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Changing faces, changing places: understanding immigration, housing market and native out-migration in established and new destinations in the United States.

Anqi Xu
University of Louisville

CHANGING FACES, CHANGING PLACES: UNDERSTANDING IMMIGRATION, HOUSING MARKET AND NATIVE OUT-MIGRATION IN ESTABLISHED AND NEW DESTINATIONS IN THE UNITED STATES

By

Anqi Xu
B.A. Sichuan Agricultural University, 2013
M.A. Sichuan Agricultural University, 2016

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A Dissertation Approved on

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by the following Dissertation Committee:

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Dissertation Director
Dr. Matthew Ruther

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Dr. Frank Goetzke

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Dr. Sumei Zhang

____
Dr. Charlie Zhang

____
Dr. Robert Carini

DEDICATION

This dissertation is dedicated to my mother

Ms. Ling Zhao

who supports my passion and gives endless love

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The idea for this dissertation emerged in 2017 during the Urban Demography & GIS course with Dr. Matt Ruther where I was provided an opportunity to explore the residential landscape of the foreign-born population in Louisville, KY in my term paper. Dr. Ruther's expertise in population estimation and spatial analysis, as well as his comments and suggestions, were valuable in refining my research questions and clarifying explanations of concepts. I appreciate his continued support as my committee chair, mentor and colleague.

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ABSTRACT

CHANGING FACES, CHANGING PLACES: UNDERSTANDING IMMIGRATION, HOUSING MARKET AND NATIVE OUT-MIGRATION IN ESTABLISHED AND NEW DESTINATIONS

Anqi Xu

July 15, 2020

This dissertation concerns residential incorporation and socioeconomic impact of immigrants primarily from Latin America and Asia with their rapid geographical dispersal in the U.S. I adopt econometrics methodologies and GIS techniques to examine how immigration affect housing price changes and white out-mobility in established and new destinations, utilizing datasets from the U.S. Census Bureau and the Panel Study of Income Dynamics (PSID).

The first part examines the effects of immigration into the U.S. established and new immigrant destinations on housing prices using county-level data that span 2011 to 2017. Using the global and local Moran's I statistics, I demonstrate how housing prices are spatially clustered across counties, and then model the housing price in a spatial econometrics context with an instrumental spatial Durbin model. This approach helps exploit and capture both the direct and indirect effects of foreign-born (im)migration on housing prices. Findings show that foreign-born concentration is associated with housing price appreciation in established destinations, but that effect is primarily constituted by

spatial spillover. Housing prices in new destinations do not respond to immigration. Findings call for attention on the processes, not just the outcomes, of the immigrant residential attainment.

Scholars have continued to debate the extent to which the urbanicity of the neighborhood shapes the relationship between immigrant concentration and white out-migration, and to which white out-migration is a result of racial prejudice or socioeconomic concern. In the second part, I combine data from the Panel Study of Income Dynamics with census data from 2011 to 2017 to examine the effects of immigrant concentration on migratory decisions of white householders. I find that the likelihood of out-mobility for white householders is positively associated with the proportion of immigrants in suburban neighborhoods. Consistent with theoretical arguments of a white flight hypothesis, the "class"/socioeconomic status (SES) of the neighborhood does not have a buffering effect on whites' out-mobility with respect to immigrants. These findings illustrate the immigrant suburbanization is not the endpoint of residential integration, but exposes new challenges confronting immigrants about their racial status.

The third part examines how changes in foreign-born populations are associated with home values and native flight in Louisville, the largest city in Kentucky. In particular, I use spatial autoregressive models (SAR) to explore the spillover effects of foreign-born populations beyond neighborhood boundaries and utilize geographically weighted regression (GWR) to tackle spatial heterogeneity that is complicating the immigrant/neighborhood relationship. Findings show an insignificant role of immigrant growth in shaping median home values of Louisville, while increasing proportions of

immigrants are positively associated with out-migration of non-Hispanic whites. I also show how those relationships vary across space: the foreign-born population is a salient predictor in white flight in affluent northeastern suburban neighborhoods, compared to less privileged southern suburbs. These findings shed light on heterogeneous local responses within the metropolitan area when confronting immigrant suburbanization.

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CHAPTER I: INTRODUCTION

The geographical distribution of the foreign-born population in the U.S. has become more extensive during recent decades (Massey & Capoferro, 2008). Specfically, immigrants are increasingly residing in new destinations with littele piror history of immmigration, instead of established destinations along the weat and east coast. There is also an extrodinarily high rate of immigrants increase suburbia (Singer, Hardwick, Brettell, & Cisneros, 2008). The growing diversity in those nontraditional destinations rasies questions about relationship between immigrant inflows and local communities. This dissertation research explores effects of immigration on the housing market and white out-mobility in established and new immigrant destionations of the U.S.

Despite an impressive body of literatures investigating immigrant residential incorporation, this research differs from previous literature in three significant ways. First it incorporates spatial aspects, particularly spatial dependence and spatial heterogeneity, in the analysis of immigrants' effect. Spatial dependence is the coincidence of value similarity (Anselin, 2001). For instance, in local housing market, housing prices of nearby locations are often interdependent for sharing locational public goods such as the school system. Likewise, the influx of immigrants may not only affect housing prices of the communities they reside, but those in surrounding communities. Spatial heterogeneity, on the other hand, refers to the uneven distribution of a relationship over the region. It means immigrants may have positive socioeconomic impact in some areas, while negative in (and even unrelated to) other areas. Therefore, in this research I uses spatial methodologies including spatial autoregressive model, spatial Durbin model and geographically weighted regression to account for spatial dependence and spatial heterogeneity. I find that immigrants' positive residential outcomes are primarily a result of their spatial spillover effect. It's likely that the immigrant-induced white out-migration pushes up housing prices of nearby locations. These findings are more accurate and informative than those generated from non-spatial hedonic models, contributing to immigrant incorporation literatures from a spatial dimension.

Second, this research contributes to the scholarly debate between white flight hypothesis and racial proxy hypothesis. White flight hypothesis recognizes the migratory decisions of white residents as racially motivated based on stereotypes and prejudice (i.e. the race effect) (Duncan & Duncan, 1957). Whereas racial proxy hypothesis sees the departure of white as primarily driven my neighborhood life cycle and housing conditions (i.e. the class effect) (Ellen, 2000; Harris, 2001). The difficulty in settling this debate lays in the geographical overlap between minority residence and historical disadvantaged neighborhoods. This overlap is also a consequence of institutional racism that has utilized regulations and policies such as zoning to force racial minorities to live in less advantaged environment. This research thus takes advantage of the restrictive-use geographical variables provided by the Panel Study of Income Dynamics in an attempt to untangle the race effect and the class effect. Results provide little evidence in support of the racial proxy hypothesis as it shows that middle-class socioeconomic status does not buffer the departure of whites from integrated neighborhoods. Findings of this study join an increasing amount of scholarly work that argue racial stereotype and prejudice may persist despite improved socioeconomic attainment of immigrants.

Third, this dissertation provides a case study of immigrants' impact on an non-traditional destination in the southeastern United States—Louisville, Kentucky. The city of Louisville serves as a typical case of immigrant suburbanization in an emerging destination. Recent Latino and Asian immigrants in Louisville are integrating in the southern and eastern suburbia partially due to a legacy of urban sprawl, black-white racial segregation and business relation. My findings show that immigration is unrelated to median home value but a strong predictor of white population loss in Louisville. Importantly, the northeastern suburban neighborhoods show strongest migratory responses against immigration. The analysis of Louisville has implications for many developing destinations in the South, where immigrants comprises a small portion of total population but are growing at a substantial rate.

This dissertation takes a three-article format. Chapter Two examines the immigrant-housing price relationship in established and new destinations the spatial econometrics context. Chapter Three investigate white immigrant suburbanization is associated with white out-mobility and whether the migratory decisions of whites are racially motivated. Chapter Four is a case study of immigrants' effects in Louisville, Kentucky. In Chapter Five is the conclusion of this dissertation research, summarizing all results and giving an outlook onto further research in the field of immigrant residential integration.

CHAPTER II: POSITIVE OUTCOME, EXCLUSIVE PROCESS? ASSESSING EFFECTS OF IMMIGRATION ON HOUSING PRICE CHANGE IN ESTABLISHED AND NEW DESTINATIONS IN THE UNITED STATES

1.1 Introduction

Foreign-born population are located in a more diverse set of communities than any point in U.S. history (Massey & Capoferro, 2008). Unprecedented movement of immigrants, who are primarily from Latin American and Asian countries, into areas with little immigration history, has been one of the most striking aspects of U.S. demography during recent decades (Singer, 2004). Meanwhile, an increasing volume of literature has documented the social and political backlash confronting new immigrants with their geographical dispersal (J. H. Cohen & Chavez, 2013; Ebert & Ovink, 2014; Fennelly, 2008; Marrow, 2011). Understanding the socioeconomic impact of immigrations is of considerable importance given not just the growing size and unique socio-demographic characteristics of immigrants (Krivo, 1995), but also speaks to social debates over the role of immigration in the U.S. economy.

Housing prices are indicative of social positions due to the considerable socioeconomic resources tied to them (Fischer & Tienda, 2006). Many studies at the neighbourhood level indicate a negative linkage between housing price appreciation and immigrant population growth (Accetturo, Manaresi, Mocetti, & Olivieri, 2014; Braakmann, 2019; Sá, 2015; Saiz & Wachter, 2011). Yet studies using larger spatial unites of analysis (such as counties or metropolitan areas) tend to find that immigration has a positive impact on average housing price growth

(Gonzalez & Ortega, 2013; Mussa, Nwaogu, & Pozo, 2017; Ottaviano & Peri, 2007; Saiz, 2007). Importantly, variation in local contexts of destinations highlights the importance of considering how housing prices in established destinations, such as New York City, respond differently to immigrant influx compared to new destinations like Austin, Texas. In addition to metropolitan areas, micropolitan statistical areas have also been fast-growing immigrant-receiving communities. For example, census statistics show that foreign-born population in the Claremont-Lebanon Micropolitan Statistical Area has increased by over 600% between 2010 and 2017. This article examines the effects of immigration on housing price changes at the county level in established and new destinations between 2011 and 2017 in the U.S. It includes both metropolitan and micropolitan areas in the destination classification, bridging a gap in the current literature of omitting micropolitan areas despite their significance in the urban settlement system (Brown, Cromartie, & Kulcsar, 2004; Vias, 2012; Wahl, Breckenridge, & Gunkel, 2007).

This article incorporates an instrumental variable approach with spatial econometrics methodology to address endogeneity and spatial dependence that is ubiquitous in the analysis of housing prices. Endogeneity suggests the simultaneity between independent and dependent variables — that immigration inflows affect housing prices, but the arrival of immigrants can also be influenced by the existing levels of housing prices. Spatial dependence, on the other hand, indicates value similarity with locational similarity (Anselin, 2001) – that housing price changes in one area can spillover into neighboring areas. Immigration influx may also have a ripple effect on housing prices of surrounding communities of their arrival. The presence of endogeneity and spatial dependence violates fundamental assumptions of traditional hedonic models and may lead to inconsistent results (Anselin, 2003; Saiz, 2007). The use of the instrumental spatial Durbin model, as shown in this article, reveals the unbiased impact of immigration on housing prices, and enhance our understanding of the direct effects and spillover effects within this relationship. The observed spillover effects may be explained by migratory responses of native-born residents with preferences against living and socially interacting with people of different racial or socioeconomic backgrounds (Frey, 1995; Hall & Crowder, 2014; Krysan, 2002b).

This chapter explores two major research questions: first, to what extent, if any, is immigration concentration associated with housing price changes and whether this association varies between established and new destinations; second, whether the spatial spillover effect plays a role in the immigrants' impact on the housing market. I use the global and local Moran's I statistics to demonstrate spatial clustering of housing prices and to justify the utilization of spatial econometrics methodology. Foreign-born children school enrollment rate of the previous year is adopted as an instrument to deal with endogeneity because it is strongly correlated with the endogenous explanatory variables (i.e. immigration concentration) but unaffected by housing prices of the following year. Findings contribute to broader immigrant residential incorporation literature from a spatial dimension and encourage policymakers to seriously consider challenges and obstacles confronting immigrants in their residential attainment process.

1.2 Literature Review

1.2.1 The New Geography of U.S. Immigration

Recent literature on the geographies of immigration in the U.S. has widely recognized the dispersion of immigrant groups from traditional destinations into communities with little prior history of immigration (Massey, 2008; McConnell, 2008; Singer, 2004). Statistics from the U.S. Census Bureau show that immigrants residing in new-destination states (e.g. South Carolina, Alabama) in 2010 are nearly four times the number in 1990; By comparison, the share of immigrants in traditional-destination states (e.g. California, Florida) decreased from 75.8 percent to 67.6 percent (Terrazas, 2011). The geographic diversification of immigrant communities has revitalized many small- and mid-sized cities and towns, especially in the Midwest and the Southeast (Gouveia, Carranza, & Cogua, 2005; Hernández-León & Zúñiga, 2000; Lichter & Johnson, 2009). The rise of these new destinations offers additional opportunities to re-examine key aspects of the immigration processes they unfold (Waters & Jiménez, 2005).

Despite the controversy on defining a "new destination" (Winders, 2014), scholars have acknowledged that characteristics of a new destination include: (1) the growth rate, rather than size, of the development of immigrant settlements (McConnell & Miraftab, 2009), (2) the absence of institutional infrastructures to provide ethnic resources (Marrow, 2011; Stamps & Bohon, 2006), and (3) the lack of clarity on how immigrants fit in existing racial/ethnic or cultural categories (Wortham, Mortimer, & Allard, 2009). Scholars find it useful to organize population trends involving diverse and numerous places into a manageable set of categories. Many large-scale studies rely on Singer's (2004) six immigrant gateway typology (i.e., former, continuous, post-WWII, emerging, re-emerging, pre-emerging), and/or Lichter's (2010) and Hall's (2013; 2014) established-new-minor destination typology. Nevertheless, Hall (2013) challenges current destination classifications that consider pan-ethnic immigrant populations but neglect specific groups' unique settlement history.

One additional challenge to the immigrant destination typology is the inclusion of micropolitan statistical areas (μSAs) — labor market areas centred on an urban cluster with a population of at least 10,000 but fewer than 50,000 people (Office of Management and Budget, 2003). While immigration remains decidedly a metropolitan affair (Singer, 2012), empirical analysis reveals that most foreign-born dispersal has not been to rural areas but rather to smaller metropolitan areas and micropolitan areas (Johnson & Lichter, 2008; Singer & Wilson, 2011). Despite a growing volume of systematic analysis on immigrants' economic and social impact on new destinations (Frank & Akresh, 2016; Hall & Crowder, 2014; Ramey, 2013), there are limited studies incorporating micropolitan areas (Hyde, Pais, & Wallace, 2015; Wahl et al., 2007). This study includes both metropolitan and micropolitan areas into destination categorization and seeks to provide a more comprehensive profile of immigrants' socioeconomic impact on the U.S. housing market.

1.2.2 Immigration and Housing Prices

Considerable empirical literature sheds light on the relationship between immigrants and housing prices. Two questions that are often asked are whether immigrants pay more than native-born whites for identical housing, and whether the presence of immigrants raises or depresses housing prices (DeSilva, Pham, & Smith, 2012). To date, studies at micro spatial levels (i.e. census tract, local district) support a negative linkage between immigration and housing prices. Saiz and Wachter (2011) adopt a geographic diffusion model to represent the growth of immigrant density of a neighbourhood. They find that increasing immigrant density is negatively associated with housing values due to the preferences of native-born residents for ethnic or economic homogeneity. Accetturo et al. (2014) collect district-level data from 20 immigrant-receiving Italian cities, and find that a 10% increase in immigrant stocks reduces housing prices by 2 percentage points in districts affected by the immigration in comparison with the rest of the city. Similarly, Ibraimovic and Masiero (2014) base their research on household interviews in the mid-sized Swiss city of Lugano, where over 40% of residents are foreign-born from over 100 different countries. They find that native-born residents are willing to pay a higher premium to avoid neighbourhoods with large immigrant populations, yet this premium declines with the education level. Sá (2015) also reveals a negative association between immigration and housing prices using the United Kingdom (UK) household survey and land registry data. Her evidence points to the negative income effect of immigration on housing demand that prompts out-migration of high-income native-born residents. Based on similar panel data, Braakmann (2019) demonstrates the variations in the effect of immigration on UK housing prices: an increase in regional immigration either decreases housing prices at the lower end of distribution, or leaves them unchanged and has almost no effects on housing prices above the median.

In contrast, studies at macro spatial levels (i.e. metropolitan statistical area, state) generally find immigrants' demand for housing is coupled with an upward-sloping housing supply: immigration raises housing price levels. Employing state-level census data from 1970 to 2000, Ottaviano and Peri (2007) document a strong positive correlation of immigration inflows with house rents which they ascribe to the competition within the house market. Their finding is supported by Saiz (2007), who adopts U.S. census data across metropolitan statistical areas (MSAs) and shows that an immigration inflow equal to 1% of a city's population is associated with an increase of approximately 1% for both rents and housing values. The positive linkage between immigration and house price is also detected in Canada (Akbari & Aydede, 2012), Spain (Gonzalez & Ortega, 2013) and Turkey (Balkan, Tok, Torun, & Tumen, 2015), based on census data at the district, province and region level respectively, although the magnitude differs depending on national context. Barbu and colleagues (2017) examine the relationship between immigration inflows and international housing prices and also confirm a positive link. Opposite findings at macro and micro geographical scales indicate that immigration may exert a positive effect on average housing prices of a city, while within a city housing prices in neighbourhoods where immigrant reside may grow at a relatively slower rate.

Recent scholarship has also paid increasing attentions to how the context of immigration destinations shapes the relationship between immigration and housing prices. Pavlov and Somerville (2017) exploit a surprise suspension and subsequent closure of an investor immigration program in Canada, to use a difference-in-difference methodology that compares affluent immigrant destination census tracts and non-destination tracts. Their findings show that immigration is associated with housing price appreciation where immigrants are wealthy investor immigrants. Sharpe (2019) argues that previous estimates can be biased upwards when they ignore notable historic and persistent difference between high- and low- immigrant cities that are important to current evolution of rents. She includes controls for historical economic and housing market characterises that were associated with immigrants in the past and predispose cities to increased future growth. Her findings based on the metropolitan-level data illustrate a weak impact of immigration on rents: 1% of the population leads to a 0.3–0.4% increase in rental prices. It is also found that rent growth is larger in high-immigration cities relative to low-immigration cities. Apart from housing prices, scholars have examined other aspects of immigrant residential settlements that vary by degree of racial segregation (Frank & Akresh, 2016; Hall, 2013), homeownership (Sánchez, 2019), neighborhood satisfaction (Brazil, 2019), etc. This growing field of work points to the heterogeneous responses from host communities with spatial diffusion of immigrants.

In addition to immigration, housing prices are naturally affected by a number of diverse and multi-scalar determinants For example, racial composition is a widely acknowledged condition for the emergence of housing price differentials (Charles, 2003; Yinger, 1975). In the United States, asymmetric residential preferences of white and black populations, linked with historical discriminative practices (Rothstein, 2017), create an uneven residential landscape featuring a well-documented shortage of black communities with favourable residential environment (Banzhaf, Ma, & Timmins, 2019; Massey & Denton, 1993). Population density also affects housing prices as an indicator of space availability (Huang & Tang, 2012). Socioeconomic characteristics play an important role, as housing prices are found to be associated with educational attainment (King & Mieszkowski, 1973), poverty rate (Jolliffe, 2006), employment opportunities (Berg, 2002), school quality (Kane, Riegg, & Staiger, 2006; Nguyen-Hoang & Yinger, 2011), public safety (Gibbons, 2004; Lynch & Rasmussen, 2001; Pope, 2008) and proximity to neighborhood amenities (Anderson & West, 2006; Bajic, 1983; Voicu & Been, 2008). Housing characteristics also matter, including housing type, age of house and quality of appliances, although their effects are highly mixed (De Bruyne & Van Hove, 2013; Sun, Tu, & Yu, 2005). Other scholarly work proposes governmental regulations (Aura & Davidoff, 2008) or environmental factors (J. P. Cohen & Coughlin, 2008) to be determinants of housing prices.

Relevant empirical studies also find it crucial to account for the endogeneity, or the reverse causality, that often emerges as a result of the omission of confounding attributes. An instrumental variables method has been widely adopted as a standard approach to address endogeneity. The method is based on projecting the endogenous variable onto a space defined by another variable, called the instrument. Instruments are correlated with the endogenous variable while being orthogonal to the error term. Previous works have utilized the "shift-share" of immigrants (Accetturo et al., 2014; Braakmann, 2019; Mussa et al., 2017; Saiz, 2007; Sharpe, 2019), constructed from historical immigration data, as the instrument to predict contemporaneous increases in immigrant population. Proposed by Card (2001), this instrument is based on the observation that immigration inflows are propagated and influenced by ethnic networks or chain migration. Simply put, immigrants are likely to flow to areas that already house a large number of immigrants. Nevertheless, Gonzalez and Ortega (2013) point out that this instrument may be less plausible if the destination lacks any prior history of accepting immigrants, or if recent immigrants originate from different regions compared to earlier immigrants. They hence incorporate an additional gateway instrument constructed from the accessibility of destination from immigrant's county of origin through several transportation modes.

1.2.3 The Spatial Aspects within Immigrant-Housing Price Relationship

Spatial econometrics has increasingly become prevalent in empirical research on housing. Spatial econometrics methodologies focus on two forms of spatial effects in econometrics models, spatial dependence and spatial heterogeneity (Anselin & Lozano-Gracia, 2009). Spatial dependence is the coincidence of value similarity with locational similarity (Anselin, 2001). In housing price analyses, it means houses at nearby locations tend to have similar prices. One explanation is that housing prices within an area are capitalized on shared location amenities, such as school system and green space (Militino, Ugarte, & Garcia-Reinaldos, 2004). Another reason is that real estate agents, buyers and seller often use similar sales in the surrounding areas as references for determining a transaction price (Can, 1990). The core of this effect is that the level of a decision variable one agent chooses will affect the utility of this agent and that of neighboring agents (Osland, 2010). A growing number of studies demonstrate that the ubiquity of spatial dependence in the housing market (Basu & Thibodeau, 1998; Can, 1992; Yu, Wei, & Wu, 2007; Y. Zhang, Sun, & Stengos, 2019). If spatial dependence in the dependent variable is present but not modelled, results from traditional methods that assume observations are spatially independent can be biased (Anselin, 1988).

A variety of econometrics models have been proposed to account for the different ways in which spatial dependence may manifest. Three popular models are spatial autoregressive model (SAR), spatial error model (SEM) and spatial Durbin model (SDM). The SAR contains a spatial lagged dependent variable as an additional explanatory variable, while the SEM incorporates a spatial autoregressive process in the error term. The SDM, introduced by LeSage and Pace (2009), nests both SAR and SEM by including a spatially lagging of both the dependent variables and the independent variables in regression models. In the case of this study, the spatial lagging of the dependent variable in SDM captures spatial dependence within housing prices of nearby locations. The spatial lagging of the independent variables captures the characteristics of neighboring counties that could have ripple effects on the price of each house in the sample (Brasington & Hite, 2005). The specifications of the SDM address multiple spatial interactions and enable SDM to outperform SAR and SEM under many circumstances (Elhorst, 2010). Another advantage of SDM is that it allows researchers to obtain total, direct and indirect marginal effects for the independent variables, contributing to a more detailed understanding of the relationship this study is exploring.

