreciation – in fact, while insignificant, the correlation is negative, the opposite of the expected relationship.

In contrast, one does see the expected relationship between house price depreciation and foreclosure rate. A number of studies have observed the negative impact that foreclosures exhibit on nearby house prices (Baxter and Lauria, 2000;
Immergluck and Smith, 2006; Li, 2008) with the first study examining the static relationship between foreclosure and depreciation (similar to this methodology) while the latter two adopt a more dynamic modeling approach. Regardless, the results are similar: a relatively-strong and negative relationship exists between foreclosures and changes in residential sales prices (or, putting it another way, a strong and positive relationship between foreclosure rates and amount of depreciation).

The correlations between the foreclosure rate and neighborhood characteristics variables also follow the relationships expected from the literature review. Foreclosure incidence is highest in the socioeconomically-disadvantaged neighborhoods characterized by a large minority population, poorly paying jobs, and a high amount of rental and vacant housing. The bivariate analysis shows a high (though not perfect) correlation between foreclosure rate and subprime lending percentage, and the relationships between these variables and socioeconomic status markers are largely similar, though again not identical. This suggests that a dynamic relationship between foreclosures (as the dependant variable) and neighborhood characteristics, subprime lending, and house price depreciation (as independent variables). The results section now turns to multivariate, spatial lag regression techniques to identify these relationships.

4.3 Regression Modeling

To ascertain the multivariate relationships between foreclosures (dependent) and neighborhood characteristics and housing market dynamics (independent), a series of nested, spatial lag regression models was constructed. Results for all models are found in Table 10. Because of a high amount of positive skewedness in the foreclosure rate, a square root transformation is applied to serve as the dependent variable. These models
allow the research to test a ‘base’ scenario, by only incorporating the socioeconomic status factors and a spatial weight as independent variables, and then successively adding the real estate variables (subprime lending percentage, house price depreciation and appreciation). Thus, the neighborhood characteristics factors act as controls to the added independent (housing) variables.

<table>
<thead>
<tr>
<th>Model</th>
<th>1</th>
<th>2</th>
<th>3a</th>
<th>3b</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pseudo-R²</td>
<td>0.644</td>
<td>0.660</td>
<td>0.661</td>
<td>0.667</td>
</tr>
<tr>
<td>Log-likelihood</td>
<td>-72.111</td>
<td>-69.258</td>
<td>-69.070</td>
<td>-68.343</td>
</tr>
<tr>
<td>Variable</td>
<td>Coeff</td>
<td>p&lt;</td>
<td>Coeff</td>
<td>p&lt;</td>
</tr>
<tr>
<td>Constant</td>
<td>1.330</td>
<td>0.000</td>
<td>0.966</td>
<td>0.001</td>
</tr>
<tr>
<td>Spatial Weight</td>
<td>0.415</td>
<td>0.000</td>
<td>0.324</td>
<td>0.005</td>
</tr>
<tr>
<td>Factor 1</td>
<td>0.413</td>
<td>0.000</td>
<td>0.263</td>
<td>0.007</td>
</tr>
<tr>
<td>Factor 2</td>
<td>0.140</td>
<td>0.011</td>
<td>0.115</td>
<td>0.034</td>
</tr>
<tr>
<td>Factor 3</td>
<td>-0.139</td>
<td>0.011</td>
<td>-0.098</td>
<td>0.082</td>
</tr>
<tr>
<td>Factor 4</td>
<td>-0.005</td>
<td>0.926</td>
<td>-0.018</td>
<td>0.727</td>
</tr>
<tr>
<td>Subprime %</td>
<td>0.019</td>
<td>0.015</td>
<td>0.020</td>
<td>0.012</td>
</tr>
<tr>
<td>Depreciation %</td>
<td>0.003</td>
<td>0.539</td>
<td>0.007</td>
<td>0.277</td>
</tr>
<tr>
<td>Appreciation %</td>
<td>0.002</td>
<td>0.604</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 10: Model Summaries. Spatial lag techniques were used for all models. Dependent variable for all models is the square root of the foreclosure rate (sqrtpforeclosure).

Model 1 serves as the ‘base’ equation and only employs the neighborhood characteristic factors as independent variables. Its pseudo-r² value of .644 signals a high amount of explanatory power in the model. The spatial weight is positive and significant, confirming the spatial autocorrelation in the dependent variable. Both factors 1 and 2 are positive and significant, indicating that foreclosure incidence increases in poorer, minority neighborhoods with high amounts of low-level service sector employment.
Factor 3 is negative and significant, signifying that foreclosure rates decrease as the proportion of white collar employment increases (and increase as the amount of blue collar jobs increases). Factor 4 is highly insignificant in this model and subsequent regressions. These results largely confirm previous authors’ findings about foreclosures.

