Inequity by Default? Metropolitan Foreclosure and Housing Market Dynamics

Thiago Marques

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Kyle Crowder

Stewart Tolnay

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Abstract

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Thiago Marques

Chair of the Supervisory Committee:

Professor Kyle Crowder

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The devastating consequences of the Great Recession on individuals and households across the United States are well-documented and far-reaching. However, few studies have attempted to connect the foreclosure crisis with housing market conditions known to reshape processes of residential stratification in American metropolitan areas. This study is among the first to investigate the impact of metropolitan-level foreclosure concentration on five features of the urban housing market: internal migration, minority suburbanization, housing value, minority homeownership, and racial residential segregation. I combine metropolitan-level census data containing demographic, economic, and housing characteristics with a unique and expansive geocoded dataset covering nearly all foreclosure listings in the U.S. between 2005 to 2010. Results indicate that concentrated home mortgage foreclosure predicts increasing internal migration and declining housing values in metropolitan areas. Despite theoretical expectations, foreclosure concentration appears to be associated with rising minority suburbanization and homeownership rates, while models of minority-white segregation are unable to reproduce significant results uncovered in prior research. The effects of foreclosures on housing market dynamics are more foreboding for minorities if, in addition to depreciating home values, rising rates of internal migration and suburbanization are markers of residential disadvantage.

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Metropolitan Foreclosure and Housing Market Dynamics

Thiago Marques
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Abstract

The devastating consequences of the Great Recession on individuals and households across the United States are well-documented and far-reaching. However, few studies have attempted to connect the foreclosure crisis with housing market conditions known to reshape processes of residential stratification in American metropolitan areas. This study is among the first to investigate the impact of metropolitan-level foreclosure concentration on five features of the urban housing market: internal migration, minority suburbanization, housing value, minority homeownership, and racial residential segregation. I combine metropolitan-level census data containing demographic, economic, and housing characteristics with a unique and expansive geocoded dataset covering nearly all foreclosure listings in the U.S. between 2005 to 2010. Results indicate that concentrated home mortgage foreclosure predicts increasing internal migration and declining housing values in metropolitan areas. Despite theoretical expectations, foreclosure concentration appears to be associated with rising minority suburbanization and homeownership rates, while models of minority-white segregation are unable to reproduce significant results uncovered in prior research. The effects of foreclosures on housing market dynamics are more foreboding for minorities if, in addition to depreciating home values, rising rates of internal migration and suburbanization are markers of residential disadvantage.

Inequity by Default?
Metropolitan Foreclosure and Housing Market Dynamics

The devastating consequences of the Great Recession on individuals, families, and communities across the United States are well-documented and far-reaching. The housing bust has been associated with postponing family formation (Morgan, Cumberworth, and Wimer 2011), increasing emergency room visits for heart and mental health problems (Currie and Tekin 2015), disrupting primary education (Been et al. 2011), and rising levels of robberies and property crime (Arnio, Baumer, and Wolff 2012; Arnio and Baumer 2012; Baumer, Wolff, and Arnio 2012). Abounding evidence suggests the devastating impact of the foreclosure crisis of 2007 was distributed unevenly across racial and ethnic groups and, given slow and uneven declines in residential segregation, concentrated in neighborhoods with the largest black and Latino populations (Bocian et al. 2011; Hall, Crowder, and Spring 2015b). Despite the recent surge in scholarly attention to the repercussions of the economic crisis generally, much less is known about the particular impact of foreclosures on the housing market conditions commonly associated with processes of residential stratification in U.S. metropolitan areas. More specifically, how did variations in the concentration of foreclosures reshape demographic and economic features of the urban housing supply that influence residential stratification above and beyond historical and contemporary features of the metropolitan area?

I use a unique and expansive geocoded dataset containing nearly all foreclosure events in the U.S. – spanning the period of time before, during, and after the recession – to understand how the crisis affected changes in internal migration, minority suburbanization, housing values, minority homeownership, and minority-white residential segregation. I generate metropolitan-level measures with geographically precise information on over five million foreclosure events

for the six-year period between 2005 and 2010. Decennial census surveys, American Community Survey (ACS) estimates, and the Bureau of Labor Statistics (BLS) provide data on the demographic, economic, and housing features of each metropolitan area.

This study contributes to the literature in three key ways. First, I expand on earlier scholarship by identifying associations between metropolitan-level foreclosure concentration and changes in several oft-cited determinants of residential stratification that are typically documented at only lower levels of aggregation. Second, I move beyond case studies of individual neighborhoods, counties, and cities, and cast a wider net to address the severe shortage in geographic coverage of the housing crisis by investigating all U.S. metropolitan areas. Third, I leverage longitudinal data describing the entirety of the housing crisis between 2005 and 2010. The evaluation of foreclosure at the metropolitan level, across the entire U.S. population, and over the course of many years as opposed to a single snapshot in time is important for resolving the ambiguity of past findings and understanding the extent to which residential inequality is influenced by shocks to the American housing system.

BACKGROUND AND THEORETICAL FRAMEWORK

Residential stratification has long been a major contributor to racial-ethnic disparities in the U.S., but recent research suggests that housing opportunities for blacks, Latinos, and Asians have been expanding in domains such as homeownership (Gabriel and Rosenthal 2005), suburban residence (Frey 2011), and integrated neighborhoods (Glaeser and Vigdor 2012). This trend towards convergence in residential attainment over the past several decades has been attributed to improvements in federal housing policies, increased economic achievement among minorities, and whites' liberalization of neighborhood racial composition preferences (Charles 2003). These encouraging patterns, however, vary according to historical and contemporary facets of the

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metropolitan context (Logan, Stults, and Farley 2004; Pais, South, and Crowder 2012). Historical characteristics of the metropolis, including regional location and industrial structure, have been linked to the development and maintenance of the first American ghettos (Farley and Frey 1994). Sources of contemporary stratification in metropolitan areas typically include growing minority and foreign-born representation, new housing construction, and interregional population shifts (Hall 2013; Iceland, Sharp, and Timberlake 2013; Logan et al. 2004), with recent investigations identifying zoning (Rothwell and Massey 2009, 2010; Rugh and Massey 2014) and subprime lending (Bond and Williams 2007; Fischer 2013) as modern mainsprings of inequality. Absent from much of this literature on residential stratification, however, is the relative impact of foreclosure as a contemporary determinant of disparity in the housing market.

