ABSTRACT

THE GEOGRAPHY OF URBAN AMERICA: SHRINKING CITIES, RIGHT SIZING, AND NEIGHBORHOOD CHANGE

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Hundreds of U.S. cities, termed shrinking cities, suffered notable population loss during the period of 1910-2010. The effects of such urban depopulation range from minor problems associated with a weakened tax base or housing market, to major problems associated with widespread abandonment and dereliction. A shrinking city literature that began in the mid-2000s has grown significantly in recent years, however, it still struggles with defining which cities belong in the shrinking city discussion, how urban systems unfold within a shrinking city, and what strategies are best to put forth to rectify their problems. The objective of this research is to understand how multidimensional urban processes unfold in shrinking U. S. cities across different scales. Specifically, this research aims to 1) develop a better understanding of the types of shrinking cities in the U.S., 2) examine the efficacy of right-sizing strategies in an iconic shrinking central city, and 3) understand how neighborhood change spatially manifests in a metropolitan area anchored by a large central city. To achieve those goals, this dissertation conducted studies on shrinking cities at different scales by 1) developing a shrinking city typology to help differentiate and illustrate heterogenous clusters of shrinking cities, 2) analyzing the property tax foreclosure and auction process of the nation’s most iconic shrinking city, Detroit, and 3) examining the spatial patterns of variables associated with income ascent and
decline within the largest shrinking city in the country, Chicago. The typology model uses a Geographic Information System (GIS) and a K-means cluster analysis to identify seven types of shrinking cities in the United States: 1) Large Shrinking Central Cities, 2) Inner-Ring Suburbs of Shrinking Central Cities, 3) Outer-Ring Suburbs of Shrinking Central Cities, 4) Inner-Ring Suburbs of Growing Central Cities, 5) Outer-Ring Suburbs of Growing Central Cities, 6) Small Shrinking Central Cities in Small Metropolitan Statistical Areas, and 7) Small Shrinking Cities in Small Micropolitan Statistical Areas. The foreclosure model uses spatial autocorrelation techniques and a Geographic Information System (GIS) to assess whether Detroit’s foreclosure and auction process benefits the city and fits within its stated right sizing planning goals. The income change model used for the Chicago analysis employs a geographically weighted regression technique to determine the spatially varying effect of variables upon per capita income change within the neighborhoods and suburbs of Chicago. The seven clusters identified in the typology model provide a new perspective for addressing the problems faced by America’s shrinking cities, which could help inform solutions and strategies to address problems associated with population loss. The foreclosure analysis finds that the foreclosure/auction process currently operationalized in Detroit is inefficient relative to its stated right sizing planning goals. The Chicago examination found that 1) the areas that rose the most in per capita income relative to the overall Chicago metro area were the gentrified Chicago neighborhoods and sprawling southwestern suburbs, while the city’s inner ring suburbs declined the most, and 2) the use of GWR revealed hidden spatially varying associations between the explanatory variables and income change. It identified that the income change had 1) a stronger positive association with college education in the central city, distance to downtown in the suburbs, the percent of
Hispanics in the suburban fringe as well as a positive association with percent of African-Americans in the central city and western suburbs; 2) a negative association with female-led households everywhere except the northern suburbs and a stronger negative association with foreign-born population in the northern and southwestern suburbs.

By conducting multi-scalar investigations of urban processes across and within U.S. shrinking cities, this research contributes to the urban literature a deeper ontological understanding of what constitutes a shrinking city and how groups of shrinking cities can differ. It is worth noting how these multiscale results may intertwine. The shrinking city typology presented in this dissertation may help inform research at smaller scales by providing homogenized units of inputs of analysis. The lessons learned from problems in Detroit can be applied elsewhere to shrinking cities either to address budding similar problems, or in a preventative manner. The study of Chicago could provide insights into the spatially varying effects of gentrification and its associated factors within the metropolitan area of a shrinking city, revealing how neighborhood change evolves in American metropolitan areas generally, and in shrinking cities particularly.
THE GEOGRAPHY OF URBAN AMERICA: SHRINKING CITIES, RIGHT SIZING, AND NEIGHBORHOOD CHANGE

BY

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A DISSERTATION SUBMITTED TO THE GRADUATE SCHOOL IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE DEGREE DOCTOR OF PHILOSOPHY

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CHAPTER 1
INTRODUCTION AND BACKGROUND

1.1 Introduction and Research Objectives

The objective of this research is to examine some urban processes related to shrinking cities in America. Though many definitions exist in the urban literature the term ‘shrinking city’ generally refers to “urban areas that have experienced population loss, economic downturn, employment decline and social problems as symptoms of a structural crisis” (Martinez-Fernandez et al., 2012, 213). Shrinkage is often thought of as a Rust Belt or Manufacturing Belt problem in the U.S. However, shrinkage occurs throughout the U.S. and, indeed, on a global scale as well. Internationally since 1950, over 350 cities of over 100,000 in population have shrunk by at least 10% (Oswalt & Rieniets, 2007). Current projections indicate that many cities in Canada, Japan and Europe will suffer double-digit declines in population in the future (Hollander et al., 2009). Whether it be a post-socialist city in Eastern Europe, an old industrial center in Western Europe, or a mining town in East Asia, shrinkage can be found everywhere.

The causes of shrinkage are multifaceted and some are explored less in the literature than others. Pure arithmetic tells us that an area will lose population if the total fertility rate drops below 2.1, a demographic tenet that has afflicted most European countries as well as some countries in other regions (e.g., Japan, Korea) (Biswas, Tortajada, & Stavenhagen, 2018; Hollander, Pallagst, Schwarz, & Popper, 2009). Other cities shrink when the nearby resources that drive their economy become depleted. Still other causes include war, post-socialist
conditions and even natural hazards. But in the international literature, the more commonly cited causes of shrinkage include the “globalization of the economy, global financial flows and the internationalization of production processes” (Martinez-Fernandez, Audirac, Fol, & Cunningham-Sabot, 2012). In the United States, which is the focus of this research, many large cities began to decline in the 1950s as suburbanization took hold, fueled by new interstate highways and federal mortgage guarantees (Jackson, 1985). Later, as deindustrialization took root, cities that were largely dependent upon manufacturing or mining job shrunk when those industries closed or relocated. In fact, it is deindustrialization that is most discussed in the U.S. shrinkage literature because as Rieniets states: “Shrinking cities have been as much a product of the industrial age as growing cities (Rieniets, 2009, 233). Once central city decline had taken root in the U.S. by the 1960s, the literature developed an ‘urban crisis’ narrative to describe it, thus obscuring the ‘shrinking city’ narrative which would not emerge until the early 2000s (Mallach, 2017). Thus, shrinkage is not a new phenomenon, only the reluctant acknowledgment of it is.

The delay of academics and particularly policy makers to recognize shrinkage as a real process relates directly to the pro-growth paradigm that dominated planning in the industrial era. Embracing policies geared towards shrinkage rather than growth seemed unnatural. But after decades of urban decline and a shift to a service-sector economy, leaders and planners of shrinking cities were forced to adapt. So, while the “current discourse in urban and regional planning in the United States still displays a high affinity toward growth models”, shrinking cities are beginning to reverse the growth paradigm by planning for population loss instead (Pallagst, 2009). While acknowledgment of a problem is often seen as a first step, no consensus
exists on the appropriate strategies moving forward. It is in this vein that this research is conducted.

Shrinkage has been described a “multidimensional process, comprising cities, parts of cities or metropolitan areas that have experienced dramatic decline in their economic and social base (Pallagst et al., 2017). It is a complex problem occurring on multiple scales. Accordingly, the purpose of this threefold research approach is to examine some of the urban dimensions applicable to shrinkage across different urban scales. Under this purpose, this dissertation performs: 1) a Geographic Information System (GIS) along with a K-means cluster analysis to create a typology of shrinking cities at the national level; 2) a spatial analysis of Detroit foreclosure data that may help to better understand how to implement more effective policies than the current foreclose/auction system, and 3) an analysis of gentrification and income change in Chicago and its suburbs, not to determine cause, but rather to examine patterns of associated variables in both declining and growing areas. The conceptual framework for these three studies appears in the next section and is followed a brief description of the research goals and expected contributions of each study in the Summary section.

1.2 Conceptual Framework

1.2.1 Types of Shrinking Cities

The challenge of planning for urban shrinkage is the dearth of models about how urban systems are affected by population loss (Schilling & Logan, 2008). There is no consensus within the literature on how to manage municipal decline in a shrinking city because cities are dynamic spaces and no two are exactly the same. Furthermore, it is difficult to correct decades of decline
with even the most innovative policy goals. Research is needed to know what cities are declining as well as some of the common traits they share. Breaking a heterogenous group of shrinking cities into mildly homogenous clusters can help identify structural relationships, differences and commonalities across and within metropolitan regions.

The modern evolution of cities has led to great “complexity of urban processes” that make “the need for classification techniques, more important than before” (Reibel, 2011). Urban typology studies have been performed by Mikelbank (2004) on U.S. suburban places, Vicino et al. (2011) on urban immigrant neighborhoods, and Hanlon (2009) on inner-ring suburbs, among others. The shrinking city literature has grown tremendously in the past 15 years, yet a common definition has to be agreed upon and very little work has been done in examining the differences between shrinking cities. The large legacy cities like Detroit and Cleveland dominate coverage in the press and literature (Sugrue, 1996; Ryan, 2008; Hollander, 2013; Eisinger, 2014; Williams, 2014; Akers, 2015; Clement & Kanai, 2015; Dewar, Seymour & Drută, 2015; Ferretti, 2015; Gallagher, 2017a; among others), yet how do these cities differ from Flint or Gary? For one, the former two cities have been able to develop sports entertainment hubs in the downtown area, a strategy that is not available to the latter two cities due to their lack of professional sports teams. There are racial differences that matter as well. Legacy cities, the older and depopulated industrial towns, have populations “where African-American residents are usually both disproportionately poor and under-represented in the city’s circles of power” (Mallach & Brachman, 2013). This contrasts with shrinking cities in Appalachia and other more remote urban areas whose population is mostly white.
1.2.2 Right Sizing Strategies for a Shrinking City

The term right sizing is traced to Schilling and Logan (2008), but other terms are used as well, such as smart decline, smart shrinkage and legacy cities. Typically, right sizing calls for strategies involved with demolition and blight removal, preservation of open green space, management of vacant land, and promotion of urban agriculture. The reasoning behind right sizing is that the population of many shrinking cities is only a fraction of what it was say in 1950, the peak population year for many cities, such as Cleveland, Detroit and others. Yet, city governments must provide costly services across the same square mileage since the city has only shrunk in population, not size. Hence, the term right sizing, its purpose is in “preserving neighborhoods where market activity is still taking place, while preparing vacant land in other areas for new uses” (Vey, Bradley & Austin, 2010). Morkel (2016) analyzed demolitions within the city of Buffalo and developed an empirical model to prioritize demolitions within the city. Shrinking cities must adapt a paradigmatic shift towards viewing “urban land as a key asset for curbing wasteful, inefficient land use patterns, maximizing their built and natural assets, and ultimately spurring economic growth (Vey, Bradley & Austin, 2010). Within this context, Chapter 3 takes a similar approach towards the analysis of a right sizing strategy in Detroit, the property tax foreclosure and auction process.

1.2.3 Neighborhood Change in a Shrinking City

The Chicago metro area experienced massive sprawl during the 1990-2010 time period of this study as the urban fringe continued ever outward. At the same time, gentrification was occurring within the city while some other areas were declining. The third part of this research examines neighborhood change and gentrification at a metropolitan level in Chicago. Specifically, it uses Geographically Weighted Regression (GWR) to investigate the spatial
dependence of gentrification and its explanatory variables, which are related to age, race, ethnicity, education, nativity, distance from downtown, housing stock, and household type. The gentrification literature is deep and muddled, but to frame the examination, this research uses the foundational theory of invasion and succession put forth by Burgess (1925) and Hoyt (1939), which is pertinent not only because of its tested explanatory power, but also because Chicago was the original setting for the theory’s development. The research also relies upon the classical tipping point theory proposed by Farley et al. (1978), which is applicable to a variety of class and socio-cultural groups. This research is particularly interested in following up upon recent research holding that “racial integration that satisfies particular thresholds is the norm, at least in Chicago, before meaningful reinvestment takes place” (Hwang & Sampson, 2014). This portion of the overall research contributes to the literature by examining the spatially varying pattern of gentrification and its explanatory factors across a metropolitan region, an area currently lacking in the literature. It also contributes by using a methodology that incorporates both central city and suburbs into the analysis, rather than solely examining the former as most studies do.

1.3 Significance of the Study

In order to unravel some of the dimensionality surrounding the issues of shrinking cities, this dissertation presents three different studies about shrinking cities in the U.S. The main contributions of these studies are as follows:

The first part of this dissertation, contained in Chapter 2, examines shrinkage at the national scale. It aims to contribute to the definitional confusion extant in the literature as to what actually composes a shrinking city, while also providing insight into whether shrinking cities in the U.S. can be categorized into smaller, homogeneous subgroups. In doing so, this
portion of the research asks whether shrinking cities differ and if so, how. These questions are answered by implementing a typology meant to deconstruct some of the demographic and spatial characteristics inherent within each shrinking city. While this portion of the research does not intend to solve definitional debates about shrinking cities, it does hope to contribute to a better empirical understanding of how shrinking cities differ so that policies may adapted accordingly.

The second part of this dissertation, contained in Chapter 3, examines shrinkage on an intra-city scale using the City of Detroit for it study area. Specifically, it examines the spatial manifestation of property tax foreclosures within the framework of the city’s stated right-sizing plan. Right-sizing is a shrinking city strategy that manages space according to current population levels, rather than hoped for future levels and in opposition to past growth strategies. Detroit has acknowledged that traditional growth policies are ineffective given its severe decline. Therefore it has adopted planning measures to address shrinkage. This research provides an empirical examination of whether an unwanted but inevitable process in a shrinking city, the auction of foreclosed properties, is managed in a way that aligns with its plan to manage shrinkage. This research will help not only inform policy but also contribute to the understanding and discussion of right-sizing processes in the literature.

The third part of this dissertation, contained in Chapter 4, examines neighborhood change and gentrification in the communities and suburbs of the largest shrinking city in America, Chicago. This research is scaled at the metropolitan level and asks whether there are associations between gentrification, using per capita income change as a proxy, and commonly used explanatory variables found in the gentrification and urban resurgence literature (Kolko, 2007; Voorhees Center, 2014; Furman Center, 2015; among others). Specifically, the
explanatory variables relate to age, race, ethnicity, human capital, immigration, family status, housing, and distance to the central business district. The dissertation also asks whether these variables exhibit spatial variation across the study area. Understanding the spatial patterns of gentrification and neighborhood change in a shrinking city can inform shrinkage planning policies. This research contributes to the literature by examining, perhaps for the first time, the spatially varying effects of gentrification and its associated factors across a metropolitan area. To the author’s knowledge, no gentrification studies have attempted to model such non-stationarity. This study also contributes by using a methodology that incorporates both central city and suburbs into the analysis, rather than solely examining the former as most studies do.

The concept of scale is often key in geographic inquiry. It is particularly so with this research. Urban shrinkage begins at the global scale and filters downward. Globalization and the international reallocation of both production and labor have produced widespread consequences across towns, cities, and regions as they either benefit from these shifts or are forced to adjust. This research jumps in to examine the latter group, beginning at the national scale in the U.S. Specifically, it seeks to deconstruct the heterogeneity inherent across America’s 367 shrinking cities, as delineated by the author from measures of population loss and economic decline, to produce more homogenous sub-groups. In so doing, discovered knowledge about group differences, be they stark or nuanced, can be used by planners, policy makers and academics to create more effective policy at the local level. However, it is not merely horizontal scale that is operationalized in the shrinkage process, vertical scale interactions unfold as well.

Individual case studies of urban shrinkage, as with those conducted in Chicago and Detroit here, can help “align the research agenda on urban shrinkage with general strands of
research in urban and regional studies” (Großmann, Bontje, Haase, et al., 2013). A component of this research studies gentrification and neighborhood change across the metropolitan region of Chicago. Most gentrification studies use only a central city for its study area, however, “suburban disinvestment has been identified by a number of scholars as part of a pervasive process of metropolitan restructuring” (Martinez-Fernandez, Audirac, Fol, & Cunningham-Sabot, 2012). By examining intra-metropolitan neighborhood change, this research gives nod to the work of Hanlon (2009) and others who have documented the decline of inner-ring suburbs and found uneven patterns of growth and shrinkage across metropolitan areas. This research also recognizes that gentrification occurs in both growing and shrinking cities. In a large shrinking city like Chicago, the displacement produced has been experienced first-hand by many residents and they fear it. In Detroit, gentrification processes have yet to take root within the older established neighborhoods, yet the residents still fear it. Though not directly the purpose of their research, Großmann, Bontje, Haase, et al., (2013) asked if shrinkage fosters or hinder gentrification and whether gentrification is an unavoidable cost of re-urbanizing shrunken central city neighborhoods. While this research will not weigh in directly on those questions, its focus upon the spatial patterning of gentrification may help others to weigh in.