Mussa and colleagues' work (2017) is among the first attempts to address the immigrant-housing price relationship with the SDM. Using MSA-level data, they show that immigration inflow into a particular MSA is not only associated with housing price increases in that MSA, but imposing spatial spillover effects on those in neighboring MSAs. They also find evidence that the positive ripple effect of immigration on housing prices is primarily ascribed to the out-migration of non-Hispanic white residents triggered by immigration. DeSilva et al. (2012) use a SAR model to examine the impact of Black and Hispanic populations on housing prices in a small urban housing market in the U.S. Their findings suggest that the impact of Hispanics is minimal, although the presence of Blacks in the neighbourhood is associated with lower housing prices. Likewise, in an examination of airport noise and housing prices, J. P. Cohen and Coughlin (2008) adopt a SEM with a spatially lagged dependent variable estimated by the generalized moments approach. Their findings illustrate that greater airport noise leads to lower housing prices after a certain noise threshold, yet this negative housing price effects are magnified by spatial spillover.

Spatial heterogeneity, on the other hand, indicates that coefficients of substantive interest may vary significantly across space, and that immigration may yield different effects on housing prices in different parts of the study area. This variation can be possibly explained through localized demand and supply imbalances (Bitter, Mulligan, & Dall'erba, 2007). For instance, houses in established destinations may be older and in denser development, compared to emerging destinations. Meanwhile, housing is a unique good due to its fixed location and durability, and those characteristics of the housing stock will be difficult to change in response to changing demand from immigration. This process hence creates spatial differences in how immigration affects housing prices. Two common strategies are proposed to deal with spatial heterogeneity: (1) a disaggregated modelling strategy based on housing submarkets (Bourassa, Hoesli, & Peng, 2003) and (2) the geographically weighted regression, which produces a set of geographic parameter estimates and measures of statistical significance that vary over space (Fotheringham, Brunsdon, & Charlton, 2002). This study employs the former one. It is crucial to understand that immigrant destinations are not a single unified housing market, but exhibit spatial patterns depending on their evolving relationship with immigration inflows.

Overall, the incorporation of both spatial dependence and spatial heterogeneity in this study allows for, first, the decomposition of the effects of immigration on housing prices into direct effects on a given community and indirect effects on surrounding communities, and second, the examination on how different types of immigration destinations can be influenced unevenly by immigrant influx.

1.3 Data

This paper considers the relationship between immigration and housing prices at the county level between 2011 and 2017. Counties are administrative units within states and exhibit considerate geographic variations of the housing market. There is the precedence of the use of counties in a study of the structural determines of housing prices (Chan, 2001; Chay & Greenstone, 2005; Favara & Imbs, 2015; Glaeser & Gyourko, 2005). Data availability motivates the use of counties here, as counties constitute both metropolitan and micropolitan statistical areas. Housing prices at larger geographies (e.g. MSAs or μSAs) and smaller ones (e.g. census tracts) are either unavailable in certain areas or less reliable. Due to relative geographic isolation and the focus of this study on spatial interactions, counties in Alaska and Hawaii are not considered. 25 counties (4% of the total sample) were identified as “islands” (i.e. with no neighbor based on spatial contiguity priciples) in the SDM and were hence removed during data clearance.

The panel data consist of 574 counties, which make up established and new destinations with respect to inflow of immigrants, over the 2011- 2017 period, so the total sample size is 4018. The housing price data comes from the Federal Housing Finance Agency (FHFA). Under FHFA, the Office of Federal Housing Enterprise Oversight estimates and publishes annual Housing Price Index (HPI) at the county level. HPI is a weighted, repeat-sales index. It measures average price changes in repeat sales or re-financings on the same properties. This information is obtained by reviewing repeat mortgage transactions on single-family properties whose mortgages have been purchased or securitized by Fannie Mae or Freddie Mac. The independent variable of main interests is immigrant inflow as the number of new immigrants divided by the county’s total population. This data is derived from the American Community Survey 5-year estimates, provided by U.S. Census Bureau.

As detailed in the literature review, housing prices can be informed by demographic and socioeconomic characteristics and therefore several controls are incorporated in the estimation. The proportion of non-Hispanic black population is controlled as it indicates demographic composition. Population density, as an indication of space availability, is included as the total population of the county divided by the county’s land area in 1000 square miles. Controls for socioeconomic characteristics include income per capita, the proportion of unemployed workers in the total labor force, the proportion of students attending K-12 private schools among all students of that age group, which respectively indicate the level of wealth, availability of jobs and education segregation. Additionally, potential housing supply is controlled by including the proportion of vacant housing units among all housing units and annual housing permits issued. Housing permits are the number of new privately-owned housing united authorized at county level. Data on control variables are obtained from the U.S. Census Bureau, except the unemployment rate, which is from the Bureau of Labor Statistics.

The instrumental variable is foreign-born children school enrollment one year ahead of the house price change, which is the proportion of foreign-born children enrolled in K-12 schools among all children. Hispanic and Asian foreign-born children school enrollment are used as instruments for Hispanic and Asian immigration concentration respectively for additional analysis. Data on school enrollment are obtained from National Center for Education Statistics (NCES). Under NCES, the Education Demographic and Geographic Estimates (EDGE) program develops information resources on the social and spatial context of education in the U.S. Because the school enrollment data provided by NCES are at the school district level, they are processed in ArcGIS software to be aggregated into data at the county level.

1.4 Methodology

1.4.1 Defining Established and New Destinations

Categorization of immigrant destinations in this study follows previous literature by Hall and Crowder (2014) and Lichter et al. (2010) that distinguish immigrant destinations as “established” and “new”. “Established” refers to metropolitan or micropolitan areas where the foreign-born percent of the total population for 1990 exceeded the national average across all metros or micros, and where the absolute number of immigrants in a particular metro or micro for 1990 exceeded the mean foreign-born population size across all metros or micros. For all those metropolitan or micropolitan areas not classified as “established”, I determined if they fit either of the two sets of criteria for a “new” destination: (1) non-established metropolitan or micropolitan areas where percent foreign-born in 2000 was larger than the national average, and the foreign-born growth rates during the 1990s or 2000s were at least 1.5 times of the national average; or (2) the foreign-born growth rates during the 1990s or 2000s were at least 3 times of the national average. Of the 574 counties in our data, 178 (31 percent) are established-destination counties and the rest are new-destination counties.

Results of categorization are mapped in Figure 1 as the study area. Established destinations are predominately clustered along the West and East Coast and centered on major cities such as New York, Los Angeles, San Francisco, Miami, Chicago and Boston. New destinations are spatially scattered with a noticeably large number located in the Southeast, and many in the Midwest and the Southwest.

1.4.2 The Model and Plan for Analysis

The study estimates the following SDM to obtain effects of housing price determinants:

$$\Delta \ln\left(H_{c,t}\right) = \rho W \, \Delta\ln\left(H_{c,t}\right) + \delta_1 \frac{Immigrants_{c,t-1}}{Population_{c,t-2}} + \beta_1 X_{c,t} + \delta_2 W \frac{Immigrants_{c,t-1}}{Population_{c,t-2}} + \beta_2 W X_{c,t} + \varepsilon_c \quad (1)$$

The dependent variable is the annual change in the log of Housing Price Index (HPI) in county *c* at time *t*. Following Saiz’s identification (2007), I modelled the first difference of the log of HPIs. Differencing the price variable helps control for area-specific factors that could simultaneously affect immigration and the level of house prices, helping remove a potential source of endogeneity. The main independent variable is the annual inflow of immigrants into county *c* divided by the county’s prior year's population. δ_1, the coefficient on the immigrant population ratio, has an intuitive interpretation as the percentage changes in HPI corresponding to an annual inflow of immigrants equal to 1% of the county's original population (Saiz, 2007). δ_1 and β_1 correspond to the direct effect estimates of immigration on housing prices while δ_2 and β_2 are parameters for the indirect effect estimates of immigration on housing prices. $X_{c,t}$ represents the vector of other county-specific control variables. The spatial weight matrix W is a block diagonal matrix describing the arrangement of the spatial units (neighbors). I utilized a row-standardized queen contiguity weight matrix, in which counties sharing any common boundary or vertex are considered neighbors.

According to Saiz (2007) and Mussa et al. (2017) , the current specification of the model only tangentially account for endogeneity. Additional sources of endogeneity could nevertheless still be present on account of reverse causality. A suitable strategy is to use variation in immigrant inflows that are plausibly exogenous to the evolution of housing prices. Thus, an instrumental variable approach is incorporated using foreign-born children school enrolment rate to predict the immigration concentration $\frac{Immigrants_{c,t-1}}{Population_{c,t-2}}$ into each county. Predictions are generated for each county by estimating the following equation:

$$(Immigrant\ concentration)_{c,t} = \alpha_0 + \alpha_1(Immigrant\ children\ school\ enrollment_{c,t}) + \alpha_2(\ Non - Hipanic\ Black_{c,t}) + \alpha_3(\ Density_{c,t}) + \alpha_4(\ LnIncome_{c,t}) + \alpha_6(\ Unemployment) + \alpha_7(\ Vacancy) + \alpha_7(\ LnPermits) + time\ fixed\ effects + e_{c,t} \quad (2)$$

I followed Mussa and colleagues' work (2017) and used bootstrapping to correct standard errors in the first stage regression. Table 1.1 displays the first stage coefficients along with the bootstrapped standard errors. Immigration is positively associated with immigrant children school enrolment, and most control variables at the 95% significance level for established, new and both destinations. The next step of the estimates requires incorporating the results of the first stage regression —predicted exogenous immigration concentration— into the SDM.

The spatial regression analysis proceeds in three stages. First, an investigation of spatial dependence is conducted with estimations of the global and local Moran's *I*. Next, I analyse the effects of immigration on housing prices using the instrumental SDM with space and time fixed effects, followed by examinations of subsamples of established- and new-destination counties. Third, additional analysis was conducted accounting for the housing boom-bust cycle and disaggregated immigration variables (i.e. Hispanic and Asian immigrant concentration) to ensure outcome robustness.

1.5 Results

1.5.1 Descriptive Statistics

Table 1.2 presents a descriptive picture of different immigrant destination types used in the analysis. As expected, established destinations have higher average annual immigrant inflows, accounting for 14 percent of the total population, compared to 6 percent in new destinations. The high level of annual immigration inflow in established destinations is also reflected by higher proportions of Hispanic and Asian immigrants (8 and 3 percent respectively), with new destinations reaching 3 and 1 percent respectively. Similarly, foreign-born children school enrollment is higher in established destinations than in new destinations, although the difference on Asian foreign-born children school enrollment is not substantial.

Among the control variables, established destinations tend to have a higher population density, income per capita, unemployment, housing vacancy, and building permits issued. The exception is in the case of the non-Hispanic Black population whose share is larger in new destinations (11 percent), partially the result of the disproportionate location of new destinations in the Southern and Midwestern states. 40 percent of the established destinations are micropolitan statistical areas, whereas metropolitan statistical areas strongly dominate new destinations.

1.5.2 Model Specification

Spatial dependence is investigated first through the estimation of the global Moran's I index of the residual of the dependent variable based on the OLS model. The results are inconsistent with the original hypothesis at 1% significance level (Table 1.3), indicating a continued presence of spatial dependence/autocorrelation. Therefore the spatial econometrics model should be selected for statistical verification over non-spatial models.

The global Moran's *I* index report the presence of spatial dependence in the data but does not reveal the patterns of the dependence or specify which counties are contributing heavily to the overall dependence. It is necessary to use a local indicator of spatial association, such as the local Moran's *I* to uncover clusters of high and low HPI counties (Anselin, 1995). The local Moran's *I* is a decomposition of the global Moran's *I* into the contribution of each county. It helps distinguish between a statistically significant cluster of high values (high-high cluster), cluster of low values (low-low cluster), outlier in which a high value is surrounded primarily by low values (high-low outlier), and outlier in which a low value is surrounded primarily by high values (low-high outlier). Figure 2-4 display those clusters and outliers in 2011, 2014 and 2017, the beginning, middle and ending point of the study period.

The visualization of local Moran's *I* demonstrates how housing prices are spatially dependent at county scale. In 2011, high HPI are clustered in Southern and

Midwest counties (indicated by light red color), and afterwards move to Western states like California, Washington and Colorado. Low HPI counties are clustered along the East and West Coast in 2011 (indicated by light blue color), and then remain mostly in the South and the Midwest in 2014 and 2017. The changing pattern of high and low HPI clusters over time can partially be a result of boom-bust cycle of housing market.

Next, I proceed by estimating the SDM model. Recall the SDM nests both of the SAR and the SEM. I followed Elhorst's (2010) guidelines and conducted a Wald test and LR test to determine whether the SDM can degenerate into the SAR or the SEM. As shown at the bottom of Table 1.4 and 1.5, the original hypothesis is rejected at the 1% level of significance for both Wald and LR tests, indicating the SAR and the SEM are rejected in favor of the SDM. The Hausman test result shows with a 1% significance level test, suggesting that the fixed effect model of SDM should be selected over the random effect model. Analysis of the joint significance of LR test (space fixed and time fixed) reveal that SDM is more reasonable under the fixed effect of space-time. Hence, the SDM with space and time fixed effects is adopted for analysis.

1.5.3 The Effect of Immigration on Housing Prices

The results from the estimation of the SDM described in Equation (1), in which the annual change in logged HPI is a function of the structural covariates in the county, are shown in Table 1.4. The coefficient estimates of the SDM are not directly interpretable, owning to the feedback effects present between neighboring counties (Elhorst & Fréret, 2009). Here, direct, indirect and total marginal effects of the covariates are presented. The direct effect is calculated as the average, over all spatial units, partial derivative of HPI with respect to changes in the covariate value in *that* county, while the indirect effect is the average, over all spatial units, partial derivative of HPI with respect to changes in the covariate values in *all other* counties (LeSage & Pace, 2009). The total effect is the sum of direct and indirect effects. It is important to recognize that the direct effect is interpreted as the change expected within any individual county, and the indirect effect is the cumulative change expected in all other counties. As such, it is not unexpected for the indirect effect to be of a larger magnitude than the direct effect.

Inspection of the instrumental SDM results suggests that immigration is not a strong predictor of HPI in both destinations, according to Column 2-4 of Table 1.4. Total effect of immigration on HPI is negative yet at 90% significance level. Among control variables, total effects shown in Column 4 indicate that housing price appreciation is associated with decreased income per capita, decreased unemployment rate, decreased vacancy rate and increased building permits. The negative income elasticity of HPI may be ascribed to income inequality, as Özmen, Kalafatcılar, and Yılmaz (2019) find that the income share of the top population quintile is negatively correlated with housing price changes, whereas the associations are positive for bottom population quintiles. It is intuitive that low unemployment level and low vacancy rate contributes to strong housing demands. Building permits can signal new development that promotes housing price appreciation, and work from Glaeser and Gyourko (2002) reveals that the difficulty in obtaining permits can also drive up home values.

In established destinations, although the direct effect of immigration on HPI is not significant (Column 5 of Table 1.4), a positive spatial spillover effect exists between immigration and HPI at 95% significance level — on average, an increase in immigrant inflows equivalent to 1% of a county's total population in a given county raises HPI in *all other* counties by 3.0% (Column 6 of Table 1.4). The total impact of immigration on housing prices is also positive, as shown in the Column 7 of Table 1.4. In new destinations, the direct, indirect and total effects of immigration on HPI are not significant. Overall, these results suggest that immigration inflows are accompanied with rising housing prices in established destinations. And this positive effect is primarily driven by immigrants' positive spillover effect on prices of neighboring counties. Established destinations also exhibit a relatively strong impact of immigration on housing price appreciation compared to new destinations. The coefficient instability across destination types suggests that the effect of immigration can be contingent on regional/local context.

1.6 Additional Analysis

Two additional analysis were conducted to ensure robustness of the outcome. First, the use of aggregated immigration variables in this study may obscure differences among immigrant groups that can relate to their residential outcomes (Hall, 2013). Hence, the main independent variable of interest was replaced by Hispanic and Asian immigration, two largest immigrant groups into United States during the study period. Likewise, Hispanic and Asian foreign-born children school enrollment rates were used as instruments to predict Hispanic and Asian immigrant concentration respectively. Table 1.5 reports the results from the instrumental SDM.

In established destinations, although the direct effect of Hispanic immigrants is minimal, there is a positive indirect effect elasticity of 3.0 (Column 6 of Table 1.5). It implies that 1% of the county's population increases HPI in *surrounding* counties by 3.0%. Coefficient of total effect is positive at 95% significance level. Housing prices in new destinations, on the other hand, is unaffected by Hispanic immigration.

Coefficients of Asian immigrant influx for established, new and both destinations are either insignificant or only at 90% significance level. In general, results of Hispanic immigrants, despite a bit difference in magnitude, are similar in “sprit” to the earlier model specifications with respect to the main independent variable of interest (Table 1.4). It should be noted here it is also primarily a result of the spatial spillover rather than direct effect of Hispanic immigration.

Second, the finding that immigrants are a strong indicator of housing price appreciation in established destinations may be affected by idiosyncratic factors within the study period such as the economic recession at the beginning of the 21st century. Hence, a dummy variable indicating the housing boom-bust cycle was added in the model. This variable takes a value of 1 for observations in 2011 and 2012, and a value of 0 for the rest of the study period. The results (Table 1.6) are enhanced as estimates largely replicate those documented in the original models (Table 1.4) — immigration exhibits strong ripple effects on housing price increases in established destinations. Coefficients and significance of control variables also share similarities with the original model.

1.7 Discussion and Conclusion

Although many scholars and policymakers have recognized immigration as an important driving force of the U.S. housing market, research is ongoing to untangle the spatial interactions, such as spatial dependence and spatial heterogeneity, embedded in this relationship. Using county-level data from 2011 to 2017, I find that immigration inflows are associated with rising housing prices in established destinations, which corresponds with findings of existing literatures at macro spatial level (Gonzalez & Ortega, 2013; Mussa et al., 2017; Ottaviano & Peri, 2007; Saiz, 2007). More importantly, the SDM methodology that this study employs shows that, this positive effect is essentially constituted by spatial spillover of the price effect of immigration into neighboring counties, rather than the direct effect. Hispanic immigrants are a strong predictor of housing price appreciation in established destinations, although their impact on housing prices is likewise a result of their ripple effect. Finally, the effects of immigration are spatially heterogeneous: although housing prices increases with immigration growth in established destinations, those in new destinations remain unrelated to immigration.

The noticeably large spatial spillover effect in the results can be explained by native out-migration triggered by immigration. Much literature documents the aversion and departure of native-born residents of/from immigrant-integrated communities, as a manifestation of the natives' racial or socioeconomic preference for segregation (Crowder, 2000; Frey, 1995; Krysan, 2002b). Mussa et al. (2017) argue that immigration-induced native flight possibly explains the upward housing price patterns, as they find that the same inflow in immigration is associated with a fall in the growth rate of native-born population in a given MSA, yet the opposite in surrounding MSAs. Other scholars have also explored how native out-migration plays a role in immigrants' residential outcomes at the neighborhood level (Accetturo et al., 2014; Sá, 2015; Saiz & Wachter, 2011), although the specific mechanism varies depending on the region-specific context. It is highly possible that positive residential outcomes of new immigrants, including increased housing prices, are essentially driven by segregation between racial groups in the locational attainment process.

The findings of this study are meaningful for redirecting attention towards the processes, not just the outcomes, of the immigrant residential attainment. I argue that analyses simply looking at immigrants' seemingly "optimistic" residential outcomes (Iceland & Scopilliti, 2008) may underestimate the extent to which new immigrants continue to face social distance when they interact with the housing market. The incorporation of spatial dependence in this study shows that immigration inflows motivate housing price changes of nearby communities through spatial spillover, which may be attributed to out-mobility of native-born residents. Scholars need to examine more critically those exclusive processes of immigrant/minority residential incorporation.

The less clear results in new destinations may be ascribed to its internal heterogeneity. New immigrant destinations are intrinsically diverse by the racial/ethnical composition of newly arrived immigrants, as well as the driving forces of their emergence. For instance, many new destinations in the Midwest rises with transnational recruitment of large corporations targeting at Mexican immigrants (Miraftab, 2016), whereas other places become new magnets of immigrants due to policy incentives, such as the refugee resettlement program for Somalis in small towns of Minnesota (Darboe, 2003). The demographic and social differences between specific immigrant groups are considerable, leading to variations in residential attainment. For instance, what is considered an "established" or "new" destinations for Hispanic immigrants may not apply to Asian immigrants or other immigrant subgroups. More studies should be produced that focus on the unique socio-demographic profiles of specific immigrant groups, as well as the historical and geographical factors linked with recent immigrant arrivals in different regions.

Despite the limitations, findings of this study merit strong considerations from policymakers as they provide a more complicated answer about the impact of immigration on the housing market: the minimal direct effect and the large spatial spillover of immigration inflows can be signs for another hurdle for them in the achievement of residential incorporation. While this ripple effects is particularly strong in established destinations, there are many reports about intensified sensitivity of natives towards new immigrants in emerging destinations (Fennelly, 2008; Hall & Stringfield, 2014). Future policies should recognize the possible exclusive processes immigrants are encountering, and enhance inter-group cooperation and trust. Particularly relevant to this research is exploring the mechanisms that precipitate racial inequality in residential attainment: Do native-born residents seek out nearby communities with fewer immigrants as a response to increasing immigration into their current communities? Do racial status of immigrants play a role in motivating native out-migration? Do new destinations themselves exhibit heterogeneity in the effects of immigrant groups on housing prices and native out-mobility? Overall, progress in this field should reflects obstacles and challenges confronting immigrants and minorities as they navigate their way through the U.S. society.