The foreclosure crisis differentially affected racial and ethnic groups, with blacks and Latinos, in particular, bearing the burden of predatory lending, risk of default, and financial misadventure. At the household-level, the prospects of experiencing a foreclosure have been significantly greater for black and other minority families than for similarly positioned white households (Allen 2011; Bocian et al. 2011). Subprime mortgages were promoted and foreclosures spatially concentrated in lower-income, high-minority communities (Delgadillo and Erickson 2006; Gerardi and Willen 2008; Lauria and Baxter 1999; Lauria 1998; Li 2011; Pedersen and Delgadillo 2007; Williams, Galster, and Verma 2013). Accordingly, metropolitan areas with larger shares of minorities and high rates of segregation from whites had greater concentrations of high-cost subprime loans and more foreclosure events (Hwang, Hankinson, and Brown 2015; Hyra et al. 2013; Rugh and Massey 2010). Racial differences in the likelihood of experiencing foreclosure likely translate to *metropolitan-wide inequalities* between minorities and whites. While prior research has investigated the basic relationship between the foreclosure

crisis and residential stratification, few studies have explicitly interrogated the potential mechanisms responsible for this association.

Earlier work assesses the effects of residential stratification on foreclosure concentrations in urban areas (Rugh and Massey 2010) or considers the reverse within a counterfactual framework that simulates segregation levels holding pre-Recession foreclosure rates constant (Hall, Crowder, and Spring 2015a). While the former does not investigate the possibility that foreclosure predicts segregation or other forms of stratification, the latter does not bound simulated values within confidence intervals that reflect the degree of uncertainty in point estimates. Other studies that explain the level of residential stratification in a city as a function of the mortgage meltdown empirically test the effects of subprime lending – not of foreclosure activity (Bond and Williams 2007; Fischer 2013). Perhaps more importantly, these previous efforts do not evaluate *changes in the determinants of residential stratification* over time as a function of metropolitan-level foreclosure concentrations.

A limited number of individual- and neighborhood-level analyses examine the influence of foreclosure on housing supply processes as well as racial composition and transition, but they do not connect these outcomes to other aggregate-level phenomena (Baxter and Lauria 2000; Lauria and Baxter 1999; Lauria 1998; Li and Morrow-Jones 2010). Although informative, many of these assessments are further constrained by geographic and temporal specifications. Those with narrow geographic scopes confine our understanding of the variation in foreclosure risk to a small sample of case counties and cities with unique demographic compositions and housing market cycles (Biswas 2012; Calem, Hershaff, and Wachter 2004; Kobie and Lee 2010; Lee and Immergluck 2012). Moreover, although a number of scholars have examined different points in time before and after the crisis (e.g., Ding et al. 2011; Doviak and MacDonald 2012; Goodstein

et al. 2011), limited years of cross-sectional data prohibit a true investigation of foreclosure effects before, during, and after the Great Recession.

These broad bodies of literature add to our knowledge of how foreclosures influence housing market conditions and patterns of residential stratification across racial-ethnic groups and over economic cycles, while also providing a conceptual bridge between individual and aggregate dynamics of foreclosure and race- and place-based inequality. Nevertheless, our knowledge of how the surge in foreclosure activity during the 2007 financial crisis might have stalled or reversed post-Civil Rights Era progress in the factors affecting residential equity remains incomplete. There are compelling reasons to believe the concentration of foreclosure events transformed patterns of residential stratification by spurring internal migration, inhibiting suburbanization among minorities, slashing property values, decreasing the percent of minority owner-occupied housing units, and impeding residential integration between minorities and whites.

First, the foreclosure crisis may have altered secular trends in residential stratification through its influence on local housing market volatility. Foreclosure dramatically increases the probability of moving, with the majority of moves occurring within the same metropolitan area (Allen 2012; Molloy and Shan 2013). During the downturn, black residents were four times more likely than whites to experience foreclosure and to migrate locally in search of sustainable employment or more affordable housing (Stoll 2013). Patterns of inter-neighborhood migration further suggest that mobile blacks and Latinos are more likely to relocate to lower-quality destinations characterized by racial isolation and more poor neighbors, while white and assimilated Asian movers sort themselves into more stable and predominately white areas (Crowder, Pais, and South 2012; Crowder and South 2005; Pais et al. 2012; Quillian 2002;

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South, Crowder, and Chavez 2005a, 2005b, 2005c; South and Crowder 1997, 1998; White and Sassler 2000). A substantial amount of residential turnover in the local housing market, in turn, can dissolve neighborhood social cohesion and institutions that monitor the well-being of communities (Sampson, Raudenbush, and Earls 1997). The high occurrence of residential relocation arising from quite possibly the largest migration event in recent U.S. history (Hall et al. 2015a) combined with nonrandom and racially-differentiated destination neighborhoods should contribute to residential inequality for minorities in metropolitan areas ravaged by foreclosure.

Hypothesis 1: Metropolitan areas with a high concentration of foreclosures experience increasing internal geographical mobility.

Changes to the representation of minorities in the suburban rings of metropolitan areas is another condition of the housing market that links the foreclosure crisis and residential inequality. Suburban residence has been associated with greater overall per capita income (Swanstrom et al. 2004), better school systems (Carruthers and Ulfarsson 2003), and lower levels of disadvantage (Timberlake and Iceland 2007). Minority access to these amenities developed slowly relative to whites (Timberlake, Howell, and Staight 2011), but raised the odds of experiencing foreclosures during the housing bust (Rugh 2015). Foreclosures were overwhelmingly concentrated in the black, Latino, and integrated neighborhoods of the suburbs (Hall et al. 2015a, 2015b), which were likely to see postforeclosure households move to denser, more urban neighborhoods in search of cheaper housing (Molloy and Shan 2013). During the crisis period, central cities of large metropolitan areas experienced rapid population gains alongside stalled suburban growth (Frey 2010, 2011). However, the traditional assumption that suburban residence is emblematic of spatial assimilation and upward socioeconomic mobility

(Massey and Mullan 1984) has been challenged by recent research that recognizes variation in suburban status (e.g., Hanlon 2009). The Great Recession should have minimal effects on rates of Asian suburbanization. These residents were relatively spared by the mortgage meltdown (Bocian et al. 2011; Jourdain-Earl 2011), traditionally live in predominantly white or advantaged neighborhoods nearly void of foreclosure activity (Hall et al. 2015b; Logan and Stults 2011; Timberlake 2002), and more readily convert socioeconomic gains into suburban residence (Massey and Denton 1988; Timberlake et al. 2011), thus making it feasible to dodge the detrimental effects of mass foreclosures.