Model 2 retains the independent variables from model 1 with the addition of subprime lending percentage. The retained variables display the same loadings (positive or negative) with only minor changes in magnitude. The spatial weight, factor 1, and factor 2 are still significant in this model; likewise, factor 4 maintains its insignificance; while factor 3 is no longer significant at $\alpha = .95$ (but is at $\alpha = .9$). The subprime variable carries a positive and significant coefficient, confirming previous research that foreclosure rates increase as subprime lending rates increase. The $r^2$ and log-likelihood values of model 2 are greater than those of model 1, signifying the increased explanatory power through the addition of subprime lending percentage (over and above the power given by just socioeconomic status indicators).

To examine further the additional explanatory power achieved through the addition of subprime lending percentage to the model, an OLS regression was constructed that regressed the socioeconomic factors on the absolute improvement in residuals from model 1 to model 2. Model results can be found in Table 11. Unfortunately, the model fails to achieve significance. The improvements in residuals are also mapped at Figure 11. A cursory glance at the patterns of improvements does not indicate any strong spatial relationship, although there appears to be some concentration in the north end of Lima.

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30 The dependent variable was calculated as $|\text{resid}_1 - \text{resid}_2|$, where $\text{resid}_1$ is the residual from model 1 and $\text{resid}_2$ is the residual from model 2
Model: Improvement in Residual

\[
\begin{align*}
r^2 &= .041 \\
\text{Adjusted } r^2 &= -.002 \\
F &= .954, p < .437
\end{align*}
\]

<table>
<thead>
<tr>
<th>Variable</th>
<th>Coeff</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Constant</td>
<td>-.010</td>
<td>.413</td>
</tr>
<tr>
<td>Factor 1</td>
<td>-.009</td>
<td>.459</td>
</tr>
<tr>
<td>Factor 2</td>
<td>.020</td>
<td>.104</td>
</tr>
<tr>
<td>Factor 3</td>
<td>.007</td>
<td>.590</td>
</tr>
<tr>
<td>Factor 4</td>
<td>-.006</td>
<td>.605</td>
</tr>
</tbody>
</table>

Table 11. Regression of Neighborhood Factors on Improvement in Residuals from Model 1 to Model 2.

Model 3a includes the addition of percentage house price depreciation, recoded so that all values under 10% are represented as 0, to the variables included in model 2. The depreciation factor is highly insignificant, and overall model fit only increases by .001 in the pseudo-\(r^2\) value, with a similarly miniscule increase in log-likelihood. Model 3b adds house price appreciation as another independent variable; however again, this factor is highly insignificant and the improvement to model fit is only marginal (a .006 increase in \(r^2\) over model 3a).
Figure 11. Improvement in Residuals from Model 1 to Model 2. Values represent change in magnitude – i.e., positive numbers indicate that the residual became closer to zero.
CHAPTER 5
CONCLUSIONS AND POLICY RECOMMENDATIONS

The final chapter relates the conclusions garnered from the analysis, policy recommendations, and ideas for future research.

5.1 Summary of Results

Overall, the results indicate that Lima/Allen County is not substantially different from other metros in either the spatial distribution of housing market phenomena or the relationships among these events and neighborhood characteristics. Subprime lending is highly concentrated in less well-to-do areas, but outlying, more affluent suburbs also received a substantial portion of high-cost mortgage finance. House price changes (both increases and decreases) were dramatic in some neighborhoods, with the greatest increases in some suburban tracts (expected, given likely construction) and the greatest decreases in inner-city areas (again expected, given neighborhood filtering patterns and vacancy rates). Post-cleanup foreclosure rates do not indicate a sudden increase in default incidence in 2007 and 2008, although the dramatic jump from 2005 to 2006 is cause for concern – perhaps the housing crisis reached Lima a few years early.

The series of spatial lag regression models, considered under Section 4.3, mirror the conclusions of some, but not all previous foreclosure research. Similar to the results in Baxter and Lauria (2000) and Kaplan and Sommers (2009), foreclosure incidence is strongly (and positively) related to socioeconomic distress, be it related to race, housing,
income (all seen in factor 1), or occupation (factor 2). There appears to exist a negative relationship between foreclosures and educational levels, as factor 3 – which strongly differentiates between (well-educated) white collar workers and (poorly-educated) blue collar workers and only moderately contrasts income levels – is significant, at least in model 1. Factor 3’s reduced significance following the addition of the subprime variable suggests that educational differences might also be reflected in the use of subprime credit, with less-educated borrowers more likely to choose high-cost mortgages.