Table 1. 1 First Stage Regression for Immigration IV

Variables		Model 1 (both destinations) Coef. (Bootstrapped SE)			Model 2 (established destinations) Coef. (Bootstrapped SE)			Model 3 (new destinations) Coef. (Bootstrapped SE)	
Foreign-born children school enrolment rate	**0.027*** (0.006)**			**0.026*** (0.008)**			**0.027*** (0.007)**		
Hispanic foreign-born children school enrolment rate		**0.018*** (0.004)**			**0.019*** (0.005)**			**0.018*** (0.005)**	
Asian foreign-born children school enrolment rate			**0.005*** (0.002)**			**0.003*** (0.001)**			**0.005*** (0.002)**
Percent non-Hispanic black population		22.606** (9.475)			0.423 (0.763)			22.606** (10.985)	
Population density		0.036 (0.047)			0.011*** (0.002)			0.036 (0.027)	
log Income per capita		9.823*** (0.067)			9.908*** (0.119)			9.823*** (0.071)	
Percent unemployed		10.500*** (0.838)			11.600*** (0.913)			10.500* (0.930)	
Percent vacant units		19.120*** (3.351)			-38.639*** (11.585)			19.120 (3.836)	
log Building permits issued		2.398** (1.225)			4.277*** (0.432)			2.398*** (0.880)	
Observations		4018			1246			2.772	
R-squared	0.302	0.164	0.294	0.379	0.133	0.276	0.322	0.385	0.459

Table 1. 2 Descriptive Statistics

Variables	Both destinations (n=4018)		Established destinations (n=1246)		New destinations (n=2772)	
	Mean	SD	Mean	SD	Mean	SD
Dependent variables						
Annual change of Housing Price Index	2.27	5.14	2.51	5.68	2.18	4.87
Independent variables						
Foreign-born population$_{t-1}$/Total population$_{t-2}$	0.08	0.08	0.14	0.10	0.06	0.05
Hispanic foreign-born population$_{t-1}$/Total population$_{t-2}$	0.04	0.05	0.08	0.07	0.03	0.03
Asian foreign-born population$_{t-1}$/Total population$_{t-2}$	0.02	0.03	0.03	0.04	0.01	0.01
Instrumental variables						
Foreign-born children enrolled in K-12 schools $_{t-1}$/Total children enrolled in K-12 schools $_{t-1}$	0.04	0.03	0.05	0.03	0.03	0.02
Hispanic foreign-born children enrolled in K-12 $_{t-1}$ schools/Total children enrolled in K-12 schools $_{t-1}$	0.02	0.02	0.03	0.03	0.02	0.02
Asian foreign-born children enrolled in K-12 schools $_{t-1}$/Total children enrolled in K-12 schools $_{t-1}$	0.01	0.01	0.01	0.01	0.01	0.01
Control variables						
Percent non-Hispanic Black population (%)	8.87	12.14	5.03	6.37	10.60	13.65
Population density (per 1000 sq mi)	620.77	2537.13	1366.35	4412.45	285.64	470.66
Income per capita	26786.13	6779.76	29055.58	8567.35	25766.02	5504.41
Percent unemployed (%)	6.45	2.70	7.30	3.27	6.07	2.30
Percent enrolled in private schools (%)	8.89	4.28	8.87	4.66	8.90	4.09
Percent vacant units (%)	13.02	8.23	13.85	8.66	12.64	8.00
Building permits issued	940.44	2139.71	1151.35	2378.16	845.64	2016.68
Metro dummy	0.83	0.38	0.60	0.49	0.93	0.27

Table 1. 3 Global Moran's I for the Residual of HPI

Year	Global Moran's I		
	Both destinations	Established destinations	New destinations
2011	14.782***	5.867***	13.585***
2012	11.934***	6.393***	8.869***
2013	15.211***	9.831***	8.687***
2014	14.102***	9.814***	8.081***
2015	9.501***	5.910***	5.867***
2016	10.811***	4.325***	7.278***
2017	8.117***	4.986***	4.445***

Table 1. 4 Instrumental SDM Results of Immigration on Housing Price Index [a]

Variables	Model 1 (both destinations)			Model 2 (established destinations)			Model 3 (new destinations)		
	Direct effect	Indirect effect	Total effect	Direct effect	Indirect effect	Total effect	Direct effect	Indirect effect	Total effect
Immigrants $_{t-1}$/Total population $_{t-2}$	-0.593	-1.477	-2.071*	0.699	2.987**	3.686**	-1.042	-1.734	-2.776*
	(0.571)	(1.067)	(1.240)	(0.780)	(1.324)	(1.671)	(0.852)	(1.361)	(1.591)
Percent non-Hispanic black population	0.002	0.000	0.002	-0.002	-0.003	-0.005	0.002	-0.004	-0.002
	(0.002)	(0.003)	(0.004)	(0.006)	(0.010)	(0.014)	(0.002)	(0.003)	(0.003)
Population density	0.016*	0.017	0.033*	0.005	-0.025	-0.020	0.092**	0.226***	0.318***
	(0.008)	(0.015)	(0.018)	(0.012)	(0.022)	(0.026)	(0.036)	(0.073)	(0.084)
log Income per capita	-0.025	-0.138**	-0.163***	-0.081	-0.296***	-0.377**	-0.003	-0.054	-0.056
	(0.028)	(0.067)	(0.079)	(0.070)	(0.105)	(0.162)	(0.032)	(0.070)	(0.080)
Percent unemployed	-0.005***	-0.003***	-0.008***	-0.008***	-0.007***	-0.015***	-0.005***	0.001	-0.004***
	(0.001)	(0.001)	(0.001)	(0.002)	(0.002)	(0.002)	(0.001)	(0.002)	(0.001)
Percent enrolled in private schools	0.000	-0.001	-0.001	0.001	0.002	0.004	-0.001	-0.001	-0.002*
	(0.000)	(0.001)	(0.001)	(0.001)	(0.002)	(0.003)	(0.000)	(0.001)	(0.001)
Percent vacant units	-0.002***	-0.002**	-0.004***	-0.003**	-0.002	-0.005	-0.002**	-0.003**	-0.004***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.003)	(0.004)	(0.001)	(0.001)	(0.002)
log Building permits issued	0.008***	0.017***	0.026***	0.003	0.004	0.007	0.009***	0.017***	0.026***
	(0.001)	(0.003)	(0.004)	(0.004)	(0.007)	(0.009)	(0.001)	(0.003)	(0.004)
R-squared		0.485			0.492			0.406	
Log-likelihood		8818.551			2804.699			6035.994	
LR test for the joint, space fixed		215.280***			146.690***			170.860***	
LR test for the joint, time fixed		772.540***			391.570***			448.360***	
Wald test, spatial lag		37.960***			15.930***			43.500***	
Wald test, spatial error		92.670***			39.030***			80.470***	
LR test, spatial lag		45.560***			23.660***			47.140***	
LR test, spatial error		99.090***			45.510***			81.590***	
Hausman test		273.130***			94.990***			273.22***	

* Regression coefficients being statistically significant at 0.10 level. ** Regression coefficients being statistically significant at 0.05 level. *** Regression coefficients being statistically significant at 0.01 level. In parenthesis are standard errors.

[a] The largest variance inflation factors (VIF) value among all the independent variables is 1.88, and all independent variables show correlations less than 0.50, suggesting that multicollinearity is not a concern. The metro dummy is omitted from SDM with space and time fixed effect.

Table 1. 5 Instrumental SDM Results of Hispanic and Asian Immigration on Housing Price Index[a]

Variables	Model 4 (both destinations)			Model 5 (established destinations)			Model 6 (new destinations)		
	Direct effect	Indirect effect	Total effect	Direct effect	Indirect effect	Total effect	Direct effect	Indirect effect	Total effect
Hispanic immigrants $_{t-1}$/Total population $_{t-2}$	-0.726	-1.137	-1.863	0.907	3.031*	3.938**	-1.832	-0.329	-2.162
	(0.826)	(1.482)	(1.694)	(0.979)	(1.547)	(1.749)	(1.373)	(2.196)	(2.516)
Asian immigrants $_{t-1}$/Total population $_{t-2}$	-1.002	-1.031	-2.033	-0.258	5.538	5.280	-0.989	-3.060	-4.049*
	(1.445)	(2.604)	(2.746)	(3.847)	(7.736)	(9.766)	(1.574)	(2.442)	(2.358)
Percent non-Hispanic black population	0.002	-0.001	0.001	0.000	-0.000	-0.000	0.002	-0.004	-0.002
	(0.002)	(0.003)	(0.004)	(0.005)	(0.011)	(0.014)	(0.002)	(0.003)	(0.003)
Population density	0.017*	0.011	0.028	0.008	-0.028	-0.204	0.053	0.269**	0.322**
	(0.009)	(0.017)	(0.020)	(0.014)	(0.032)	(0.039)	(0.064)	(0.113)	(0.129)
log Income per capita	-0.025	-0.151**	-0.175**	-0.067	-0.308***	-0.375**	-0.002	-0.069	-0.071
	(0.027)	(0.066)	(0.077)	(0.067)	(0.110)	(0.162)	(0.030)	(0.066)	(0.075)
Percent unemployed	-0.005***	-0.003**	-0.008***	-0.008***	-0.006***	-0.014***	-0.005***	0.001	-0.004**
	(0.001)	(0.001)	(0.001)	(0.002)	(0.002)	(0.003)	(0.001)	(0.001)	(0.001)
Percent enrolled in private schools	-0.000	-0.001	-0.002	0.001	0.002	0.003	-0.001	-0.001	-0.002*
	(0.000)	(0.001)	(0.001)	(0.001)	(0.002)	(0.003)	(0.000)	(0.001)	(0.001)
Percent vacant units	-0.002***	-0.002	-0.004**	-0.003**	-0.002	-0.005	-0.002**	-0.003*	-0.004**
	(0.001)	(0.001)	(0.002)	(0.001)	(0.003)	(0.004)	(0.001)	(0.001)	(0.002)
log Building permits issued	0.009***	0.017***	0.026***	0.003	0.004	0.006	0.010***	0.017***	0.026***
	(0.001)	(0.003)	(0.004)	(0.004)	(0.008)	(0.011)	(0.001)	(0.003)	(0.004)
R-squared		0.482			0.494			0.454	
Log-likelihood		8817.7495			2804.981			6036.328	
LR test for the joint, space fixed		211.680***			145.140***			168.970***	
LR test for the joint, time fixed		759.800***			390.860***			445.870***	
Wald test, spatial lag		36.820***			16.170***			42.260***	
Wald test, spatial error		89.560***			37.860***			78.350***	
LR test, spatial lag		44.520***			23.200***			47.310***	
LR test, spatial error		97.300***			45.150***			80.890***	
Hausman test		253.570***			100.250***			273.080***	

* Regression coefficients being statistically significant at 0.10 level. ** Regression coefficients being statistically significant at 0.05 level. *** Regression coefficients being statistically significant at 0.01 level. In parenthesis are standard errors.

[a] The largest variance inflation factors (VIF) value among all the independent variables is 2.16, and all indepedent variables show correlations less than 0.50, suggesting that multicollinearity is not a concern. The metro dummy is omitted from SDM with space and time fixed effect.

Table 1. 6 Instrumental-SDM Results of Immigration Inflow on Housing Price Index in Boom-Bust Cycle

Variables	Model 1 (both destinations)			Model 2 (established destinations)			Model 3 (new destinations)		
	Direct effect	Indirect effect	Total effect	Direct effect	Indirect effect	Total effect	Direct effect	Indirect effect	Total effect
Immigrants $_{t-1}$/Total population $_{t-2}$	-0.597	-1.521	-2.118*	0.576	3.318**	3.894**	-1.028	-1.775	-2.802*
	(0.559)	(1.089)	(1.209)	(0.763)	(1.311)	(1.616)	(0.831)	(1.390)	(1.539)
Percent non-Hispanic black population	0.002	0.000	0.002	-0.002	-0.003	-0.009	0.002	-0.004	-0.002
	(0.002)	(0.003)	(0.003)	(0.006)	(0.010)	(0.013)	(0.002)	(0.003)	(0.003)
Population density	0.016*	0.018	0.034*	0.005	-0.033	-0.027	0.086**	0.248***	0.3334***
	(0.008)	(0.015)	(0.019)	(0.012)	(0.021)	(0.026)	(0.036)	(0.076)	(0.086)
log Income per capita	-0.026	-0.144**	-0.170**	-0.097	-0.375***	-0.472***	-0.001	-0.044	-0.044
	(0.028)	(0.066)	(0.080)	(0.071)	(0.101)	(0.162)	(0.032)	(0.068)	(0.079)
Percent unemployed	-0.005***	-0.003***	-0.008***	-0.008***	-0.004**	-0.012***	-0.004***	0.001	-0.004***
	(0.001)	(0.001)	(0.001)	(0.002)	(0.002)	(0.002)	(0.001)	(0.002)	(0.002)
Percent enrolled in private schools	0.000	-0.001	-0.002	0.002*	0.002	0.003	-0.001	-0.001	-0.002*
	(0.000)	(0.001)	(0.001)	(0.001)	(0.002)	(0.003)	(0.000)	(0.001)	(0.001)
Percent vacant units	-0.002***	-0.002**	-0.004***	-0.003**	-0.003	-0.007*	-0.002**	-0.002*	-0.004***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.007)	(0.003)	(0.001)	(0.001)	(0.002)
log Building permits issued	0.008***	0.017***	0.026***	0.003	0.002	0.005	0.009***	0.017***	0.026***
	(0.001)	(0.003)	(0.004)	(0.004)	(0.007)	(0.009)	(0.001)	(0.003)	(0.004)
Housing bust period dummy	0.003	0.002	0.005	-0.004	-0.050*	-0.055	0.004	0.030	0.033
	(0.033)	(0.020)	(0.054)	(0.034)	(0.028)	(0.059)	(0.003)	(0.024)	(0.027)

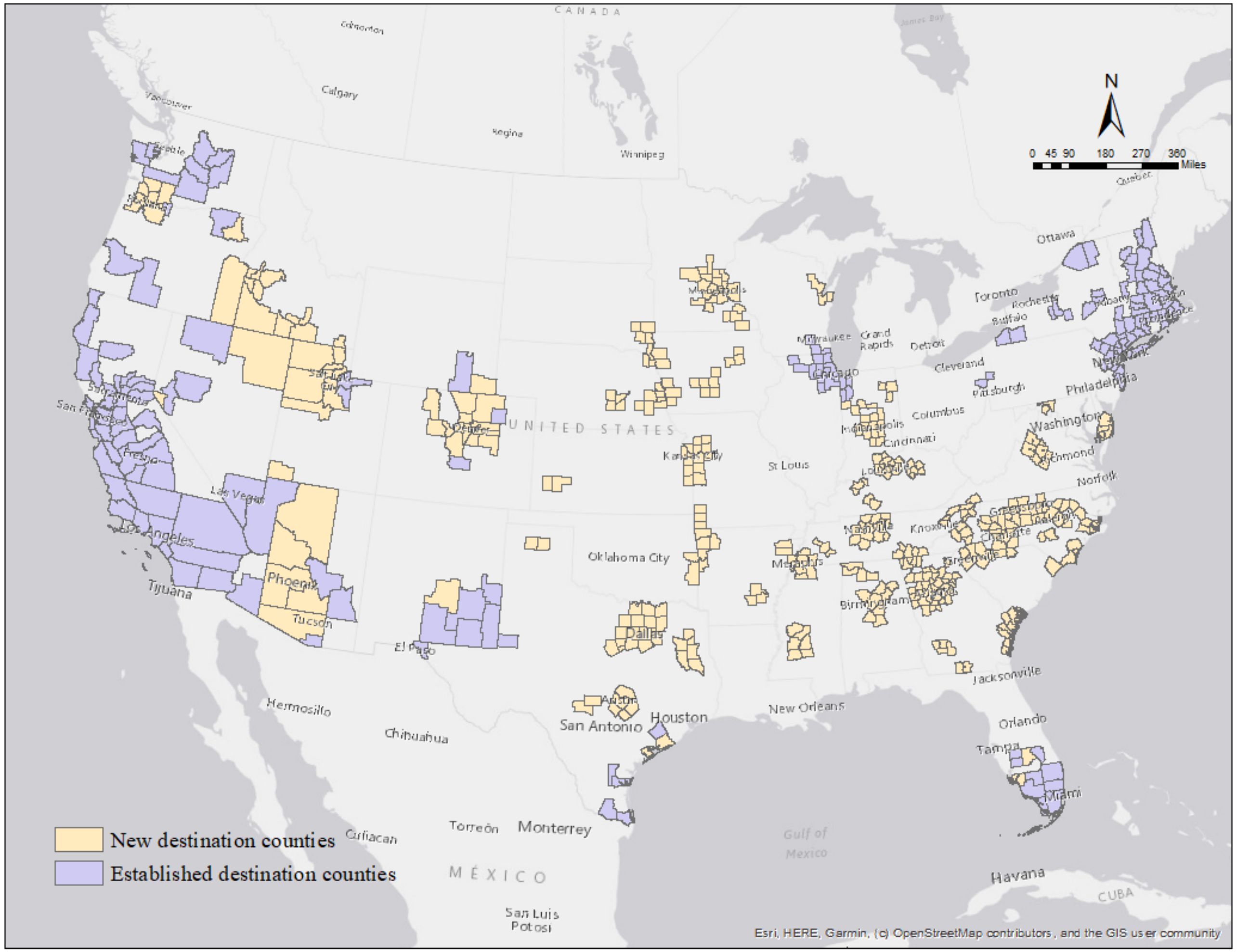

Figure 1. Established and new immigrant destinations at county level

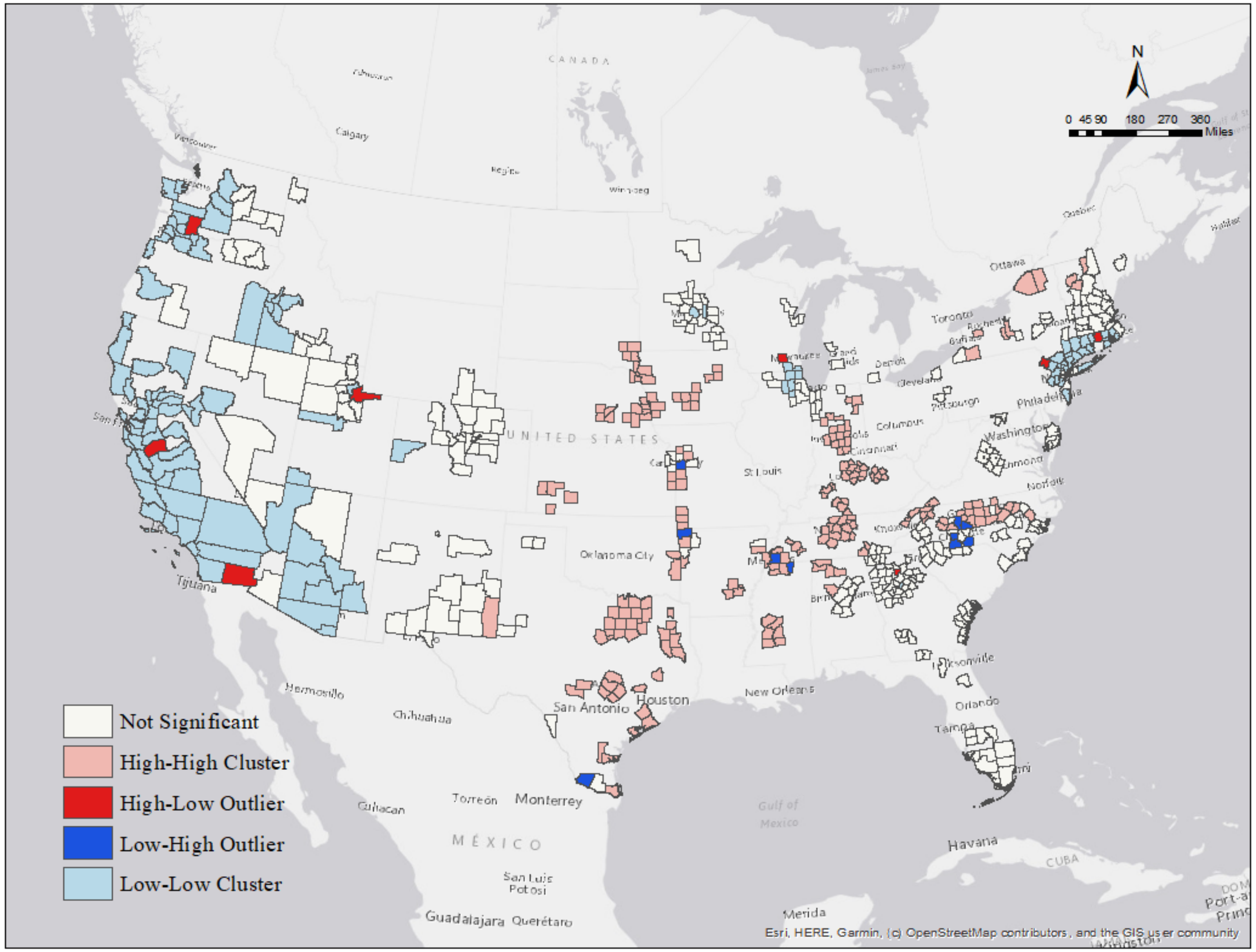

Figure 2. HPI annual change rate clusters and outliers in 2011

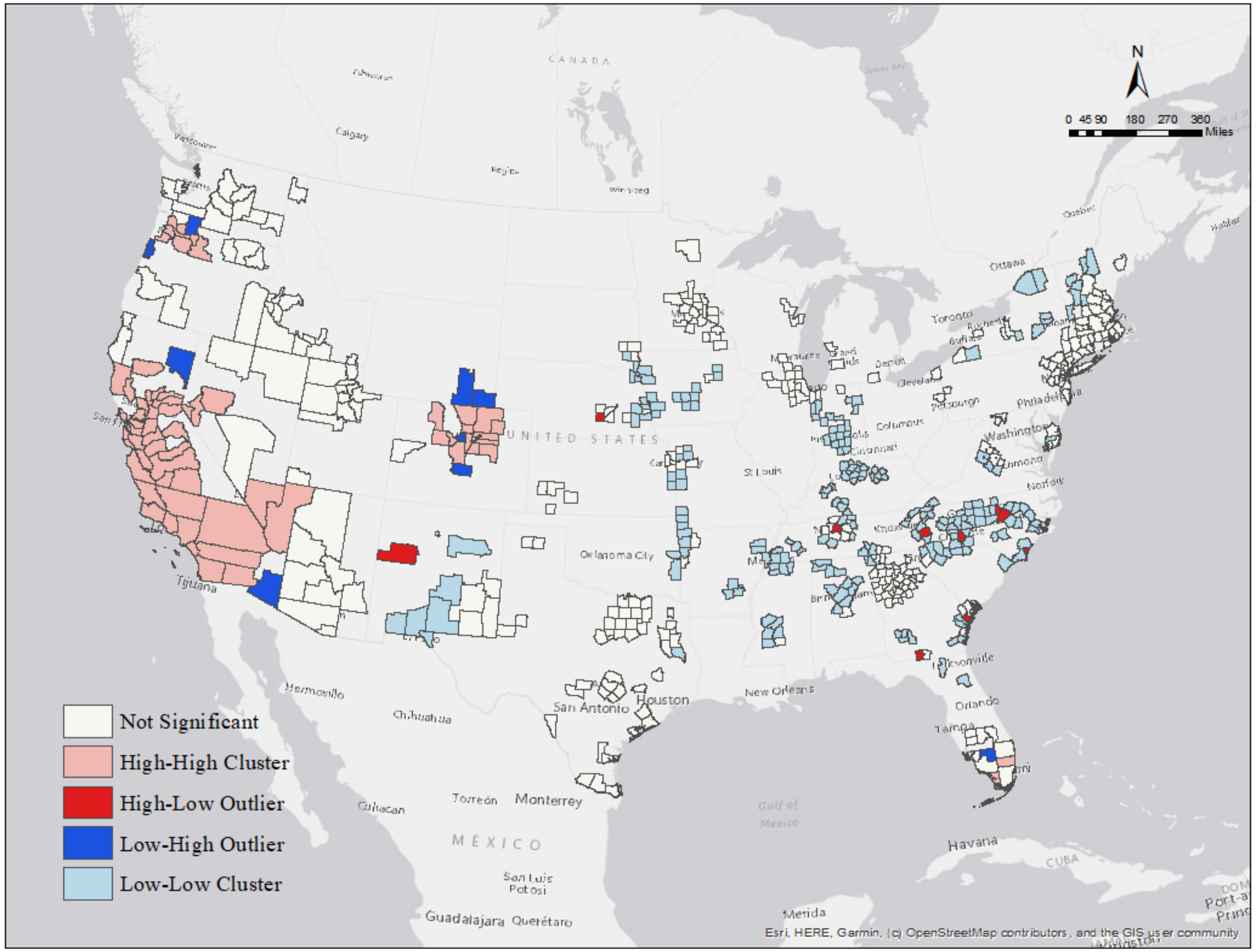

Figure 3. HPI annual change rate clusters and outliers in 2014

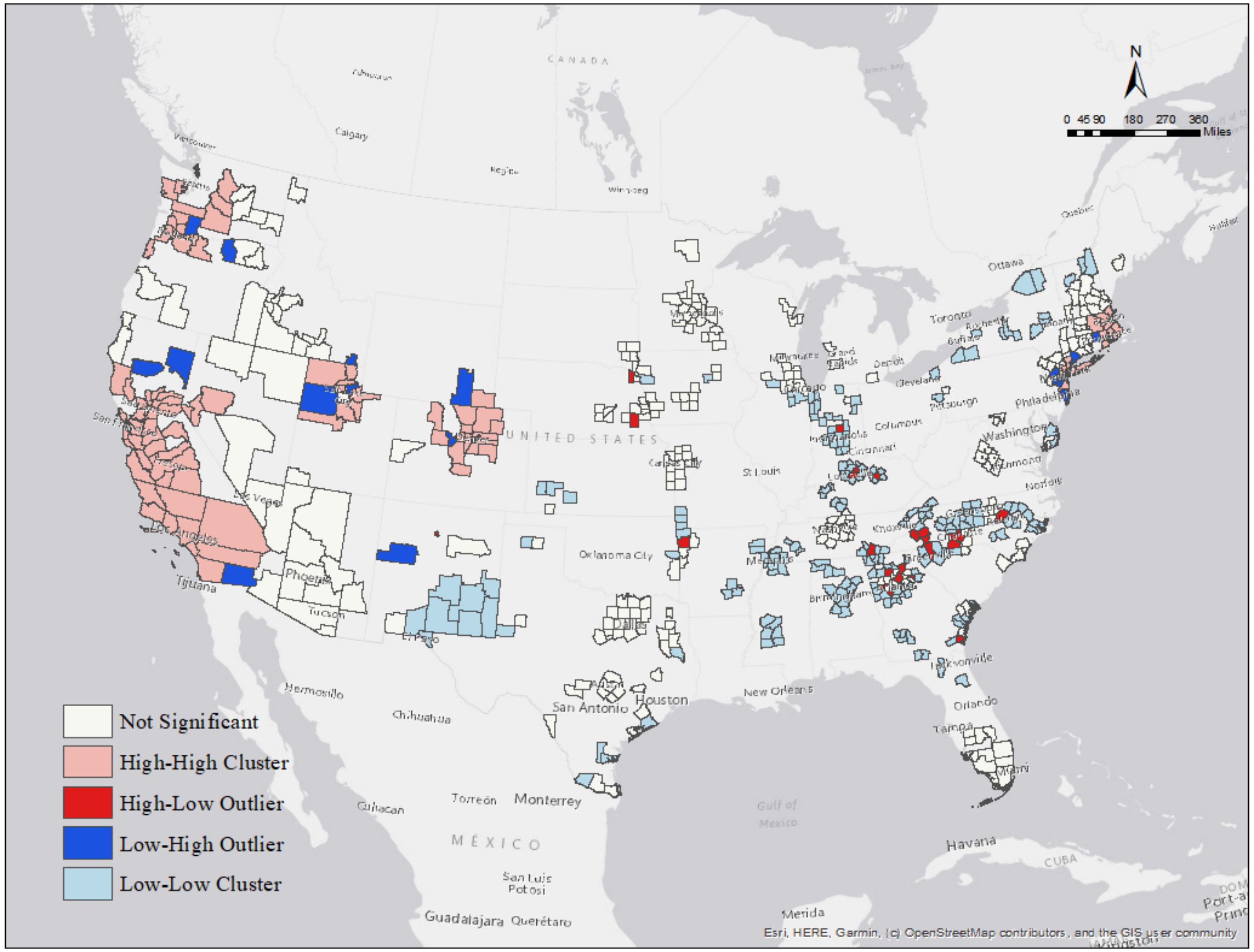

Figure 4. HPI annual change rate clusters and outliers in 2017

CHAPTER III: RACIAL PREJUDICE OR SOCIOECONOMIC CONCERN? EXAMINING THE IMPACT OF IMMIGRANT SUBRUBANIZATION ON WHITE OUT-MIGRATION