Hypothesis 2: Higher levels of foreclosure concentration in the metropolitan area slow the rate of minority suburbanization by displacing suburban minorities and deterring minority groups from exiting the central city for suburban residence.

A third mechanism by which metropolitan areas could experience more residential inequality is through depreciating housing values fomented by aggregated foreclosure activity. Once tagged a disamenity, foreclosed properties endure underinvestment throughout phases of serious delinquency and in the possession of lenders (Gerardi et al. 2012), and transmit the spillover effects of depressed sales prices to neighboring housing units (Daneshvary and Clauretie 2012; Harding, Rosenblatt, and Yao 2009; Lin, Rosenblatt, and Yao 2007; Schuetz, Been, and Ellen 2008). The accumulation of toxic home mortgages has severe financial implications for the public revenue streams of a city. Approximately 3,750 foreclosures in 1997 and 1998 are estimated to have lowered the collective value of Chicago's housing stock by almost $600 million (Immergluck and Smith 2006). Areas hard-pressed by a dwindling tax base and lower property values typically suffer from poor service provisions, such as decreased police protection, and are more likely to amass sewerage disposal plants, municipal airports, and other

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undesirable facilities (Carruthers and Ulfarsson 2003). Racial-ethnic disparities in housing equity and unequal rates of property appreciation further suggest black and Hispanic households will have difficulty rebounding after the foreclosure crisis (Flippen 2004).

Hypothesis 3: A high percentage of foreclosed housing depreciates the value of residential homes in the metropolitan area.

Minority homeownership is a fourth feature of the housing market that suffered from concentrated mortgage foreclosure and may alter patterns of residential stratification. Homeownership status has been associated with racial integration (Clark 2007; Crowder, South, and Chavez 2006; Sharp and Iceland 2013), neighborhood stability (Rohe and Stewart 1996), social capital (Rosenthal 2008), and self-rated health (Finnigan 2014). Blacks and Latinos were most likely to experience foreclosure and transition out of homeownership in the wake of the housing crash (Gould Ellen and Dastrup 2012; Sharp and Hall 2014). The proportion of owner-occupied housing in neighborhoods declines as a result of foreclosure activity (Baxter and Lauria 2000) since individuals typically inhabit rental units after undergoing foreclosure (Molloy and Shan 2013). Predatory investors also purchase foreclosed properties and convert them into rental units, effectively shrinking the stock of available owner-occupied housing (Immergluck 2009; Treuhaft, Rose, and Black 2010). A dramatic transformation in the tenure composition of the metropolitan housing stock can erode the socioeconomic gains gleaned by minorities over past decades (Kuebler and Rugh 2013), elevate their costs of owning a home (Dieleman, Clark, and Deurloo 2000), and downgrade the economic status of their neighborhoods over time (Rosenthal 2008). Homeownership exit could further undermine the ability for black and Latino families to transfer housing wealth to future generations (Conley 1999, 2001; Hall and Crowder 2011).

Hypothesis 4: The rate of minority owner-occupation decreases in high-foreclosure metropolises.

Finally, foreclosure density might be an important factor shaping variations in changes in racial segregation, a familiar driver of residential disparity. Cities like Las Vegas, NV; Phoenix, AZ; and Merced, CA made relatively small progress toward integration between 2000 and 2010[1] and were also particularly devastated by the foreclosure crisis. For instance, over 25 percent of the housing stock in the Las Vegas and Phoenix metropolitan areas experienced foreclosure. These two cities also saw Latinos and Asians live in more isolated neighborhoods and black-white segregation decline at a slower rate than in the preceding decade. Evidence suggests white population loss as well as black and Latino growth in minority-dominant and diverse neighborhoods where foreclosures were overrepresented stalled the downward trend in black segregation (Hall et al. 2015a). Foreclosure-triggered neighborhood racial change and rising segregation can significantly agitate residential equality. A plethora of academic work links the segregation of non-white racial-ethnic groups to a variety of outcomes including concentrated poverty (Quillian 2012), violent crime (Logan and Messner 1987), overweight status (Chang 2006), and industrial pollution (Crowder and Downey 2010). The expectation that changes in racial residential segregation is a function of foreclosure concentration rests in the observation that the crisis knocked on the doors of some urban housing markets with more intensity than others.

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[1] Compared to declines in the previous decade. For instance, black-white metropolitan dissimilarity in Las Vegas declined by 20.5 percent between 1990 and 2000 but only declined by 8.1 percent in the succeeding decade. In contrast, segregation from whites increased for Asians by 14.4 percent between 2000 and 2010, a massive rise in light of the 0.69 percent increase observed in the 1990s. In Phoenix, Asian-white segregation declined by less than one percent in the closing decade of the 20th century and increased by a little over 7 percent between 2000 and 2010, while black-white dissimilarity decreased by 13.55 percent between 1990 and 2000, but only by 4.5 percent in the 2000s. Merced saw Latino-white segregation stall over the last 20 years. In addition to seeing 23 percent of its homes foreclosed upon, the California city saw a 5.53 percent decrease by 2000, compared to a decline of 2.53 percent by 2010.

Hypothesis 5a: High-foreclosure metropolitan areas experience increasing black-white and Latino-white segregation.

Hypothesis 5b: The foreclosure crisis has a minimal positive or no significant effect on change in Asian-white segregation. Alternatively, high-foreclosure metro areas see decreasing segregation between Asians and whites.

DATA AND METHODS

To understand the effects of foreclosure concentrations on housing market dynamics that may alter trends in residential stratification, I merge foreclosure records with demographic, economic, and housing data. Foreclosure events were acquired through proprietary agreements between Cornell University, the University of Washington, and real estate firm RealtyTrac, who compiled foreclosure records from the offices of county assessors in 2,860 of 3,143 U.S. counties – over 91 percent of the population. The geographic location of each foreclosed housing unit is pinpointed using latitude-longitude coordinates and summed to construct metropolitan-level records. This unique, geocoded dataset covers nearly all foreclosure listings in the U.S. for the six-year period from January 1, 2005 to April 1, 2010[2].