The scale of devastation in Detroit brought about by population decline had made it the iconic American example of an American shrinking city. Detroit’s decline is so severe that one may wonder if it is the right laboratory for conducting shrinkage research due to concerns of generalizability. But in fact, some scholars have argued just the opposite about studying Detroit:
Phenomena that researchers might overlook elsewhere are pushed to the surface, making them and their significance more evident. In this regard, Detroit serves as an “extreme” case – an unusual circumstance whose study allows researchers to develop a richer, deeper understanding of hard-to-observe phenomena. What researchers learn in Detroit they can then test in other places. (Dewar et al., 2015, 7)

1.4 Organization of the Dissertation

This research contains three related component studies and is organized as follows. Chapter 2 develops a typology of U.S. shrinking cities to understand differences across and within sub-clusters. Chapter 3 examines foreclosure data within Detroit to investigate whether its auction process helps or hinders its right-sizing planning goals. Chapter 4 uses a Geographically Weighted Regression model to better understand the spatial patterns of neighborhood change and gentrification in the metropolitan area of Chicago, America’s largest shrinking city. Finally, the conclusions, contributions, and integrative summaries of this research are discussed in Chapter 5.
CHAPTER 2

A TYPOLOGY OF U.S. SHRINKING CITIES

2.1 Abstract

The literature on shrinking cities has significantly grown in recent years. However, little work has been done towards the development of a shrinking city typology, which could help inform solutions and strategies to address problems associated with population loss. With a focus upon central cities, this article identifies 367 shrinking cities within the United States and categorizes them using a Geographic Information System (GIS) and a K-means cluster analysis to identify seven types of shrinking cities in the United States: 1) Large Shrinking Central Cities, 2) Inner-Ring Suburbs of Shrinking Central Cities, 3) Outer-Ring Suburbs of Shrinking Central Cities, 4) Inner-Ring Suburbs of Growing Central Cities, 5) Outer-Ring Suburbs of Growing Central Cities, 6) Small Shrinking Central Cities in Small Metropolitan Statistical Areas, and 7) Small Shrinking Cities in Small Micropolitan Statistical Areas. The empirically generated clusters, combined with associated social and demographic information, identify at-risk (and “not-at-risk”) city types and provide a new perspective for addressing the problems faced by America’s shrinking cities.
2.2 Introduction

Though various definitions exist, a shrinking city “can be characterized and measured based on population loss” (Rieniets, 2009). Beauregard (2009) states that the term shrinking cities refers to population loss, rather than geographic compression. Thus, for example, the cities of Detroit, MI and Coronado, CA can both technically be loosely defined as ‘shrinking cities’ since their current populations are below their peak census-year highs. However, the problems posed by Detroit’s population loss are vastly different from Coronado’s, if indeed the latter can even be considered to have problems associated with its population loss. This nuanced difference lies behind the motivation for this study.

Fortunately, many large American central cities enjoyed historical peak population levels during the 2010 Census enumeration (listed in terms of population size): New York City; Los Angeles; Houston; Phoenix; San Antonio; San Diego; Dallas; San Jose; Jacksonville; Indianapolis; San Francisco; Austin; Columbus; Fort Worth; Charlotte; El Paso; Seattle; Nashville-Davidson; Denver; Louisville; Portland; Las Vegas; Oklahoma City; and Albuquerque. As such, those cities are not considered in this study. However, many other central cities, among those that are considered herein, were well off their peaks in 2010. Many central cities peaked in population during the census year of 1950. The cities of Chicago, Philadelphia, Detroit, Baltimore, Boston, Washington (DC), Cleveland, Minneapolis, St. Louis, Pittsburgh, Cincinnati, Buffalo and Rochester reached their all-time population peaks in that census year. Hollander et al. (2009) succinctly provide an overview of America’s shrinking city problem. They note that large-scale shrinkage of large and medium-sized American cities began soon after World War II when the cities of Buffalo, Cleveland, Detroit, Pittsburgh and St. Louis
lost more than half their population; Baltimore and Philadelphia nearly a third; and scores of smaller cities went reeling from population decline. According to Hollander et al. (2009), the main causes of urban shrinkage in the U.S are suburbanization, the post-industrial shift from manufacturing to service industries, and the resultant unemployment increases. Vey (2007) eloquently describes the plight of certain American central cities:

While many of these cities have strong pockets of real estate appreciation and revitalization, on the whole they remain beset by slow (or no) employment and business growth, low incomes, high unemployment, diminishing tax bases, and concentrated poverty—remnants of five decades of globalization and technological change, and the dramatic shift of the country’s population away from the urban core. (Vey, 2007, 4)

It should be stated at that outset that there exists a large literature addressing urban shrinkage both in the U.S. and abroad. A large part of the international discussion has centered on the collapse of former socialist regions in Europe and Central Asia. For example, the decline of cities in former East Germany such as Dresden and Leipzig, have received much attention. However, just as with the U.S. literature, the international literature is also replete with examinations of the relationship between deindustrialization and urban shrinkage, particularly in the United Kingdom which was the birthplace of the Industrial Revolution.

Hollander et al. (2009) analyzed the issue of urban shrinkage by examining it causes, assessing the recent literature, and proposing opportunities for future research. The authors noted that urban shrinkage is not just an American Rust Belt phenomenon: “Over the last fifty years, 370 cities throughout the world with populations over 100,000 have shrunk by at least 10% (198)”. Evidence of widespread urban shrinkage is apparent in the deteriorating economic and
population trends which have afflicted not only the U.S., but Canada, Europe and Japan as well. Though Hollander et al. (2009) focuses primarily upon U.S. cities, they include ample discussion directed toward their German counterparts. The German causes of shrinkage are more complex than those in the U.S., since they often entail post-socialist issues not applicable to U.S. studies. After the 1990 German reunification, unemployment rates of over 20% in former East German cities fueled a massive wave of migration westward. Some European research has examined how these former communist cities adjusted to their shrunken population base, but the results have been largely ignored in the United States: “These discussions take place in German (amongst) the German intellectual elite, with few links to other countries’ scholars or policymakers” (Hollander et al., 2009, 226). Notwithstanding the strong international literature on urban shrinkage, the focus of this research is exclusively upon the manifestation of shrinkage within the U.S. and any references made herein to “the literature” refers primarily to the U.S. literature discussion.

The literature on shrinking cities has significantly grown in recent times (Martinez-Fernandez et al., 2012). However, little work has been done towards the development of a shrinking city typology, which could help inform solutions and strategies to address problems associated with population loss. The process of city shrinkage does not “follow a basic homogenous pattern” (Rieniets, 2005). Thus, the purpose of this research is to help disentangle those patterns by developing a comprehensive inventory of shrinking cities and classifying them according to measures of income, race and ethnicity, education, city size, immigration and employment. The results are expected to help clarify which cities meet the spirit of a defined ‘shrinking city’ as well as those whose inclusion only serve to confuse the definition.
This article identifies 367 ‘shrinking cities’ in the United States. These are cities with populations that had ever reached 25,000, but whose 2010 population level was below that of any prior decennial census year. In addition, these 367 cities have experienced economic decline. This research employs a two-step methodology to identify different types of shrinking cities. Specifically, it uses a Geographic Information System (GIS) along with a K-means cluster analysis to identify types of shrinking cities in the United States. The empirically generated clusters, combined with associated social demographic information, may provide a new perspective for addressing the problems faced by America’s shrinking cities.

This paper is divided in six sections. Section 2 contains a literature review which examines the definitional aspects of the term shrinking cities, as well as a theoretical overview of depopulation. Section 3 discusses the data and methodology, Section 4 analyzes the results, followed by a discussion in Section 5. Finally, Section 6 summarizes the findings and discusses directions for future studies.

2.3 Literature Review

2.3.1 Definitions of a Shrinking City

Separate from the term shrinking city is a term also found in the literature, “legacy city”. Legacy city is used to describe cities that “have experienced profound social and economic disruption as a result of fundamental shifts of the global economy in recent decades, and policy decisions made at the local, state, and federal level” (Legacycities.org, 2017). Legacy cities are defined as those cities having “lost between 20–70% of residents since their mid-century population peak … where African-American residents are usually both disproportionately poor and under-represented in the city’s circles of power” (Mallach & Brachman, 2013). A common
affliction of legacy cities is the high number of vacant housing units that only seem to increase over time. These cities are often the central cities of major metropolitan areas and were once powerful manufacturing and industrial centers during the height of America’s industrial revolution. Though an official list of legacy cities does not exist on their web site, Legacycities.org defines them as “older, industrial urban areas that have experienced significant population and job loss, resulting in high residential vacancy and diminished service capacity and resources” (Legacycities.org, 2017).

The literature contains many definitions of a ‘shrinking city’, yet a clear definition of the term has yet to emerge. A common definition found in the literature comes from The Shrinking Cities International Research Network (SCiRN) which defines a shrinking city as “a densely populated urban area with a minimum population of 10,000 residents that has faced a population loss in large parts of it for more than two years and is undergoing economic transformations with some symptoms of a structural crisis” (Wiechmann, 2006; Hollander et al., 2009). Hollander (2011) conceptualizes shrinking cities in his research in terms of population loss from one American Housing Survey period to the next. Schilling and Logan (2008) also use the long-term to define shrinking cities as urban centers that have suffered heavy population losses (25% over 40 years) and blight. Beauregard (2009) analyzed shrinking cities geographically and measured them in terms of “prevalence, severity, and persistence.” Still other definitions include “significant population loss” (Rieniets, 2005; Beauregard, 2013) and “economic decline” (Pallagst, 2007). A more long-term definition states that shrinking cities are “urban areas (cities and towns) or regions (system of towns) that over the past 40–50 years have experienced population loss, employment decline or/and protracted economic downturn until very recently” (Reckien &
Martinez-Fernandez, 2011). The definitional view of Reckien & Martinez-Fernandez (2011) is used herein, specifically, this research identifies 367 U.S. cities that have both lost population and have had their poverty rate increase over the period 1980 to 2010.

2.3.2 The Causes of Shrinking Cities

According to Hollander et al. (2009), the main causes of urban shrinkage in the U.S are suburbanization, the post-industrial shift from manufacturing to service industries, and the resultant unemployment increases. However, the rise and fall of central cities, and some of their suburbs, are only partly explained by shifts from manufacturing to services industries. Other theoretical explanations exist for uneven regional development and the phenomenon of shrinking cities, such as path dependence, agglomeration economies, and industrial structure. The remainder of this literature review touches on these theoretical concerns.

2.3.3 Suburbs as Shrinking Cities

Unfortunately, the problems of urban shrinkage afflict not only central cities but suburbs as well. A review of historical census data reveals that while 1950 represents the peak year for a number of larger central cities, many smaller shrinking suburbs (population > 25,000) peaked in the census year of 1970. Kenneth Jackson’s *Crabgrass Frontier* (1985) provides a sweeping chronological account of the American suburbanization process from the early nineteenth century to the late twentieth century. As an urban historian, Jackson’s focus is on the decentralization, and later de-concentration, of American cities. Jackson describes how mass transit facilitated suburban growth in the 1800s and how the automobile played a similar role, though to a much larger extent, in the 1900s. He also reveals how cheap land and the assembly line techniques of Fordism were applied to housing construction in order to enable the masses to
acquire the American dream of home ownership. But perhaps his most powerful analysis lies in his treatment of the federal government’s role in facilitating suburban home ownership, which thereby fueled suburban growth through road development, mortgage subsidies and income tax credits. This combination of federal assistance along with America’s drive-in culture created the massive scale of suburban sprawl which has come to uniquely define twentieth century America. Jackson attributes suburban growth to problems associated within the city core, rather than the ideological allure of the suburbs themselves. He asserts that when the problems of the city are viewed alongside the transportation and financial infrastructure put in place by the government, the development of suburbia was inevitable.

While Jackson’s work provides a compelling and multidimensional account of American suburbanization, it is mainly applicable to a defined period, not defined locations. More recently, a general agreement has developed among urban scholars regarding a newer understanding of suburban history that has yielded the following stylized facts: 1) there is considerable diversity within and among suburbs, 2) the distinction between city and suburb is now often muddled and 3) the suburban myth of the American Dream is open for definitional debate and question (McManus and Ethingon 2007, 326). Using these assumptions as a foundation, a new research agenda has developed acknowledging that the age of many suburbs is only slightly different from their orbit city and, furthermore, that continued suburban expansion has now placed many suburbs closer to the central city than to the fringe (Hanlon, 2009, among others). As a consequence, while headline-making population declines such as Detroit’s consume the popular shrinking city discussion, the fact that most of America’s shrinking cities are in fact ‘suburbs’ goes largely unnoticed except among urban scholars. A shift in the
literature has occurred which moves beyond a suburb’s founding, its remote setting, and its appeal towards those seeking the American Dream, to alternatively examine the broader aspects of its location (relative to central cities, surrounding suburbs and the metropolitan region as a whole). Hanlon (2009) made a contribution to this evolving literature with a taxonomic examination of inner-ring suburbs and this paper borrows from her methodology in identifying and classifying shrinking cities, amongst which many suburbs are included.

2.3.4 Early Industrial Growth

Manufacturing began clustering in the late 1800s but later started de-concentrating in response to falling transportation costs, rising land costs and globalization, so as manufacturing firms spread out to the hinterlands in search of cheaper land, the services industries began agglomerating within the larger cities (Desmet & Falchamps, 2005). The concept of how U.S. industrial structure developed regionally begins with geographic concepts of spatial development as described by Cronon (1991). First-nature geography, Cronon states, is concerned with the physical geography of an area and can be considered a determinant of the location decisions made regarding early economic centers as with, for example, the initial development of St. Louis or Cincinnati as river trading posts. However, as time evolves, first-nature geography quickly loses its explicative power relative to industrial development and second-nature geography takes over, which concerns itself with the actors and agents involved in geographic space. Moving on from Cronon, Krmene and Esparza (1999) detail the history of U.S. industrial structure and in so doing explain the causality of divergent economic regions. They argue that the diffusion of industrialization, which had spread to the Northeast and Midwest regions of the United States by the mid-19th century, did not take hold in the southern and western states. They cite Meyer
(1983) to explain that the lack of population density in the rural south, and the dominant market mechanisms already in place in the north, prevented the diffusion of industrialization to the South. A map of American industrial locations in 1929 is shown in Figure 1. It is worth noting here that a current map of large American shrinking cities would be almost indistinguishable from this map, which was first published in 1936 (Hartshorne, 1936). As for the Western U.S., Krmenec and Esparza (1999) state that the mountain ruggedness, expansive aridness, and lack of navigable waterways prevented industrialization from taking hold there. As the country grew, the lack of industrialization within the West and South served to amplify the industrial significance of the Northeast and Midwest, and launched their trajectories as the current home for most of America’s shrinking cities.

Figure 1. Location of manufacturing cities, 1929 (Hartshorne 1936).
2.3.5 Deindustrialization

The industrial complexes of the Midwest and Northeast, with their dependence upon manufacturing, continued to flourish for decades until reaching their apex during the Fordist period of the 1940s-1960s. What followed, is best described by Thomas Lassman:

By the 1970s, the American economy was in the midst of a wrenching transformation that eviscerated once-venerable manufacturing industries on a scale not seen since the Great Depression. The extent of the wreckage was unprecedented, as Pittsburgh, Buffalo, Detroit, Baltimore, and scores of other communities across the country experienced plant shutdowns and massive employee layoffs. No longer able to compete effectively in an increasingly global economy dominated by more nimble foreign firms, American producers of steel, automobiles, and other capital-intensive goods closed aging factories and shifted their resources to new locales outside the Rust Belt. (Lassman, 2005, 350)

Deindustrialization had taken full hold by the 1980s. The determinants of deindustrialization have been oft studied, but the primary determinants might be best summarized as the effects of globalization, technological change, and the decline of the unions (Green & Sanchez, 2007). Many firms in the North either closed, moved to the South, or relocated overseas in an effort to remain competitive. Commonly used reasons offered for the decline of the Northeast and Midwest in favor of the Sun Belt include the lack of unions, lower wages, better weather, and a more pro-business climate (Crandall, 1988). Another reason for the rise of the South and West beginning in the 1980s, and the decline of the industrialized Northeast, is provided by Trubowitz (1998). Trubowitz eloquently argues that those three regions have historically jockeyed for economic power by consolidating their political power during three important periods: the 1890s, 1930s and 1980s. In the 1890s, the West and industrialized Northeast teamed up against the South to institute an expansionist foreign policy inviting foreign trade. In the 1930s, the agrarian South and urbanized Northeast favored
internationalism versus the protectionist policies of West and its large domestic export market. Finally, as deindustrialization took root in the 1980s, the West and South teamed up against the deindustrialized Northeast to promote expansionism rather than retrenchment. Since the 1980s, regional hegemony in the U.S. has accrued to the South and West to the detriment of the Northeast.