2.1 Introduction

Suburban neighborhoods have traditionally been viewed as racially homogenous and part of the American middle-class identity (Jackson, 1987). However, the growing suburbanization of immigrants has challenged this unitary image of suburbia (Farrell & Firebaugh, 2016). The rise of diversity in the US suburbia means a wide range of new outcomes, including the labor market (Mattingly, 1999), cultural exchange (Brettell & Nibbs, 2011), demand for school desegregation (Lewis-McCoy, 2018), dynamics of political participation (C. T. Lee, 2019) and so on. A deep research tradition has examined how increased racial diversity has affected the migratory patterns and segregation of population groups across the residential space. One strand of this research sees immigrant suburbanization as a process of spatial assimilation (Alba & Logan, 1992; Massey, 1985), leading to increased demographic integration ("melting pot suburbs", see Frey, 2001) and improved residential circumstances of minorities (Rosenbaum, Friedman, & Friedman, 2007). A growing number of studies, however, point out persistent white out-migration from suburban neighborhoods, which accounts for an increasing share of metropolitan segregation (Crowder, 2000; Farrell, 2016; Frey, 2011; Kye, 2018). Consistent with the this view, research also shown that minorities and immigrants residing in suburbia largely fail to achieve neighborhoods of equal quality relative to native-born whites with similar levels of income (J. R. Logan, Xu, & Stults, 2014). Immigrant suburbanization may exacerbate the spatial segregation of racial groups and prosperity.

The movement of immigrants into socioeconomic advantaged suburban neighborhoods, or middle-class suburbia, also attracts growing scholarly attention, as it decouples the race effect and the class effect of immigration in motivating white out-migration. Scholarship has not reached any consensus on whether white out-migration is driven by racial prejudice (Crowder, 2000), or by the general avoidance of socioeconomic decline (Anderson & West, 2006; Krysan, 2002a). The difficulty in separating effects of race (i.e. non-white racial status of minorities and immigrants) and class (i.e. socioeconomic status of the neighborhood) lies in the disproportionate concentration of minorities in poor inner city neighborhoods (Sampson, 2009; Wilson, 1987). Examinations on white out-mobility in middle-class suburbia provide an opportunity to understand the independent role of race, since those neighborhoods are less likely to be affected by disadvantaged socioeconomic context that might otherwise explain white out-migration.

This chapter explores two major research questions. The first one assesses the association between immigrant suburbanization and white out-migration. The second one examines whether white out-migration persists with immigrant influx in the middle-class suburban neighborhoods. To accomplish these goals, I use available proprietary household data from the Panel Study of Income Dynamics (PSID), as well as demographic and economic data from the American Community Survey. The PSID not only provides rich individual-level information relative to mobility, but also geocoded variables that allow for locating origins and destinations of individual movements at the census tract level. Findings contribute to broader residential segregation and neighborhood change literature, and urge policymakers to recognize the detrimental role of white flight in the reproduction of increasingly segregated U.S. suburbia.

2.2 Background and Hypotheses

In the wake of deindustrialization and dispersed employment (Liu & Painter, 2012; Singer et al., 2008), suburbs are now first destinations of many incoming immigrants rather than a residential stepping stone from the city (Farrell & Firebaugh, 2016). The "suburban immigrant nation" not only emerged in gateway cities that have historically housed the bulk of immigrants, but also in new destinations that have gained popularity during recent decades (Hardwick, 2008; Massey, 2008). According to Singer and Wilson (2011), in 2010 three out of every five immigrants in large metropolitan areas reside in suburban neighborhoods. This spatial dispersal of immigrant settlements has increasingly exposed the nation's white majority to diverse minority populations.

Existing literatures on white mobility have strong implications for the broader literature of neighborhood change and residential assimilation. Substantively, white flight — the aversion and departure of native-born residents of/from minority-integrated neighborhoods — remains a key mechanism in the reproduction of residential segregation, one common outcome examined by the research in this field (Alba & Nee, 2009; Hall, 2009; South, Crowder, & Chavez, 2005). Three theoretical perspectives on neighborhood change in multi-group context are proposed as *bifurcation*, *fragmentation* and *demographic integration* (Charles, 2003; Farrell & Lee, 2011; Hall, Tach, & Lee, 2016; J. R. Logan, Alba, & Leung, 1996). The bifurcation model predicts that the residential pattern develops along a white/non-white color. That is, white population loss continues to be triggered in neighborhoods with highly concentrated non-white minorities (Denton & Massey, 1991). Consequentially, the residential landscape is characterized with Black, Latino and Asian residents living in integrated neighborhoods, while white households residing in separate areas (Friedman, 2008). The fragmentation perspective foresees multiple color lines, with different minority groups as well as whites seeking out homogenous neighborhoods. One example is the formation of "ethnourbs", the suburban ethnic clusters of residential and business areas since the 1990s that provide social support for minority communities (Li, 1998; Lin & Robinson, 2005). Under this scenario, immigrant/minority population growth constantly fragments the metropolis that used to be dominated by white-black residential segregation (Flores & Lobo, 2013; J. R. Logan, Stults, & Farley, 2004). Finally, the demographic integration model argues for the growth of racially diverse or so-called "global neighborhoods" (J. R. Logan & Zhang, 2010). It essentially aligns with traditional spatial assimilation thesis that sees residential integration as an ultimate outcome as immigrants improve their cultural adaptation and economic attainment (Alba & Logan, 1991; Massey & Denton, 1988). It is predicted with Hispanic and Asians as pioneer integrators of previously all-white zones, later followed by African-Americans, racial integration will be achieved with lessened white flight (Fowler, Lee, & Matthews, 2016; J. R. Logan & Zhang, 2010).

Theoretical formulations of white intra-metropolitan mobility are largely based on movements from racially diverse cities *to* homogenous suburbs (Farley, Schuman, Bianchi, Colasanto, & Hatchett, 1978), as suburban neighborhoods have long been recognized as desirable locations of residence and part of the American middle-class identity. Yet, the emergence of immigrant suburbanization has called into question of this canonical view, with recent evidence showing persistent white flight *from* suburban neighborhoods (in many cases, to the outlaying exurbs; see Frey, 2011). Indeed, despite a sharp decline of all-white neighborhoods in suburbia (Hall et al., 2016; K. O. Lee, 2016), empirical analyses show that white out-migration facilitates "hyper-concentration" of ethnic groups in those areas (Jones, 2008). That is, the compositional diversity is increasing, yet highly diverse neighborhoods remain rare due to whites' sensitivity to minority neighbors (Holloway, Wright, & Ellis, 2012; Krysan, Couper, Farley, & Forman, 2009). This argument is further supported by Parisi and colleagues'(2019) work that draws on individual-level mobility data from the PSID and suggests the exodus of whites is significantly higher in racially diverse suburbs than predominately white suburbs. Meanwhile, a large volume of literatures on educational inequality also indicate the presistance of white flight that propels the re-segregation of suburban schools (Baum-Snow & Lutz, 2011; Murray, 2016; Reardon, Grewal, Kalogrides, & Greenberg, 2012; H. Zhang, 2011).

These discussions lead to the first hypothesis of this study, which is that *white households in suburbia will be more likely to leave neighborhoods with high concentration of immigrant populations than those in the principle city/urban area*. Suburban neighborhoods represent political and economic actors that presumably affect white decision making and community attachment (J. Logan & Molotch, 1987). Many suburban neighborhoods enjoy higher autonomy over public goods than their urban counterparts, as residents pay for the privilege of making collective decisions with a homogenous electorate (Boustan, 2007). Minority influx challenge the monochrome description of suburban life, through political participation (C. T. Lee, 2019), school desegregation (Lewis-McCoy, 2018) and economic transitions (Surya, Saleh, & Remmang, 2018). Politically conservative white population may consider this demographic change as a threat to status quo. Therefore, it is meaningful to understand whether the suburban context facilitate or attenuate white out-mobility in response to immigrant suburbanization.

Recent studies have also paid particular attention to the decoupling of race and class effects with immigrant suburbanization, which speaks to the mechanism of white out-migration. The *white flight hypothesis* recognizes mobility responses of whites as racially motived based on stereotypes or prejudice (Duncan & Duncan, 1957). That is, the entrance of immigrants into the neighborhood induces white out-migration mainly due to the "non-white" status of the immigrants, irrespective of neighborhood socioeconomic characteristics. A contrasting theory, known as *racial proxy hypothesis*, suggests that the departure of local residents is primarily indicative of neighborhood life cycle and housing characteristics (Ellen, 2000; Harris, 2001). According to this perspective, out-migration should be interpreted as a general aversion to social ills; race acts as a proxy of socioeconomic decline.

Early evidence supporting the white flight hypothesis largely comes from residential attitude studies. They demonstrate that the presence of minorities often invokes stereotypes, and activates a sense of anxiety among the ethnic majority (Blalock, 1957; Bobo & Zubrinsky, 1996; Sampson & Raudenbush, 2004). One example is that white residents often associate immigrants with crimes and disorder, despite the mounting evidence suggesting that the immigration influx does not contribute to elevated crime levels (Polczynski Olson, Laurikkala, Huff-Corzine, & Corzine, 2009; Ruther, 2014).

Increasing availability of locational data also enables recent scholarship to incorporate geographical aspects to untangle the historical overlap between minority residence and poverty in the study of white flight. Merging the geocoded individual-level PSID with census data, Crowder (2000) shows that neighborhood-level racial and ethnic conditions represent salient predictors of individual mobility net of other important influences of mobility; there is little evidence to suggest that the mobility decisions of white metropolitan householders reflects efforts to avoid proximity to poor residents or to escape unstable neighborhood environments. Likewise, Parisi et al. (2019) advance Crowder's (2000) work with a multiscale approach focusing on white suburban movers, and find that racial considerations significantly affect white out-mobility at both place and block level. Based on Census data from 1990 and 2000, Kye (2018) uses principal component analysis to identify "poor" and "middle-class" suburban neighborhoods subsamples for comparison. By demonstrating white flight is more likely to happen in middle-class rather than poorer suburban neighborhoods, his work makes a strong argument confirming the independent effect of race in driving white flight.

Studies supporting the racial proxy hypothesis, on the other hand, argue that white flight is essentially associated with neighborhoods with high levels of poverty, crime and other social problems (Clark, 1986). Harris (2001) finds both white and black populations are averse to deteriorating black neighborhoods. Work from Fairlie (2002) on education segregation also indicates the presence of "Latino flight" into private schools with the growing black share of the school-age population; since there is no evidence Latinos respond differently to black schoolchildren than do whites, it is unlikely the exit of Latinos are racially motivated. In addition, Ellen (2000) suggests that the entry decision is more likely to be influenced by racial concerns than the exit decision, which is instead mostly dependent on the neighborhood's quality. With estimations of both exit and entry models, her findings are consistent with the racial proxy hypothesis. More recently, Andersson, Berg, and Dahlberg (2018) utilizes geo-coded register data from Sweden, and find that while ethnic closeness does not matter for observed white flight behavior. Nevertheless, scholarship of this kind has been constantly criticized for neglecting the enduring racial effect on neighborhood quality that limits the potential for minority neighborhoods, at the first place, to substantively narrow the wealth/socioeconomic gap (Friedman & Rosenbaum, 2007; Markley, Hafley, Allums, Holloway, & Chung, 2020).

I based my second hypothesis on the theoretical debate between white flight hypothesis and racial proxy hypothesis, which is *white households in middle-class suburbia will be less likely to leave neighborhoods with high immigrant concentration than those in other relatively disadvantaged suburban neighborhoods*. According to Kye (2018), if racial composition is a stronger predictor of white flight than neighborhood quality, non-white presence in middle-class suburbia should lead to a similar or higher level of white flight compared with in other disadvantaged suburban neighborhoods. Affluent whites in middle-class suburbia not only enjoy greater financial freedom to find alternative neighborhoods that satisfy their racial preferences, they are also resourceful to affect local areas policies that inherently restrict the in-migration of population groups they deem “undesirable” (Bashi & McDaniel, 1997; Sampson, 2009). Therefore, if whites in middle-class suburbia show weaker migratory responses to immigration concentration, race may play a less important role than nonracial factors such as family structure, income level, quality of housing, etc.

Research also suggest that the effect of metropolitan-scale factors will hinge on motivations of white out-mobility (B. A. Lee & Wood, 1991). Whether the metropolitan area is historically a major immigrant destination shapes social attitudes towards racial minorities. Fischer and Tienda (2006) find Hispanic immigrants are more segregated from other groups in new Hispanic destinations (e.g. Charleston, SC) than established ones (e.g. San Diego, CA). Hall and Crowder (2014) explore native out-migration in new destinations and find that the tendency to move away from immigrants is pronounced for natives living in developing-destination MSAs. Second, racial composition of a metropolitan area matters, as it relates to the availability of neighborhoods with various combination of racial and ethnical groups (Reibel & Regelson, 2011). For instance, a large concentration of African American may increase opportunities for white residents to move into neighborhoods with greater non-white representation. Yet some scholarship also suggests this demographical effect may be counterbalanced by an enhanced motivation to move into racially homogenous neighborhoods (Lieberson, 1980). Third, the metropolitan functional specialization shapes race-specific process of residential mobility. J. R. Logan et al. (2004) find that MSAs dominated by manufacture employment tend to maintain higher levels of racial residential segregation. Cities with a high proportion of the “creative class”, on the other hand, are associated with more progressive racial opinions among white residents (Florida, 2004; Sharp & Joslyn, 2008). Forth, metropolitan-area population size plays a role. White out-migration is more likely in large MSAs compared to smaller ones (J. R. Logan et al., 2004), indicating white residential options are much less constrained in bigger metropolises. Finally, a housing competition perspective argues that the limitation of the local housing stock may exacerbate competition within the housing market, leading to relocation of white residents. Farley and Frey (1994) observe a large drop of segregation level in metropolitan areas with a significant level of recent housing construction, suggesting that a large supply of new houses provides opportunities for racially diverse neighborhoods. Moraga and colleagues' work (2019) supports this argument and suggests that native out-migration is more prevalent in supply-constrained areas. In less-constrained areas, developers simply build more. Thus both natives and immigrants are collocating, resulting in almost no change in overall measures of racial segregation.

The association between white flight and immigrant concentration are multilevel in nature. It is important to recognize that although white flight is constituted by individual-level mobility decisions, it often happens when minority population presence reaches certain thresholds at the neighborhood level (Schelling, 1971). Previous empirical research have been largely based upon single-level aggregated analyses (Alba, Logan, Stults, Marzan, & Zhang, 1999; Frey & Liaw, 1998; Kritz & Gurak, 2001; Saiz & Wachter, 2011). The increasingly available individual-level data sources, including the PSID, the New Immigrant Survey, and regional surveys such as the Los Angeles Family and Neighborhood Study enable detailed examinations of white movements accounting for micro-level factors (Crowder, 2000; Frank & Akresh, 2016; K. O. Lee, 2016). This study follows work on segregation and mobility by Crowder and colleagues (2012; 2019), and incorporates the PSID with census data to conduct a multilevel analysis. Additionally, while previous studies typically focus on white out-migration happening before 2010, this study uses mobility data of whites from 2011 to 2017, providing up-to-date evidence on the mechanism of white flight.

2.3 Data, Measures and Methods

2.3.1 Data

The primary data for this study come from the PSID and U.S. Census Bureau. The PSID is the nation's largest running household panel survey and commonly used by researchers and policy analysts to tract the changing employment, income, education and residential patterns of U.S. residents and their descendants. Began in 1968 with a sample of over 18,000 individuals living in 5,000 families, PSID interviews have been primarily biennial. PSID families are followed regardless of where they live. The sample grows naturally as children and grandchildren from these families form their own households and invited to join the PSID. As of 2017, more than 11,000 families are followed, and there are as six generation represented within sample families.

The PSID is ideal to analyses mobility not only because it provides a wealth of individual-level characteristics that affect mobility, but also the restricted-use Between-Wave Moves file that accurately tracks movements. Using the included geographical variables such as "Metropolitan Statistical Area" and "2010 Census Tract", it is possible to obtain origins and destinations of each PSID individual's movements. The records in Between-Wave Moves file are for the household heads. No matter who the respondent is, the question about current and past residences are asked about the head only. Another important feature of this data is that it reflects the physical addresses where respondents actually reside, rather than “permanent addresses” that are reported to receive mails (e.g. P.O.Box).

I thus utilize the PSID data from 2011 to 2017 and restrict the sample to all white household heads. Among the 12,827 individuals who meet these selection criteria, some have moved multiple times over the study period. Mobility is defined as any move by a white household head out of the census tract of origin but within the same metropolitan area of residence. As Parisi et al. (2019) indicate, motivations for intra-metropolitan mobility is more likely to be linked to racial/ethnical considerations than those for inter-metropolitan mobility, which are typically job-related factors. The data is structured in person-interview periods, accounting for all mobility intervals between successive interviews. The analytical sample resulted in 14,037 person-period records.

Data on immigrant inflows are drawn from 5-year American Community Survey (ACS) during the same period. Data on neighborhood socioeconomic status to identify middle-class suburban neighborhoods are from the 2010 ACS. These data are at census tract level defined by the 2010 Decennial Census. As detailed in the literature review, mobility decisions can be informed by MSA characteristics, and thus a number of ecological controls at the MSA level are constructed from ACS data.

2.3.2 Measures of Dependent and Independent Variables

The dependent variable is a dichotomous variable indicating whether a white household head moved out of their current housing unit or not.

The focal explanatory variables are neighborhood urbanicity, neighborhood socioeconomic status (SES), immigrant composition and their intersections at census tract level. Neighborhood urbanicity is a dichotomous variable that distinguishes suburban neighborhoods from urban ones. The sample of analysis includes 250 metropolitan areas with at least 1000 foreign-born residents in 2010 and at least one principal city of 50,000 or more in 2010. Tracts within principal city boundaries are identified as “urban”, and those within MSAs but outside of principal city boundaries as “suburban” (Farrell, 2016) . This resulted in 22,584 urban neighborhoods and 32,146 suburban neighborhoods.

Neighborhood SES is a dichotomous variable indicating the “class” of the neighborhood. Following a practice use in Kye’s (2018) work, I use principal component analysis to construct factors of a normalized scale that adequately capture characteristics associated with privileged neighborhoods. Principle component analysis loads the following characteristics on the first factor, identified as *socioeconomic advantages*: percent with a bachelor’s degree or higher, median household income, percent of workers in professional occupations, and median home value. Meanwhile, a second factor is identified as *concentrated disadvantages*, based on characteristics including percent below poverty line, percent of female-headed households, percent of residents on welfare, and percent unemployment. Table 2.1 and 2.2 show correlations of variables for principal component analysis and rotated components. Figure 5 justifies the two-factor solution, as the two factors to the left of the “elbow” point should be retained as significant. Kaiser-Meyer-Olkin Measure of variables are all above 0.70, suggesting the sampling is adequate (Table 2.3). Next, neighborhoods that exhibit above-average socioeconomic advantages and below-average concentrated disadvantages are considered the “middle-class” (Kye, 2018). The rest are “less privileged”. This resulted in 12,671 middle-class neighborhoods and 42,056 less privileged neighborhoods

Immigrant composition variables are the proportion of foreign-born population among total population. The inclusion of intersection variables (i.e. suburban neighborhood * % foreign-born, middle-class neighborhood * % foreign-born) allows for the examination of the effect of immigration in suburban and high-SES neighborhoods, which helps untangle the socioeconomic characteristics that confound racial effects.

The primary measures of individual characteristics refer to a household head's age measured in the number of years, gender (1 = female, 0 = male), education measured as the number of completed year of schools, number of children in the household, marital status (1 = married, 0 = not married), housing structure (1= single-family house, 0=other), homeownership (1 = homeowner, 0 = otherwise), employment status (1 = employed, 0 = otherwise), and total taxable income of the household. The survey year is included as a continuous variable to control for year-to-year temporal changes in residential mobility over the study period. A separate dummy variable for the survey year 2011 and 2013 is included to accommodate the effect of housing boom-bust cycle.

A number of ecological controls at the MSA level are also included. Immigration destination type is included following the "established-new-nongateway" typology developed by Hall and Crowder (2014) and Lichter et al. (2010) (2=established gateways, 1=new destinations, 0=nongateway destinations)[1]. The proportion of non-Hispanic black

1 "Established" refers to metropolitan areas where the foreign-born percent of the total population for 1990 exceeded the national average across all metros, and where the absolute number of immigrants in a particular metro for 1990 exceeded the mean foreign-born population size across all metros. For all those metropolitan areas not classified as "established", I determined if they fit either of the two sets of criteria for a "new" gateways: (1) non-established metropolitan areas where percent foreign-born in 2000 was larger than the national average, and the foreign-born growth rates during the 1990s or 2000s were at least 1.5 times of the national average; or (2) the foreign-

population is another control variable of racial composition at MSA level. I also control the proportion of the labor force employed in the manufacture as an indicator of metropolitan-area functional specialization. Population size is measured as the natural log of total population. Housing permits are the number of new privately-owned housing units authorized in each metropolis.