Because this study aims to understand the impact of foreclosure on metropolitan housing market dynamics, non-residential properties are excluded from the analysis. Residential housing units that have completed the foreclosure process are kept for three reasons. First, the foreclosure process is characterized by a continuum of stages that vary by state, but concludes with a public auction sale (i.e., Notice of Trustee Sale or Notice of Sale), or is repossessed by a lender and classified as real-estate owned (REO). The inclusion of only these properties controls for state-

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[2] Since 1930, the census has been conducted on April 1, also known as Census Day.

level variation in the foreclosure process. Second, this strategy prevents a housing unit from being counted more than once in the sample. Third, auction notices are legal and public announcements that notify potential buyers and residents. Visible signs of foreclosure, or "low signals," reveal to neighboring householders that the property market is on the decline (Agarwal et al. 2012) and can initiate changes in metropolitan housing market features as a result. After eliminating possible duplicate records and restricting years of observations, the final sample of foreclosure records used in this study is 5,079,141.

Data on demographic, economic, and housing characteristics were collected from the 1990, 2000, and 2010 U.S. Census decennial surveys, the ACS 1-year estimate for 2005 and 5-year estimates for 2008-2012 (which approximates a 2010 average), and the 2010 Current Employment Statistics (CES) from the BLS for all 366 metropolitan statistical areas (MSAs) as defined by the U.S. Office of Management and Budget (OMB) in 2009.

Measuring the dependent variables. I operationalize features of the urban housing supply that can govern residential stratification using five distinct outcomes. First, internal migration captures the volatility of a metropolitan area's housing market and is measured as the percentage of the total population that moved within the MSA in the past year. The 2008-2012 ACS provides reliable estimates of local moves at the metropolitan-level that occurred at the tail-end of the recession in 2009. Second, minority suburbanization is measured as the percent of the population living in the suburban rings that is nonwhite. Third, metropolitan-level housing value is operationalized as the median dollar value of specified owner-occupied housing units[3]. Fourth, the minority homeownership rate is derived by subtracting the total number of non-

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[3] Specified houses are one-family houses on no more than 10 acres of land that do not contain a business or medical office on the property.

Hispanic/Latino white owner-occupied housing units from the total number of owner-occupied housing units divided by the total number of owner-occupied housing units. Lastly, racial residential segregation is measured by the index of dissimilarity (*D*) estimated across census tracts[4]. It is calculated using data available through the US2010 project and Spatial Structures in Social Sciences initiative at Brown University. The index of dissimilarity is considered one of the most interpretable dimensions of segregation and is commonly used to measure the proportion of whites, blacks, Latinos, or Asians that would have to move between tracts in order to match their total share in a metropolitan area.

Because my analysis investigates the effects of foreclosure concentration on *changes in housing market conditions* over the last decade, my models predict the percent change in the outcome variables. Measures of percent change capture the rates of change between two time periods to more accurately describe the relative differences in housing dynamics within a city over time. The percent change in minority suburbanization, minority homeownership, and residential segregation is measured as follows:

$$\Delta Y_{2000,2010} = \left(\frac{Y_{2010} - Y_{2000}}{Y_{2000}}\right) 100 \tag{1a}$$

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[4] The index of dissimilarity is insensitive to group size and describes the relative distribution of each group across city tracts. The formula for the 2010 index of dissimilarity using the black-white dichotomy as an example is:

$$D_{BW} = \frac{1}{2}\left(\sum_{j=1}^{J}\left|\frac{b_j}{B} - \frac{w_j}{W}\right|\right)100 \tag{2}$$

where b_j and w_j refer to the black and white populations in tracts j; and B and W refers to the total population of blacks and whites in the metro area. The index of dissimilarity has at least two drawbacks. First, it only measures evenness between two groups. The index is reliable in areas where two predominate groups characterize the racial-ethnic composition, but can arguably distort segregation patterns in multiethnic cities. Second, the measure provides insights into the relative degree of segregation but its aspatial properties prevent it from describing geographic patterns of segregation, potentially masking or overstating the degree of segregation within a defined area. Moreover, the index of dissimilarity is dependent upon the administrative boundaries of these predefined areas from which population counts are aggregated.

The percent change in internal migration[5] and median housing value is measured as follows:

$$\Delta Y_{2005,2010} = \left(\frac{Y_{2010} - Y_{2005}}{Y_{2005}}\right) 100 \qquad \text{(1b)}$$

Measuring the independent variables. The primary predictor in this analysis is the metropolitan-level foreclosure concentration. I derive my primary explanatory variable, percent foreclosure, from the cumulative number of foreclosed residential properties for each MSA between 2005-2010 divided by the estimated total number of housing units in the metropolitan area as provided by the 2000 Census decennial survey. Historical and contemporary features of the metropolitan context are exogenous to the foreclosure-stratification associations. These contextual and compositional characteristics of the MSA include region, age of the metropolitan area, industrial structure, population size, and minority representation.

Region is measured using the four Census-designated areas: Northeast, Midwest, West, and South (referent). The age of a metro is determined by the decade in which the largest city first reached a population size of 50,000 – the minimum threshold for which the U.S. Census Bureau defines a metropolitan area. The referent category describes MSAs with no principal city of 50,000. The functional specialization, or industrial structure, of a metropolitan area has been recognized as ecologically important to stratification because of its ability to shape demographic, economic, and housing conditions (Farley and Frey 1994; Logan et al. 2004; Rugh and Massey 2014). Metropolitan areas can be specialized as retirement communities, manufacturing bases, government centers, military centers, and university communities. A city was specialized in one

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[5] As mentioned previously, the data for percent local moves are derived from the ACS 2005 and 2008-2012 estimates, but in reality reflect a move in the *past year*. That is, the change in internal migration measure used in this study captures movement between 2004-2009.

of these five types of economic activity if the percentage of its population or workers was at least

one standard deviation above the national average for all 366 MSAs. Cities with two or more

economic specializations were categorized according to their higher *z*-score. A city was

described as having a diversified (referent) industrial structure if it did not score one or more

standard deviations above the national average in any type. The log population size and

percentage black, Latino, and Asian round out the compositional sources of spuriousness.