Historically, as noted by Green and Sanchez (2007), manufacturing had provided the middle-class opportunities for upward mobility, and had supported agglomerated economies with its multiplier effects. While cities may have morphed from manufacturing centers to service centers, Green and Sanchez (2007) remind us that the manufacturing sector still pays an important role within the U.S. economy. Further light on this topic is shed by Hanson (2001) when he states that while the death of manufacturing plants may feed the decline of a particular region, the birth of new plants helps recreate a new cluster in a different region, proving that second-nature agglomeration processes have replaced a region’s first-nature endowments as the primary determinant of firm locational choice.

2.3.6 Path Dependence

Economic development does not evolve evenly over space (Krugman 1995) and this differential development can often be traced to a city’s past, and more specifically to a concept termed path dependence. The geographic concept of path dependence is used to help describe the evolutionary process of unequal economic development involving places that are unable to escape its past (Martin & Sunley, 2006). While examples of evolutionary path dependence abound, perhaps none is more notable for purposes herein than that of Henry Ford’s decision to locate his auto manufacturing plant in the Detroit area, a decision that reverberates still today.
However, it is important for researchers to go beyond the mere description of a city’s path dependence and into the analytics of forward strategies. Musterd et el. (2007) suggest research into four “dimensions” of a city’s path dependence: 1) an economic dimension which analyzes how a city can adapt to current macro-level trends given its current economic structure, 2) a socio-demographic dimension which considers a city’s current population composition and the challenges and strengths it presents for city growth, 3) an institutional dimension which evaluates a city’s organizations (governments, trade associations, large companies, and universities) and the prevailing norms and values of those institutions along measures of innovativeness, entrepreneurialism, progressivism or conservatism, and 4) a built environment dimension which seeks to find out how current city structure, layout, transport infrastructure, housing stock and public spaces might affect future development. In the final analysis, no matter their particular histories, some cities have adapted well and others have found it difficult to adapt the economic structures from manufacturing to service based. So, while history is important in explaining a city’s present and its possible path forward, it is important to remember that path dependence is not historical determinism; choices are made along the way (Wilsford, 1994). Within the literature, the theoretical gap left by considering path dependency is often filled with the theory of agglomeration economies.

2.3.7 Agglomeration Economies

Agglomeration economies is a term used in economic geography to describe the clustering processes underlying regional development and can be operationalized at scales ranging from local to regional in context. Within the literature, its origin is usually traced to Alfred Marshall (1890), who cited three external economies resulting from the clustering of
firms around specific locations: (1) lower transportation and transaction costs arising from improved access along the supply chain; (2) access to a large and qualified labor pool as well as a shared public infrastructure; and (3) knowledge and innovational spillovers resulting from the increased informational exchange between persons within close proximity of each other. Marshall’s work, and its many derivatives, have proven quite durable over the years and remain quite useful for explaining the unevenness of economic development across regions.

Rosenthal and Strange (2004) point out that 75% of Americans within the contiguous U.S. live in cities which in aggregate accounts for only 2% of U.S. land area. This aggregation of industry, capital and labor is manifested in numerous clusters across the country, for example; furniture in North Carolina, high-tech in Boston, software in Silicon Valley, wine in Napa Valley, and autos in Detroit, to name but a few (in fact, according to Kolko (1999), the high-tech service sector requires agglomeration in order to be near a qualified labor pool). Since agglomeration economies have been found to be the driving forces behind the growth of large cities and regions, (Fujita et al., 1999; Scott, 2001; Melo et al., 2009), the existence and location of these clusters play a significant role in which cities grow or shrink. However, while a city’s human capital pool, in tandem with the existence of a beneficial agglomeration, has a lot to do with whether it ultimately grows or shrinks, the role that agglomeration economies plays can be hard to distinguish. Why? Because while agglomeration effects can drive the growth of large cities, not all large cities grow. A paradox thus exists, whereby larger cities enjoy superior efficiency relative to smaller cities, however, “the possible drivers of efficiency increases for each city size, especially in terms of the capacity to change a city’s internal characteristics which may act as structural constraints on its growth” (Camagni et al., 2016
Even in the midst of desirable agglomeration effects, the population growth of certain cities may remain unaffected due to spatial mismatch - the separation of the segregated minority poor from decentralized job opportunities (see Kain, 1968; Kasarda, 1995; Mouw, 2000). The Spatial Mismatch Hypothesis (SMH) was first formulated by Kain in 1968 (Sultana, 2005). The original discussion of SMH centered on the disparity between minority workers located in the central city and the ever expanding job market in the suburbs (Painter et al., 2007). SMH contends that low-skilled minorities residing in central cities are disadvantaged from procuring suburban job opportunities owing to the decline of entry-level jobs in the inner cities, but also the inability of the inner-city poor to gain access to suburban jobs. Factors compounding the SMH effect have been studied as well, such as the lack of 1) public transportation infrastructure (Ong & Miller, 2005) and automobile access (Taylor & Ong, 1995). Reckien & Martinez-Fernandez (2011) extended the SMH discussion to shrinking cities, noting that to tackle the SMH dilemma shrinking cities must bring service sector as well as industrial jobs to their areas. As mentioned before, many central cities peaked in population during the census year of 1950. Gobillon et al. (2007) note that in that same year, 1950, central cities contained nearly 70% of metropolitan area jobs, a figure that had dropped to merely 40% by 2000 (as measured in the top ten metro areas, excluding centralized New York City). Detroit is a prime example of the SMH dynamic where “an imbalance between available jobs and skills of central city residents, together with the spatial, racial, and skill barriers to distant suburban labor markets, all conspire against African-American employment” (Silver, 2015). Suburban Detroit has grown remarkably since 1950, while the city itself has lost over a million residents. While Detroit represents an extreme of SMH, in actuality, the relationship between growth in the central cities and their suburbs is more
nuanced, with Leichenko (2011) finding that “suburban growth promoted city growth during the 1970s and 1980s, while city and suburban growth were jointly determined during the 1990s” (p. 322).

2.4 Data and Methodology

2.4.1 Data

The dataset for this study was compiled from the Minnesota Population Center (2018) which provided data from the decennial U.S. census enumerations of 1790-2010, and the American Community Survey 5-year estimates for 2011-2015 (U. S. Census Bureau. 2018). Shrinking cities can be measured in the United States “by comparing the most recent population data (2010 census) to earlier censuses holding the geographies constant” (Cox 2014). The methodological approach used in this paper begins with this measurement. The list of shrinking cities used here was derived from an initial dataset of 1,600 U.S. cities that had ever reached 25,000 people as counted by the U.S. Census during the decennial periods 1790 – 2010. Culling from that list, 420 cities were identified that experienced a population peak before 2010. However, population loss alone does not qualify for shrinking city status since population decline must be accompanied by “employment decline or/and protracted economic downturn” (Reckien & Martinez-Fernandez, 2011). Thus, to operationalize the definition and yield a final qualifying count, the list of 420 cities was queried in a GIS to eliminate 1) those having a median household income above $54,000 or a poverty rate below six percent, and 2) those which experienced a decline in poverty rate since 1980. This query produced a list of 367 qualifying shrinking cities.
2.4.2 Using GIS to Develop Shrinking City Clusters

Census data for the 367 shrinking cities were entered into a GIS. The United States Office of Management and Budget (OMB) delineates metropolitan statistical areas (MSA) and micropolitan statistical areas (µSA) according to published standards that are applied to Census Bureau data. The term core based statistical area (CBSA) is a collective term for both MSAs and µSAs. An MSA contains a core urban area of at least 50,000 people, while an µSA contains an urban core of at least 10,000, but less than 50,000, population. Because of their importance, the initial methodological focus here was to identify which of the 367 shrinking cities were considered central cities. The OMB designates the largest city in each MSA as a central city, with additional cities qualifying for this designation if specified requirements are met concerning population size and commuting patterns. Using OMB central city designations, the GIS identified 139 of the 367 shrinking cities as central cities. This central city grouping was then decomposed into two clusters according to population criteria: 1) Cluster 1A was assigned the large shrinking central cities, while 2) Cluster 6 was assigned smaller shrinking central cities, e.g., those under 50,000 in population or those that were smaller in population than the other designated central city for a particular MSA. Next, a spatial query was conducted in the GIS to locate all shrinking cities within five miles of a large central city. Depending upon whether the central city was growing or shrinking, the identified cities were assigned either to Cluster 1B or 2B. Cities beyond five miles of a central city but within the same MSA were designated as Outer-Ring and assigned either to Cluster 1C or 2C. By spatial definition, the remaining shrinking cities were all located within an µSA and thus assigned to Cluster 7. The outcome of
the cluster assignment methodology is shown in Table 1 and a representative map of all seven cluster types is shown in Figure 2.

**Table 1: The Seven Shrinking City Cluster Types**

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<thead>
<tr>
<th>Central Cities</th>
<th>Inner-Ring Suburbs</th>
<th>Outer-Ring Suburbs</th>
<th>Non-Suburban Cities</th>
</tr>
</thead>
<tbody>
<tr>
<td>1A: Shrinking (N=81)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(N=103)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1B: of shrinking central cities</td>
<td></td>
<td>1C: of shrinking central cities (N=38)</td>
<td></td>
</tr>
<tr>
<td>2B: of growing central cities</td>
<td>2C: of growing central cities (N=21)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6: Small central cities in small MSAs (N=58)</td>
<td></td>
<td></td>
<td>7: Small cities in μSAs (N=46)</td>
</tr>
<tr>
<td>N/A: Growing (Not a Cluster)</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Seven Shrinking City Types

1A: Shrinking Central City - Springfield, MA
1B: Inner-Ring Suburb of Springfield - Holyoke, MA
1C: Outer-Ring Suburb of Springfield - Northampton, MA
2B: Inner-Ring Suburb of Growing City (NYC) - Yonkers, NY
2C: Outer-Ring Suburb of Growing City (NYC) - Newburgh, NY
Small Central City of Small Metropolitan Area - Norwich, CT
Small City in Micropolitan Area - Amsterdam, NY

Figure 2. Cluster Typology Examples.
2.4.3 Cluster Analysis

Long term structural adjustments are an important aspect of shrinking cities. Thus, in recognition of the important function that central cities serve within a metropolitan area, a cluster analysis was conducted on the cluster of large central cities (Cluster 1A) to help deconstruct possible homogeneous groupings. The four variables used for this analysis relate to the current poverty rate, poverty rate change from 1980 to 2010, employment change in the agricultural, mining and manufacturing sectors from 1980 to 2010, and the percent foreign-born. The descriptive statistics for these variables are shown in Table 2. The first three variables relate to the employment decline or protracted economic downturn typically associated with shrinking cities, while the percentage foreign-born population is used because of the important influence of immigrant populations in stabilizing certain shrinking city populations. As Glaeser and Shapiro (2001) found in a separate study of 1990s city growth, cities with more foreign-born residents grew more quickly than cities with fewer foreign-born residents.

Table 2. Descriptive Statistics.

<table>
<thead>
<tr>
<th>Variable</th>
<th>N</th>
<th>Min</th>
<th>Max</th>
<th>Mean</th>
<th>Std Dev</th>
</tr>
</thead>
<tbody>
<tr>
<td>PovChg8010</td>
<td>81</td>
<td>-23.59%</td>
<td>117.03%</td>
<td>42.66%</td>
<td>33.96%</td>
</tr>
<tr>
<td>PctPoverty10</td>
<td>81</td>
<td>11.73%</td>
<td>37.42%</td>
<td>23.70%</td>
<td>05.61%</td>
</tr>
<tr>
<td>ChgAgMfg8010</td>
<td>81</td>
<td>-04.89%</td>
<td>-46.26%</td>
<td>-23.57%</td>
<td>-08.34%</td>
</tr>
<tr>
<td>PctFoB15</td>
<td>81</td>
<td>01.29%</td>
<td>40.27%</td>
<td>09.60%</td>
<td>07.98%</td>
</tr>
</tbody>
</table>
Clustering is the unsupervised classification of data into groups. As used here, clustering divides shrinking cities into groupings whereby shrinking cities are similar to one another within the cluster but dissimilar to those in other clusters. Two common clustering methods have been used in the urban literature, hierarchical clustering (Mikelbank, 2004) and K-means (Hanlon, 2009; Vicino et al., 2011, among others). Each method produces different results, the main difference between them has to do with their methodological starting points (Aldenderfer & Blashfield, 1984). Hierarchical clustering begins by identifying cases as their own cluster and uses a distance tolerance in the next step as an additive tool to form the second cluster based on cluster variate scores. The additive process continues until all cases ultimately form one entire group. As such, hierarchical clustering is computationally demanding and ultimately requires the researcher to select the best clustering solution using tools such as an agglomeration schedule and dendogram. The hierarchical clustering method is useful for starting-point analyses but does not generally produce “homogenous and well-balanced” results (Arimond & Elfessi, 2001). Of the two methods, K-means is more successful when there is a substantial body of previous literature to inform variable input decisions (Dwyer, Gill, & Seetaram, 2012). As such, the K-means clustering method was chosen for this research since the input variables are well documented within the urban literature and because of the prevalent use of K-means within the urban discipline.
The K-means clustering method is an iterative technique whereby the number of clusters is chosen upfront by the researcher. K-means clustering is used to partition \( n \) objects into \( k \) clusters. Each object is assigned to the cluster with the nearest mean, with the statistical objective being to minimize total intra-cluster variance. Using a prespecified number of output clusters (\( k \)), the technique produces exactly \( k \) different clusters of greatest possible distinction. K-means stores \( k \) centroids that it uses to define clusters and a point is considered to be in a particular cluster if it is closer to that cluster’s centroid than any other centroid. The membership of the \( k \) clusters is not known a priori and must be computed from the data. Hence, K-means clustering is a type of unsupervised learning in that there are no predefined labels in the data nor are there class values denoting a priori data groupings. In other words, the technique groups objects in a population by similarity of the underlying data input, without the process being driven by a specific purpose. Clusters begin as random groupings and subsequent assignments are made based on variate distance. As such, each subsequent iteration changes cluster membership. The iterations end when there are no more assignments to be made and the number of predetermined identified clusters has been reached.

The K-means method requires an input of the number of clusters to be assigned. Previous urban studies have used two, three, four, five or six clusters (Hanlon, 2009; Orfield, 2002; Short, 2007; Vicino et al., 2007; Vicino et al., 2011). There is no generally-accepted operating principle to determine an optimal number. Choosing the number of \( k \) to use in K-means clustering is usually an ad hoc decision based on prior knowledge, with the caveat that choosing too many \( k \) will result in “a needlessly complex description of the data, and in fact the multiple centers capture the truth about the subset less well than one center” (Hamerly & Elkan,
A comparison and review of the outputs based on different $k$ values is likely helpful to determine a reasonable $k$ value. Another methodological consideration is the amount of membership in the resultant $k$ groupings. For instance, a cluster with only 10 members is probably too small a grouping to be practical, conversely, too many members can produce an overly dominant grouping (Krantz, Korn and Menninger, 2009). Three separate cluster analyses were performed to check for membership groupings using 2, 3 and 4 clusters. It was found that using two clusters produced a relatively balanced membership grouping, with $N$ ranging from 16 to 65. Therefore, this study specified two as the number of output clusters.