2.3.2 Analytical Strategy

The analysis comprises three stages. Based on the sample data, I begin with an examination of foreign-born population growth residing in suburbia, and a residential change matrix of white intra-metropolitan moves by neighbourhood urbanicity and SES. Then I use multilevel logistic regression model to examine the association between immigration concentration in suburbia and white out-migration. Finally, to understand whether the race effect or the class effect play a greater role in affecting white out-mobility, I select subsamples of white suburban movers, and examine its association with immigrant concentration in middle-class neighborhoods. The use of multilevel modelling strategy reflects the hierarchical structure of the data. Supplementary analysis is conducted using immigrant subgroup variables (i.e. Hispanic and Asian immigrant concentration) to ensure robustness of the outcome and to further explore patterns relevant to race and ethnicity.

born growth rates during the 1990s or 2000s were at least 3 times of the national average. The rest are classified as “nongateway” gateways

2.4 Results

2.4.1 Patterns of Immigrant Suburbanization and White Intra-metropolitan Mobility

Table 2.4 presents the within-group distribution of foreign-born population across neighborhoods, and demonstrates the validity of immigrant suburbanization during the study period. As expected, suburban neighborhoods exhibit a modest increase in immigrant population, whereas urban neighborhoods witness a shrinking size of immigrants. This upward trend in suburban residence has also reflected in Hispanic and Asian immigrant groups. Particularly, Asian immigrants living in suburbs have outnumbered those in urban neighborhoods during the study period (50 percent vs. 50 percent in 2011, and 52 percent vs. 48 percent in 2017). A majority of Hispanic immigrants reside in urban neighborhoods by 2017.

A closer look at neighborhoods summarized by both urbanicity and neighborhood SES suggests that immigrant influx into suburbia is involved with varied socioeconomic context — immigrants have dispersed into both less privileged and middle-class suburbia. The largest proportion of Hispanic and Asian immigrants are found in less privileged suburban neighborhoods, reaching 37 percent and 47 percent respectively in 2017. Meanwhile, proportions of Hispanic and Asian immigrants residing in middle-class suburbia increases by 0.02 and 0.06 percentage point respectively, despite their relative small sizes.

Table 2.5 presents a residential change matrix — the cross-classification of neighborhood type at origins and destinations. Observations on the diagonal represent moves between neighborhoods of the same neighborhood type, and those in the offdiagonal cells represent moves between different types of tracts. The total size of sample column show that 63 percent (8706/13867) of white households originated in less privileged suburban neighborhoods, almost 23 percent (3202/13867) originated in less privileged urban neighborhoods, 8 percent (1061/13867) originated in middle-class urban neighborhoods and the least from middle-class suburbia .

The percentages in the body of Table 2.5 indicate white mobility patterns between neighborhoods of varying SES and urbanicity. Of white households originated in less disadvantaged urban neighborhoods, 36 percent (1168/3202) moved during the study period, and the largest proportion of the movers (48 percent) go to other disadvantaged urban neighborhoods. White households from middle-class urban neighborhoods show a higher level of out-mobility (43 percent, 455/1061), with 37 percent of movers into less privileged suburban neighborhoods. On the other hand, out-migration from less privileged and middle-class suburban neighborhoods is comparatively lower, both at around 24 percent. Interestingly, a majority of white households from suburbia moved into less privileged suburban neighborhoods. An overall pattern is that white households are generally relocating in suburbia, but a limited proportion moves into the relatively privileged suburbia.

2.4.2 Determinants of White Out-mobility

Table 2.6 presents coefficients from logistic regression models predicting the likelihood of white out-migration from 2011 to 2017. Model 1 displays the baseline model with effects of foreign-born composition and urbanicity. Consistent with existing literature (Frey & Liaw, 1998; Short, Hanlon, & Vicino, 2007), results confirm that immigrant concentration in suburban neighborhoods have a significant effect increasing the odds of white out-mobility (*b*=0.012). It should also be noticed that the overall effect of suburban neighborhoods is negative (*b*=-0.842) and statistically significant, suggesting that suburban neighborhoods, compared to their urban counterparts, is less likely to experience white out-migration. This baseline model suggests that although suburbia may buffer against white flight, whites continue to leave suburban neighborhoods with a significant level of immigrants.

Model 2 incorporates individual-level characteristics to assess whether the white migratory response to local immigration in suburbia varies after controlling for those characteristics. The odds ratio of the "% foreign-born * suburban neighborhood" variable becomes smaller in Model 2 (*b*=1.009), yet remains statistically significant. It indicates immigrant concentration in suburbia remains more likely to trigger white out-mobility than in cities. The results also demonstrate how demographic and socioeconomic characteristics of household heads affect mobility decisions. As expected, household heads who are older, married, employed and homeowners are less likely to move out of their current neighborhoods. The number of children in the household also reduces the possibility of moving. Conversely, increases in income are likely to trigger out-migration, as higher income provides resources and introduces expectations of better geographical match (Kennan & Walker, 2011). The year of recession is associated with a higher possibility of white intra-metropolitan migration. In general, those micro-level characteristics only slightly attenuate effects of immigrant concentration.

The last model includes MSA-level characteristics to examine whether the observed differentials in the association between immigrant suburbanization and white out-mobility reflects compositional differences in varied metropolitan context. The odds ratio of the “% foreign-born * suburban neighborhood” variable remains statistically significant, despite becoming smaller in Model 3 (*b*=1.008). It suggests whites continue to be more likely to leave suburban neighborhoods with immigrant influx than urban neighborhoods with the same level of immigration with all controls. Nevertheless, the overall effect of suburban neighborhoods is negative on white population loss. As for MSA-level factors, whites in established gateways are less likely to migrate than those in nongateways, whereas the coefficient of new gateways is insignificant. It confirms to Hall and Crowder’s (2014) work that natives in nongateways may be more sensitive at immigrant inflow than in established gateways due to their lack of exposure. Apart from that, whites in MSAs with high proportion of non-Hispanic black, high proportion of labor force in manufacture, low population size and large number of building permits show less out-migration tendency.

Table 2.7 reports results of multilevel logistic regression based on a subsample with suburban neighborhoods as origins. Model 4 provides a basic answer to the question about whether white out-mobility may be racially motivated — the likelihood of white out-migration responding to immigration in middle-class suburban neighborhoods is not different from responding to immigration in other less privileged suburban neighborhood, although middle-class SES (*b*=0.479) and immigrant concentration (*b*=0.010) separately contributes to overall white out-migration. These findings rejects the racial proxy hypothesis, that the middle-class SES may not have a significant effect buffering against white exodus in immigrant-receiving neighborhoods.

Micro-level characteristics of white household heads are included in Model 5. Coefficients of middle-class status and immigrant concentration become insignificant, indicating no difference in the possibility of white out-migration regardless of neighborhood SES or the level of immigrant concentration. Meanwhile, the intersection variable remains insignificant. The signs and magnitudes of individual-level variables are similar to those in Model 2 (Table 2.6). Again, findings cannot support the hypothesis that white residents in middle-class suburbia are less likely to migration due to immigration than in other less privileged suburban neighborhoods.

The addition of MSA-level characteristics in Model 6 does not alter the effects of immigration in middle-class suburbia in any meaningful way — coefficients of all three tract-level variables are insignificant. The MSA coefficients indicate that that white out-mobility from suburbia is lower in established gateways, in metros with high proportion of manufacture workers and low population size and high level of building permits issued. Overall, neighborhood SES plays a limited role in shaping the likelihood of immigration-induced white out-mobility.

To further explore the effect of racial/ethnical status of immigrants, supplementary analysis is conducted replacing the immigrant concentration variable with Hispanic and Asian immigrant concentrations. Table 2.8 displays full multilevel logistical regression model results. Model 7 suggests that white migratory responses may be segmented by racial/ethnical status of immigrants in suburbia. Suburban neighborhoods with higher Hispanic immigrant concentration is likely to trigger white out-mobility (*b*=0.007), whereas those with Asian immigrant influx is not (*b*=-0.011). Overall effects of Asian and Hispanic immigrants tell a different story: odds of white leaving *any* neighborhood where Asian immigrants reside is larger than neighborhoods with Hispanic immigrants (1.014 vs. 0.994). Those findings demonstrate how effects of immigrant subgroups on white out-migration is likewise dependent on the urbanicity of neighborhoods. Finally, Model 8 illustrates that the possibility of white flight from suburbia responding to Hispanic and Asian immigrants in middle-class neighborhoods is not different from other suburban neighborhoods. These findings continue to reject the second hypothesis, and suggest the limited role of middle-class SES in mitigating white out-migration.

2.5 Discussion and Conclusion

The settlement of immigrants into suburban areas has decoupled the race effect and the class effect in the analysis of white flight. While some recognize white out-mobility as motivated by the non-white racial status of immigrants, a robust assessment of this so-called white flight hypothesis is difficult due to the geographical overlap between the residence of racial minorities and the location of historically disadvantaged neighborhoods. In this context, the middle-class suburbia becomes the key site to understanding the association between white out-migration and immigrant concentration. In this multilevel analysis, I combined rich longitudinal information from the Panel Study of Income Dynamics with tract- and metropolitan level data drawn from American Community Survey to examine the mobility of white household heads between neighborhoods of different urbanicity and socioeconomic status as well as immigrant concentration.

Findings show that despite the lower odds of white out-mobility from suburban neighborhoods, the presence of immigrants in suburbia is more likely to motivate white out-migration compared with those in inner cities. This is consistent with Farrell’s work (2016), which illustrates that although immigrant suburbanization is associated with lower segregation from native whites at metropolitan level, it may have a segregative effect *within* the suburban ring. These findings underscore the importance of the underlying and sometimes countervailing city/suburb contribution to metropolitan segregation.

There is also some suggestive evidence consistent with a fragmentation perspective —there are large group differences in the association between immigrant suburbanization and white out-mobility. Hispanic immigrants in suburban neighborhoods are more likely to trigger white flight, whereas white out-mobility in response to Asian immigrant in suburbia shows no difference from that responding to the same level of Asian immigrants in inner cities. These findings also support a view of segmented assimilation that recognized that immigrant groups may face different opportunities and obstacles in a host community depending on their race, national origin, and access to ethnic networks and resources (Portes & Zhou, 1993). For instance, Fong and Hou (2009) find East Asian immigrants are more "efficient" than South Asian immigrants in translating socioeconomic resources to residential integration. Likewise, Farrell (2016) shows that four Caribbean immigrant groups (Cubans, Jamaicans, Colombians and Hondurans) are more segregated in suburban neighborhoods from native whites than European immigrant groups such as Germans and British. More generally, these results suggest that high level of immigrant suburbanization does not contribute to residential integration of all groups.

Results in this chapter provide little evidence in support of racial proxy hypothesis. I show that the possibility of whites leaving middle-class suburbia with immigrant influx is not different from those leaving less privileged suburban neighborhoods. Middle-class SES does not buffer whites' avoidance from immigrants. The inclusion of Asian and Hispanic immigrants in the model does not change this outcome either. This is at some extent consistent with recent research that suggests a decoupling between "residential economic integration from residential racial integration" (Kye, 2018). For example, Friedman, Tsao, and Chen (2013) illustrates that a greater ratio of Asian to white income does not reduce segregation levels. Hall (2013) also finds the level of residential segregation experienced by Indian and Korean immigrants increases significantly with their income. Those studies point to the fact that racial stereotype and prejudice may persist despite improved socioeconomic achievement and residential attainment of immigrants (Golash-Boza, 2006; J. C. Lee & Kye, 2016). Findings of this chapter also point to an urge for consistent scholarly attention on identifying the independent effect of race in motivating white exodus.

This chapter should also be understood in light of several limitation and possible extensions. First, simply using an immigrant composition variable may not be enough to detect racially-motivated mobility. Kye and Halpern-Manners (2019) argue that white flight is less likely to occur in neighborhoods that have become multiracial over a span of several decades, but rather prominent in neighborhoods that experience accelerated *growth* in non-white population over a relatively short amount of time. Therefore, immigrant population size and growth over time should both be taken into account in the analysis of white out-mobility. Second, this study did not incorporate "pull" factors of destination communities. Push-pull theory has been widely utilized in residential mobility studies, as it acknowledged (1) conditions that motivates people to leave, and (2) factors that attracts people to a certain location (Sabagh, Van Arsdol Jr, & Butler, 1969). Racial composition in destination communities can function as a "pull" factor and attracts white residents seeking racially homogenous neighborhoods. Therefore, the inclusion of characteristics of both the origin and the destination of movers may generate meaningful outcomes about the race effect on white out-mobility. While there are already some good attempts in current scholarship (Bakens, Florax, & Mulder, 2018; Spring, Tolnay, & Crowder, 2016), future research should continue to experiment with methodologies that concern the movement as an "out-and-in" two-stage process.

The key implication of this work is that immigrant suburbanization is not the endpoint of residential integration but instead exposes a number of new challenges and obstacles confronting immigrants when they are increasingly exposed to native white population. Suburbanization has traditionally been viewed as the spatial manifestation of upward mobility of racial minorities (Massey, 1985). However, the evidence of persistent white out-migration with immigrant suburbanization suggests that minorities in suburbia may inherit the white- non-white gap in various aspects of achievement. Scholars have already observed increasing neighborhood inequality among recent suburbanized immigrants (Farrell & Firebaugh, 2016; Suro, Wilson, & Singer, 2011). Future policies should seriously consider those active struggles of racial minorities and weight the detriment of white flight in reproducing neighborhood inequality. Diversity should be seized as opportunities for sustainable development in suburban neighborhoods rather than threats.

Table 2. 1 Correlations of Variables for Principle Component Analysis

	% Bachelor degree & above	% Below poverty line	% Female-head households	Median household income	% On welfare	% Professional occupations	Median home value	% Unemployed
% Bachelor degree & above	1							
% Below poverty line	-0.435**	1						
% Female-head households	-0.230**	0.582**	1					
Median household income	0.711**	-0.682**	-0.553**	1				
% On welfare	-0.360**	0.516**	0.410**	-0.389**	1			
% Professional occupations	0.558**	-0.211**	-0.029**	0.447**	-0.120**	1		
Median home value	0.623**	-0.345**	-0.212**	0.665**	-0.168**	0.496**	1	
% Unemployed	-0.413**	-0.568**	-0.421**	-0.444**	0.478**	-0.150**	0.240**	1

.** Regression coefficients being statistically significant at 0.05 level.

Table 2. 2 Rotated Components [a, b]

Variables	Component 1	Component2	Unexplained
% Bachelor degree & above		0.490	0.231
% Below poverty line	0.477		0.253
% Female-head households	0.505		0.370
Median household income		0.364	0.184
% On welfare	0.462		0.445
% Professional occupations		0.571	0.314
Median home value		0.533	0.292
% Unemployed	0.451		0.418

[a] Rotation: oblique promax

[b] Values less than 0.30 were omitted.

Table 2. 3 Kaiser-Meyer-Olkin Measure of Sampling Adequacy

Variables	KMO
% Bachelor degree & above	0.796
% Below poverty line	0.830
% Female-head households	0.775
Median household income	0.760
% On welfare	0.856
% Professional occupations	0.849
Median home value	0.845
% Unemployed	0.855
Overall	0.812

Table 2. 4 Within-group Distribution of Foreign-born Population in 2011 and 2017

	2011			2017		
	Foreign-born population	Hispanic foreign-born	Asian foreign-born	Foreign-born population	Hispanic foreign-born	Asian foreign-born
By urbanicity						
% in urban neighborhoods	51.71	54.55	49.99	50.39	53.14	48.41
% in suburban neighborhoods	48.29	45.45	50.01	**49.61**	**46.86**	**51.59**
By urbanicity and neighborhood SES						
% in disadvantaged urban neighborhoods	32.54	30.48	37.09	31.95	29.80	36.21
% in middle-class urban neighborhoods	19.17	24.07	12.89	18.44	23.35	12.20
% in disadvantaged suburban neighborhoods	41.20	36.50	45.82	**42.51**	**37.88**	**47.32**
% in middle-class suburban neighborhoods	7.10	8.95	4.20	**7.10**	**8.97**	**4.26**

Table 2. 5 Residential Change Matrix of White Household Heads by Urbanicity & Neighborhood SES

Origin Neighborhoods	Destination Neighborhoods				Total size of sample	Movers
	Less privileged urban neighborhoods	Middle-class urban neighborhoods	Less privileged suburban neighborhoods	Middle-class suburban neighborhoods		
Less privileged urban neighborhoods	555 (47.52%)	154 (13.18%)	406 (34.76%)	53 (4.54%)	3202	1168
Middle-class urban neighborhoods	142 (31.21%)	117 (25.71%)	170 (37.36%)	26 (5.71%)	1061	455
Less privileged suburban neighborhoods	390 (18.96%)	156 (7.58%)	1340 (65.14%)	171 (8.31%)	8756	2057
Middle-class suburban neighborhoods	37 (13.21%)	34 (12.14%)	167 (59.64%)	42 (15.00%)	847	280

Table 2. 6 Multilevel Logistic Regression Model Predicting White Out-migration

Variables	1		2		3	
	Coeff.	SE	Coeff.	SE	Coeff.	SE
Individual-level characteristics						
Age	-	-	-0.062	0.002***	-0.062	0.002***
Female (1 = yes)	-	-	0.128	0.072*	0.149	0.066**
Education (in years)	-	-	0.005	0.003	0.006	0.003**
Number of children	-	-	-0.128	0.025***	-0.140	0.023***
Married (1 = yes)	-	-	-0.193	0.072***	-0.187	0.065***
Single-family house (1=yes)	-	-	-0.115	0.062*	-0.165	0.058***
Homeowner (1 = yes)	-	-	-1.427	0.064***	-1.381	0.059***
Employed (1 = yes)	-	-	-0.352	0.075***	-0.343	0.070***
log Income	-	-	0.083	0.032***	0.119	0.030***
Year	-	-	0.257	0.025***	0.685	0.041***
Year of recession (1 = yes)	-	-	0.428	0.103***	1.283	0.115***
Tract-level characteristics						
Suburban neighborhoods (1 = yes)	-0.842	0.081***	-0.351	0.088***	-0.310	0.078***
% Foreign-born population	-0.002	0.003	-0.008	0.003**	-0.003	0.003
% Foreign-born * suburban neighborhoods	**0.012**	**0.004*****	**0.009**	**0.004****	**0.008**	**0.004****
MSA-level characteristics						
Destination type (nongateway as reference)						
Established gateways	-	-	-	-	-0.446	0.131***
New gateways	-	-	-	-	0.092	0.103
% Non-Hispanic black population	-	-	-	-	-0.010	0.005**
% Labour force in manufacture	-	-	-	-	-0.049	0.011***
log Population size	-	-	-	-	0.450	0.050***
log Building permits issued	-	-	-	-	-0.410	0.029***
Intercept	-0.233	0.067***	-515.013	49.676***	-1380.501	82.343***
Random effect						
Unconditional variance	1.210		0.896		0.254	
Percentage of variance explained	0.824		0.849		0.805	
ICC (unconditional model)			0.270			
N person-periods			13866			
N metropolitan areas			250			

Table 2. 7 Multilevel Logistic Regression Models Predicting White Out-migration from Suburbia

Variables	4		5		6	
	Coeff.	SE	Coeff.	SE	Coeff.	SE
Individual-level characteristics						
Age	-	-	-0.057	0.003***	-0.056	0.002***
Female (1 = yes)	-	-	0.175	0.093*	0.201	0.084**
Education (in years)	-	-	0.004	0.004	0.005	0.003
Number of children	-	-	-0.096	0.031***	-0.118	0.028***
Married (1 = yes)	-	-	-0.188	0.091**	-0.174	0.083**
Single-family house (1=yes)	-	-	-0.348	0.078***	-0.341	0.071***
Homeowner (1 = yes)	-	-	-1.529	0.080***	-1.491	0.073***
Employed (1 = yes)	-	-	-0.358	0.092***	-0.344	0.085***
log Income	-	-	0.090	0.041***	0.129	0.038***
Year	-	-	0.271	0.031***	0.653	0.050***
Year of recession (1 = yes)	-	-	0.460	0.129***	1.223	0.142***
Tract-level characteristics						
Middle-Class neighborhoods (1 = yes)	0.479	0.158***	0.002	0.171	-0.070	0.141
% Foreign-born population	0.010	0.003***	0.000	0.004	0.004	0.004
% Foreign-born * Middle-Class neighborhoods	**0.000**	**0.010**	**-0.004**	**0.011**	**0.002**	**0.010**
MSA-level characteristics						
Destination type (nongateway as reference)						
Established gateways	-	-	-	-	-0.372	0.150**
New gateways	-	-	-	-	0.156	0.115
% Non-Hispanic black population	-	-	-	-	-0.008	0.005
% Labour force in manufacture	-	-	-	-	-0.050	0.013***
log Population size	-	-	-	-	0.430	0.059***
log Building permits issued	-	-	-	-	-0.378	0.036***
Intercept	-1.121	0.047***	-544.436	61.808***	-1316.666	100.677***
Random effect						
Unconditional variance	1.132		0.941		0.289	
Percentage of variance explained	0.803		0.862		0.821	
ICC (unconditional model)			0.259			
N person-periods			9603			
N metropolitan areas			240			

Table 2. 8 Full Multilevel Logistic Regression Models Results of Asian and Hispanics Foreign-born

Variables	7 (full sample)		8 (suburban mover subsample)	
	Coeff.	SE	Coeff.	SE
Individual-level characteristics				
Age	-0.062	0.002***	-0.056	0.002***
Female (1 = yes)	0.147	0.066**	0.202	0.084**
Education (in years)	0.005	0.003*	0.005	0.003
Number of children	-0.134	0.023***	-0.119	0.028***
Married (1 = yes)	-0.187	0.065***	-0.175	0.083**
Single-family house (1=yes)	-0.154	0.058***	-0.343	0.071***
Homeowner (1 = yes)	-1.385	0.059***	-1.493	0.073***
Employed (1 = yes)	-0.336	0.070***	-0.343	0.085***
log Income	0.108	0.030***	0.129	0.039***
Year	0.681	0.042***	0.653	0.050***
Year of recession (1 = yes)	1.276	0.116***	1.234	0.142***
Tract-level characteristics				
Suburban neighborhoods (1 = yes)	-0.274	0.079***	-	-
% Asian	0.014	0.005***	-	-
% Hispanics	-0.006	0.002***	-	-
% Asian * suburban neighborhoods	**-0.011**	**0.007**	-	-
% Hispanics * suburban neighborhoods	**0.007**	**0.002*** **	-	-
Middle-class neighborhoods (1 = yes)	-	-	-0.061	0.133
% Asian	-	-	0.003	0.006
% Hispanics	-	-	0.001	0.002
% Asian * middle-class neighborhoods	-	-	**-0.007**	**0.019**
% Hispanics * middle-class neighborhoods	-	-	**0.002**	**0.005**
MSA-level characteristics				
Destination type (nongateway as reference)				
Established gateways	-0.431	0.133***	-0.358	0.150**
New gateways	0.089	0.104	0.154	0.116
% Non-Hispanic black population	-0.010	0.005**	-0.007	0.005
% Labour force in manufacture	-0.052	0.011***	-0.050	0.013***
log Population size	0.448	0.050***	0.405	0.060***
log Building permits issued	-0.410	0.029***	-0.377	0.036***
Intercept	-1383.281	82.453***	-1315.824	100.672***
Random effect				
Unconditional variance	0.260		0.291	
Percentage of variance explained	0.806		0.821	
ICC (unconditional model)	0.270		0.259	
N person-periods	13866		9603	
N metropolitan areas	250		240	

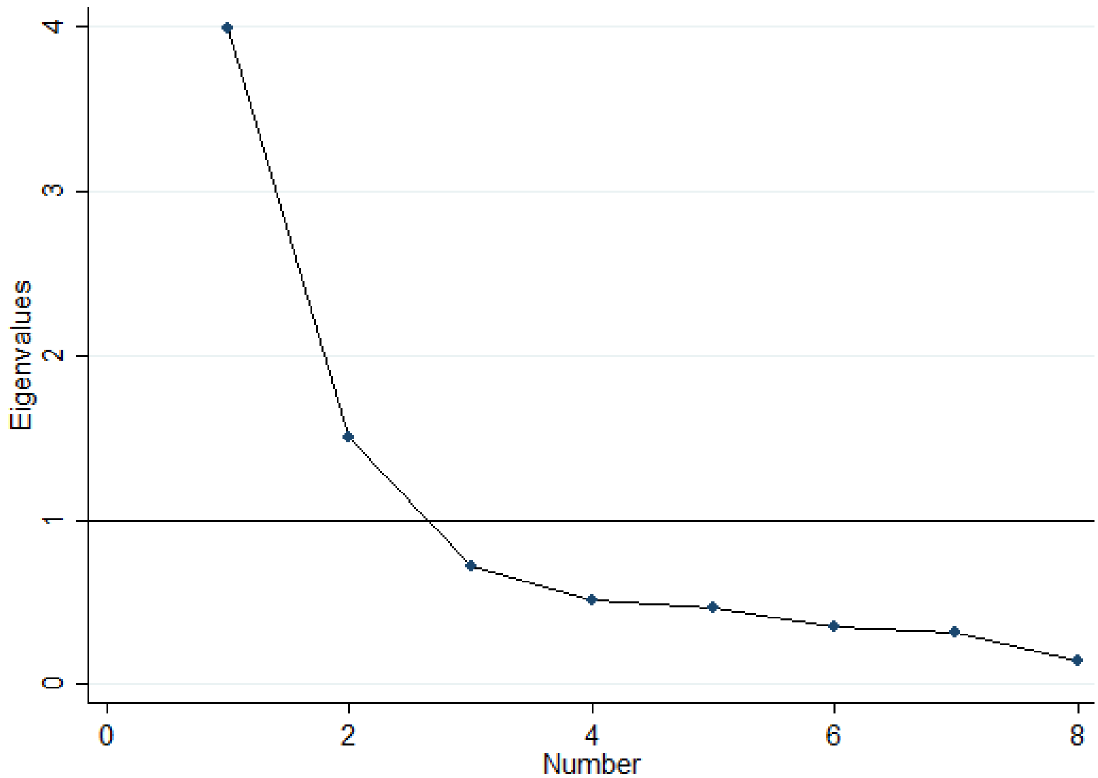

Figure 5. Scree plot of eigenvalues

CHAPTER IV: SPATIAL DEPENDENCE AND SPATIAL HETEROGENEITY IN THE EFFECTS OF IMMIGRATION ON HOME VALUES AND NATIVE FLIGHT IN LOUISVILLE, KENTUCKY

3.1 Introduction

The number of immigrants in the U.S. has reached record highs in recent decades. At the same time, the geographic distribution of the foreign-born population in the U.S has become more extensive, as new immigrants settle in emerging new destinations and non-traditional settlement neighborhoods – such as the suburbs – within metropolitan areas (Massey & Capoferro, 2008; Singer et al., 2008). In light of the rapid increase and widespread dispersion of foreign-born populations in U.S. metropolitan areas, an investigation of how the inflow of new immigrants impacts host communities have important policy implications. These impacts include common urban socioeconomic issues, such as the effect of immigrants on housing prices and on residential demographic change (Alba & Nee, 2009; Farrell, 2016; J. R. Logan, Zhang, & Alba, 2002; Waters & Jiménez, 2005). Immigration is widely considered an important driving force of the housing market. The arrival of new immigrants also reshapes the distribution of residential demographics, sometimes prompting the out-migration of native-born residents (e.g., white flight), which may exacerbate racial/ethnical segregation (Rathelot & Safi, 2014). Often discussed in tandem by scholars, housing price and native out-migration constitute crucial dimensions in the broader literature on urban residential patterns.