Analytic strategy. I employ ordinary least squares (OLS) regression techniques to fit

seven models. In the first set of models, I regress the percentage change in features of the urban

housing market on metropolitan-level foreclosure concentration. The second set of models

predicts the percentage change in the index of dissimilarity for black-white, Latino-white, and

Asian-white pairs. Multivariate regression models elaborate on bivariate associations. In order to

isolate the effects of foreclosure on measures of residential stratification, I control for

confounding covariates reflecting the contextual and compositional arrangements of the

metropolitan area known to shape housing supply processes and racial-ethnic settlement patterns.

I estimate these models with Equation 3:

$$Y = \alpha + \beta_1 \textbf{Foreclosure} + \beta_2 \textbf{Context} + \varepsilon \qquad (3)$$

where *Y* represents the percentage change in internal migration, minority suburbanization,

median housing value, minority homeownership, or the minority-white indexes of dissimilarity;

α is the intercept; **Foreclosure** is a vector of percent foreclosure values with coefficients β_1;

Context is a set of ecological and compositional control variables with coefficients β_2 that

represents region, age of the metropolitan area, functional specialization, log population size,

percent black, percent Latino, percent Asian, and lagged change in the outcome[6]; ε is the error term. For models regressing change in the index of dissimilarity, I limit the final sample to MSAs with at least 2,500 of each minority group because measures of segregation tend to be unstable for analyses with smaller populations (Logan et al. 2004; Timberlake and Iceland 2007).

RESULTS

Summary Statistics

Table 1 presents the means, frequencies, and standard deviations of dependent and explanatory variables. With respect to housing market dynamics, the average rate of local moves between 2004 and 2009 declined by about six percent. This finding supports claims that internal migration has stalled in recent years (Cooke 2013). Rates of suburbanization and homeownership among minorities increased since 1990, but slowed down considerably in the 2000s. Median housing values appreciated by almost 50 percent between 1990 and 2000 but dropped sharply in the following decade. Black-white dissimilarity declined steadily over the last 20 years, showing reductions of seven and eight percent in the 1990s and 2000s, respectively. Asian-white segregation in the 1990s decreased by over seven percent and again by almost three percent in the 2000s. In contrast, Latino segregation from whites grew by roughly 15 percent during the last decade of the 20th century, and increased by just over one percent between 2000 and 2010.

Foreclosure concentrations between 2005 and 2010 averaged at just over three percent. Regarding the metropolitan context of the sample, most areas are located in the South, followed by the Midwest, West, and Northeast. Roughly 45 percent are so-called young metropolitan

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[6] Models examining the effects of foreclosure on changes in minority suburbanization, minority homeownership, and minority-white segregation between 2000 and 2010 control for changes in these variables between 1990 and 2000. The lagged variable of change in median housing value is measured between 2000-2005. Due to data limitations, I do not control for the pre-trend in internal migration.

areas, meaning that they are comprised largely of cities that did not exceed populations of 50,000 until after 1970 or else are still developing core urban areas. Diverse industrial structures constitute over half of the MSAs, followed by centers of manufacturing, retirement communities, government and military centers, and university communities.

Change in Internal Migration

Table 2 highlights the effects of percent foreclosures, regional location, metropolitan age, functional specialization, and population composition on the change in the internal migration rate between 2004 and 2009. Foreclosure concentration had a significant positive effect on change in internal migration. The rate of internal migration increases by 0.62 percent for every one percent of foreclosures, holding other covariates constant. The finding lends support to Hypothesis 1, suggesting that high-foreclosure MSAs experienced increased rates of residential turnover and overall volatility in their housing markets. For example, the Atlanta-Sandy Springs-Marietta metropolitan area in Georgia, where roughly 23 percent of all residential units buckled under the housing bust, would expect to see intra-metropolitan migration increase by about 14 percent, all else equal. Net of other metropolitan-level characteristics, the Midwest experienced local moves at significantly higher rates than in the South. Areas dominated by manufacturing had lower rates of internal mobility within their metropolitan boundaries, compared to metropolitan areas with diversified economic bases. The age of the metropolis, size, and minority share of the population had no significant impact on the change in internal migration.

Change in Minority Suburbanization

Net of contextual and compositional characteristics of the metropolis, the association between foreclosure concentration and the change in minority suburbanization, shown in Table 3, was statistically significant. However, the positive slope coefficient is contrary to expectations

put forth by Hypothesis 2. Every one percent of foreclosures is associated with an increase of 0.71 percent in the minority suburbanization rate when demographic, economic, and housing factors are controlled. Perhaps reflecting the average foreclosure experience of the metropolitan areas in the sample, Chicago[7] foreclosed almost 3.43 percent of its total housing supply while predicting a growth of 2.44 percent in the proportion of the suburban population that is minority. This surprise positive result could reflect either the declining significance of suburban status on locational attainment or endogeneity bias. With respect to ecological characteristics, the West had decreases in suburbanization among minorities that was almost 10 percentage points lower than the South. Compared to MSAs sustained by a diversified functional base, places where college students comprised a large percentage of the population were associated with decelerating rates of minority suburbanization. Metropolitan areas with large proportions of blacks and Latinos also saw the rate of minority group movement into the suburban rings slow down, net of other factors. Percent Asian is also negatively associated with minority suburbanization, but the relationship is not statistically significant. Not surprisingly, the change in minority suburbanization in the previous decade is positively associated with change in the 2000s. Metropolitan age and size are not statistically associated with the pace at which minorities suburbanize, potentially highlighting contemporary population dynamics as primary drivers of suburban settlement.

Change in Median Housing Value

As shown in Table 4, median housing value was also strongly and negatively associated with foreclosure concentration in metropolitan areas, consistent with Hypothesis 3. Holding the effects of other covariates constant, higher percent foreclosure in a metropolitan area attenuated

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[7] Chicago-Joliet-Naperville, IL-IN-WI Metropolitan Statistical Area.

the appreciation of median housing values. Residential properties depreciated by 1.43 percent for every one percent of foreclosures concentrated in the MSA. This association can yield a drop of 33 percent in the median value of the housing supply in metros where foreclosure affected over one in every five homes. In other words, net of other historical and contemporary characteristics of the metropolis, foreclosure concentration in cities like Stockton, CA predicted a decline of approximately $125,268 in median housing value. Relative to the South, residential property values in the Midwest depreciated immensely. The older the metropolitan area, the greater the appreciation of housing costs. Compared to still-developing metros with no central city, metropolitan areas that established their urban cores by 1900 were associated with continued growth in housing value. Metros characterized by a high percentage of elderly residents saw smaller returns to their housing values relative to MSAs supported by a wide range of economic functions. Change in the median housing values of metropolitan areas between 2000 and 2005 was strongly and negatively associated with change in values between 2005 and 2010. Features of the metropolitan population, like size and racial-ethnic makeup, had no bearing on property values.