2.5 Results

2.5.1 Membership in the Seven Shrinking City Clusters

The name and membership numbers for each cluster are shown in Table 3 and the map of all seven cluster locations is provided in Figure 3. Of particular note is that only 41 out of 367 shrinking cities exist in metropolitan areas where the central city is growing, a nod to the city-region concept. Also, almost 13% of all shrinking cities exist in micropolitan areas, largely removed from larger cities and major metropolitan areas.
### Table 3: Cluster Distribution

<table>
<thead>
<tr>
<th>#</th>
<th>Reference</th>
<th>Cluster Name</th>
<th>N</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1A</td>
<td>Large Shrinking Central Cities</td>
<td>81</td>
</tr>
<tr>
<td>2</td>
<td>1B</td>
<td>Inner-Ring Suburbs of Shrinking Central Cities</td>
<td>103</td>
</tr>
<tr>
<td>3</td>
<td>1C</td>
<td>Outer-Ring Suburbs of Shrinking Central Cities</td>
<td>38</td>
</tr>
<tr>
<td>4</td>
<td>2B</td>
<td>Inner-Ring Suburbs of Growing Central Cities</td>
<td>20</td>
</tr>
<tr>
<td>5</td>
<td>2C</td>
<td>Outer-Ring Suburbs of Growing Central Cities</td>
<td>21</td>
</tr>
<tr>
<td>6</td>
<td>6</td>
<td>Small Shrinking Central Cities in Small</td>
<td>58</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Metropolitan Statistical Areas</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>7</td>
<td>Small Shrinking Cities in Small Micropolitan</td>
<td>46</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Statistical Areas</td>
<td></td>
</tr>
</tbody>
</table>
Beside the quick identification of shrinking central cities, the usefulness of the typology developed herein is that non-central cities are categorized largely by whether they are situated within metro areas having shrinking or growing central cities. This allows for some easy pattern identification. For instance, the following seven metropolitan areas account for 25% of all shrinking cities in the U.S.: Chicago, Detroit, Boston, Minneapolis/St. Paul, Cleveland, St. Louis, and Pittsburgh (Table 4).
Table 4: Seven Metropolitan Areas Account for 92 Shrinking Cities in the U.S. (25%)

<table>
<thead>
<tr>
<th>Shrinking Central City (1A)</th>
<th>Inner-Ring Suburb (1B)</th>
<th>Outer-Ring Suburb (1C)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chicago, IL</td>
<td>Calumet City, Cicero, Dolton, East Chicago (IN), Elmwood Park, Evergreen Park, Gary (IN), Hammond (IN), Harvey, Lansing, Maywood, Niles, Oak Lawn (13)</td>
<td>Chicago Heights, Highland (IN), North Chicago, Park Forest (4)</td>
</tr>
<tr>
<td>Detroit, MI</td>
<td>Allen Park, Dearborn, Dearborn Heights, Ferndale, Garden City, Hamtramck, Highland Park, Inkster, Lincoln Park, Madison Heights, Oak Park, Roseville, Royal Oak, Southfield, Southgate, St. Clair Shores, Taylor, Warren, Westland, Wyandotte (20)</td>
<td>Pontiac, Port Huron (2)</td>
</tr>
<tr>
<td>Boston, MA</td>
<td>Cambridge, Chelsea, Everett, Lynn, Medford, Somerville, Weymouth (7)</td>
<td>Brockton, Gloucester, Lawrence, Lowell, Portsmouth (NH), Salem (6)</td>
</tr>
<tr>
<td>Minneapolis/St. Paul, MN</td>
<td>Brooklyn Center, Crystal, Fridley, Richfield, Roseville, South St. Paul, St. Louis Park (7)</td>
<td></td>
</tr>
<tr>
<td>Cleveland, OH</td>
<td>Brook Park, Cleveland Heights, East Cleveland, Euclid, Garfield Heights, Lakewood, Maple Heights, North Olmsted, Parma, Parma Heights, South Euclid (11)</td>
<td>Lorain</td>
</tr>
<tr>
<td>St. Louis, MO</td>
<td>East St. Louis (IL), Ferguson, Florissant, Granite City (IL), Hazelwood, University City (6)</td>
<td>Alton (IL)</td>
</tr>
<tr>
<td>Pittsburgh, PA</td>
<td>Baldwin, Bethel Park, McKeesport, Monroeville, West Mifflin, Wilkinsburg (6)</td>
<td>Aliquippa</td>
</tr>
</tbody>
</table>
Before discussing the differences between the seven clusters, it is worthwhile to examine how the entire group of shrinking cities (N = 367) differs statistically from growing cities (N = 1,079). Of course, the most obvious difference lies with population growth. On average, the population of shrinking cities in 2015 was 22% off of their peak population. Demographically, as shown in Figure 4, growing cities in 2015 had larger shares of Caucasian (73% vs. 64%) and Hispanic (22% vs. 14%) persons than shrinking cities, while shrinking cities had greater percentages of African-American persons (24% vs. 10%). The average growing city had a higher number of foreign-born population (16% vs. 11%). There was also a significant difference in median household income between growing cities ($60,447) and shrinking cities ($41,144), with shrinking cities having an average of 20% of its population living at or below the poverty line compared to only 15% for growing cities. Differences in housing naturally show that shrinking cities had higher levels of vacant housing (12% vs. 8%). Growing cities had a higher percentage of owner-occupied housing (55% vs. 46%) and the median value of those units were much higher in growing cities ($252,908 vs. $146,919). Also, the housing stock in growing cities was much newer than that in shrinking cities. Finally, 1980 was the median year that all residential structures were built in growing cities, as opposed to 1955 for shrinking cities. With the clusters identified, this paper now turns towards describing the characteristics of each shrinking city cluster.
Figure 4. The demographic breakdown of growing (N = 1079) and shrinking cities (N=367).

2.5.2 Cluster 1A – Large Central Cities

The first cluster includes 81 large shrinking cities as shown in Figure 5. The vast majority of Cluster 1A cities are located in the former Manufacturing Belt, now the Rust Belt. This cluster is named the Shrinking Central Cities cluster. In terms of population, it is by far the largest cluster of the seven, averaging 229,839 people, with a range of 50,288 to 2,717,534 (Chicago). This cluster ranks highest amongst the seven clusters in unemployment and poverty rate. It also ranks second most in population decline, averaging an 24% decline off of its peak population (Figure 6). Representative of this cluster are the former industrial powerhouse cities that are commonly referred to as Legacy cities. Low levels of professional employment, high poverty and high unemployment are emblematic of the many former industrial towns belonging
to this cluster. The few cities outside of the Rust Belt in this cluster are mostly in the Southeast (e.g., Birmingham) and along the Gulf Coast. Unlike their northern counterparts, population losses along the Gulf have occurred more recently, and the causes can be traced directly or indirectly to Hurricane Katrina (e.g., Biloxi, Kenner, Pensacola) or the vagaries of business cycle, as with the industrial towns of Beaumont and Galveston.

**Figure 5.** The location of Cluster 1A cities: Shrinking Central Cities.
2.5.3 Results of Cluster Analysis on Large Shrinking Central Cities

A K-Means cluster analysis was performed on the 81 shrinking central cities in the 1A cluster. The four variables used for this analysis related to the current poverty rate, poverty rate change from 1980 to 2010, employment change in the agricultural, mining and manufacturing sectors from 1980 to 2010, and the percent foreign-born. K-means clustering has been used often in the urban literature to identify clusters of U.S. suburbs (Orfield, 2002), firm headquarters and branch offices in Australian cities (Sigler et al., 2016), urban places within Megalopolis (Vicino et al., 2007), and urban immigrant neighborhoods (Vicino et al., 2011). The results of
the cluster analysis conducted here show that Cluster 2 had a lower increase in the poverty rate for the period 1980-2010 than Cluster 1 cities (Table 5). The biggest difference between the cluster variables is that Cluster 2, labeled as Culturally-Transforming Shrinking Cities, has a much higher rate of foreign-born population (23% vs. 6%). Cluster 2 had a higher level of Hispanic (30% vs. 8%) and Asian (8% vs. 2%) populations as well as a lower level of African-Americans (25% vs. 33%) and Non-Hispanic Whites (36% vs. 54%). Median household income was higher in the Culturally-Transforming Shrinking Cities cluster ($42,888 vs. $37,229) as was the median value of owner-occupied homes ($227,544 vs. $119,354), though home ownership was lower (34% vs. 44%) and the average year of built housing stock was older (1947 vs. 1955). Both clusters declined about 23% from peak population levels. The location of the cluster members is shown in Figure 7. Note how most of the Culturally-Transforming Shrinking Cities are located in the Northeast.

Table 5. Shrinking Central City Cluster Variable Values

<table>
<thead>
<tr>
<th>Variable</th>
<th>Cluster 1</th>
<th>Cluster 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Increase in Poverty Rate: 1980 - 2010</td>
<td>45.34%</td>
<td>31.79%</td>
</tr>
<tr>
<td>% Foreign-Born Population, 2015</td>
<td>6.20%</td>
<td>23.40%</td>
</tr>
<tr>
<td>Poverty Rate, 2010</td>
<td>23.74%</td>
<td>23.58%</td>
</tr>
<tr>
<td>% Change in Employment Sector (Mining, Agriculture, and Manufacturing) 1980-2010</td>
<td>-11.34%</td>
<td>-14.81%</td>
</tr>
</tbody>
</table>
Figure 7. K-Means cluster results for large shrinking central cities (N=81).
2.5.4 Cluster 1B

The second derived cluster is labeled the Inner-Ring Suburbs of Shrinking Central Cities. As shown in Figure 8, nearly all of the 103 cities in this cluster are located in the Northeast and Midwest. Essentially, this group represents the inner-ring suburbs of America’s Legacy cities. The cities in this cluster have declined in population at a rate of 24%, nearly identical to the 25% rate of the shrinking central city cluster. This cluster ranks highest in median household and per capita income and has the second-highest median house value of the seven clusters. However, these figures belie the fact that the poverty rate for this cluster has more than doubled since 1980, the highest of any cluster.

Figure 8. The location of Cluster 1B cities.
2.5.5 Cluster 1C

Cluster 1C is named the Outer-Ring Suburbs of Shrinking Central Cities. Naturally, the spatial distribution of Cluster 1C is nearly identical to Cluster 1B except there are fewer outer-ring suburbs (38) that have shrunk than inner-ring suburbs (103) (Figure 9). Similar to their inner-ring counterparts in Cluster 1B, this outer-ring cluster ranks high in per capita income. The poverty rate for this cluster has increased by nearly 50 percent since 1980. The average city in this cluster has decline 22 percent from their population peak.

Figure 9. The location of Cluster 1C cities.
2.5.6 Cluster 2B

Cluster 2B represents the inner-ring suburbs of growing, rather than shrinking, central cities (Figure 10). There are only 20 such cities and 12 of them are in California. Demographically the cities in Cluster 2B have the highest percentage of foreign-born and Hispanics and the lowest percentage of African-Americans. Since 1980 this cluster has experienced a relatively low increase of 33 percent in its poverty rate even though it has the highest percentage of renters (57%). Its unemployment rate is the lowest of all clusters. Cluster 2B has the highest median home value and its housing stock is newer than all but one of the other clusters. These cities are more populated than all other cluster cities with the exception of Cluster 1A. The average population decline for Cluster 2B cities is only 16 percent, compared to an overall average of 23 percent.

Figure 10. The location of Cluster 2B cities.
2.5.7 Cluster 2C

The cities in Cluster 2C represent the outer-ring suburbs of growing central cities. Statistically and spatially, this cluster is very similar to its inner-ring counterparts in Cluster 2B (Figure 11). Nine of the 21 cities in this cluster are in California. Demographically, like Cluster 2B, this cluster ranks high in percentage of foreign-born and Hispanics and low in percentage of African-Americans. Also, its poverty rate has increased by only 31 percent since 1980 while its percentage of renters is 53 percent. Of all seven clusters, the median age of this cluster’s housing stock is the youngest, with 1964 being the median year for structures built.

Figure 11. The location of Cluster 2C cities.
2.5.8 Cluster 6

Cluster 6 contains small central cities located in small metropolitan areas (Figure 12). This cluster ranks low in per capita income and median home value. Demographically, it ranks high in Caucasian population (70%) and low in Hispanic (6%) and foreign-born (6%) populations. The average city in this cluster has declined nearly 25% in population from its peak, which ranks second highest of all the clusters. The cluster ranks low in per capita income and median home value and its poverty rate has increased by 50 percent since 1980. With the exception of Cluster 7, the average population (38,710) of this cluster is the smallest of all groupings. All cities in this cluster are located in the eastern part of the U.S.

![Figure 12. The location of Cluster 6 cities.](image)

Data Source: Author's calculations from the American Community Survey 5-year data (2011-2015) and historical decennial census. Data obtained from the Minnesota Population Center.
2.5.9 Cluster 7

Cluster 7 represents small cities in micropolitan areas that are largely removed from the major metropolitan areas (Figure 13). The average population for this cluster is only 26,948. This cluster is perhaps the poorest of all seven clusters as it ranks lowest in household income, median home value, and college education. Demographically it has the highest percentage of Caucasian population (74%) and the lowest percentage of foreign-born (5%) and Hispanic (5%) populations. Since 1980 this cluster has experienced a 58% increase in poverty.

**Figure 13.** The location of Cluster 7 cities.
2.6 Discussion

The maps for Clusters 1A, 1B and 1C show a nearly identical location pattern whereby most cities in these three clusters are nested within the Rustbelt. The exhibited spatial pattern is of course to be expected as there is a direct relationship, spatial and otherwise, between central cities and their suburbs. The central cities of Cluster 1A once hosted prosperous core manufacturing areas which in turn led to surrounding suburban development in the Cluster 1B and 1C cities. The most commonly given reason for the decline of these three Rustbelt clusters are deindustrialization and suburbanization (Rieniets, 2009). The rapid urbanization which accompanied the industrialized period came to a halt in the mid to late twentieth century. Though significant urban depopulation occurred in the Great Depression of the 1930s, only to have growth resume in the 1940s, it is the period of 1950 to 1980 that saw the number of large U.S. shrinking cities balloon (see Figure 14). In fact, the shrinking city phenomenon that began in 1950 can only be described as having reached chronic status by the year 2000.

![Graph showing the number of cities with population loss from 1820 to 2000](image)

**Figure 14.** Large cities with population loss, 1820 – 2000 (borrowed from Beauregard 2009 – large cities defined as the fifty largest cities in each decade).
It is interesting to note that seven metropolitan areas anchored by shrinking central cities contain 92 out the country’s 367 shrinking cities, while other large shrinking cities contain no shrinking suburbs at all. Perhaps more interesting is that only 41 suburbs anchored by growing central cities have shrunk in the U.S. Since many of these 41 suburbs are located in California, it would be worth exploring in future research how ‘Chicago School’ and ‘Los Angeles’ urban models are operationalized in shrinking city distribution.

The K-Means cluster analysis revealed the important role that immigrants serve in America’s shrinking central cities. Immigration to the U.S. slowed around the time of the Great Depression, putting a dent in city growth rates, until it resumed vigorously in the 1970s (Kotkin, 1999). Hispanic migration patterns in particular increased at this time and settlement patterns soon extended beyond the Southwestern U.S., manifesting in unpredictable chain migration paths. The 16 cities in the identified Culturally-Transforming Shrinking Cities cluster declined in population at about the same rate as the 65 cities outside the cluster. In fact, the cities outside the Culturally-Transforming Shrinking Cities cluster experienced a much higher increase in poverty between 1980 and 2010 (45% vs. 32%). Undoubtedly, cities within this cluster would have suffered even greater population loss without immigrant settlement.

The cities in Clusters 6 and 7 are smaller and are largely removed from major metropolitan areas. Cluster 6 cities are located exclusively in the eastern part of the U.S., while Cluster 7 cities are a bit more dispersed. About a quarter of Cluster 7 cities extend west beyond the Mississippi River. Many of the Cluster 6 cities are former industrial towns in the old Manufacturing Belt and about a third of the cluster’s cities are located in Appalachia. These two clusters are very similar demographically and have the highest level of Caucasian population
among the seven clusters. The major difference between the two groups is that most Cluster 6 cities were once industrial towns while Cluster 7 cities ranked lowest of all seven clusters in job loss from the manufacturing sector. Many of the cities in Cluster 6 are older and were originally settled for reasons related to first-nature geography, often along a river, later to become small and isolated industrial centers. In partial contrast, Cluster 7 cities tend to be more rural in character so the agglomeration effects operationalized within a metropolitan area largely escape these cities. So while deindustrialization may be partially attributed for causing decline in Cluster 6 cities, the reasons for the decline of Cluster 7 cities tend to be more varied and location specific.

2.7 Conclusion


This research contributes a useful typology to the urban literature from which to launch subsequent examinations of urban shrinkage. The derived seven clusters have an understandable taxonomy that are both distinct from each other yet inherently related in some aspects. Clusters 1A, 1B and 1C are directly related in an intra-metropolitan manner. Clusters 1B and 2C relate to Clusters 2B and 2C in an inter-metropolitan fashion. Clusters 6 and 7 relate to each other
demographically and in size, yet the former has industrial roots while the latter is more rural in character and diverse in historical development. In addition, this research identifies a cluster of large shrinking cities in which the foreign-born population has ameliorated shrinkage and its effects. This could help inform future studies investigating the links between shrinkage and immigration.

It is hoped that the empirical results of this study may inform the shrinking city literature and public policy by helping researchers and policy makers better understand the subtle differences in shrinking cities and address possible solutions accordingly. A significant contribution of this research is to help clarify definitional muddiness and provide a starting point for identifying the different types of shrinking cities in the U.S. It may also serve to inform strategies to address population loss, if in no other way than by clarifying that different types exist.