Much existing literature has explored the relationship between immigration and housing prices and the reactions of native-born residents. However, there is disagreement on whether immigration plays a positive or negative role in driving metropolitan housing market change (Mussa et al., 2017; Saiz, 2007) and on whether white flight still exists (Harris, 2001; Kye, 2018).Most studies have analyzed the nexus of immigration and housing *across* U.S. metropolitan areas (Hall & Crowder, 2014; Kritz & Gurak, 2001; Mussa et al., 2017; Saiz, 2007). Less research has investigated this relationship *within* individual metropolitan areas, using more granular census tract or neighborhood-level data. Furthermore, limited research has explored whether the impact of immigration in new destinations and suburban communities is similar to that being found from previous studies which tended to focus on traditional gateway cities (Lichter & Johnson, 2009). This research examines the mid-sized city of Louisville, Kentucky as the study area. Louisville serves as a typical case of immigrant suburbanization in non-traditional destinations of the southeastern United States.

This research also addresses two methodological issues that might have limited the ability of hedonic models to ascertain whether immigrant influx influences housing prices and native flight. The first issue is a consideration of the spatial dependence/autocorrelation in conditions of nearby neighborhoods that often spill over into a local neighborhood. The second issue is an examination of the spatial heterogeneity that may be present in the immigrant-housing relationship, from which the immigrant effect may appear as a phenomenon that is contingent on local structural and spatial contexts. The incorporation of these spatial aspects, as I show in this article, reveals locally specific effects which can be more accurate and informative than an effect averaged across space. In other words, spatially-informed analysis is not limited to examining whether immigration has a positive or negative effect on host communities, but also attempts to understand the spatial variations in those effects — whether immigration can have a positive effect in some neighborhoods but a negative effect in others.

I explore two research questions: (1) Is growth in immigrant concentration associated with home value depreciation among Louisville's neighborhoods, and does this association vary across space? (2) Is growth in immigrant concentration associated with white flight from neighborhoods in Louisville, and does this association vary across space? Using a hedonic ordinary least squares (OLS) regression as a baseline model, I test the spillover effects of immigration by adopting a spatial autoregressive regression (SAR) method and investigate whether the immigration effect demonstrates spatial heterogeneity across neighborhoods utilizing geographically weighted regression (GWR). Findings contribute to the broader residential integration literature within the current context of immigrant suburbanization in places like Louisville. They also advance understandings of spatial-structural interactions shaping immigrants' residential outcomes, and encourage policymakers to seriously consider spatial context in the development of local policies regarding immigration.

3.2 Literature Review

3.2.1 Residential Integration with Immigrant Suburbanization

An increasing number of studies have investigated the spatial dispersal of new immigrants into emerging new destinations and non-traditional settlement neighborhoods, such as the suburbs (Farrell, 2016; Hall and Crowder, 2014; Katz, Creighton, Amsterdam, & Chowkwanyun, 2010; Singer, 2013). While immigration remains a decidedly metropolitan affair (Radford, 2019), new immigrants have broken with historical residential patterns within inner-city enclaves and produced new forms of residential integration in suburbia (Dawkins, 2009). National statistics show that the suburbs witnessed three quarters of the growth in the foreign-born population between 2000 and 2013 (Wilson and Svajlenka, 2014). Many of these suburban immigrant communities possess considerable heterogeneity in demographic and socioeconomic characteristics (Hall and Lee, 2010; Katz, et al., 2010; Singer, et al., 2008).

One of the main theoretical models used to explain immigrant residential integration is the spatial assimilation model. Rooted in the human ecology tradition, the model identifies residential integration as an outcome of immigrants' status attainment process (Alba and Logan, 1991; Massey, 1986). It stresses the role of cultural adaptation and socioeconomic advancement in propelling immigrants to move from central city enclaves to ethnically isolated suburbs (Massey, 1985). In this model, suburbanization is viewed as the spatial manifestation of acculturation and upward mobility for immigrants. The spatial assimilation model has been supported by many studies of residential outcomes of immigrants or minorities: socioeconomic status is positively associated with residential outcomes indicated by suburban locations, homeownership, and proportion of residents who are non-Hispanic white (Alba and Logan, 1991, 1992; Alba, Logan, Stults, Marzan, & Zhang, 1999; South, Crowder, & Chavez, 2005).

The migration of new immigrants directly into the suburbs violates the assumption of the model, which involves a move from the central city to the suburbs (Alba and Logan, 1991). A sizable amount of subsequent literature has challenged the traditional notion of spatial assimilation. Scholars have noted the persistent racial/ethnical segregation accompanied with immigrant suburbanization (Friedman, Tsao, & Chen, 2013; Lichter, Parisi, Taquino, & Grice, 2010), and the inadequacy of the homogeneous conception of "suburb" to capture the region's complex residential ecology (Jones, 2008; Katz, et al., 2010). Some alternative theories have been proposed, including segmented assimilation, which emphasizes varied pathways to immigration incorporation (Portes and Zhou, 1993), and racialized assimilation, which stresses that assimilation occurs concurrently with the continued relevance and significance of minorities' non-white racial status (Golash-Boza, 2006; Lee and Kye, 2016). This progression within the literature suggests immigrant residential integration may no longer follow the uniform path suggested by the spatial assimilation model.

3.2.2 The Effect of Immigration on Housing Prices and Native Flight

A considerable empirical literature sheds light on the relationship between immigrants and housing prices. Two questions that are commonly examined are (1) whether immigrants pay more than native-born whites for identical housing and (2) whether the presence of immigrants depresses neighborhood housing prices (DeSilva et al., 2012). Many studies suggest that the inflow of immigrants to urban communities has a detrimental impact on housing prices due to the resulting white flight (Kanemoto, 1980; Schelling, 1971; Yinger, 1975). Studies supporting a negative linkage between immigrant presence and housing prices have largely relied on the analysis of data aggregated to micro spatial levels, including census tracts, block groups or neighborhoods (Accetturo et al., 2014; Balkan et al., 2015; Sá, 2015; Saiz & Wachter, 2011). In contrast, studies at larger spatial levels (i.e. metropolitan area, state) find that immigrants' demand for housing is coupled with an upward-sloping housing supply — immigration raises housing price levels (Akbari & Aydede, 2012; Gonzalez & Ortega, 2013; Mussa et al., 2017; Nistor & Reianu, 2018; Ottaviano & Peri, 2007; Saiz, 2007). These contrasting findings suggest that while immigration may exert a positive effect on average housing prices at the metropolitan level, housing prices in neighborhoods where immigrants reside may grow at a relatively slower rate within the city. A simple focus on the average effect across metropolitan areas may hide heterogeneous effects within the city (Accetturo et al., 2014).

In a regional context, housing prices can be affected by diverse and multi-scalar determinants. Racial composition, particularly the presence of racial segregation, is one likely condition for the emergence of neighborhood housing price differentials (Charles, 2003; Yinger, 1975). In the United States, asymmetric residential preferences of white and black populations, linked with historical discriminative practices (Rothstein, 2017), create an uneven residential landscape with a well-documented shortage of black neighborhoods with favorable amenities (Farley, Fielding, & Krysan, 1997; Massey & Denton, 1993). Scholars also find that other demographic contexts, such as population density, affect housing prices (Clapp, Dolde, & Tirtiroglu, 1995). Neighborhood socioeconomic characteristics likewise play an important role, as housing prices are found to be associated with educational attainment (King & Mieszkowski, 1973), poverty rate (Jolliffe, 2006), employment opportunities (Berg, 2002), school quality (Kane et al., 2006; Nguyen-Hoang & Yinger, 2011), public safety (Gibbons, 2004; Lynch & Rasmussen, 2001; Pope, 2008) and proximity to public goods (Anderson & West, 2006; Bajic, 1983; Voicu & Been, 2008). Naturally, housing condition also matter, and the interaction of available housing stock and population change can create considerable fluctuations in price (Glaeser & Gyourko, 2005). Other factors, such as the type of housing, the age of housing, and the quality of appliances may also affect prices, although their effects are mixed (De Bruyne & Van Hove, 2013; Sun et al., 2005). Other scholarly work proposes that governmental regulations (Aura & Davidoff, 2008), environmental factors (J. P. Cohen & Coughlin, 2008), and/or geographic characteristics such as urban/suburban distinction (Voith, 1999) can influence housing prices.

"Native flight" refers to the aversion and departure of native-born residents of/from immigrant-integrated neighborhoods, and is considered a manifestation of the natives' racial or socioeconomic preferences for segregation (Crowder, 2000; Frey, 1995; Krysan, 2002b). It is most prominent among the non-Hispanic white population (Hall, 2013; Iceland & Nelson, 2008; Lichter & Johnson, 2009). Schelling (1971) demonstrated the well-known "tipping model" – that a high degree of segregation can emerge even if relatively few whites demand complete segregation and a majority of whites prefer moderate segregation. However, a desire to live among the same racial/ethnic groups has also been observed among immigrant populations (Iceland & Nelson, 2008; Li, 1998). Earlier work perceived native flight as a process of "regional balkanization" replete with divergent political interests and social conditions (Frey, 1995; Frey & Liaw, 1998). Some recent scholars see native flight as a destabilizing mechanism precipitating racial inequalities in neighborhood quality (Farrell & Firebaugh, 2016).

There are several competing theoretical arguments regarding the mechanism of native flight. The white flight hypothesis, recognizes the mobility response of natives (particularly of non-Hispanic whites) as racially motivated based on stereotypes and prejudice (Crowder, Hall, & Tolnay, 2011). In other words, the entrance of immigrants into the neighborhood induces native out-migration mainly due to the "non-white" status of the immigrants, irrespective of neighborhood socioeconomic characteristics. A contrasting theory, that of socioeconomic context, suggests that the departure of native residents is indicative primarily of neighborhood life cycle and housing characteristics (Ellen, 2000; Harris, 1999). According to this perspective, native out-migration should be interpreted as a general aversion to social ills; it remains complicit in residential segregation only to the extent that immigrant neighborhoods possess higher levels of disadvantage (Harris, 2001). An additional theoretical model – the housing competition model – focuses on the process within which immigrant arrival increases demand within local housing markets, and "pushes" the natives out through increasing the cost of housing (Ley & Tutchener, 2001).

The effects of immigration on housing prices and native flight at the neighborhood level are highly intertwined. Saiz and Wachter (2011) argue that when the natives pay a premium to live in neighborhoods with native predominance, the presence of immigrants generates depreciation in housing prices. Their proposition has been empirically supported: Sá (2015) reports, using UK Labor Force Survey data, that low-skill immigration reduces housing prices in hosting regions due to the mobility response of high-skill native-born residents. Accetturo et al. (2014), and Balkan et al. (2015) document similar results using Italian and Turkish data, although the magnitude varies depending on the country-specific context. It is possible that the decline in housing prices could be a consequence of native flight triggered by the increasing concentration of immigrants. However, it should also be noted that preferences for segregation do not necessarily depress housing prices when there is high demand for housing, as indicated in early studies of self-segregated black neighborhoods (Yinger, 1975) and recent studies of immigrant-driven neighborhood revitalization (Hum, 2002).

3.2.3 Current Gaps in the Literature

Previous empirical studies have often focused on the effects of immigration across metropolitan areas, rather than within a particular metropolitan area. Indeed, studies encompassing multiple metropolises have been useful in identifying major economic and social impacts of immigrants. Yet the increasing complexities in residential integration shaped by new forces, such as immigrant suburbanization, require in-depth case studies that incorporate local contexts. For example, Ley and colleagues' (2002) work in Toronto and Vancouver shows that that the impact of immigration on housing is highly dependent on metropolitan-specific context. Previous empirical studies have also overwhelmingly examined "world cities" at the top of the urban hierarchy (Alba, Denton, Leung, & Logan, 1995; Skop & Buentello, 2008; Wyly & Holloway, 1999). There has been limited focus on the nexus between immigration, housing prices, and native out-migration in destinations of smaller sizes, despite their rising contributions to diversity.

This study focuses on the non-traditional destination of Louisville, Kentucky, which, I argue, may reveal some valuable generalities. Louisville's per capita income and foreign-born population growth are quite similar to many southeastern metropolises overall, and its shift from a "non-gateway" to a "developing gateway" (Hall & Crowder, 2014) at the beginning the 21st century also resembles the trajectories of nearby cities such as Cincinnati, St. Louis and Nashville. This study contributes to the research on how increasing immigrant concentration affects housing and residential demographic changes in a developing destination, in which immigrants comprise a relatively small portion of the population but are growing at a substantial rate.

Furthermore, there is a lack of literature giving precedence to spatial aspects in the effect of immigration, particularly spatial dependence and spatial heterogeneity. Spatial dependence, referred to as the "coincidence of value similarity with locational similarity" (Anselin, 2001), in the housing market means houses at nearby locations tend to have similar prices. Such dependence may arise because homeowners tend to follow their neighbors' improvement activities, resulting in similar dwelling sizes, designs and other structural characteristics (Yu et al., 2007). Housing prices within a small area (e.g., neighborhood) are also capitalized on shared location amenities, such as police departments, shopping centers, local schools, green space, etc. (Basu & Thibodeau, 1998; Militino et al., 2004). Likewise, native out-migration in nearby neighborhoods is often interpreted as the precursor to a "invasion and succession" process in one's own neighborhood (Crowder & South, 2008). To estimate home values and white flight solely with information from the immediate neighborhood may lead to misleading and possibly biased results.

Spatial econometric techniques such as the spatial autoregressive model (SAR), have been developed to address concerns regarding the impact of spatial dependence on analytical outcomes (Anselin, 1988; Bowen, Mikelbank, & Prestegaard, 2001). By explicitly incorporating the spatial autocorrelation information in model construction, spatial econometric models tend to eliminate the spatial effects on coefficients (Anselin, 1988). Thus far, few studies have adopted such an approach within the immigrant settlement literature (DeSilva et al., 2012; Florax, de Graaff, & Waldorf, 2005; Mussa et al., 2017). The use of a SAR allows for the decomposition of the effect of immigrants on housing prices and out-migration into a direct effect on the neighborhood of interest and an indirect effect on surrounding neighborhoods. This decomposition contributes to a comprehensive understanding of the immigration effect on housing and out-migration within neighborhoods.

Spatial heterogeneity – which is distinct from spatial dependence – indicates that coefficients of substantive interest may vary significantly across space, and that immigration may thus yield different effects on housing prices and native flight in different parts of the city. For example, Graif and Sampson (2009) find that immigrant concentration is inversely related to homicide in some Chicago neighborhoods but remains unrelated in others. The presence of spatial heterogeneity challenges the utility of traditional hedonic models such as OLS, which assume constant correlations between variables across space.

Geographically weighted regression (GWR) is an alternative to OLS and explicitly addresses spatial heterogeneity. The GWR procedure estimates a local model, producing a set of geographic parameter estimates and measures of statistical significance that vary over space (Fotheringham et al., 2002). With the use of GWR, this study is able to show how different parts of the metropolitan area might be unevenly influenced by the presence of immigrants. Differential local responses to immigration may also reflect differences in the characteristics of the immigrant population to which communities are being exposed.

3.3 Study Area

Jefferson County, Kentucky, also known as Louisville Metro, is the largest city in Kentucky, with a population of 771,158 as of 2017. The foreign-born population comprises 5.2% of Louisville's total population. Although the proportion of immigrants in Louisville is below the national average in all metropolitan statistical areas (10.1%) (U.S. Census Bureau, 2017), its growth has been dramatic during recent decades. Between 1990 and 2000, the number of immigrants in Louisville increased by approximately 146%, albeit from a low starting population. Over this period, immigrants accounted for nearly half of the city's total population growth (Capps, Fortuny, Zimmermann, Bullock, & Henderson, 2006). The surge in immigration to Louisville continued during the first decade of the 21st century (U.S. Census Bureau, 2017).

The distribution of the origins of Louisville's immigrants generally follows the national trend. Prior to 1980, immigrants in Louisville predominantly had European origin. In later years, immigrants have become increasingly likely to have origins in Asia and Latin America. Immigrants in Louisville are concentrated at both ends of the educational spectrum, with more immigrants holding a bachelor's degree and more immigrants without a high school diploma, compared to the native-born residents. The median household income of immigrant-headed households ($47,878) is approximately 87 percent of the level of native-headed households ($55,034). Health care, manufacturing and recreation are the industrial sectors with the largest immigrant workforce employment in Louisville, with the manufacturing sector being where immigrants are most overrepresented (13.7 percent native-born population vs. 17.1 percent foreign-born population) (U.S. Census Bureau, 2017).

Suburbanization, intertwined with racial segregation, has profoundly shaped the residential integration of immigrants in Louisville. Since the 1930s, Louisville's city limits have moved inexorably to consume the new suburbs on both the south and east sides, fueled by exclusionary public policies including zoning, highway development and public housing projects. Those policies perpetuated the movement of black residents into the city's west end and white flight to the city's suburbs (Cummings & Price, 1997; Kleber, 2001). While early European immigrants concentrated in ethnic enclaves such as Germantown and Limerick at the urban periphery (Cummings & Price, 1997), newcomers from Latin America and Asia have largely settled in the city's southern and eastern suburbs. Using census data, Singer (2013) finds that Louisville has the fastest growing suburban foreign-born population among all U.S. metropolitan areas. Between 1990 and 2000, 151 of Louisville's 190 census tracts experienced an increase in foreign-born population (Figure 4), with suburban neighborhoods witnessing an overall growth rate of 164%.

3.4 Data and Methods

This study uses census tract data from the 1990 Census of Population and Housing Summary File 3 (SF3), the 2000 Decennial Census, and the 2017 American Community Survey (ACS) 5-year estimates. Census tracts are the most commonly used proxy for neighborhoods in this type of research (Jargowsky, 1997; Saiz & Wachter, 2011). Census tract boundaries may change over time due to population and housing shifts, thus I use the Longitudinal Tract Database (LTDB) (J. R. Logan et al., 2014) to interpolate 1990 and 2000 data to the 2010 census tract boundaries. Using data from 2000 and 2017, I calculate percent change in median home value and net change in non-Hispanic white population as measures for housing price change and native flight; these two variables are used as dependent variables in two separate models. In explaining the factors associated with home value change and white flight between 2000 and 2017, the primary variable of interest is percentage point change in the foreign-born population as a share of total population between 1990 and 2000.

This study examines how changes in the foreign-born population in an initial period (1990-2000) are associated with changes in home values and white population in a later period (2000-2017). As suggested by Macpherson and Sirmans (2001), housing price appreciation can be affected more by the change in the demographic makeup of an area than by the level of the composition itself. Findings from Saiz and Wachter (2011) and Tesfai and colleagues (2019) demonstrate the validity of using immigration data in a prior decade to estimate residential outcomes in a subsequent decade. Importantly, this approach allows us to mitigate the endogeneity – the fact that foreign born population change can be both a cause and an effect of housing value and white population change – inherent in research questions.

As detailed above, housing prices and mobility decisions can be informed by the neighborhood's demographic context, socioeconomic characteristics and housing conditions. I therefore include a series of control variables in the two models:

(1) **Neighborhood demographic variables** for the home value model include racial and ethnic composition (percent point change in non-Hispanic white population), group quarters population (percent point change in group quarter population), educational attainment (percent point change in population over 25 years old with a bachelor's degree or higher), and population density (net change in population density). For the white flight model black population is included (percent point change in non-Hispanic black population).

(2) **Neighborhood socioeconomic variables** for the home value model include poverty (percent point change in population in poverty) and homeownership (percent point change in homeownership). For the white flight model, controlled socioeconomic variables include income (net change in per capita income), homeownership (percent point change in homeownership), and household lifecycle (percent households who moved into the unit less than 10 years ago in 2000). I also control for school type (percent point change in private schools enrollment) in the neighborhood, as prior research has suggested white flight into private schools as the proportions of minority population increase in metropolitan areas (Clotfelter, 2001; Fairlie & Resch, 2002; Reber, 2005).

(3) **Housing condition variables** for both models include housing supply (percent housing built after 2000) and housing structure (percent point change in multi-family units). Additionally, the foreclosure rate during the 2007-2008 period from U.S. Department of Housing and Urban Development is included in the home value model to mitigate the effect of the late 2000's mortgage crisis on housing values. For the white flight model, net change in median home value is included as an additional control variable.

(4) **An urban/suburban dummy variable** is included in both models based on the Jefferson County-City of Louisville merger in 2003. Indicated by the consolidation legislation, the former city of Louisville was established as an "urban service district" with one tax rate and service mix, while the remainder of Jefferson County incorporated areas serve as "suburbs" and continue operating their own tax rates, services and council elections (Kelly & Adhikari, 2013). This variable takes a value of 1 for suburban neighborhoods and a value of 0 for urban neighborhoods. Table 3.1 and Table 3.2 show

the descriptive statistics for the variables used in the home value model and the white flight model, respectively.