Change in Minority Homeownership

In Table 5, percent foreclosure had a significant and positive effect on minority homeownership independent of numerous ecological features of the MSA. High-foreclosure metros were associated with expanding homeownership among minorities. The rate of homeownership among minorities rises by 0.65 percent for each percent of the housing supply that is foreclosed. Put differently, owner-occupation among minority families was predicted to rise by 14 percent in Greeley, CO and MSAs characterized by housing stocks that were at least 22 percent foreclosures. This finding contradicts Hypothesis 4, which posited that the effect of

foreclosure concentration on homeownership dynamics would be negative. Perhaps more housing opportunities are available for minorities in areas desolated by economic recessions. Endogeneity, however, might bias this association through reverse causality. Region had a strong influence on the change in homeownership rates among minorities, all else equal. In line with most assessments of the geographic spread of the foreclosure crisis, the West experienced the sharpest declines in the growth of minority homeownership, compared to the South. The Midwest observed slower rates of owner-occupied housing. The positive slope coefficient for the Northeast reveals nonwhite minorities were able to transition into owner-occupied housing units at a faster rate than a devastated South. The percent of black residents in a metropolitan area was significantly and negatively associated with the percent change in minority homeownership. In other words, cities with large black populations confronted barriers to achieving homeownership status. Places with many Latinos mirrored this effect, but it was not statistically significant. The age, functional specialization, and population size had no net effect on the change in minority homeownership.

Change in Racial Residential Segregation

OLS regression coefficients presented in Table 6 suggest the independent effects of foreclosure concentration on measures of minority-white dissimilarity are not statistically significant, although the direction of the associations operate as hypothesized[8]. For instance, positive but non-significant coefficients suggest high-foreclosure metropolitan areas are

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[8] I also examined the effects of foreclosure concentration on the isolation index. Results for black, Latino, and Asian isolation were not statistically significant but substantively interesting. The effects of isolation were less straightforward across these racial-ethnic groups, compared to the indexes of dissimilarity. For black residents, the possibility of coming into contact with someone of the same race increases in urban housing markets with higher concentrations of foreclosure activity. The opposite is true for Latinos and Asians, for whom exposure to other groups increases with the proportion of foreclosed housing units.

associated with rising segregation between minorities and whites, supporting recent evidence that urban blacks and Latinos carried the heaviest adverse costs (Hall et al. 2015a). However, models of minority-white dissimilarity fail to support Hypothesis 5a and 5b on statistical grounds. Urban areas in the Northeast region of the country experience statistically significant increases in black segregation compared to the South. Latinos saw declines in dissimilarity in the Northeast and Midwest over the same period of time. Asian segregation from whites was not significantly influenced by the regional location of metropolitan areas. Instead, the age of the metropolis was positively associated with change in Asian segregation in American neighborhoods until 1939. Change in the index of Asian-white dissimilarity was also significant in areas that erected principal cities from 1970 onward. In other words, Asian residential inequality intensified faster in older metropolitan areas than in younger cities with no established urban core. Age was not a significant predictor of racial residential segregation for blacks and Latinos.

Black- and Asian-white dissimilarity was not reshaped by the industrial arrangement of the metropolis. Compared to cities with diversified economic bases, Latino integration with whites grew the most in cities where a larger percentage of the population serve in the armed forces, net of other predictors. This is probably due to the inclusive nature of the military and housing quarters favorable to coethnic integration. In terms of metropolitan compositional features, minority representation was related to changes in Latino segregation, but did not alter trends for blacks or Asians. Metropolitan areas with large Latino populations saw decreasing segregation from whites. This counterintuitive effect could stem from stalling trends in the recent growth of Latinos, which has previously pointed to increasing integration with whites (Logan et al. 2004). Changes in the long-term trends of racial residential segregation are significantly and positively associated with black and Asian dissimilarity in the 2000s, but do not predict Latino-

white dissimilarity. The size of the metropolitan population did not demonstrate any significant force on residential patterns of racial settlement.

DISCUSSION AND CONCLUSION

The extraordinary economic fallout and ensuing waves of mass foreclosure that inundated U.S. metropolitan areas is unprecedented in scope and strength. The Great Recession has stressed social, cultural, and economic dynamics in the U.S. since 2007 (Grusky, Western, and Wimer 2011), and it appears that racial differences in the foreclosure experience have translated into residential differences as well. The aim of the current study was to illuminate the effect of foreclosures on the housing supply dynamics correlated with residential stratification across metropolitan areas that vary in contextual and compositional features, both historical and contemporary. Estimates from regression models suggest that the foreclosure crisis reshaped several conditions of the housing market that are associated with racial and ethnic residential inequality. However, the effects of foreclosures on housing market dynamics are foreboding for minorities in post-Recession cities if, in addition to depreciating home values, rising rates of internal migration and suburbanization are burgeoning markers of residential disadvantage that can squander recent socioeconomic gains.

The percent of a MSA's housing supply that succumbs to foreclosure is associated with mounting residential turnover and withering housing values. Consistent with prior work on intra-metropolitan migration, the rate of local moves increases in economically shocked housing markets (Stoll 2013). Increasing migration in metropolitan areas can have serious implications for equitable residential attainment if patterns of movement are stratified by racial group membership, as is inferred by the vast literature on mobility outcomes (Crowder and South 2005; Massey, Gross, and Shibuya 1994; Quillian 1999). The inverse relationship between foreclosure

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concentration and change in median housing values further reveals the deleterious effects of the Great Recession on black and Latino capital acquisition and intergenerational transmission of wealth. As a result of foreclosure concentration disproportionately affecting housing values in predominantly black and Latino communities, neighborhood quality is more likely to deteriorate as sources of funding for local amenities diminish and housing returns to future generations shrink in light of unequal price appreciation (Bocian, Smith, and Li 2012; Conley 1999; Flippen 2004).