As noted, the shrinking city typologies identified herein can provide a starting point for future research. There are several proposed topics for further inquiry. For instance, why do only seven, out of hundreds of metropolitan areas, contain over a quarter of America’s shrinking cities? What is it about those seven central cities that differ from other large central cities such as Washington, Baltimore, and Milwaukee which have no shrinking cities in their surrounding metropolitan area? How is it that Chicago and Detroit, which have completely different suburban interactivity levels, both serve a metropolitan area with multiple shrinking cities? Why do cities surrounding growing central cities shrink? It is hoped that the typologies developed by this research can help answer these and other questions related to urban shrinkage in America.
CHAPTER 3
PROPERTY TAX FORECLOSURES IN A SHRINKING CITY: RIGHT SIZING IN DETROIT

3.1 Abstract

Detroit is a city in Wayne County in the state of Michigan that has lost over 1,000,000 of its residents since 1950. The city has adopted right sizing strategies to combat the ravages brought about by such large scale abandonment. This study analyzes a unique and specific outcome related to such dereliction: massive property foreclosures based on a database of Detroit properties that were foreclosed and put up for auction from 2002 to 2013. This research uses spatial autocorrelation and hot spot detection techniques to identify the spatial patterns of Detroit’s foreclosure activity, then examines those patterns within the context of Detroit’s planning framework zones to determine process efficiencies and inefficiencies relative to the city’s stated planning strategies. This research finds that the foreclosure process currently operationalized in Detroit is inefficient relative to its stated right sizing planning goals and suggests changes to address problems related to the tax foreclosure process in Detroit. The findings highlight the shortcomings of tax foreclosure policy in shrinking cities and other urban pockets of disinvested neighborhoods with weak property demand.

3.2 Introduction

The city of Detroit has undergone significant economic and demographic decline since 1950. Founded in 1701 and incorporated in 1806, Detroit was the fastest-growing city in the world from 1900 to 1930, the 4th largest city in the U.S. from 1920 to 1940, and the 5th largest in
1950 when its population peaked at 1,849,568. With a current population of 680,250 spread out across 139 square miles, Detroit is the only U.S. city to lose over a million of its residents (Author’s calculations based on census data retrieved from Manson et al., 2018). Vast portions of the city currently lie in a state of abandonment and decay, to the point where Detroit has become the iconic example of legacy city decline in both academia and the media. In July of 2013, Detroit’s emergency manager filed for Chapter 9 bankruptcy protection, the largest such municipal bankruptcy in the country, from which the city emerged in December 2014 (Declaration of Kevyn D. Orr, 2013; Farley, 2015). Moving forward from this point, Detroit, like many legacy cities, must find a way to navigate high crime rates, poverty, blight, aging equipment, a dysfunctional infrastructure, and outdated systems - all in the face of decreased tax revenues (Galster, 2012; Declaration of Kevyn D. Orr, 2013; Mallach & Brachman, 2013; Morckel, 2016). Various strategies have been proposed and implemented to fight the city’s decline, including urban farming, open space greening, and blight demolition, land banking and property foreclosure auctions. This paper focuses particularly on the latter, property foreclosure auctions.

This research examines property foreclosure within the context of a shrinking city, specifically, Detroit. In addition to evaluating annual foreclosure summary data provided by Wayne County, the host county of Detroit, it uses spatial analyses to examine the spatial properties of 89,554 foreclosures during the period 2002 - 2013. Moran’s I is used to detect spatial autocorrelation in the global context, while the local Getis-Ord Gi * is used to identify clusters. The results were then evaluated not only to decipher the variation of any found spatial
dependency, but to empirically investigate how identified patterns relate to Detroit’s overarching planning objectives.

The City of Detroit faces overwhelming challenges as it tries to forge ahead after emerging from bankruptcy in 2014. While the city’s finances are better off because of this, that benefit doesn’t directly accrue to its citizenry. Faced with one of the highest poverty rates in the country, Detroiters continue to encounter hardships related to the property taxes on their homes. These hardships endure whether they own the home, or rent it. State law requires the host county, Wayne County in Detroit’s case, to foreclose on property that is three years delinquent of property taxes. The purpose of this research is to analyze the efficacy of this foreclosure process as it relates to Detroit and its stated planning goals. Specifically, this research asks whether the foreclosure process in Detroit is aligned with its current right sizing planning strategies, namely, consolidation, greening and land banking; and whether the foreclosure process helps meet the stated goal of its planning document “to move toward a more efficient and sustainable city and improve the quality of life and business in Detroit” (Detroit Future City, 2013). In so doing, this research can help highlight the shortcomings of tax foreclosure policy in shrinking cities and other urban pockets of disinvested neighborhoods with weak property demand.

The rest of the paper is organized as follows: Section 2 contains a literature review which examines the events that led to the decline of Detroit as well as the property tax foreclosure system; Section 3 discusses the data and methodological steps used in this study; Section 4 presents the results; Section 5 discusses the findings and implications of this study; Finally, a summary of this study’s main conclusions is contained in Section 6.
3.3 Literature Review: How Detroit Arrived at this Point

3.3.1 1940s and 1950s

The narrative of Detroit’s decline must naturally begin near the peak of its ascent, the 1940s and 1950s, a period ingested with contradiction and irony. In 1945, Detroit’s population was still rising and it stood as one of the world’s mightiest industrial cities, having been a major contributor to America’s ‘Arsenal of Democracy’ and the winning war effort of World War II. Yet, tears in the city’s fabric had already begun. In 1943, a mere two years before the war’s successful conclusion, Detroit itself suffered a calamitous race riot which tore apart the city and embarrassed the nation as 6,000 federal troops had to be sent in by President Roosevelt to quell the violence (Sitkoff, 1969). The statistics from the three-day 1943 riot are telling: 600 persons were injured, 75% of whom were black; 34 people were killed, 25 of whom were black and 17 of whom were killed by Detroit’s predominately white police force; 1,800 people were arrested, 85% of whom were black (Sitkoff 1969). Scholars have attributed the underlying causes of Detroit’s 1943 riot to the city’s housing shortage, a pervasive problem that particularly affected the city’s black residents (see Sugrue, 1996, among others). Unfortunately, the housing shortage affecting Detroit’s African-Americans only became worse after the 1943 riot as government funded freeway construction and urban renewal programs were proposed and built, a process termed by one early scholar as none other than “Negro removal” (Anderson, 1964).

3.3.2 Freeways and Urban Renewal

In the post-World-War II Rust Belt era, economic and social forces, along with public policy choices, altered the urban landscape and helped drive suburban ascent to the detriment of central cities. Facilitating the post-war suburbanization process was the federal government,
who provided up to 90% of the funding for urban renewal, highway construction, mortgage subsidies, and housing-related income tax credits (Jackson 1985; Ryan, 2008). The following section outlines generally how that process unfolded in Detroit.

It is fitting that the Detroit area’s first strip of freeway was built during the early 1940s in the Detroit enclave of Highland Park, near the site of the Highland Park Ford Plant, the nation’s first moving assembly plant and thus the birthplace of Fordism. Construction of the Edsel Ford (I-94), Chrysler (I-75) and Lodge (M-10) freeways soon followed and decimated many Detroit neighborhoods from the late 1940s through the 1960s. One of the hardest hit neighborhoods was Detroit’s Poletown area, a traditionally Polish immigrant neighborhood on the city’s near east side. The decades-long spiral of Poletown’s population decline first began in 1955 with the construction of I-94, a situation later exacerbated by the acquisition and razing of parcels for the Detroit Medical Center in 1956, and later by the construction of I-75 in 1967 (Bukowczyk, 1984). The final blow to Poletown occurred in 1981 when the General Motors Detroit/Hamtramck Assembly plant was built after Mayor Coleman Young successfully acquired the necessary parcels to enable construction of the plant, removing 4,200 Poletown residents in the process.

Using the Poletown incidents to frame his arguments, Bukowczyk (1984) enumerates several ways in which Detroit’s politicians and planners exacerbated Detroit’s problems in the mid-20th century. First, though Detroit suffered from economic developments beyond anyone’s control, the tacit acceptance by Detroit’s political leaders of its decline, particularly with regard to a lack of policies to address the decline of the urban core, enabled the city’s demise. Second, political leaders continually made land use decisions that eroded the population base needed to
support local communities, either by demolishing large urban tracts or erecting physical barriers within neighborhoods. Third, public policy decisions to build freeways or enable new development in neighborhoods they deemed blighted “gave rise to a self-fulfilling prophecy” by accelerating population decline in those neighborhoods (Bukowczyk 1984). In reality, the decimation of Poletown notwithstanding, freeway construction and urban renewal projects took a much greater toll upon black neighborhoods for the white population simply moved to the suburbs.

According to Sugrue (1996, 47), Detroit highway planners avoided the disruption of middle-class areas, but no such care was applied to black neighborhoods where highway construction was deemed a slum-razing tool:

Beginning in the late 1940s, the most densely populated sections of black Detroit were devastated by highway construction. The Oakland-Hastings (later Chrysler) Freeway blasted through the black Lower East Side, Paradise Valley, and the Hastings Street business district, wiping out many of the city's most prominent African American institutions, from jazz clubs to the Saint Antoine branch of the YMCA. The John C. Lodge Freeway cut through the Lower West Side, the increasingly black area bordering Twelfth Street, and the heavily black neighborhoods bordering Highland Park. The Edsel Ford Freeway, an extension of "Bomber Road" which connected Detroit to the Willow Run defense complex west of the city, bisected the black West Side, and cut through the northernmost fringe of Paradise Valley. (Sugrue 1996 47)

Highway construction displaced thousands of black Detroiters in the 1950s, compounding an already dire housing situation and, in effect, fueling the city’s 1943 riot (Sugrue, 1996). Blacks that were renting dwellings located in the path of future planned highways were only given 30-day notices to vacate, but were offered no relocation assistance. In a city already short of housing stock, this made it even more difficult for poor blacks to find rental housing in other parts of the city. Compounding their plight, the city began extensive urban renewal projects to
remove the blight associated with the dilapidated and densely populated black neighborhoods close to downtown. Land clearance efforts associated with renewal projects in Detroit’s Black Bottom and Paradise Valley neighborhoods further aggravated the acute housing crisis facing black residents (Sugrue, 1996). These projects included the modernist Lafayette Park (originally called the Gratiot Redevelopment Site) and its successor projects (Elmwood I, II, and III), the Douglass public housing projects, the high-rise Jeffries Homes, and the Medical Center Area (Psarra & Kickert, 2012). These urban renewal projects, along with highway construction, unseated tens of thousands of black Detroiters in the 1950s and 1960s and forced them to seek housing within a city still clinging to its segregationist ways.

The travesty of Detroit’s mid-20th century highway construction and urban renewal programs lies not in the destruction of the city’s sub-standard housing stock in African-American neighborhoods, considered some of the city’s worst, but rather that those programs failed to provide concomitant housing to the displaced. Detroit’s urban renewal goals were focused upon removing blighted neighborhoods with little thought given to the people inhabiting them. The lack of alternative housing that was both suitable and affordable forced many blacks to seek shelter elsewhere, which in turn contributed to overcrowded slum conditions in other black neighborhoods. Furthermore, redevelopment plans did not provide for the construction of a large enough supply of low-rent housing to accommodate the displaced. As a result, Detroit’s redevelopment efforts did not eliminate blight, it simply transferred it (Sugrue, 1996). As other scholars have noted, during the mid-20th century, Detroit was not the only city in the nation to have its black citizens afflicted by poorly planned urban renewal and highway construction efforts (e.g., see Mohl, 2004). Detroit’s unique problem was that unlike its urban contemporaries
like Chicago and New York, Detroit had “a dearth of low-rent apartments and public housing” largely because “white single-family neighborhoods staunchly resisted the construction of multiple housing” in their neighborhoods (Sugrue, 1996, 51). Ultimately, the planning and political leadership displayed in mid-20th century showed a blatant disregard by those in power for those who lacked any, and this would cost the city dearly in 1967.

3.3.3 The Civil Unrest of 1967

By the time of Detroit’s third riot in 1967 (the first occurred in 1863), the exodus to the suburbs was well underway, though the riot certainly spurred it pace (Sugrue 1996). Detroit lost about 180,000 residents between 1950 and 1960, for a seemingly modest 10% decline and it lost 18% of its population between 1950 and 1970. However, these statistics mask the fact that over 700,000 whites left the city during this 20-year period while nearly 360,000 blacks moved into the city (calculated by author from data obtained from Manson et al., 2018). Thus by 1970, nearly half (46%) of Detroit’s 1950 white population had left for the suburbs or elsewhere while the city’s black population more than doubled (calculated by author from data obtained from Gibson & Jung, 2005). The mass exodus of whites during the 1950-1970 period in Detroit marked the one of the biggest out-migration of whites from any central city in U.S. history.

One of the areas blacks congregated to after freeway construction and urban renewal displaced them from Black Bottom, Paradise Valley and the Cass Corridor was Detroit’s Twelfth Street area located on the near northwest side adjacent to Highland Park (Langlois, 1983). It was on Twelfth Street that the riot of 1967 broke out after a 3:00am raid on an unlicensed bar where a party for two Vietnam veterans had taken place (Langlois, 1983). Fueled by decades of racial injustice, the uprising (called by some a civil rebellion – See Sugrue, 1996) turned into the worst
racial violence of 20th-century America (Capeci & Wilkerson, 1990). Its aftermath left 42 dead and 7,231 people arrested and similar to the 1943 riot, the 1967 uprising happened during war time, required federal troops to quell the violence, and inflicted the deadliest toll upon the black community. Of the fatalities, 33 of 43 were black, half of whom were killed either by police or National Guardsmen (Sugrue, 1996).

Efforts to restrain Detroit’s black population to certain parts of the city, either through racially restrictive deed covenants, loan refusals to blacks in the suburbs and even whites in black city neighborhoods (redlining), and efforts by grassroots homeowner associations were successful into the 1950s. But in 1948 the Supreme Court held in Shelley v. Kraemer that racially restrictive deed covenants could no longer be legally enforced (Plotkin, 2001) and efforts to restrain Detroit’s black population began to unravel with it. With whites leaving the city in droves beginning in the 1950s, and blacks from the south moving in, the geographic space of black Detroit residents exploded from 1950 to 1970, and of course continued in the decades that followed.

3.3.4 City-Suburb Divide

Until Mike Duggan’s election in 2014, an African-American had served as mayor of Detroit for forty straight years (1974-2013). Coleman Young, the longest-serving mayor in city history, served the first 20 of those years. Young was a polarizing figure, still reviled in Detroit’s suburbs as racially divisive, but revered by many in the city as an iconic symbol of black self-autonomous rule. To suburbanites, Young also represented corruptness, perhaps because his Police Chief, William Hart, and Deputy Police Chief, Kenneth Weiner, were both jailed for stealing $1.3 million, each, from the same police undercover fund, however, Young
himself was never charged with a crime. Many of Young’s suburban foes characterized his administration as wasteful and financially irresponsible, but others, including the Detroit Free Press’ John Gallagher, viewed Young as the “most austere Detroit mayor since World War II, reducing the workforce, department budgets and debt during a particularly nasty national recession in the early 1980s” (Gallagher, 2013). Gallagher goes on to note that: “For critics who want to blame Mayor Coleman Young for starting this mess, think again. The mayor’s sometimes fiery rhetoric may have contributed to metro Detroit’s racial divide, but he was an astute money manager who recognized, early on, the challenges the city faced and began slashing staff and spending to address them” (Gallagher, 2013). Racial divisiveness aside, many scholars support Gallagher’s view that Detroit was structurally too weak and irreparably devastated by the time Young took office in 1974 to lay the blame for the city’s demise at his feet (Sugrue, 1996; Martelle, 2012; Eisinger, 2014; among others). If Detroit’s situation was too far gone for Coleman Young to salvage beginning in 1974, then the same logic should seemingly be extended for most of his mayoral successors, except for Kwame Kilpatrick: “While it would be unrealistic to expect Kilpatrick to reverse five decades of decline, the fact that he made the city worse under the guise of austerity while actually lining his pockets and those of his friends is what makes Kilpatrick the worst of the worst” (Austin, 2014). Kilpatrick resigned as mayor in 2008, later, in 2013, he was sentenced to 28 years in federal court on the additional charges of felony mail fraud, wire fraud, and racketeering. Kilpatrick did not single-handedly ensure Detroit’s demise, but he sped up the city’s eventual bankruptcy and in so doing handcuffed his successors’ ability to provide even the most basic of services to the city’s residents.
With the flight of whites and capital to the suburbs, businesses soon followed and by the 1970s downtown Detroit had become abandoned. Even the Detroit Lions left for the city of Pontiac, the county seat of suburban Oakland County. As the most populous and wealthiest of Detroit’s five suburban counties, Oakland County stands in stark contrast to its central city and according to its County Executive, L. Brooks Patterson, wants nothing to do with it. Patterson, the de facto “mayor of suburbia”, has built a career upon denouncing the failures of Detroit, and the particular target of his ire has been, and continues to be, Coleman Young, even decades after his death (McGraw, 2018). The fractured and acrimonious relationship between Detroit and its suburbs, particularly Oakland County, may perhaps best characterized by an article appearing in The New Yorker entitled, “Drop Dead Detroit!” (Williams, 2014). The article highlights the views of Patterson who has led the county since 1992. The article insightfully captures the essence of the city-suburb divide by documenting a litany of Patterson’s blunt and unapologetic bluster, which is part Oakland County boosterism, part central city spite, all of which is politically calculated to appeal to a large segment of suburban constituents who share a collective feeling of disdain towards Detroit. Perhaps the most revealing utterance was Patterson’s insensitive response to how Detroit could fix its financial problems:

I made a prediction a long time ago, and it’s come to pass. I said: What we’re gonna do is turn Detroit into an Indian reservation, where we herd all the Indians into the city, build a fence around it, and then throw in the blankets and corn. (Williams, 2014)

For his part, Patterson has remained popular with his constituent suburbanites and was named by the nonpartisan magazine, Governing, as “one of nine public officials of the year” whose “pioneering use of a three-year rolling budget … allows the county to plan ahead for problems rather than be forced to triage them in a crisis” (Williams 2014). As a result, the scale
of uneven regional development favors the suburbs by a staggering amount, to the detriment of Detroit. As Galster notes: “In 1950 the median income in the suburbs of Detroit was only 3% higher than that of the city. By 2000 the suburban median income was nearly 100% larger” (Galster, 2012 p. 61 as cited by Eisinger, 2014).