The analysis proceeds in three stages. I begin with a classic OLS model as the baseline model. The OLS equation to be analyzed is given by the following equation:

$$Y_{i,2000-2017} = \alpha + \beta X_{i,1990-2000} + \delta Z_i + \varepsilon_i$$

In this equation, $Y_{i,2000-2017}$ is the change in the given outcome (median home value or non-Hispanic white population) for tract *i* between 2000 and 2017 and $X_{i,1990-2000}$ is the percentage point change in tract i's explanatory variables between 1990 and 2000. Z_i represents the time-invariant neighborhood controls and ε_i is a randomly distributed error term. α, β and δ are parameters to be estimated.

Next, I employ a spatial autoregressive model (SAR) as an alternative to the OLS model. The selection of the SAR model is based on results of Lagrange Multiplier (LM) test (Anselin, 1988), which suggest a relatively strong spillover/diffusion effect of dependent variables (Table 3.3). Two different spatial weight matrices are used in the SAR to ensure outcome robustness: (1) a queen contiguity matrix, in which tracts that share any common boundary or vertices are considered neighborrs, and (2) a distance-band matrix, in which tracts that fall within a specific distance band of 0.5 mile from a given tract are considered neighbors.

Finally, I run a geographically weighted regression (GWR) model. A Breusch-Pagan (BP) test, which evaluates whether the variance of the errors from a regression is dependent on the values of the independent variables, is used to detect spatial heterogeneity (Breusch & Pagan, 1979). The statistically significant BP statistics obtained from the OLS model justify the use of GWR. The local coefficients from the GWR are mapped to show the nature of their variation across space. I use *GeoDa* software to conduct OLS and estimate SAR via maximum likelihood. The GWR is applied using ArcGIS 10.6 software.

3.5 Results

3.5.1 The Immigrant Effect on Home Values

Table 3.4 presents coefficients from the regression models predicting percent change in median home value between 2000 and 2017. The OLS results in the first column reveal a negative but insignificant association between median home value and foreign-born population. Among control variables, the presence of multi-family units is a statistically significant predictor of median home value, with a 10 percentage point increase in the former associated with a 2.3 percent increase in the latter. Foreclosure rate, as expected, has a negative effect on median home value. The lower home values in neighborhoods with higher foreclosure rates may be the result of a greater supply of housing in those neighborhoods. The suburban dummy coefficient shows that median home value, on average, declines from 2000 and 2017 in suburban tracts, possibly due to the boom-bust cycle exhibited during this time period. The significant and positive Moran's I value reveals the presence of spatial autocorrelation among the residuals of the observations.

The second and third columns in Table 3.4 list SAR results using a queen contiguity matrix (SAR_1) and a distance-band spatial weights matrix (SAR_2) respectively. With the inclusion of a spatially lagged value of the dependent variable (i.e., W x Median home value) as an additional independent variable, foreign-born population remains an insignificant but positive predictor of median home value in both SAR models. The spatial lag terms are statistically significant, suggesting the spillover or diffusion effect of home values among neighboring census tracts. An improvement in model performance is reflected by the smaller Akaike's Information Criterion (AIC) value relative to the OLS model (i.e. from 1681.39 to 1655.43 and 1661.12). Notably, Moran's I becomes insignificant in the SAR models, indicating that the SAR models effectively eliminate the spatial autocorrelation issue.

The last column in Table 3.4 shows the results from the GWR analysis. Because GWR estimates local coefficients for each independent variable and for every tract in the study area, here I report only the median values (in italic) and minimum and maximum values (in parentheses) of the GWR model. The estimated local coefficients on the foreign-born population change variable for each study tract are displayed in Figure 7. The median of local regression coefficients for foreign-born population is positive (0.013), although the range of the effect is between -1.567 and 1.378. Approximately half of census tracts exhibit *negative* signs for local estimates for foreign-born population, while the rest exhibit *positive* signs. Only 3 out of the total 190 tracts (illustrated by dots in Figure 7) exhibit a statistically significant relationship between immigration and housing price[2]. Overall, these results suggest that foreign-born population does not significantly predict median home values in Louisville.

Mapping the GWR local estimates also complements global averaging models by showing spatial disparities of the immigrant effect. Figure 7 indicates that census tracts showing negative coefficients are mainly located in the north central urban neighborhoods

2 Pseudo-t-statistics are calculated to determine the significance by dividing the local coefficient value for each independent variable for each census tract by its corresponding standard error (Fotheringham et al., 2002).

and the northeastern suburbs, many of which have relatively high white population concentrations and low poverty rates. At the other end of the spectrum, many southern neighborhoods, dominated by working-class white households, experience positive effects of immigration on home values. West Louisville tracts, in which a majority of residents are African American, also exhibit home value appreciation with immigrant inflows.

3.5.2 The Immigrant Effect on White Flight

Between 1990 and 2017, 62 percent of the census tracts in Louisville experienced a loss of non-Hispanic white population. Table 3.6 presents the coefficients for immigrants' impact on the outflow of white population as measured by the net change of non-Hispanic white population in each census tract. The OLS results shown in the first column of Table 3.5 indicate that foreign-born population is negatively associated with non-Hispanic white population at a 0.05 significance level. A one percent point increase in foreign-born population share is associated with a 34 person reduction in white population. Among the control variables, non-Hispanic white population loss is also associated with the growth in the share of non-Hispanic black population. Neighborhoods with increasing new housing and multi-family units are likely to exhibit less white flight. This is consistent with existing literature on the role of the real estate industry in "pulling" whites into neighborhoods with new developments (Gotham, 2002). Neighborhoods with increasing median home values are also associated with less white flight. Again, there exists spatial autocorrelation among the residuals of the observations as indicated by the significant Moran's I value.

The SAR results displayed in the second column of Table 3.5 also show a significant negative association between foreign-born population and non-Hispanic white population

(Table 3.5). The spillover/diffusion effect is indicated by the statistically significant spatial lag term (i.e. W× Non-Hispanic white population). Because the coefficients from SAR models are insufficient in displaying actual "effects" – due to the regressive structure of the model (LeSage & Pace, 2009) – I calculate the average direct effect (ADE), average indirect effect (AIE), and average total effects (ATE) of percent point change in the foreign-born[3]. Results indicate that on average, a one percentage point increase in immigrant share is associated with a 26 person decrease in non-Hispanic whites in a given census tract and an 11 person decrease in non-Hispanic whites in surrounding census tracts (Table 3.5).

The last column of Table 3.5 shows the GWR results for the white out-migration model. The median of the local regression coefficients shows a significant negative association between immigration and non-Hispanic whites (i.e. -45.02). Local coefficients range from -59.57 to -7.92, with all census tracts exhibiting *negative* effects (Figure 8). Approximately 80% of the tracts (153 out of 190, illustrated by dots in Figure 8) show statistically significant impacts of immigration on future out-migration of whites, suggesting relatively robust relationships between foreign-born population and white flight in Louisville's neighborhoods. A more pronounced effect of immigration on white flight is observed in the relatively affluent northeastern suburbs, where residents are predominantly high-socioeconomic-status (high SES) white population. Socioeconomically disadvantaged downtown and west Louisville also exhibit large local

[3] The average direct effect is a partial derivative of the dependent variable with respect to changes in each independent variable *in a given unit*. The average indirect effect is a partial derivative of the dependent variable with respect to changes in each independent variable *in all other units*. The AIEs thus capture the spillover effects from changes in the independent variables in the original spatial unit. The average total effect is the sum of ADE and AIE (LeSage & Pace, 2009).

coefficients. However it is possible that these are a result of a lower “tipping” point for those neighborhoods on the verge of becoming hyper-segregated communities (Schelling, 1971), as downtown and west Louisville have little initial white population presence. On the other hand, the southern suburbs – which are dominated by working-class white households – show a lesser relationship between immigration and white out-migration. In sum, the GWR results illustrate that foreign-born population is a strong predictor of white flight in a majority of Louisville’s neighborhoods, but this effect decreases geographically from north to south.

As for control variables in the GWR model, private school enrollment is insignificant, whereas median home value, multi-family units and new housing are positively linked with growth in white population. Overall, these observations from GWR show that demographic and socioeconomic characteristics do not equally motivate white flight at local scales.

3.6 Additional Analysis

Two additional analysis is conducted to ensure the robustness of regression results. First, current findings that immigrants are not a strong predictor of home value change but an important factor triggering white out-migration, may be affected by idiosyncratic factors within the later time period and may therefore not be generalizable to other time periods. To address this issue, I narrow the time period in question to conduct a corollary analysis using independent variables between 1990 and 2000 to predict home value change and white out-migration between 2000 and 2010. These OLS results (Table 3.6) largely replicated those documented in original models (Table 3.4 & Table 3.5) — percentage point change in foreign-born population between 1990 and 2000 remains insignificant in the home value model, and also remains negative and statistically significant in the white flight model. Coefficients and significance of control variables also share similarities with the original models.

The second issue concerns whether the use of change scores as dependent variables and independent variables may have lower reliability relative to component variables, and whether current regression results are less meaningful due to the almost universal phenomenon of regression toward the mean from pretest to posttest measurements (Allison, 1990). Although a number of scholars defend the standing of change score variables in the literature (Gottman & Rushe, 1993; Rogosa & Willett, 1983), scholarship generally concerns the possible presence of Lord's paradox (Lord, 1967). It refers to the phenomenon that a change score approach and a residualized change approach yield opposite outcomes, even though both are designed to produce estimates of the effect of the predictor on change in the dependent variable that are equivalent (Allison, 1990; Castro-Schilo & Grimm, 2018). To this end, I also estimate a residualized change model given by:

$$Y_{i,2017} = \alpha + \gamma Y_{i,2000} + \beta X_{i,2000} + \varepsilon_i$$

Where $Y_{i,2017}$ is the given outcome (median home value and non-Hispanic white population) for tract *i* in 2017 and $Y_{i,2000}$ is the corresponding variable for tract *i* in 2000. $X_{i,2000}$ is the vector of tract-specific independent variables, all of which are measured in 2000. ε_i is a randomly distributed error term and α, γ and β are parameters to be estimated. As shown in Table 3.7, coefficients on the percent foreign-born population variable in 2000 are generally similar to those in original models (Table 3.4 & Table 3.5), indicating the change score approach is reliable for this study. In addition, Castro-Schilo and Grimm (2018) suggest that when the correlation of independent variables of main interests and the pretests scores are closer to zero, the more likely the change sore approach and the residualized change approach will arrive at the same inference. An examination on correlations between median home value in 2000 and percent foreign-born population in 2000, as well as between non-Hispanic whites in 2000 and percent foreign-born population in 2000 also supports this thesis.

3.7 Conclusion and Discussion

This chapter aims to advance contemporary understandings of spatial dependence and spatial heterogeneity in the effect of immigration, through an examination of the relationships between immigrant growth, home value change and white flight across neighborhoods in Louisville. Results underscore some important spatial-structural interactions occurring within these relationships. In particular, I find there are spillover effects of neighborhood housing price change and white population loss on surrounding neighborhoods; furthermore, immigration differentially predicts housing price appreciation and white out-migration in different parts of Louisville. This work contributes to the growing interest in spatial aspects within immigrant settlement studies.

First, immigration is unrelated to housing price change across neighborhoods in Louisville. Despite an averaged negative impact of immigrant inflows on housing prices at the census tract level indicated by previous studies (Accetturo et al., 2014; Saiz & Wachter, 2011), my findings provide a more complicated answer: immigration may unevenly affect housing prices at the neighborhood level but is generally not a strong force in shaping the local housing market in Louisville. Local GWR coefficients demonstrate that a larger magnitude of housing price depreciation is likely to happen in relatively affluent urban and suburban neighborhoods. Those neighborhoods, in Louisville's case, are also destination communities for high-SES Asian immigrants (U.S. Census Bureau, 2000a, 2000b). The insignificant results may point to challenges confronting high-SES immigrants in translating their socioeconomic gains into positive residential outcomes in upper-class neighborhoods. It is also possible that other unobserved variables relating to the boom-bust cycle during the study period play a role in home value deprecation, although attempt was made to mitigate this effect by controlling for neighborhood foreclosure rate during the recession in the model.

Second, immigrant concentration is a strong predictor of non-Hispanic white population loss across neighborhoods in Louisville. With limited data, my use of a single absolute population loss criterion (i.e. net change in non-Hispanic whites) in defining white flight may have some drawbacks (Alba et al., 1995). Yet, no white flight observed in predominantly white affluent northeastern suburbs provides some support to that literature which suggests that upper-class neighborhoods are more sensitive in identifying "threats" of immigration, compared to other disadvantaged inner-city and suburban neighborhoods (Kye, 2018; Sá, 2015). Powerful majority-group members living in the northeastern areas of the county may have more resources to protect their interests (Farrell, 2016; Friedman & Rosenbaum, 2007), while many low-income working-class whites in south Louisville do not have the means to leave their neighborhoods when confronted with immigrant suburbanization.

Third, this study points to the inability of what is commonly defined as "suburban" to capture the heterogeneous local responses with immigrant suburbanization. Much prior work has relied on the urban/suburban dichotomy as one of the most important geographic classifications in the analysis of immigrant settlements (Frey & Fielding, 1996; Walker & Leitner, 2011), and operationalize the suburbs as a single and undifferentiated entity. While not diminishing the appropriate focus given to urban-suburban differences, my results urge scholars to give precedence to the heterogeneous processes of residential integration occurring concurrently within the suburbs. For example, northeastern suburbs may be considered as a possible case for “the decoupling of residential economic integration and residential racial integration” of immigrants, because white flight occurs despite immigrants’ high human capital in those areas (Hall, 2013; Kye, 2018). On the other hand, in south Louisville, where recently arrived immigrants are mainly low-SES Hispanics, it is less clear whether the moderate level of white out-migration should be ascribed to immigrants’ socioeconomic status or racial prejudice. In either case, immigrant suburbanization is not a successful endpoint of the spatial assimilation process. It is paramount that future research and policy makers consider the inconsistency of the effect of immigration at the neighborhood level, which is closely linked with the demographic and socioeconomic profiles of immigrant groups.

Although the analyses cannot pinpoint the precise mechanisms underlying the relationships among immigration, white out-migration and housing prices, regression results illustrate that white population decline is not associated with home value depreciation, whereas home value change is a significant predictor of white population change (Table 3.4 & Table 3.5). It is likely that housing price appreciation at the neighborhood level functions as a “pull” factor that attracts whites, rather than a consequence of white population relocation. Therefore, these findings to some extent do not support that immigrant-induced white flight contributes to housing depreciation.

Due to data availability, it is difficult to incorporate specific demographic and socioeconomic characteristics of immigrants into the analysis to see whether those characteristics drive spatial disparities in the effect of immigration on housing prices and white out-migration. Some scholars suggest that the use of pan-ethnic immigrant populations obscures differences among immigrant groups that can relate to their residential behaviors or their reception by host communities (Hall, 2013). Apart from that, relying on data aggregated to census tracts alone may preclude the identification of relationships associated with other geographic scales. The relationship between immigrants, housing prices and white flight can be sensitive to the issue of modifiable areal unit problem (MAUP): outcomes of statistical analysis and interpretations of spatial patterns can be affected by the scale and boundary delineation to which data are aggregated (Openshow, 1979). A complete understanding of the spatiotemporal patterns of housing prices and native flight within metropolitan contexts must be attentive to the arbitrary nature of spatial data aggregation. Those issues remain important questions left for future research.

Despite these limitations, the findings of this study warrant strong consideration from policymakers. The presence of spatial spillover requires local policies addressing residential segregation to take into account the direct and indirect effect of immigration. In this case study, immigration has a negative effect on white flight in both immediate and surrounding neighborhoods. Yet in some other cases, direct and indirect effects can be opposite — immigrants moving into one region "push out" older residents (a negative direct effect) but also introduce population gain into surrounding regions (a positive indirect effect) (Mussa et al., 2017). With suburban neighborhoods becoming key sites of residential integration/segregation, policies that help improve inter-group cooperation and trust should rely on thorough investigations of demographic profiles at the local scale, and consider how spatial structures such as neighborhoods, school districts, and/or voting districts condition the immigrant-host community interaction.

Table 3.1 Descriptive Statistics for the Home Value Model (n=190)

Variables	Mean	SD	Min	Max
Dependent variables				
Percent change in median home value between 2000 and 2017 (%)	-0.37	22.45	-100	75.26
Independent variables				
Percent point change in foreign-born population between 1990 and 2000	1.81	3.10	-1.96	27.68
Control Variables				
Percent point change in non-Hispanic white population between 1990 and 2000	-5.99	5.05	-23.10	4.67
Percent point change in population over 25 years old with a bachelor's degree or higher between 1990 and 2000	4.77	5.51	-10.10	26.49
Percent point change in group quarter population between 1990 and 2000	-0.06	3.25	-31.56	10.41
Net change in population density between 1990 and 2000 (per sq mi)	13.39	45.74	-66.60	266.27
Percent point change in population in poverty between 1990 and 2000	-0.75	5.78	-49.86	12.76
Percent point change in owner occupied housing units between 1990 and 2000	-0.48	6.61	-16.23	29.46
Percent point change in vacant housing units between 1990 and 2000	0.48	3.16	-14.87	18.19
Percent point change in multi-family housing units between 1990 and 2000	25.35	21.92	-58.87	92.63
Percent new housing built after 2000 (%)	12.05	15.22	0.00	84.40
Foreclosure rate during the 2007-2008 recession (%)	4.59	3.01	0.00	12.75
Suburban dummy	0.48	0.50	0.00	1.00

Table 3.2 Descriptive Statistics for the White Flight Model (n=190)

Variables	Mean	SD	Min	Max
Dependent variable				
Net change in non-Hispanic white population between 2000 and 2017	-31.85	866.15	-2777.64	4119.97
Independent variable				
Percent point change in foreign-born population between 1990 and 2000	1.81	3.10	-1.96	27.68
Control Variables				
Percent point change in non-Hispanic black population between 1990 and 2000	3.42	4.31	-7.61	19.11
Net change in income per capita between 1990 and 2000 * 10^{-3}	4.68	4.35	-6.67	28.93
Net change in median home value between 1990 and 2000 * 10^{-3}	34.99	23.25	-106.84	113.13
Percent point change in owner occupied housing units between 1990 and 2000	-0.48	6.61	-16.23	29.46
Percent household head move into the unit less than 10 years ago in 2000 (%)	60.65	10.75	37.08	86.72
Percent point change in population over 3 years old enrolled in private schools between 1990 and 2000	-4.10	16.31	-129.46	37.75
Percent point change in multi-family housing units between 1990 and 2000	25.35	21.92	-58.87	92.63
Percent new housing built after 2000 (%)	12.05	15.22	0.00	84.40
Suburban dummy	0.48	0.50	0.00	1.00

Table 3. 3 Lagrange Multiplier Diagnostics for Spatial Dependence

Test	Value	Prob.
Home value model (queen contiguity matrix)		
Lagrange Multiplier (lag)	28.567	0.000
Robust LM (lag)	35.281	0.000
Lagrange Multiplier (error)	10.103	0.001
Robust LM (error)	16.816	0.000
Home value model (0.5 mile distance-band spatial weights)		
Lagrange Multiplier (lag)	30.405	0.000
Robust LM (lag)	18.262	0.000
Lagrange Multiplier (error)	17.091	0.000
Robust LM (error)	4.948	0.026
White flight model (queen contiguity matrix)		
Lagrange Multiplier (lag)	20.684	0.000
Robust LM (lag)	13.866	0.000
Lagrange Multiplier (error)	7.251	0.007
Robust LM (error)	0.434	0.510

Table 3. 4 Regression Results of Percent Change in Median Home Value and change in percent foreign-born population in Louisville, KY [a] (n=190)

Variables	OLS parameters	SAR_1 parameters	SAR_2 parameters	GWR parameters [min, max] [b]
Percent point change in foreign-born 1990-2000	-0.145 (0.541)	0.289 (0.472)	0.218 (0.485)	*0.013* [-1.567, 1.378]
Percent point change in non-Hispanic white 1990-2000	0.250 (0.372)	0.204 (0.324)	0.480 (0.334)	*0.522* [-0.237, 2.179]
Percent point change in population 25+ with bachelor+ 1990-2000	0.507 (0.360)	0.270 (0.315)	0.588 (0.323)*	*0.741* [0.260, 2.363]
Percent point change in group quarter population 1990-2000	0.777 (0.472)	0.751 (0.412)*	0.650 (0.599)*	*1.026* [0.291, 2.367]
Net Change in population density 1990-2000	-0.060 (0.040)	-0.046 (0.035)	-0.154 (0.255)*	*-0.055* [-0.221, 0.401]
Percent point change in population in poverty 1990-2000	-0.218 (0.285)	-0.328 (0.249)	-0.154 (0.255)	*0.062* [-0.751, 1.225]
Percent point change in homeownership 1990-2000	0.459 (0.270)*	0.292 (0.236)	0.409 (0.241)*	*0.262* [-0.691, 1.944]
Percent point change in vacant units 1990-2000	0.426 (0.480)	0.722 (0.418)*	0.477 (0.429)	*0.832* [-0.833, 3.022]
Percent point change in multi-family units 1990-2000	0.225 (0.089)**	0.118 (0.078)	0.153 (0.080)*	*0.247*** [-0.176, 0.514]
Percent new housing built after 2000	0.178 (0.124)	0.186 (0.108)*	0.176 (0.111)	*0.161* [-0.350, 1.283]
Foreclosure rate during the recession 2007-2008	-2.267(0.639)**	-0.914 (0.572)	-1.718(0.576)**	*-1.706* [-3.840,4.403]
Suburban dummy	-9.894 (3.673)**	-5.458 (3.245)*	-9.768 (3.289)**	---
Constant	6.957 (5.765)	0.962 (5.052)	6.145 (5.165)	*5.932* [-38.937, 17.595]
W× Median home value	---	0.523(0.081)**	0.542 (0.093)**	---
Akaike's Information Criterion (AIC)	1681.393	1655.430	1661.12	1674.194
R_2	0.290	0.420	0.389	0.538
Moran's I	0.136**, 0.133** [c]	-0.053	0.059	0.096

* Regression coefficients being statistically significant at 0.10 level. ** Regression coefficients being statistically significant at 0.05 level. In parenthesis are standard errors.

[a] The largest variance inflation factors (VIF) value among all the independent variables is 1.95 (smaller than 3), suggesting that multicollinearity is not a concern. We use queen contiguity spatial weights for SAR_1 and distance-band spatial weights for SAR_2 with a bandwidth of 0.5 mile.

[b] GWR parameters are reported in median value (in italic). In square bracket are minimum and maximum.

[c] Moran's I is 0.136 when using queen contiguity spatial weights and 0.133 when using distance-band spatial weights.

Table 3. 5 Regression results of change in non-Hispanic white population and change in percent of foreign-born population in Louisville, KY [a] (n=190)

Variables	OLS parameters	SAR parameters [b]	GWR parameters [max, min] [d]
Percent point change in foreign-born 1990-2000	-34.437 (13.716)**	-25.505 (12.675)** [c]	*-45.017*** [-59.571, -7.920]
Percent point change in non-Hispanic blacks 1990-2000	-33.778 (9.956)**	-28.307 (9.235)**	*-33.552*** [-48.051, -6.642]
Net change in income per capita 1990-2000	4.016 (10.950)	0.611 (10.070)	*-7.044* [-13.420,30.614]
Net change in median home value 1990-2000	4.385 (1.897)**	3.155 (1.767)*	*4.283** [1.287, 12.436]
Percent point change in homeownership 1990-2000	1.863 (7.007)	0.151 (6.434)	*2.856* [-17.911, 10.964]
Percent households move into the unit less than 10 years ago in 2000	1.011 (5.502)	-4.820 (5.200)	*-4.070* [-17.577, 2.414]
Percent point change in private school enrollment 1990-2000	4.825 (2.492)*	4.678 (2.291)**	*2.919* [0.878,8.732]
Percent point change in multi-family units 1990-2000	5.410 (2.730)**	6.215 (2.514)**	*8.637*** [4.570, 14.276]
Percent new housing built after 2000	41.573 (3.502)**	37.808 (3.318)**	*31.354*** [17.437, 50.963]
Suburban dummy	-256.210 (95.432)**	-283.865 (88.045)**	---
Constant	-582.283 (276.179)**	-168.912 (270.503)	*-383.178* [-549.967, 30.745]
W× Non-Hispanic white population	---	0.314 (0.075)**	---
Akaike's Information Criterion (AIC)	2927.772	2912.10	2907.622
R^2	0.656	0.692	0.738
Moran's I	0.115*	-0.042	0.093

* Regression coefficients being statistically significant at 0.10 level. ** Regression coefficients being statistically significant at 0.05 level. In parenthesis are standard errors.