The positive associations between foreclosure concentration and changes in suburbanization and homeownership are unexpected findings. Results for suburbanization, however, may align with recent work demonstrating the declining significance of suburban residence on life chances. The rise of minority representation in the suburban rings of metropolitan areas could reflect growing disadvantage since suburbanization in the contemporary era has been associated with increasing the spatial mismatch between workers and employment opportunities (Kneebone and Holmes 2015), a growing concentration of poverty (Howell and Timberlake 2014; Kneebone, Nadeau, and Berube 2011), and higher levels of metropolitan segregation from whites (Logan et al. 2004). In contrast, the concentration of foreclosures can predict rising rates of minority homeownership if foreclosures are associated with increases in the economic opportunities of minorities (Lauria 1998). Yet, examination of minority experiences in the context of the foreclosure crisis reveals the prospect of reaping residential benefits is faint for these groups (Firebaugh et al. 2015; Lee et al. 2015). As a result, a reasonable explanation of the positive coefficients between percent foreclosure and these outcomes of residential stratification is reverse causality. It is plausible that rising minority suburbanization and homeownership that were facilitated by subprime lending schemes during the housing boom

in the early 2000s (Kuebler and Rugh 2013) created conditions that concentrated foreclosure activity among blacks and Latinos in the latter years of the decade (Rugh 2015; Sharp and Hall 2014). The confounding effect of the housing boom on the bust persists even after controlling for long-term trends in the preceding decade.

Analyses of U.S. metropolitan areas find no significant effect of percent foreclosure on racial residential segregation between whites and three minority racial-ethnic groups. This null result counters theoretical expectations and much of the consensus in the literature evaluating comparable associations. Simulation work suggests that the recent foreclosure crisis slowed declines in the metropolitan-level of residential segregation of whites from blacks and Latinos through neighborhood racial change (Hall et al. 2015a). Micro-level mobility streams that induce neighborhood racial change vary across a number of metropolitan features (South, Crowder, and Pais 2011), but can lead to aggregate-level segregation in cities (Quillian 2002). Models of segregation, however, are unable to reproduce results uncovered in previous endeavors. As a result of sluggish decadal changes in segregation at such a high-level of aggregation, white noise is expected to hide observable effects.

Ongoing research can improve upon the contributions of this study. First, researchers should arrange the temporal order among foreclosure and housing market dynamics to bolster confidence in the estimated direction of associations, and to evade issues of reverse causality. I suspect my model estimates are unstable because my parameter for foreclosure concentration between 2005 and 2010 is not temporally prior to – and highly correlated with – percent changes in minority suburbanization and homeownership that transpired between 2000 and 2010. Second, metropolitan-level measures of minority outcomes should decompose effects by racial-ethnic group affiliation to reveal how the foreclosure crisis was dispersed across whites, blacks,

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Latinos, and Asians. Lastly, analyses of residential stratification at finer levels of detail can assay the mechanisms underpinning housing supply processes that affect individuals and households more proximately. For instance, MA-level rates of internal migration do not necessarily indicate the destination of movers, limiting our ability to claim it is a condition of the housing market that shapes residential stratification. The battery of unanswered questions should motivate the intellectual pursuits of future scholarship on foreclosure effects, housing supply dynamics, and residential stratification.

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Table 1. Summary Statistics for Variables used in Analyses of Change in Residential Stratification; U.S. Metropolitan Areas

Variables	t_1 Mean (Freq.)	t_1 SD	t_2 Mean	t_2 SD
% Internal migration, %Δ[a]	-6.12	14.97		
Minority % suburban, %Δ[b]	41.93	40.60	37.10	29.23
Median housing value, %Δ[a] ($)	46.86	36.45	13.39	17.63
Minority % homeowners, %Δ[b]	44.56	38.54	27.59	22.65
Black-white dissimilarity, %Δ[b]	-8	10.72	-7.19	9.97
Latino-white dissimilarity, %Δ[b]	14.8	30.92	1.1	14.55
Asian-white dissimilarity, %Δ[b]	-7.31	12.49	-2.95	11.57
% Foreclosure (2005-2010)	3.37	4.22		
Region (2010)				
Northeast	0.12 (45)	0.33		
Midwest	0.25 (93)	0.44		
West	0.22 (80)	0.41		
South	0.4 (148)	0.49		
Age of metropolis				
Prior to 1900	0.16 (59)	0.37		
1900 to 1939	0.21 (76)	0.41		
1940 to 1969	0.18 (65)	0.38		
1970 or later	0.22 (79)	0.41		
No principal city of 50,000	0.24 (87)	0.43		
Functional specialization (2010)				
Retirement community	0.1 (38)	0.31		
Manufacturing base	0.13 (46)	0.33		
Government center	0.09 (32)	0.28		
Military center	0.07 (24)	0.25		
University community	0.06 (23)	0.24		
Diversified base	0.56 (203)	0.5		
Population size (2010)	705,161	1,579,627		
Minority representation (2010)				
% Black	11.27	10.82		
% Latino	12.37	15.5		
% Asian	3.16	4.28		

[a] — time t_1 is 2000-2005 and time t_2 is 2005-2010. Internal migration reflects movement in the prior year (2004-2009). Due to data limitations, I do not control for the pre-trend in internal migration.
[b] — time t_1 is 1990-2000 and time t_2 is 2000-2010.
Note: Frequencies of MSAs in parentheses sum to 366. Due to rounding, means for region, age of metropolis, and functional specialization might not sum to 100 percent.