Many believe that the Detroit metro area has yet to fully recover from the events of 1967 and that it has led to a staggering level of uneven regional development favoring the suburbs. Worse, the divide that separates Detroit from its suburbs is something that “neither the Black politically controlled central city nor White suburban leaders were willing to repair” (Jacobs, 2009). Detroit’s high unemployment is further complicated by the automobile-dependent urban morphology of its metropolitan area, which in turn contributes to the poor job access endured by the many Detroit residents without cars (Grengs, 2010). Grengs (2010) notes that the Detroit metropolitan area is 1) “the largest urban area in the nation without regionally-oriented heavy or light rail transit” and 2) that its public transit system is “unusually poor compared to that of peer regions of similar population and historical development” (2010, 45).

Many of the problems Detroit faced came from the failure to view the metropolitan area as unified community, where everyone was responsible for the good of the whole. This was the reason that regionalists, planners and labor activists wanted to restructure the region in the 1940s. Yet it was easier for suburban communities to incorporate than for central cities to expand. Local reliance upon the property tax encouraged middle- and upper-income taxpayers to cluster in safe municipalities protected from the masses by restrictive zoning ordinances. The American attachment to local control or ‘home rule’ could not be shaken. Mild forms of regionalism exist. (Thomas, 2004, 92)
3.3.5 Coleman A Young Airport

The inability of Detroit to properly steward foreclosed properties is drastically highlighted by the city’s plan for Coleman A Young International Airport. Formerly known as Detroit City Airport, the facility is situated upon 264 acres on Detroit’s east side, in an area close to some of the most devastated neighborhoods in the city (Figure 15). Southwest Airlines began flying in and out of the airport in 1988, but pulled out in 1993 when government-mandated runway expansion did not occur. The last commercial airline to fly out of the airport left in 2000, but in 2016 the airport still serviced about 65,000 takeoffs and landings from private craft (Ferretti, 2017). In 2015 the City of Detroit secured funding, about $2.2 million, to buy the remaining homes near Coleman A. Young International Airport so that runway expansion could begin (Ferretti, 2015). This seemed like the long awaited fruition of a 1994 city plan to expand the airport, attract air carriers, and turn it into a revenue generator like so many other municipal airports around the country, but as of this writing, the city hasn’t proceeded with the purchases. The extent of airport’s mismanagement as it relates to parcel accumulation is investigated later in this paper.
Figure 15. Coleman A Young International Airport neighborhood.

3.3.6 Property Taxes in a Shrinking City

Detroit emerged out of bankruptcy in December 2014, which allowed the city to shed fifty years of legacy costs related to accumulated debt and interest, as well as retiree pensions and benefits. However, the path forward is fraught with challenges as the city must still navigate between historically low property and income tax receipts. Since emerging from bankruptcy, income tax collection has been taken over by the state, which helps boost compliance, increases revenue and, in particular, makes it more difficult for city residents who work in the suburbs to avoid paying the city’s income tax. Property taxes remain the problem.
In 1951, property taxes accounted for 96% of total tax revenue, while accounting for only 35% in 2012 (calculated by author from data obtained from the Census of Governments, 2017). Around the peak of Detroit’s population in 1950, property tax revenues could be relied upon to finance city nearly all city services. Property tax revenues in 1951 were $86,065,000 ($759,954,000 in inflation-adjusted 2012 dollars) while the city collected only $265,475,000 of property taxes in 2012, for a net property tax revenue loss of an inflation-adjusted $494,470,000. On a per capita basis, that averages out to $411 in property taxes paid for each Detroit resident in 1951, and $372 for 2012 Detroit residents (again, inflation adjusted). So, while the per capita property tax revenue difference between 1951 and 2012 is seemingly moderate, the net revenue loss of nearly a half billion dollars is staggering. The difference between 1951 and 2012 per capita property tax revenues highlights two major problems facing Detroit: 1) when city population declines, property tax collection declines, and 2) the per capita costs to run a shrinking city increase greatly as the population decreases because the area under governance remains fixed.

According to the Citizens Research Council of Michigan (2013), Detroit residents pay property taxes levied by the city but they also pay property taxes to support a number of other governmental entities, “including the Detroit Public Library, Detroit Public Schools, Wayne County, Wayne County Community College, a number of special authorities, and the State of Michigan.” Thus, while Detroit residents incur property tax rates higher than any large city in Michigan, less than half of what Detroiter pay in property taxes actually ends up in Detroit’s coffers to support city services (Citizens Research Council of Michigan, 2013).
3.3.7 Right Sizing

Desperate times in shrinking cities call for unusual measures, known in the literature as right sizing strategies. The term is traced to Schilling and Logan (2008), but other monikers are sometimes used, such as smart decline, smart shrinkage and perhaps most notably, legacy cities. There is a bit of salesmanship in the term - why would anyone want to wrong size? But cities like Detroit have embraced these terminologies, as well as their associated strategies. “Right-sizing recognizes that some shrinking cities will continue to shrink and it would be advantageous for these cities to plan for this shrinkage” (Hummel, 2015a). The acquiescence of cities in forgoing traditional growth strategies to focus on appropriate right sizing measures is merely a realistic nod to the daunting realities they face. Depressed real estate markets, high crime rates, reduced tax bases, large scale abandonment, inexhaustible land surpluses, and an unskilled workforce present overwhelming structural challenges.

Youngstown, Ohio was one of the first cities in the country to adapt right-sizing as a planning strategy in the early 2000s (Parris Jr. 2008). Since then right-sizing strategies have been adapted in a number of major cities including Buffalo, Baltimore, Cleveland and Flint, amongst others. Youngstown’s plan incorporated the right-sizing strategies of demolitions, greening and consolidation while facing unparalleled challenges and though the results have been markedly mixed, one notable achievement has been the revitalization of its downtown (Hummel, 2015a). Buffalo’s 2006 plan has “seven development priorities of which three of those address the right-sizing paradigm directly ... (and) are transforming the city’s economy, rebuilding Buffalo’s neighborhoods and repairing the fabric of the city through smart growth and sustainability measures” (Hummel, 2015a). In 2001 Baltimore started a plan to acquire vacant
properties through tax foreclosures with the intent of reselling them to productive owners, however, it has met with mixed success as many of the properties ended up in the possession of absentee owners content to rent out the properties, an outcome at odds with the intent of the original right sizing plan (Hummel, 2015a). Cleveland has developed a large-scale farm (Blue Pike Farm) within its border and in 2008 passed the Vacant Land Re-Use Pattern Book plan to help manage shrinkage by assisting individuals and groups who want to create productive benefit from vacant land in their neighborhoods (Hollander et al., 2009). In Michigan, the City of Flint uses land banking as a tool for right-sizing and managing shrinkage (Pallagst, Fleschurz, & Said, 2017).

Hummel (2015b) identifies the five most cited right-sizing strategies in the literature as rehabilitation, demolition, consolidation, greening, and land banking. Rehabilitation and demolition are important right-sizing strategies but current market conditions in Detroit render them ineffectual to the tax foreclosure analysis considered herein. The core purpose of rehabilitation is to facilitate redevelopment, but in many shrinking cites, Detroit in particular, market conditions prevent the flow of restoration funds. Similarly, while demolition in a growing city is regarded as a necessary step before restoration or redevelopment, in a shrinking city demolition is simply a problem-driven process undertaken to remove blight since the costs of property improvement would exceed the final value of improvements (Mallach, 2011). Thus, while foreclosed properties in Detroit may be in need of rehabilitation, or of demolition to enable future development, such considerations are currently not feasible.

More germane to the right-sizing options available to Detroit planners, within the context of foreclosed properties, are the right sizing strategies of consolidation, greening and land
banking. Consolidation of residents to reduce infrastructure costs is a right-sizing strategy intended to effectually promote the removal of residents from sparsely populated areas into more intact neighborhoods. Many large shrinking cities, Detroit most notable amongst them, peaked in population during the census year of 1950, but have retained their former urban footprint. Thus, many shrinking cities are in the position of providing fixed-cost services to a diminishing population base, in other words, less dense population density infers greater per capita infrastructure costs. The relevance of this to the property tax foreclosure discussion is that properties placed into auction can potentially be removed if located within low-density neighborhoods.

The right-sizing strategy of greening lessens infrastructure costs by opening up areas of the city to urban agriculture and other green uses while reducing service provision costs. Foreclosed properties placed into open spaces (e.g., urban farms) require little infrastructure from the city. The list of greening options available from vacant urban land is long and includes trails and greenways, green spaces, forestry sites, community gardens, parks, solar fields, storm water management systems, pavement removal, wetlands, and bioremediation (LaCroix, 2010). Greening can assist cities with land banking their parcel inventory at low cost until market conditions improve and in some instances can help ameliorate short-term property values. For instance, Nicholls (2004) found that nearby parks can improve home values by 10%.

Land banks are public entities, rather than financial institutions, whose sole function is to acquire, maintain or repurpose vacant and foreclosed properties. Abandoned properties depress property values and discourage property ownership. A land bank is an oft-used tool that helps retool acquired properties into (tax) revenue-generating assets in the ideal case, or to at least
remove the blight associated with a property and inventory it until market conditions and/or planning goals favor its future development. Land banks “act as an economic and community development tool to revitalize blighted neighborhoods and business districts … (which) can benefit urban schools, improve tax revenues, expand housing opportunities, remove public nuisances, assist in crime prevention and promote economic development” (De Wit, 2008).

The Wayne County Treasurer’s office handles the tax foreclosure process and auction on behalf of its constituent cities, including Detroit, whose properties comprise the vast majority of involved parcels. According to Cwiek (2017), since 2009 Wayne County has foreclosed on tens of thousands of homes, the vast majority in Detroit, representing about one in four of properties within the city. Recently, in September 2017, the county put up about 6,000 properties for its online auction, down from previous years, but undoubtedly only because about 30,000 were withdrawn from the auction process due to payment plan arrangements, amongst other reasons. State law requires the county to foreclose on properties whose owners are delinquent for three years, however, a common citizen complaint is that the process need not be so harsh, for “treasurers and other elected officials have the authority to take other measures until the larger system can be retooled” (Cwiek, 2017).

In Wayne County, properties are auctioned after a judgment of foreclosure, about half of which contain residential structures (Dewar, 2009). In the past, the starting bid for properties usually began at only $500. Properties that do not sell at three consecutive auctions enter into the possession of the Detroit Land Bank Authority, which has not the capacity to sell, let alone manage, all the properties it receives. Thus, the majority of properties held by the land bank remain in limbo and off the tax roll. It should be noted that in the past the unsold properties
were, by law, intended to revert to the City of Detroit, but the city refused them, so for years Wayne County amassed a large number of unwanted parcels.

In a treatise analyzing county foreclosure processes, Dewar (2009) concluded that programs such as Wayne County’s foreclosure and auction 1) fails to reduce the number of owner-occupants losing their homes, 2) fails to strengthen neighborhoods, 3) encourages multiple auctions on the same properties, and 4) ultimately fails to return individual properties to productive use. In a later study, Dewar and colleagues further elaborated her position by stating that “at each of the three stages of property foreclosure and disposition, implementers took actions that promised to encourage disinvestment in property by facilitating the spread of blight and encouraging negative externalities” (Dewar, Seymour, & Drută, 2015, 587).

The assessment of right sizing plans for shrinking cities is difficult since they differ in purpose and scope from plans undertaken within the traditional growth paradigm. The goal of the right sizing approach is “preserving neighborhoods where market activity is still taking place, while preparing vacant land in other areas for new uses” (Vey et al., 2010). Defined as such, this research assesses the efficacy of Detroit’s foreclosure process within the context of the stated goals and right-sizing strategies of its planning arm, Detroit Future City.

3.3.8 Detroit Future City – The Plan Forward

The Detroit Future City (DFC) framework is a 347-page urban planning document adopted in 2013 as a strategy for the city to deal with its massive population growth while still pursuing achieve economic growth. The planning document classifies the city into Framework Zones according to four main composite characteristics found across the city, framed by degrees of existing and anticipated vacancy (see Figure 16). The detailed plan garnered widespread
approval from municipal leaders who bought into its vision of strategies like greenways, parks and urban agriculture. Opinions about the plan in the literature vary. Some in the literature view the plan as a guiding light forward:

Two years in the making, this plan is nothing less than a watershed moment in the history of cities. The plan's right-sizing approach is a bold and powerful way for this city of 714,000 people to address its future, untethered by decades of growth-based policy commitments. While not without its flaws, the plan explodes with a new kind of urban optimism. (Hollander, 2013, 1)

Others, however, see it as more of the same type of oppressive planning that has defined urban renewal in Detroit:

The DFC proposes to phase out municipal services in large sections of the city, by reclassifying their land use designations to agricultural and green zoning. Whereas Detroit’s poorest and most isolated residents disproportionately reside in these “innovation landscapes” of the future, these areas are not internally homogenous and would negatively affect pockets of resilient residential life, already threatened by rezoning and discontinued service provision. (Clement & Kanai, 2015, 2)
In August of 2017, the DFC released a 77-page statistical overview of the city’s situation entitled 139 Square Miles (referencing the area of Detroit). The report stated that 1) 37% of city renters spend more than half their income on housing, 2) residents older than 55 make up 25% of the total population, though the 25-34 age cohort increased by 10,000 new residents since 2011, and 3) 24 square miles of Detroit lie vacant, not including abandoned roads or railroad lines, shuttered schoolyards, or unmaintained parks (Gallagher, 2017a). The report’s implication is that Detroit’s large number of poor and elderly residents cannot afford to pay their rent, though help may be on the way if younger residents continue flocking to the city.

Figure 16: DFC Framework Zones (Detroit Future City, 2017).
The stated planning goal of Detroit Future City (2013) is “to move toward a more efficient and sustainable city and improve the quality of life and business in Detroit” (p. 11). The planning document produced by Detroit Future City (2013) is long and detailed, but if one looks closely the document’s right sizing strategies of consolidation, greening and land banking can be gleaned from its words:

“Introduce new and innovative land use typologies in high-vacancy residential and industrial areas” 325

“The key is to be smart about how and where we locate and reinforce residential areas” p 350

“Bus service for high-vacancy areas may need to be re-patterned” 371

“In high-vacancy areas, take some parts of the network off-grid” 381

The inference of the above statements is that population in low density areas will be encouraged to move. A noted theorist within the shrinking cities literature has commented that with this plan Detroit intends to “manage shrinkage by right-sizing it”, which means “focusing money and resources around the islands of residential and business energy that remain in the city and turning the rest back to nature” (Hollander 2013). Hollander goes on to note that residents will be discouraged from staying in neighborhoods decimated by population loss so that these areas can be converted to greening strategy use.