Returning to the ultimate conceptual question, whether foreclosure rates are influenced by housing market phenomena, the research presents a mildly affirmative answer in the case of subprime lending and a negative response for house price dynamics. The addition of subprime lending provided some, but not substantial, improvement in model fit diagnostics. Both house price change amounts were highly insignificant and only provided a marginal improvement in model fit.

Perhaps most importantly to city officials, the research confirms that Lima’s housing market is highly differentiated from Detroit’s. In conversations with policymakers and elected officials, many expressed a fear that Lima’s economy “had fallen off an edge,” with steep rises in unemployment and foreclosures and a concomitant fall in housing prices, and commonly associated these potential changes with the economic distress seen in Detroit. However, the analysis here reveals a slumping, but not cascading, local economic picture. Lima’s house prices increased modestly from 2000 to 2006 – similar to those seen in other metros – and have decreased slightly in the years after 2006. Foreclosure rates have increased, but they are not spiraling out of control.
5.2 Policy Recommendations

Despite the previously-discussed intractability in much of the policy discussions surrounding the current foreclosure crisis (see Section 2.4), this discussion elucidates common-sense policy measure that would likely achieve a high degree of consensus, largely following the work of Shiller (2008). The remedies below are aimed at satisfying three goals. First, remedies must be holistic in nature. Instead of confining responses to one aspect of the mortgage market – for example, originating institutions, or mortgage servicers (cf. Eggert, 2004) – policy reforms must consider the various actors in the mortgage industry (Renuart, 2004; White, 2004). Second, policy must preserve buyer choice. While mandating 15- or 30-year fixed rate mortgages for all buyers might be an easily-implemented solution, it neglects the variegated circumstances of this nation’s homebuyers. Third, while preserving buyer choice, policy solutions must concurrently eliminate the worst practices of the mortgage market. To this end, predatory lending must be curtailed, and barriers that prevent distressed borrowers from negotiating loan work-outs should be eliminated. With the charge that responses must embrace a holistic methodology, the following discussion begins with the borrower and proceeds through the various mortgage market actors: brokers, originating institutions, and secondary market participants.

Homebuyer protections against high-cost loans, embodied in the Home Ownership and Equity Protection Act of 1994 (HOEPA), should be strengthened. Currently, buyer protections are only triggered by a first-lien mortgage that is ten percentage points above prime, a second-lien mortgage that is eight percentage points above prime, or when fees exceed eight percent of the loan amount (Federal Trade
Commission, 2008). When these triggers are met, lenders must provide additional disclosures (compared to those currently mandated by the Truth in Lending Act [TILA]) to the purchaser, including the APR, the monthly payment for the first month, whether the interest rate will adjust, and, if so, the maximum potential monthly payment. HOEPA also outlaws certain practices for these loans, including balloon payments within the first five years of the mortgage and any negative amortization payment schedule. Additionally, HOEPA obligates the lender to ensure that the loan is in the best fiduciary interest of the borrower.

Strengthening HOEPA would ensure that these common-sense disclosures reach more buyers in the subprime market. Lowering the HOEPA triggers to five percentage points for a first-lien mortgage and four percentage points for a second-lien would dramatically increase the number of borrowers meeting HOEPA protections.\textsuperscript{31} Even given current practices to skirt HOEPA -- White (2004) notes that subprime loan volume tends to ‘bunch’ immediately under the HOEPA ceiling -- those buyers just escaping the triggers have much better loan terms than those who are currently just outside of HOEPA purview.\textsuperscript{32}

While brokers occupy a powerful position in the mortgage industry as knowledge gate-keepers, they exist in a lightly-regulated environment with ambiguous fiduciary responsibilities. In theory, brokers have an obligation to the borrower that mandates them to locate the best loan product by ‘shopping’ a mortgage to several lenders

\textsuperscript{31} I would argue that HOEPA should be expanded to include all loans, but in the interest of pragmatism in the near-term, these triggers seem reasonable. However, given the low opinion that many currently exhibit toward the finance industry, now might be the best time to enact strong homebuyer protection legislation.

\textsuperscript{32} White (2004) demonstrates that a greater-than-expected (given borrower’s income) percentage of first-lien subprime loans carry an interest rate between 9.5-9.9 percentage points above prime – just below the HOEPA trigger of 10 percentage points.
(Renuart, 2004). However, in practice, brokers often collude with originators to maximize profits for both institutions. Brokers are regulated at the state level, often with a lenient licensing board and little to no ongoing oversight.

Policy reforms of the mortgage broker industry must make the broker’s fiduciary responsibilities clear and provide some recourse for borrowers against brokers who do not fulfill this responsibility. Regarding the latter point, I am reminded of the slogan, most often heard in appliance store commercials, of “best price or we’ll pay you the difference.” Applying this tactic to brokers, if they fail to provide the borrower with the best possible mortgage, the homebuyer would have the option to pursue the difference through legal channels. Since the borrower would incur significant legal fees in such an action, lawsuits would be limited to the most egregious violations by brokers where the borrower would expect to recoup the difference above-and-beyond litigation expenses.