Table 2. OLS Regression of Change in Internal Migration on Metropolitan Foreclosure and Selected Independent Variables; U.S. Metropolitan Areas, 2004-2009

Independent Variables	b	SE
% Foreclosure	0.62*	0.24
Region		
Northeast	0.62	3.11
Midwest	6.59*	2.56
West	-2.9	3.01
South	—[a]	
Age of metropolis		
Prior to 1900	0.09	3.74
1900 to 1939	-2.67	2.76
1940 to 1969	1.41	2.62
1970 or later	-1.62	2.49
No principal city of 50,000		—
Functional specialization		
Retirement community	0.17	3.07
Manufacturing base	-6.53*	2.65
Government center	0.52	2.98
Military center	5.58	3.57
University community	-0.24	3.59
Diversified base		—
Population size (log)	-1.68	1.26
Minority representation		
% Black	-0.08	0.1
% Latino	0.04	0.06
% Asian	-0.03	0.22
Intercept	14.12	15.1
Adjusted R^2	0.03	
Number of MSAs	353	

[a] — omitted variable

* $p < 0.05$ ** $p < 0.01$ *** $p < 0.001$

Table 3. **OLS Regression of Change in Minority Suburbanization on Metropolitan Foreclosure and Selected Independent Variables; U.S. Metropolitan Areas, 2000-2010**

Independent Variables	b	SE
% Foreclosure	0.71*	0.33
Region		
Northeast	5.22	4.29
Midwest	1.46	3.54
West	-9.88*	4.16
South	—[a]	
Age of metropolis		
Prior to 1900	8.13	5.2
1900 to 1939	3.46	3.83
1940 to 1969	2.11	3.63
1970 or later	2.02	3.36
No principal city of 50,000	—	
Functional specialization		
Retirement community	-1.04	3.98
Manufacturing base	1.67	3.84
Government center	-1.22	4.16
Military center	-7.28	4.72
University community	-9.36*	4.94
Diversified base	—	
Population size (log)	0.45	1.75
Minority representation		
% Black	-0.81***	0.15
% Latino	-0.43***	0.09
% Asian	-0.31	0.31
% Change in minority suburbanization, 2000-2010	0.33***	0.03
Intercept	29.87	21.17
Adjusted R^2		0.5
Number of MSAs		364

[a] — omitted variable

* $p < 0.05$ ** $p < 0.01$ *** $p < 0.001$

Table 4. **OLS Regression of Change in Median Housing Value on Metropolitan Foreclosure and Selected Independent Variables; U.S. Metropolitan Areas, 2005-2010**

Independent Variables	b	SE
% Foreclosure	-1.43***	0.16
Region		
Northeast	-0.7	2.06
Midwest	-13.37***	1.66
West	1.98	1.96
South	—[a]	
Age of metropolis		
Prior to 1900	7.19**	2.42
1900 to 1939	3.41	1.81
1940 to 1969	2.82	1.69
1970 or later	1.28	1.61
No principal city of 50,000	—	
Functional specialization		
Retirement community	-5.73**	1.98
Manufacturing base	-2.54	1.71
Government center	3.54	1.93
Military center	3.79	2.31
University community	2.90	2.32
Diversified base	—	
Population size (log)	-1.55	0.82
Minority representation		
% Black	-0.00	0.07
% Latino	0.05	0.04
% Asian	-0.06	0.15
% Change in median housing value, 2000-2005	-0.3***	0.02
Intercept	51.93***	9.9
Adjusted R^2	0.71	
Number of MSAs	354	

[a] — omitted variable

* $p < 0.05$ ** $p < 0.01$ *** $p < 0.001$

Table 5. **OLS Regression of Change in Minority Homeownership on Metropolitan Foreclosure and Selected Independent Variables; U.S. Metropolitan Areas, 2000-2010**

Independent Variables	B	SE
% Foreclosure	0.65**	0.24
Region		
Northeast	9.82**	3.15
Midwest	-7.93**	2.58
West	-13.69***	3.02
South	—[a]	
Age of metropolis		
Prior to 1900	-4.73	3.8
1900 to 1939	-4	2.81
1940 to 1969	0.09	2.65
1970 or later	1.03	2.46
No principal city of 50,000	—	
Functional specialization		
Retirement community	5.16	2.93
Manufacturing base	3.89	2.72
Government center	4.17	3.01
Military center	-2.72	3.46
University community	-2.15	3.62
Diversified base	—	
Population size (log)	1.47	1.28
Minority representation		
% Black	-0.44***	0.11
% Latino	-0.09	0.07
% Asian	0.09	0.22
% Change in minority suburbanization, 1990-2000	0.37***	0.02
Intercept	0.18	15.44
Adjusted R^2	0.55	
Number of MSAs	366	

[a] — omitted variable

* $p < 0.05$ ** $p < 0.01$ *** $p < 0.001$

Table 6. OLS Regressions of Change in Minority-White Residential Segregation on Metropolitan Foreclosure and Selected Independent Variables; U.S. Metropolitan Areas, 2000-2010

Independent Variables	Black-White		Latino-White		Asian-White	
	b	SE	b	SE	b	SE
% Foreclosure	0.04	0.15	0.07	0.22	0.1	0.17
Region						
Northeast	4.48*	1.92	-11.82***	3.07	3.7	2.46
Midwest	0.72	1.58	-7.71**	2.44	-0.44	2.07
West	1.15	2.14	-3.32	2.77	2.17	2.36
South	—[a]		—[a]		—[a]	
Age of metropolis						
Prior to 1900	-1.25	2.33	5.31	3.46	6.69*	2.89
1900 to 1939	-0.5	1.74	2.33	2.61	6.85**	2.31
1940 to 1969	0.66	1.69	-0.67	2.46	3.58	2.26
1970 or later	0.98	1.65	-1.99	2.25	6.05**	2.17
No principal city of 50,000	—		—		—	
Functional specialization						
Retirement community	-1.98	1.94	-1.78	2.79	4.8	2.52
Manufacturing base	-0.51	1.69	-1.94	2.56	0.98	2.16
Government center	-0.94	1.92	1.29	2.72	1.72	2.31
Military center	-0.61	2.1	-10.13**	3.12	-0.09	2.46
University community	-0.14	2.33	-6.19	3.43	3	2.79
Diversified base	—		—		—	
Population size (log)	-0.52	0.78	-2.230	1.16	-0.33	0.96
Minority representation						
% Black	0.09	0.07	0.12	0.1	0.14	0.09
% Latino	-0.08	0.05	-0.17**	0.06	0.03	0.05
% Asian	0.15	0.14	-0.01	0.2	0.07	0.15
% Change in residential segregation, 1990-2000	0.3***	0.06	-0.04	0.03	0.14*	0.06
Intercept	0.69	9.45	34.55*	-13.99	-7.25	12.1
Adjusted R^2	0.08		0.12		0.08	
Number of MSAs	330		346		256	

[a] — omitted variable

* $p < 0.05$ ** $p < 0.01$ *** $p < 0.001$