As noted above, past “urban renewal” efforts have been unsuccessful in Detroit as well as in other shrinking cities. Furthermore, these efforts have hurt the city’s marginalized populations. Understandably then, the City of Detroit’s current efforts to re-envision the city via the Detroit Land Bank and Detroit Future City, are being met with resistance from certain
pockets of the citizenry. It is beyond the scope of this research to fully evaluate the exhaustive DFC plan that Detroit has now embraced. Rather, this paper examines property tax foreclosures within the context of 1) the city’s stated goal “to move toward a more efficient and sustainable city and improve the quality of life and business in Detroit,” and 2) the alignment of the property foreclosure process with the right-sizing strategies of consolidation, greening and land banking currently being implemented by Detroit (Detroit Future City, 2013). A few notable studies exist that examine property taxes in Detroit, however, they are 1) focused on improving compliance and predicting delinquency (Alm et al., 2014), and 2) examining the impact of property tax delinquency on the sales price of nearby residential properties (Alm et al., 2016). A study by Dewar (2006) compared the differences between Cleveland and Detroit in handling tax-reverted properties and found Cleveland’s approach to be more efficient. Notwithstanding, no known studies examine the property tax foreclosure process in Detroit with an eye towards spatial patterns and planning alignment. Thus, since the city’s right sizing strategies differ according to area, the results of this research are analyzed within the context of the city’s ten Framework Zones, each of which have different planning strategies.

3.4 Data and Methodology

3.4.1 Data and Study Area

The study area is the city of Detroit, MI, the central city of the Detroit–Warren–Dearborn Metropolitan Statistical Area (MSA). Detroit is the nation’s 11th largest urban area, and the third largest shrinking city (author calculation from Manson et al., 2018). Foreclosure data for the period 2002 – 2013 were obtained in shapefile format from Data Driven Detroit (2017). This foreclosure data was obtained as address point data. In order to ensure privacy and prevent
reverse geocoding, the data was aggregated to the 2010 census block level. Census block data and shapefiles for the year 2010 were obtained from the Minnesota Population Center’s National Historical Geographic Information System (Manson et al. 2018). Finally, aerial imagery was obtained from the USGS Earth Explorer (2017) website. All analyses were conducted at the 2010 census block level, except for the Kernel Density Estimation (KDE) method, which by its nature smooths out foreclosure observations thus ensuring privacy.

3.4.2 Methods

Spatial analytical techniques and models are often used to identify spatial anomalies (hot spots) in urban phenomena (Reis, Silva & Pinho, 2016). Here, the spatial dynamics of property foreclosures in the City of Detroit between 2002 and 2013 were examined using Geographic Information Systems (GIS) technology, specifically ESRI’s ArcGIS v. 10.5. The GIS maps presented herein identify the density of property foreclosures by aggregating point level parcel data to the census block level, which in turn were analyzed within the context of the stated planning framework zones of Detroit Future City. These parcel level data were aggregated to the 2010 census block level. In total, foreclosure data for 83,281 parcels were examined.

This research employed a three-step methodology to examine property foreclosures in Detroit during the study period. First, Kernel Density Estimation (KDE) was used to visualize hot spots of foreclosure activity. Second, global Moran’s I was used to detect spatial autocorrelation within the global context of the Detroit study area. Third, the local Getis-Ord Gi* was used to identify statistically significant clusters of foreclosures as well as to reveal their spatial structure. The results were then evaluated not only to decipher the variation of any found
spatial dependency, but to empirically investigate how identified patterns relate to Detroit’s overarching planning objectives.

3.4.3 Kernel Density Estimation

Kernel density estimation (KDE) produces a smoothed output of point density through a nonparametric point conversion process. Because it does not produce tests of statistical significance, it is often used for exploratory visualization (Rogerson, 2001). Kernel Density Estimation (KDE) is a popular method for analyzing and visualizing point event distribution (Silverman, 1986) partially because of its ubiquitous availability in major GIS software packages, as with the Spatial Analyst Extension of ESRI’s ArcGIS, used herein. Previous geographic applications of kernel density estimation include point pattern analyses of crime distribution (Chainey, Reid, & Stuart, 2003), pedestrian crash zone detection (Pulugurtha, Krishnakumar, & Nambisan, 2007), highway accident “hot spot” analysis (Erdogan et al., 2008), and the visualization of population distribution (Wood et al. 1999), all using KDE within GIS. A recent study used KDE to visualize the distribution of vacant properties and aggravated assaults in shrinking city neighborhoods (Branas, Rubin, & Guo, 2012).

Kernel density estimation (KDE) is a spatial method that accounts for the location of features (e.g., foreclosures) relative to each other. It is often preferred over count or proximity measures since it transforms point data onto a continuous surface and permits feature density to be estimated for any point of the map (Kloog, Haim, & Portnov, 2009). Here, KDE offers visual analysis of the spatial patterns of property tax foreclosures by accounting for the spatial proximity of foreclosures, without the constraint of geographic boundaries (e.g., census blocks). KDE estimates a density at each point of a foreclosure per unit area using a set search radius.
Values are then interpolated using a kernel smoothing algorithm in order to generate a probability density function which when mapped depicts the spatial intensity of the foreclosures, with higher values representing highly concentrated areas of foreclosures. The two parameters which most affect KDE outcome are bandwidth (search radius) and cell size, with the former considered the most important criterion (Silverman, 1986; Fotheringham, Brunsdon, & Charlton, 2000). Search radius choice will affect hotspot outcome locations since larger bandwidths will increase the smoothing of the KDE hotspot map, thus degrading the power of the KDE hotspot map to predict spatial patterns (Chainey, 2013). In ArcGIS the default output resolution is determined by the coarsest of the input raster dataset. While a particular cell size may be specified, inputs finer in resolution than the input dataset will create no new data, due to nearest neighbor resampling. Since the default search radius (bandwidth) is calculated based on the amount and spatial configuration of foreclosure points, it automatically corrects for spatial outliers, thus avoiding an unreasonable search radius. Thus, the final search radius choice was based upon the default search radius of ½ mile. The geodesic method was used for the KDE rather than the planar method since the former is preferable for local areas not projected with the purpose of preserving correct distance and area.

3.4.4 Moran's I and Spatial Autocorrelation

Exploratory Spatial Data Analysis (ESDA) as defined in Anselin (1994, 1999), is a collection of techniques to discover patterns of spatial dependence, (i.e., clusters or hot spots). ESDA is a data-driven analysis, not theory-driven, so while it is useful for identify spatial patterns, it does not possess the capability to explain why they occur. Nonetheless, it is useful for identifying patterns which can be later examined through a theoretical lens. Tests for spatial
autocorrelation help identify the similarities of nearby values as well as to determine whether objects are distributed in either a clustered, dispersed, or random geographic pattern (Longley et al., 2003). Spatial autocorrelation can be expressed in two different perspectives: 1) globally, as within the entire data extent, or 2) locally, as when determining hot and cold spots that may be driving local cluster patterns, or reflecting data heterogeneity that is distinguishable from the overall global pattern. Moran's I, proposed by Moran (1950), is one of the most commonly used indices for measuring global spatial autocorrelation. The measure is able to detect whether clustering exists within the data, though it cannot identify individual clusters. The Moran's I statistic, a global measure of spatial autocorrelation (clustering), is defined as

\[
I = \frac{N}{\sum_i \sum_j w_{ij}} \frac{\sum_i \sum_j w_{ij} (X_i - \bar{X}) (X_j - \bar{X})}{\sum_i (X_i - \bar{X})^2}
\]

where \(N\) is the number of spatial units indexed by \(i\) and \(j\); \(X\) is the number of foreclosures; \(\bar{X}\) is the mean of \(X\); and \(w_{ij}\) is a matrix of spatial contiguity. To preserve confidentiality, foreclosure addresses were aggregated to the 2010 census block level (U.S. Census Bureau, 2010). There were 83,381 foreclosures during the study period of 2002 – 2013 across 15,899 Detroit census blocks. Using the census block level as the unit of analysis prevents identification of specific addresses while shifting locational coordinates only slightly since census blocks in an urban area such as Detroit are very small. This aggregation ensured privacy and provided a foreclosure count within each census block.

Following Anselin (2003), the first step in the analysis is to construct spatial contiguity weights. Weighting can be achieved by defining neighborhoods as those within a prescribed distance, or alternatively, by eschewing distance in favor of defining neighborhoods as those...
within K-nearest neighborhoods (closest observations), whereby spatial units that are within “K” neighbors are assigned the value of 1, and 0 otherwise. The distance method is appropriate when observations are regularly spaced and a conceptual basis exists for the selected distance threshold, while the K nearest neighbors method is used otherwise (Nelson and Boots 2008). Since property foreclosures in Detroit do not follow an even distribution across aggregated census blocks, this study uses the latter method, specifically, it follows Nelson and Boots (2008) in using \( K = 8 \) nearest neighbors.

After weighting, Moran’s I is calculated to determine geography’s effect upon the shape of foreclosures in Detroit for the period 2002 - 2013. Positive spatial autocorrelation is shown with positive values, negative values suggest dispersion, and values approaching zero indicate spatial randomness or the absence of autocorrelation (O’Sullivan & Unwin, 2003). Depending on its value, Moran’s I may indicate the existence of spatial clustering. However, as it is a global measure, it does not indicate where the clusters exist. To detect possible clusters of foreclosure activity, the local Gi* statistic is used.

### 3.4.5 Using Local Gi* for Foreclosure Hot Spot Analysis

Two well-known measures used to consider local forms of global indices are the local Moran's I (also known as local indicators of spatial association, or LISA) and the local Getis-Ord Gi* statistic. These methodologies were proposed by Anselin (1995) and Getis and Ord (1992), respectively. Local Moran's I and Getis-Ord Gi* are similar in terms of the types of questions that they answer and they both produce a calculated value for each observation unit, in this case census blocks. The main difference between them is that Local Moran’s I is based on the
difference between the value of an observation and the average value (Anselin, 1995), whereas the local mean for Getis-Ord Gi* includes all features (Ord & Getis, 1995).

The formula for the Gi* statistic (Getis and Ord 1992; Ord and Getis 1995) is calculated as:

\[ Gi* = \frac{\sum_{j=1}^{n} W_{i,j}(D)X_j - \bar{X}\sum_{j=1}^{n} W_{i,j}}{S\sqrt{\frac{\sum_{j=1}^{n} W_{i,j}^2 - (\sum_{j=1}^{n} W_{i,j})^2}{n-1}}} \]

Where, Gi* is the Getis Ord Gi* value for feature i; Wi,j (D) is the weight between feature i and j; D is the distance between feature i and j; Xj is the frequency at location j; X is the attribute value of an observation; S is the standard deviation of xj; and, n is the number of all features. The Gi* method used herein is estimated by defining a spatial weighting matrix delineating the neighborhoods over which relationships are statistically evaluated. To be consistent, as with the analysis at the global level, the Gi* values were computed using K = 8 nearest neighbors as the weighting scheme.

Hot spot analysis using the Gi* statistic tests the null hypothesis that foreclosures patterns observed in Detroit emerged by chance, with rejection of the null evidencing defined hot spots of significant foreclosure activity. In this study, identified clusters of significantly high foreclosure activity were analyzed within the context of the framework zones put forth by the Detroit Future City plan. In particular, the analysis focuses upon those census blocks identified as hot spot foreclosure zones with z-scores greater than 1.96 (95% significance).
3.5 Results

For the period 2002 – 2013, there were 83,381 Detroit properties foreclosed, involving 89,696 different auction transactions (Table 6). In fact, 6147 properties were sold at least twice in the 12-year study period, 155 sold thrice, and seven properties were foreclosed four times. In total, the data set represents 89,554 foreclosures, of which 12,462 involved multiple foreclosure transactions. Put another way, 7.3% of properties were auctioned at least twice or more, and many of these, if not most, sold for the minimum $500 (auction sales prices are not included in the data). Foreclosure totals increased significantly beginning in 2009 as the Great Recession began to ravage the city. While foreclosures sent to auction were only 2,039 in 2004, they increased to 20,030 by 2012. Indeed, there would have been many more. However, because of the sheer volume of foreclosed properties, Wayne County actually held back from foreclosing on 40,000 properties in 2012, and an additional 36,000 in 2013 (Kirtner, 2016).

Table 6: Foreclosed Properties Sold at Auction: 2002 - 2013

<table>
<thead>
<tr>
<th>Year</th>
<th>2002</th>
<th>2003</th>
<th>2004</th>
<th>2005</th>
<th>2006</th>
<th>2007</th>
</tr>
</thead>
<tbody>
<tr>
<td>2002</td>
<td>247</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2003</td>
<td></td>
<td>2,489</td>
<td>2,039</td>
<td>2,090</td>
<td>5,100</td>
<td>2,251</td>
</tr>
<tr>
<td>2004</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<td>2005</td>
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<td>2007</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2008</td>
<td>4,100</td>
<td>8,008</td>
<td>11,588</td>
<td>13,001</td>
<td>20,030</td>
<td>18,750</td>
</tr>
<tr>
<td>2009</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2010</td>
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<td>2011</td>
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<tr>
<td>2012</td>
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</tr>
<tr>
<td>2013</td>
<td></td>
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<td></td>
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<td></td>
</tr>
</tbody>
</table>
3.5.1 KDE Heat Map

The KDE method produces a smoothed map of foreclosure point density. While it does not produce any tests of statistical significance, it is nonetheless useful for exploratory visualization. A Kernel density heatmap showing the distribution of property foreclosures for the study period appears in Figure 17. The map shows widespread hot spots of foreclosure activity all across the city, particularly in the city’s northeast side. High levels of foreclosures include the orange and red areas, which show large portions of the city having a rate of over 2,000 foreclosures per square mile for the study period. The only area not affected by foreclosure activity is the greater downtown area, shown in blue along the lower middle part of the city.

**Figure 17:** KDE map of property foreclosures in Detroit between 2002 and 2013.
3.5.2 Global Spatial Autocorrelation Results

The global spatial autocorrelation analysis was conducted after the point-level parcel data were aggregated to the 2010 census block level (Figure 18). Global Moran’s I for foreclosure counts was positive and statistically significant (Moran’s I= 0.44; z=171; p<0.0001), indicating a tendency for clustered rather than dispersed foreclosure activity among census blocks. Thus, the null hypothesis that the spatial distribution of property foreclosures is random is rejected. Rather, as is the case here, the spatial distribution of high values and/or low values in the dataset is more spatially clustered than would be expected under random circumstances. This finding allows for investigation of where clustering is occurring.

Figure 18: Property foreclosures per square mile in Detroit by census block, 2002 - 2013
3.5.3 Clusters and Hot Spots Detection

Based on the foreclosure aggregated at the census block level and weighting scheme of $K = 8$, Getis-Ord $G_i^*$ was used to identify statistically significant hot and cold spots, as well as to map patterns of foreclosure activity. The results are shown in Figure 19. The map shows multiple areas of significantly high levels of foreclosures (red tones) throughout most of the city’s residential areas.

![Image of significant hot and cold spots of foreclosure auction activity in Detroit, 2002-2013.]

**Figure 19.** Significant hot and cold spots of foreclosure auction activity in Detroit, 2002-2013.
There are also regions of significantly low foreclosure activity (blue and gray tones) located mostly in nonresidential areas, such as in and around the greater downtown area (Downtown, Midtown and New Center areas), on Belle Isle (a large island park with no residents), and in various parks and industrial centers scattered about the city. The only significant low area of residential foreclosures can be seen in the central part of the city along the northern border of 8-Mile Road. This low foreclosure area contains the city’s most substantial and intact neighborhoods, located directly north and west of the Detroit Golf Course, including Green Acres, Palmer Park, Palmer Woods, Sherwood Forest and the University District. In total, out of 15,899 blocks in Detroit, 2,306 (16.23%) have significantly high foreclosure activity, with 3,698 (23.26%) showing significantly low activity.

To discern possible relationships between foreclosures and housing vacancies, a Hot Spot Analysis (Getis-Ord Gi*) was also performed on the percent of vacant housing for each Detroit census block for 2010 (Figure 20). Of the 15,899 census blocks, 2,109 were identified as significantly high hot spots (95% level). Notably, the location of these hot spots are highly correlated to the foreclosure hot spot locations shown in Figure 19. In fact, 1,195 common blocks are identified as both foreclosure hot spots and housing vacancy hot spots.
Figure 20. Significant hot spots of percent housing vacancy in Detroit, 2010 (N = 2,109).

3.5.4 Census Block Hot Spot Aggregation to DFC Framework Zones

Figure 21 shows foreclosure hot spot locations aggregated to each of the ten DFC framework zones. Individual framework zone/foreclosure data can be viewed in Table 7. Not surprisingly, the highest number of foreclosures occurred in the Moderate Vacancy 2 and High Vacancy zones. However, there are some interesting revelations when foreclosure data is viewed alongside the hot spot aggregations. Notably, while the amount of foreclosures occurring in Low-Vacancy 2 zone is 16% of the total, only 5.76% of the hot spot activity is recorded in that same zone, indeed suggesting that the foreclosure activity in this zone is dispersed. On the
contrary, the Moderate Vacancy 2 zone experienced 28% of total foreclosures, but 38% of the foreclosure hot spots occurred there, suggesting intense clustering of foreclosure activity.