[a] The largest variance inflation factors (VIF) value among all the independent variables is 2.49 (smaller than 3), suggesting that multicollinearity is not a concern.

[b] We only use queen contiguity spatial weights for SAR because LM test show little spatial autocorrelation when using distance-band spatial weights.

[c] ATE=-37.180, ADE = -25.995, AIE = -11.185.

[d] GWR parameters are reported in median value (in italic). In square bracket are minimum and maximum.

Table 3. 6 OLS Regression Results of the Corollary Analysis

Home Value Model (Chang rate in median home value 2000-2010)	OLS parameters	White Flight Model (Change in non-Hispanic whites 2000-2010)	OLS parameters
Percent point change in foreign-born 1990-2000	**-0.447 (0.560)**	Percent point change in foreign-born 1990-2000	**-21.954 (10.238)****
Percent point change in non-Hispanic white 1990-2000	-0.005 (0.385)	Percent point change in non-Hispanic blacks 1990-2000	-24.531 (7.414)**
Percent point change in population 25+ with bachelor+ 1990-2000	-0.101 (0.373)	Net change in income per capita 1990-2000 *10^{-3}	-3.384 (8.016)
Percent point change in group quarter population 1990-2000	-0.442 (0.488)	Net change in median home value 1990-2000 *10^{-3}	3.065 (1.420)**
Net change in population density 1990-2000	0.047 (0.041)	Percent point change in homeownership 1990-2000	8.161 (5.634)
Percent point change in population in poverty 1990-2000	-0.061 (0.295)	Percent household head move into the unit less than 10 years ago in 2000	3.446 (3.319)
Percent point change in homeownership 1990-2000	0.336 (0.279)	Percent point change in private school enrollment 1990-2000	5.704 (1.866)**
Percent point change in vacant units 1990-2000	0.901 (0.496)*	Percent point change in multi-family units 1990-2000	0.035 (0.028)
Percent point change in multi-family units 1990-2000	0.248 (0.092)**	Percent new housing built after 2000	30.534 (2.514)**
Percent new housing built after 2000 (%)	0.195 (0.128)	Suburban dummy	-194.610 (68.158)**
Foreclosure rate during the recession 2007-2008	-0.199 (0.661)	Constant	-469.977 (197.175)**
Suburban dummy	-8.101 (3.801)**	Akaike's Information Criterion (AIC)	2803.294
Constant	6.523 (5.966)	R^2	0.691
Akaike's Information Criterion (AIC)	1694.395		
R^2	0.132		

Table 3. 7 OLS Regression Results Using a Residualized Change Model

Home Value Model (Median home value in 2017 *10^{-3})	OLS parameters	White Flight Model (Non-Hispanic whites in 2017)	OLS parameters
Median home value in 2000 *10^{-3}	0.829 (0.066)**	Non-Hispanic whites in 2000	0.831 (0.038)**
Percent foreign-born in 2000	**-1.214 (0.605)****	Percent foreign-born in 2000	**-21.719 (10.758)****
Percent non-Hispanic white in 2000	0.203 (0.125)	Percent non-Hispanic black in 2000	2.227 (2.033)
Percent population 25+ with bachelor+ in 2000	1.063 (0.281)**	Income per capita 2000in 2000 *10^{-3}	-13.806 (8.598)
Percent group quarter population in 2000	1.192 (0.437)**	Median home value 2000in 2000 *10^{-3}	4.479 (1.580)**
Population density in2000	-0.002 (0.003)	Percent homeownership in 2000	9.082 (7.188)
Percent population in poverty in 2000	-0.287 (0.316)	Percent household head move into the unit less than 10 years ago in 2000	3.055 (5.205)
Percent homeownership in 2000	-0.126 (0.441)	Percent private school enrollment in 2000	7.039 (3.895)*
Percent vacant units in 2000	0.359 (0.652)	Percent multi-family units in 2000	8.333 (5.794)
Percent multi-family units in 2000	0.233 (0.336)	Percent new housing built after 2000	35.829 (3.463)**
Percent new housing built after 2000	0.426 (0.181)**	Suburban dummy	-68.419 (107.015)
Foreclosure rate during the recession 2007-2008	-0.408 (1.412)	Constant	-1347.442 (601.782)**
Suburban dummy	-17.286 (5.581)**	Akaike's Information Criterion (AIC)	-2903.184
Constant	2.225	R^2	0.904
Akaike's Information Criterion (AIC)	1805.015		
R^2	0.924		

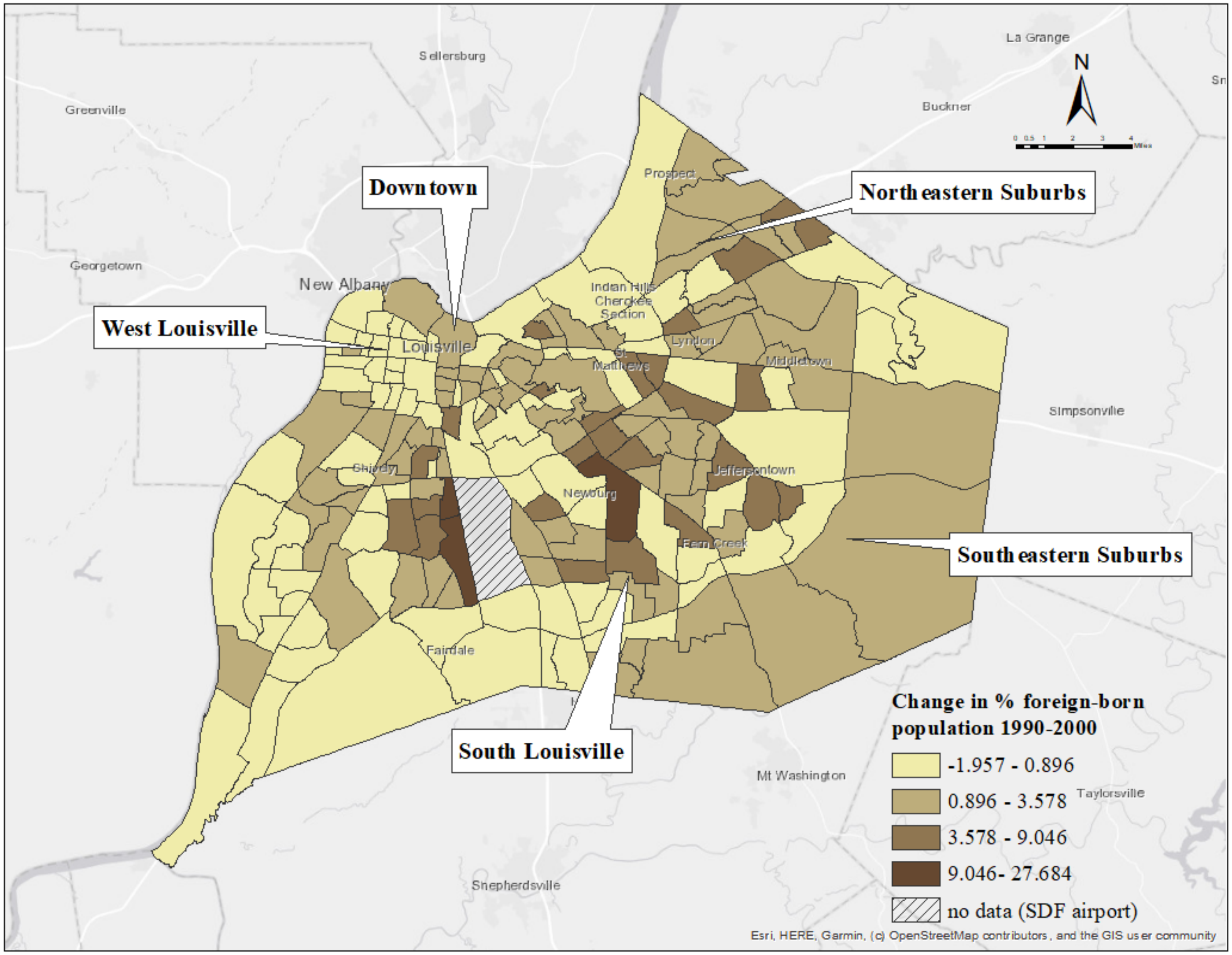

Figure 6. Choropleth map showing percentage changes of foreign-born population across census tracts in Louisville, KY

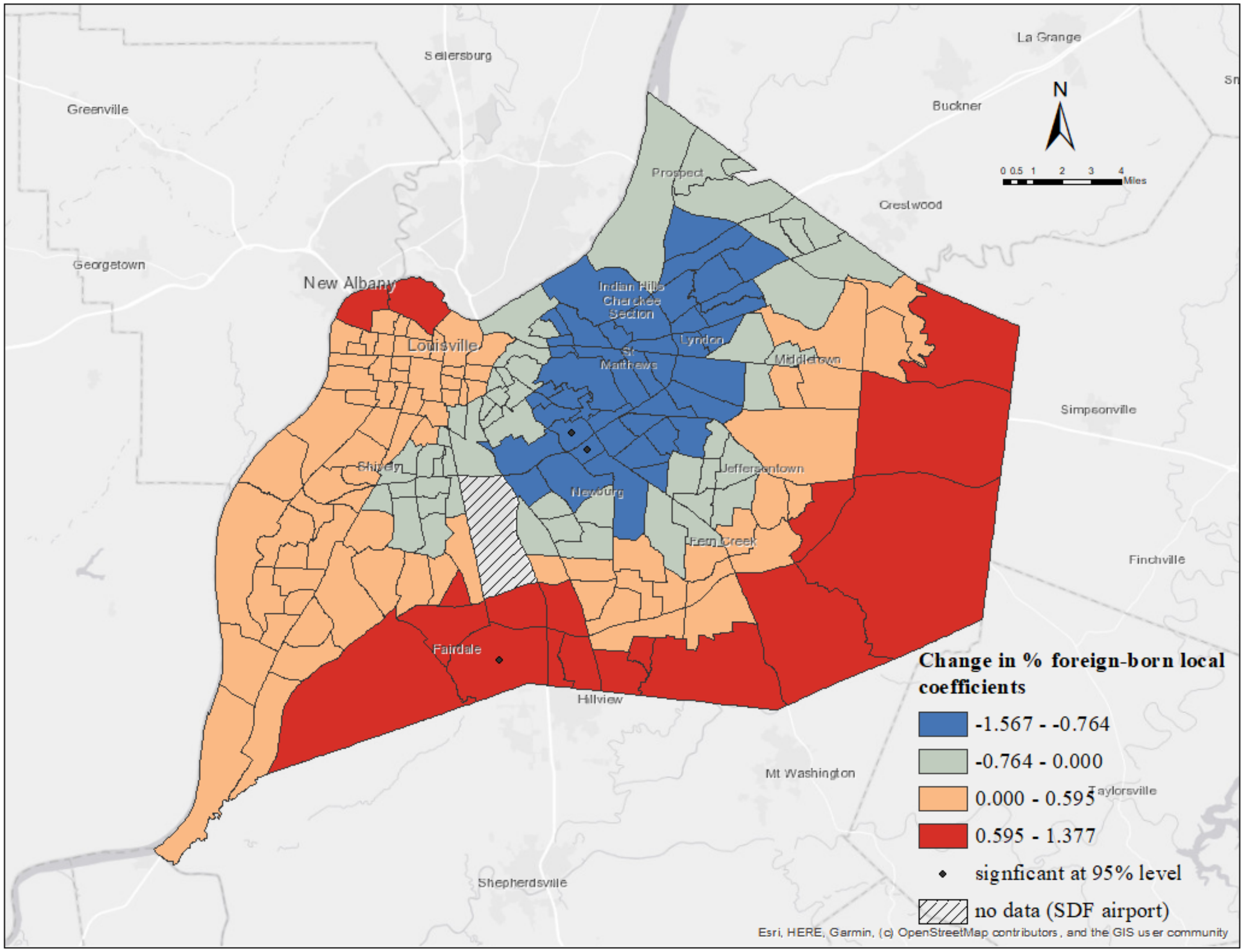

Figure 7. Local regression coefficients for the independent variable of foreign-born population across census tracts in geographically weighted regression (GWR) model for median home values

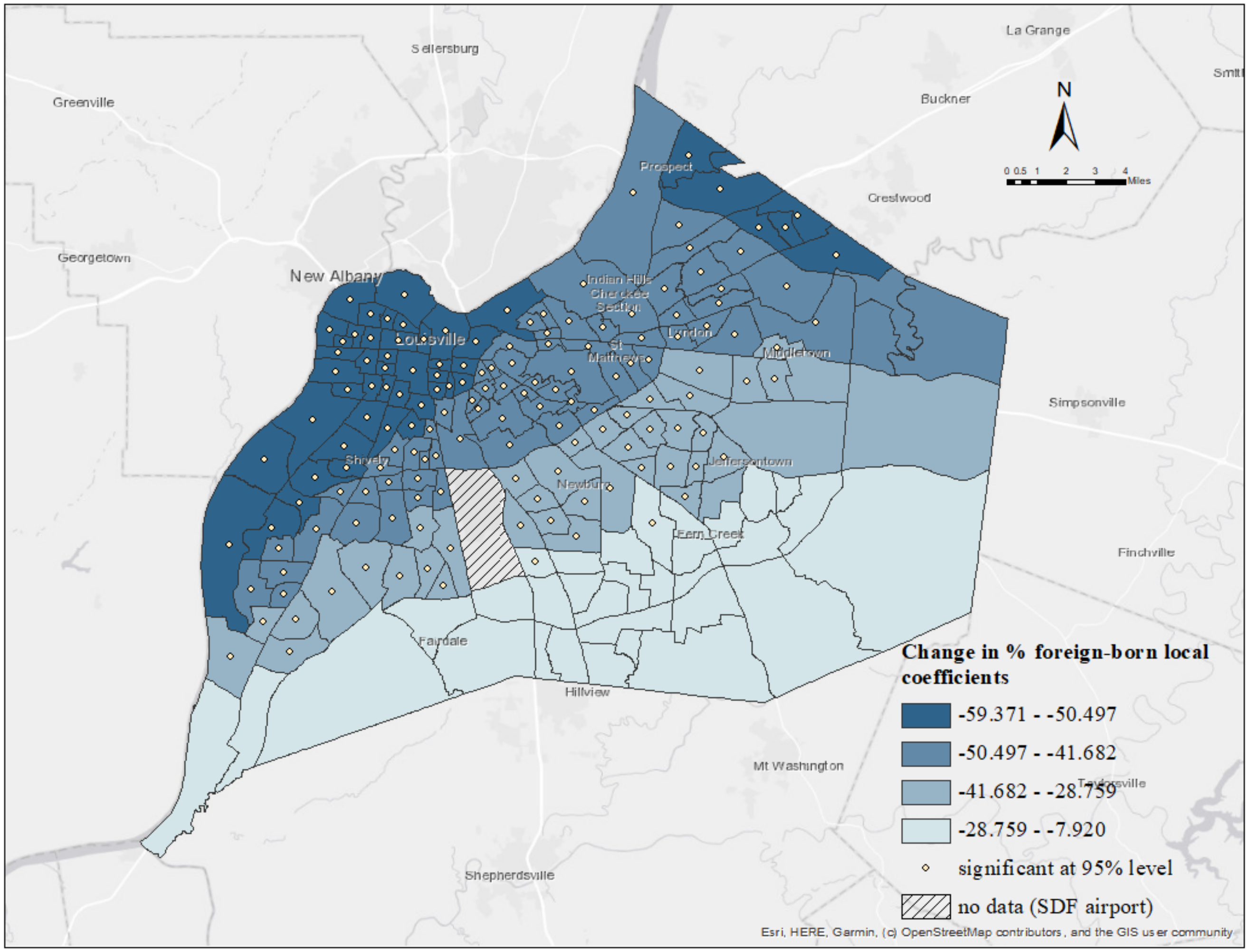

Figure 8. Local regression coefficients for the independent variable of foreign-born population across census tracts in geographically weighted regression (GWR) model for non-Hispanic White population

CHAPTER V: CONCLUSION

The geographical dispersion of immigrants across the country is the one of the most profile features of America's new demography. Although traditional destinations along the west and east coast continue to attract a large number of new arrivals, immigrants are increasing settling in new destinations, and non-traditional settlement neighborhoods in suburbia. A classic spatial assimilation perspective links the spatial incorporation with the socioeconomic incorporation of immigrants and argue for the "twilight of ethnicity" (Alba, 1981) and demographic integration (J. R. Logan & Zhang, 2010). This research project, however, points to signs that the dispersion of immigrants is not leading to greater residential integration. Supporting recent theories of segmented assimilation (Portes & Zhou, 1993) and racialized incorporation (Golash-Boza, 2006; J. C. Lee & Kye, 2016), it argues that new immigrants may continuously confront discriminations which cannot be fully explained by socioeconomic factors in the process of their adaption. That is, even immigrants achieve high socioeconomic status, they may still confront avoidance and exclusions from other high-socioeconomic-status white population. Racial/ethnic boundaries may be enhanced rather than dissolved.

In this research, an examination of the effects of immigrants on the housing market show positive residential outcomes of immigrants — immigrants motivate housing appreciation at county level, which also conforms to findings of existing literature at macro spatial scale (Mussa et al., 2017; Saiz, 2007). Importantly, the incorporation of spatial dependence suggests that this positive impact is constituted by spatial spillover effect of immigration, which may be further ascribed to residential segregation. Future studies should examine more critically the processes, not just outcomes, of immigration locational attainment. They should also pay attention to barriers confronting immigrants to translate their human capitals into housing appreciations.

Immigrant segregation is generated through the migratory behaviors of non-Hispanic white residents. This research analyzes the impact of immigration suburbanization on the white out-mobility. Results indicates that immigrants in suburban neighborhoods have a significant effect increasing the odds of white out-migration. Furthermore, results reject a racial proxy hypothesis and show that whites' departure from neighborhoods with growing immigrant concentration may be less a consequence of socioeconomic disparities but rather racially motivated (Kye, 2018; Lichter et al., 2010). Residential economic integration does not insure racial integration. It is important for future studies to assess the effect of racial/ethnic status, to investigate whether and how privileged groups of white population may be better positioned to leave diversifying neighborhoods and its impacts.

The immigrant effects on housing market and migratory responses of whites to immigration are differentiated by race and ethnicity of immigrants. This finding supports a segmented assimilation perspective that immigrant groups face different opportunities and obstacles due to their race, access to ethnic network, history of receiving communities and many other factors (Newbold, 2003; Portes & Zhou, 1993). The examination of broad racial/ethnical categories in this research may minimize differences among immigrant groups that can relate to their residential behaviors or their reception by host communities (Hall, 2013). As a result, the implications of findings for specific immigrant groups should be considered with caution until more fine-grained approaches disaggregated patterns of residential integration by immigrant groups within U.S. panethnic categories.

Finally, the case study of immigrants' effects on median home value and non-Hispanic white population in Louisville provides a more informative answer with the incorporation of spatial heterogeneity. Immigrant composition is a strong predictor of white population loss but its effect is spatially uneven. Particularly, socioeconomically advantaged suburban neighborhoods exhibit relatively larger white population loss relevant to immigration, which conforms to the decoupling of economic and racial residential integration purposed by previous literature (Friedman and Rosenbaum, 2007, Logan, 2014). Theoretically, findings on spatially differentiated responses to immigration point to pitfalls in current literature that often operationalize the suburbs as a single and undifferentiated entity. It is well beyond time to theorize the remaking of suburbia with rapid demographic and socioeconomic changes.

One extension of this dissertation research is to investigate the precise mechanisms underlying relationships among immigration, white out-mobility and housing prices. House price changes can be a consequence of both the out-migration of local residents and the in-migration of immigrants. Further analysis should attempt to untangle the effect of white population loss and the independent effect of immigration. Likewise, how does house price changes facilitate or attenuate migratory decisions of white population? The clarification about those connections is crucial to thoroughly understand immigrant residential integration.

Increasing immigrants and their geographic dispersion has been celebrated as new opportunities for immigrants to advance their social positions and for people to enjoy benefits from growth diversity. This research yet offers cautions for policy makers:

equality for immigrants cannot be achieved when policy makers rely on a traditional assimilationist perspective that views the socioeconomic mobility of immigrants as the root cause. structural racism may continue to reproduce barriers that deny immigrants and many other minorities' full entry into American Society. Policies that fundamentally address the long-last racial disparities in residential attainment and in other important domains are in much need.

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CURRICULUM VITA

NAME: Anqi Xu

ADDRESS: Department of Urban and Public Affairs
426 W Bloom St.
University of Louisville
Louisville, KY 40292

DOB: Chengdu, China – February 25, 1991

EDUCATION
& TRAINING: B.A., Resource & Environment Management
Sichuan Agricultural University
2009-2013

M.A., Land Use Planning
Sichuan Agricultural University
2013-2016

Ph.D., Urban & Public Affairs
University of Louisville
2016-2020

AWARDS
(SELECTED): Doctoral Dissertation Completion Award
University of Louisville Graduate School
2020

Graduate Student Traveling Award
University of Louisville Graduate Student Council
2020

Graduate Student Intermural Research and Creative Activities Grant
University of Louisville College of Arts & Science
2019

International Student Scholarship
University of Louisville International Center
2018

Student Traveling Grant
University of Louisville Department of Urban & Public Affairs
2017

Excellent University Graduate
Ministry of Education of the People's Republic of China
2013

National Scholarship
Ministry of Education of the People's Republic of China
2012

Chia Tai Scholarship
Chia Tai Group
2011

Yicong Huang Scholarship
Sinar Mas Group
2010

PROFESSIONAL SOCIETIES:

American Association of Geographers
Urban Affair Association
Southern Regional Science Association
Congress of the New Urbanism

PUBLICATIONS:

Xu, A., Zhang, C., & Ruther, M. Spatial Dependence and Spatial Heterogeneity in the Effects of Immigration on Home Values and Native Flight in Louisville, Kentucky. *Journal of Urban Affairs*. Forthcoming.

Gao, X., **Xu, A.**, Liu, L., Deng, O., Zeng, M., Ling, J., & Wei, Y. (2017). Understanding Rural Housing Abandonment in China's Rapid Urbanization. *Habitat International*, 67, 13-21.

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NATIONAL MEETING PRESENTATIONS (SELECTED):

"Making a Place for Space: Assessing Effects of Immigration on Housing Price Change in Metropolitan and Micropolitan Destinations," poster presented at the American Association of Geographers, April 2020 (*virtual conference*).

"Spatial Dependence and Spatial Heterogeneity in the Effects of Immigration on Native Out-migration in Louisville, Kentucky," paper presented at the Southern Regional Science Association, Arlington, VA, April 2019

"A Spatial Analysis of Foreign-born Population, Home Values and Native Flight in Louisville, Kentucky," paper presented at the Southeastern Division of Association of American Geographers, Johnson City, TN, November 2018

"Driving Forces of Rural Housing Abonnement in Southwestern China", paper presented the National Natural Science Foundation of China, Beijing, China, October 2012

INVITED PRESENTATIONS:

"Making a Place for Space: Assessing Effects of Immigration on Housing Price Change in Metropolitan and Micropolitan Destinations," Department of Geography, University of Nevada-Reno, March 2020.