Since the least financially-savvy consumers are most likely to take out a subprime loan, originators should simplify the often-complex nature of subprime pricing. As illustrated in White (2004), subprime originators employed incredibly elaborate pricing tables that included options for prepayment penalties, points, loan-to-value ratios, and loan structure (fixed-rate vs. adjustable-rate). While, in theory, providing the buyer with more mortgage options is a net gain for the borrower, since he/she can ‘tailor’ a loan to his/her particular situation, White (2004) argues that the various options can confuse homebuyers. Additionally, since subprime rates are considered trade secrets, they are not promulgated (like prime rates) in press; thus, subprime buyers have no objective standard that allows them to compare with offered rates.
Policy makers should consider the role of securitization in preventing distressed buyers from conducting loan work-outs (Morgenson, 2007b). Securitized bonds contain numerous protections for their purchasers which often include restrictions on interest rate changes and prohibitions on principal adjustments. However, tinkering with the interest rate can only achieve so much, particularly if the house has lost a considerable amount of value. Regulators should explore the legal options of modifying MBS contracts so that loan servicers can reduce the mortgage principal for distressed borrowers. Perhaps limiting such adjustments – to, say, 10% -- would make the change palatable to bond holders.

Reforms in the secondary market should obligate originators to focus again on underwriting – that is, making the best loans – instead of volume – making the most loans. Covered bonds are one proposed method for accomplishing this end (US Treasury, 2008). These instruments would allow secondary market purchasers to have some recourse for losses above a specified level. If losses exceeded this, bond holders could recoup any additional deterioration in value, presumably through legal action against the bond issuer. The originator would, in turn, be liable to the bond issuer for losses due to loans it had originated. An alternative method of secondary market reform would be to limit the interest that an originating institution could sell into the secondary market. Originators would be forced to keep a certain fractional amount of each loan (say, 25%) on their balance sheet, while the remaining amount could be sold into the
secondary market. Thus, the lender would have a vested interest in originating only the best loans.\textsuperscript{33}

5.3 Ideas for Future Research

While I believe the research presented here makes important inroads in understanding various housing market phenomena in a smaller, Rust Belt city, more work can be done toward examining these unique (and understudied) metros. Just within the state of Ohio, similar work could be conducted in Mansfield, Findlay, Marion, and Steubenville – three cities comparable to Lima in population and some (but not all) demographic and economic characteristics.

One salient aspect of the methodology employed here is that it is essentially timeless, i.e. the models do not incorporate variables that identify \textit{when} the underlying phenomena are occurring. Future analysis should adopt a more robust consideration of time. Possible actions include calculation of time-series statistics and studying the interactions between phenomena and years (e.g., the relationship between subprime lending in 2005 and foreclosures in 2008). The calculation of the latter would undoubtedly require a larger dataset than the one used in this research.

Another potential improvement to the regression modeling could be the use of interaction variables between each principal component and subprime lending percentage. Including interaction terms in a regression model in addition to each principal component could illuminate whether subprime lending

Going forward, it is important that the subprime/housing bubble/foreclosure literature move beyond the current case study mentality and begin to approach more

\textsuperscript{33} Alternatively, lenders could be forced to keep a certain percentage of their mortgage portfolio (instead of individual mortgages) on their balance sheets. While simpler in execution, this reform would likely cause originators to hold the loans of the most qualified buyers and securitize the riskiest instruments.
theoretical issues surrounding the various phenomena. While case studies are important in cultivating necessary data, their spatial bounds make widespread theorizing difficult. I would suggest that the literature follow a path similar to that seen in gentrification scholarship – an early period of case studies, followed by a rich theoretical debate.

Additionally, future research on subprime lending and foreclosures should endeavor to improve how it accounts for agency – that is, who takes out the subprime loan, and who defaults on it? As discussed previously, a substantial body of literature has shown that subprime lending and foreclosures are spatially concentrated in socioeconomically-disadvantaged areas, particularly in the inner-city. These areas are often the site of much rental property; for example, owner-occupancy rates in some of Lima’s south end blockgroups are as low as 7% (from Census 2000 data). Since so few people own their residence, it is likely that they are not the ones taking out subprime loans and not those choosing to enter foreclosure. The research here, and those using similar methodologies, cannot account for who is taking out subprime loans or entering foreclosure, just where these phenomena are occurring. Thus, researchers in this vein, including myself, must be content with limiting the scope of our conclusions to ‘foreclosures are more prevalent in areas of certain characteristics, and not that ‘certain buyers are more likely to be in foreclosure.’
WORKS CITED