**Figure 21.** Auction foreclosure hot spots aggregated to the DFC Framework Zones, 2002-2013.
Table 7: Foreclosures per DFC Framework Zone

<table>
<thead>
<tr>
<th>Zone</th>
<th>Foreclosures per Square Mile</th>
<th>Total Foreclosures</th>
<th>Percent Foreclosures</th>
<th>Census Blocks Identified as Hot Spots</th>
<th>% of Total Hot Spot Blocks</th>
<th>Median House-Hold Income</th>
</tr>
</thead>
<tbody>
<tr>
<td>'CEM' = Cemetery</td>
<td>0</td>
<td>19</td>
<td>0.02%</td>
<td>0</td>
<td>0%</td>
<td>$40,622</td>
</tr>
<tr>
<td>'GDT' = Greater Downtown</td>
<td>90</td>
<td>391</td>
<td>0.47%</td>
<td>0</td>
<td>0%</td>
<td>$38,976</td>
</tr>
<tr>
<td>'HV' = High Vacancy</td>
<td>1,607</td>
<td>22,099</td>
<td>26.51%</td>
<td>745</td>
<td>28.59%</td>
<td>$28,249</td>
</tr>
<tr>
<td>'IC' = Industrial Land Use Change</td>
<td>149</td>
<td>387</td>
<td>0.46%</td>
<td>6</td>
<td>0.23%</td>
<td>$32,280</td>
</tr>
<tr>
<td>'IS' = Industrial Land Use Strength</td>
<td>75</td>
<td>1,723</td>
<td>2.07%</td>
<td>28</td>
<td>1.07%</td>
<td>$33,736</td>
</tr>
<tr>
<td>'LV1' = Low Vacancy 1</td>
<td>392</td>
<td>2,580</td>
<td>3.10%</td>
<td>8</td>
<td>0.31%</td>
<td>$52,947</td>
</tr>
<tr>
<td>'LV2' = Low Vacancy 2</td>
<td>745</td>
<td>13,447</td>
<td>16.13%</td>
<td>150</td>
<td>5.76%</td>
<td>$40,399</td>
</tr>
<tr>
<td>'MP' = Major Parks</td>
<td>4</td>
<td>316</td>
<td>0.38%</td>
<td>7</td>
<td>0.27%</td>
<td>$44,231</td>
</tr>
<tr>
<td>'MV1' = Moderate Vacancy 1</td>
<td>1,392</td>
<td>18,824</td>
<td>22.58%</td>
<td>675</td>
<td>25.90%</td>
<td>$36,271</td>
</tr>
<tr>
<td>'MV2' = Moderate Vacancy 2</td>
<td>1,684</td>
<td>23,566</td>
<td>28.27%</td>
<td>987</td>
<td>37.87%</td>
<td>$32,523</td>
</tr>
</tbody>
</table>
3.5.5 Properties Near Coleman A Young International Airport

Figure 22 shows aerial imagery of the airport and abutting neighborhood both in 1978 and in 2015. Note how the housing stock was still intact in 1978 but by 2015 had suffered a devastating level of abandonment. In the half square mile neighborhood immediately abutting Coleman A Young International Airport (shown in green in Figure 22), 388 properties were auctioned during the study period, 24 were sold twice, and one was sold three times. At an average price of $10,000, it would have cost the city at least $3,880,000 to buy all of these properties on the open market. Knowing the city wanted the parcels for its airport expansion, it is logical to conclude that many homeowners would have held out for much more than $10,000.

Figure 22: The neighborhood next to Coleman A Young International Airport in 1978 (left) and 2015.
3.6 Discussion

As of 2013, the end of the study period for this research, nearly 78,000 Detroit properties sat vacant or blighted, almost half (48%) of the city’s properties were tax delinquent, and nearly 20% of potential property tax revenue sat uncollected (Kirtner, 2015; Alm et al., 2014). The intent of the foreclosure auction process is to reclaim lost income and regenerate property tax income streams. However, according to Kirtner (2015), 78% of properties sold at the Wayne County auctions since 2011 have fallen back into delinquency, precluding any tax payment relief. Indeed, the results of this study show that 6,147 of the 83,281 auctioned parcels (7.3%) later went back to auction. At first glance, that might seem like a large discrepancy, however, one has to understand the nuanced difference between properties reaching delinquency and reaching auction. And to understand that nuanced difference, the foreclosure process in Detroit must be further explained.

The tax collection and foreclosure process for Detroit is handled by Wayne County, which has delinquency problems far greater than most communities. That said, there are many other counties containing shrinking cities with similar blight and delinquency problems and, thus, in many ways the auction process for Wayne County is not all that unique (Kirtner, 2015). On average, it takes about three years from continuous nonpayment of taxes for a property to hit the county’s auction block. That three-year period helps explain the difference between the rate of 78% of properties being delinquent cited by Kirtner (2015), and the 7.3% rate of properties reentering the auction process found by this research.

A brief continuation of the Detroit foreclosure process is warranted to help couch the results of this research. There are several opportunities along the way for missed property tax
payments to be settled, though further penalties and interest accrue along the way. Eventually, if the balance due is not paid by in full by March 31st of the third year, the property is foreclosed on April 1st. Barring a payment arrangement made via a taxpayer assistance program, the property owner loses all rights to the property. Wayne County uses a two-round process to sell its foreclosed properties. The first round requires purchasers to begin bidding at the level of back taxes. The vast majority of first round properties go unsold, then enter the second round at a minimum price set by the county, clear of any back taxes. The historical minimum bid amount for vacant or abandoned properties tended to be only $500. Properties not selling in the second round are offered to the city, but Detroit usually declines to take possession of the properties, so they revert instead to the Detroit Land Bank where they are placed into a variety of programs on a lien free basis. At present, the Detroit Land Bank possesses 96,408 properties, or roughly 25% of all Detroit parcels,

In 2009 the number of properties auctioned by Wayne County increased significantly to over 8,000 and soon ballooned to over 20,000 in 2012. Ubiquitous posts on the internet during that time promoted the idea that a house could be bought in Detroit, a major American city, for a mere $500. Speculators flocked to the Wayne County auction. In the late 2000s, “one investor’s properties accounted for 22 percent of the auctioned properties that returned to foreclosure, suggesting to others that the Wayne County auction for Detroit properties “promotes speculative buying by absentee owners, at the expense of renters and home owners, the latter of which is usually unable to pay the cash bid price of their properties” (Dewar, 2009). Indeed, the recidivism rate of properties entering and reentering both delinquency and auction supports this notion.
Of interest to this research is not only how properties enter foreclosure, but where. This research found that 388 properties around the airport found their way into the Wayne County auction during the study period despite the fact that the City of Detroit was actively pursuing a strategy to assemble nearby parcels to enable its airport expansion plans. The lack of coordination between Wayne County and the City of Detroit cost the latter millions of dollars in acquisition fees, and much time. Had the properties simply been transferred to the City of Detroit, millions of dollars could have been saved and perhaps the airport expansion could already be under way, but the city is still struggling to get the airport development project off the ground (Gallagher, 2018).

One of the more notable results of this study is that property foreclosures are clustered and correlate to neighborhood decay since they exhibit similar spatial patterns to housing vacancy in Detroit. This finding falls in line with the results of other studies; e.g., Alm et al. (2016) examined the impact of property tax delinquency on the sales price of nearby residential properties and found that unsold properties with a tax lien had a negative spillover of 5.1 percent ($12,872) on surrounding properties. Furthermore, they stated that the harmful effects of property tax delinquency are highly correlated with mortgage foreclosure, a huge problem in Detroit. A similar study by Seymour (2016) examined how bank disposition methods influenced housing stability in Detroit. Specifically, he examined the post-foreclosure trajectory of real estate owned (REO) foreclosure properties in Detroit the surrounding tri-county area from 2005 to 2013. He found that investor, rather than owner-occupant, purchases of REOs in the city were more likely to be foreclosed upon in the future, thus destabilizing Detroit neighborhoods further. He noted that such studies may challenge “lenders and government entities to devise property
disposition practices that do less unnecessary damage to neighborhoods in cities where demand is weak” (Dewar et al., 2015, 10).

The most important finding of this research is perhaps that the auction process in Detroit is incongruent with the city’s stated planning goals as elaborated by the DFC. The DFC defines Moderate-Vacancy 2 zones as those with weak residential markets and very low demand whose areas verge on losing their residential character, while High-Vacancy zones are often isolated in large fields next to illegal dumping sites in areas that have already lost their residential character (Detroit Future City, 2013). According to the DFC, infrastructure capacity is the key to long-term success of its planning goals:

Although the transitions to new and innovative land use types will take 20 years or more, there is a relatively pressing challenge now: In many areas that have experienced long-term loss of people, homes, and businesses, with high-vacancy levels or industrial abandonment, deciding the most appropriate capacity of infrastructure systems in the future cannot be put off indefinitely. (Detroit Future City, 2013).

The stated goal of right sizing in general, and the DFC plan in particular, is to phase out municipal services in large sections of the city by reducing or eliminating population in certain zones for purposes of service provision efficacy. What sense then does it make to offer on the cheap through auction nearly 50,000 parcels in the High-Vacancy and Moderate Vacancy 2 zones alone, without generating significant tax revenues, when keeping those parcels helps achieve your planning goals more quickly?

The Wayne County auction of tax-foreclosed properties is one of the most criticized public policy processes in Detroit, resulting in the seizure of thousands of properties which in turn causes widespread displacement and neighborhood destabilization (Gallagher, 2017b; Weyl,
In 2014 the Wayne County treasurer began foreclosure proceedings upon 62,000 Detroit properties, 37,000 of which were occupied, which led to more homeowner evictions, housing abandonment, blight and population loss (Mogk, 2014). This process has been repeating itself annually since 2002, the beginning of the study period for this research, the effects of which have been particularly pronounced post the Great Recession. But what should be done?

A policy fix to the Wayne County auction would no doubt be an arduous process requiring cooperation from the State of Michigan since the auction is mandated by state law. One proposed solution is to abolish the property tax in Detroit altogether. Mogk (2014) argues that abolishing the residential property tax would end the crisis suffered by Detroiter, who have one of the lowest levels of median household in the country as well as some one of the highest unemployment and poverty rates. He also notes that the property tax structure in Detroit suffers from inflated property assessments and that even with such bloat, property tax revenues make up only 10 percent of the city’s budget (income tax, casino tax and state revenue sharing are the primary revenue sources).

Still, abolishing Detroit’s property tax seems not only politically untenable, but desperate and short-sighted as well. Downtown Detroit is rebounding and so are other select parts of the city, though this resurgence has yet to manifest itself within the city’s residential neighborhoods (McGraw, 2017). A recent opinion piece in the New York Times concurs: “As capitalism returns to Detroit’s downtown in all its feverish forms, you can see the city materialize before your eyes. It’s like watching hot lava cool… In Detroit, the future is still being written” (Larsen, 2017). It is not unreasonable to think that the recent wave of commercial investment may in time spillover to the residential areas, as it has in other central cities. The abolishment of the city’s
property tax now would deny the city significant tax revenues in the future when Detroit home values may well rebound, thus inflating tax revenues.

Even Mogk (2014) admits that Detroit’s operating budget is lean and any lost revenue from abolishing the property tax needs to be replaced. To that end, Mogk proposes the implementation of a new local sales tax or excise tax to replace this lost revenue. However, the shifting of local taxes does not represent a sound structural solution to the problem. Rather, two other suggestions put forth by Mogk might bring about more efficacy. First, remove the favored tax treatment that Tax Increment Financing (TIF) provides for downtown commercial properties. This would allow the hundreds of millions of dollars that have flowed into downtown over the years to flow into the neighborhoods instead. Downtown Detroit is now a thriving commercial success, TIF subsidies are no longer needed downtown. Detroit would be better served by having those funds flow into city’s general fund where they can be allocated to the neighborhoods. Second, remove the tax exemption for the substantial number of tax exempt properties in Detroit which “receive the bulk of city services and pay for none of the costs, a concession Detroit can no longer afford” (Mogk, 2014, 1).

3.7 Conclusion

Research on Detroit significantly advances urban studies, “not in spite of Detroit’s decline but rather because of its decline” (Dewar et al., 2015). While urban geography is replete with studies focusing on conditions of growth, much fewer studies examine how cities manage decline (Galster 2012). The results of this study highlight the importance of extending the discussion of how delinquent properties in Detroit are processed. As cited in Alm et al. (2016),
there has been much urban research in shrinking cities, such as examining the negative effects of mortgage foreclosures upon childhood outcomes (Been et al., 2011), health outcomes of homeowners (Pollack & Lynch, 2009), and the foreclosure discount (Immergluck & Smith, 2006). However, research into the effects of the tax foreclosure process in shrinking cities has been limited.

The intent of the foreclosure auction process is to “reclaim lost income and reestablish the income streams from previously delinquent properties” (Kirtner, 2015). However, the results of this study show that 6,147 of the 83,281 auctioned parcels (7.3%) later fell back into delinquency, and according to Kirtner (2015), 78% of properties sold at the Wayne County auctions since 2011 fell back into delinquency, precluding any tax payment relief. Furthermore, the foreclosure system keeps pumping new owners into properties located within clearance zones, while the city planners are working frantically to remove residents from these zones. Inexplicably, the City of Detroit has missed numerous opportunities to acquire parcels in the airport neighborhood cheaply, if not for free. The development of the airport could bring huge revenues down the line, so it appears almost criminal to let nearly 400 parcels slip out of the city’s coffers. Perhaps the most obvious indictment of the property tax foreclosure systems is that 7.3% of foreclosed parcels end up being foreclosed upon again. Simply put, Detroit is operating under a property tax foreclosure system that serves neither its citizens nor its own stated planning goals.

In a treatise analyzing county foreclosure processes, Dewar (2009) concluded that programs such as Wayne County’s foreclosure and auction 1) fail to reduce the number of owner-occupants losing their homes, 2) fail to strengthen neighborhoods, 3) encourage multiple
auctions on the same properties, and 4) fail to return individual properties to productive use. The results of this study affirm her findings and further concludes that the overall auction process is incongruent with the City of Detroit’s stated planning goals.

In summary, this article agrees with the suggestions of Mogk (2014) to 1) reduce the large number of tax exempt properties which are currently receiving costly city services while not contributing to the tax rolls and 2) remove the TIF policies currently benefitting downtown at the expense of the neighborhoods. This article also adds a third policy suggestion: to place a moratorium, renewable annually, on property tax foreclosures in Detroit. This would allow home owners and/or renters to stay in their homes, give neighborhoods the opportunity to stabilize during the resurgence currently happening in Detroit, remove the market scourge of speculative and absentee owners, and provide a window to policy makers with which to gauge the real estate market and to assess the direction of neighborhood decline or improvement. It also would prevent more properties from being haphazardly accumulated by land banks, the county, the city and derelict owners, all lacking a cohesive plan for right-sizing Detroit.
CHAPTER 4
GENTRIFICATION AND NEIGHBORHOOD CHANGE IN CHICAGO’S NEIGHBORHOODS AND SUBURBS, 1990 – 2010

4.1 Abstract
This research empirically examines neighborhood change, as measured by relative change in per capita income for 335 Chicago neighborhoods and suburbs for the period 1990 to 2010. Its purpose is to examine the potential underlying factors associated with neighborhood change, as well as gentrification, in a metropolitan region anchored by a shrinking central city by analyzing the spatially varying impacts of explanatory variables commonly used in the gentrification and urban resurgence literature. The typical research on neighborhood change, employs global (OLS) regression models that ignore spatial autocorrelation in the variables and thus cannot explore the spatial heterogeneity inherent across urban regions. By contrast, this study builds both a traditional OLS regression model and a Geographically Weighted Regression (GWR) model to investigate the spatial dependence. The dependent variable is change in per capita income from 1990-2010 and the explanatory variables are related to age, race, ethnicity, education, nativity, distance from downtown, housing stock, and household type. The results demonstrate that the most gentrified area of Chicago was in the northern part of the city, while neighborhood ascent in the suburbs occurred mostly on the suburban fringe as opposed to the inner-ring suburbs where neighborhood decline was prevalent. These findings confirm previous studies in the gentrification field. Furthermore, this research finds that minority neighborhoods in Chicago did indeed gentrify, which challenges the findings of some previous studies. Finally,
this research contributes to the literature by unveiling a gentrification methodology that incorporates both central city and suburbs into the analysis. This could allow for a better understanding of gentrification and neighborhood change throughout an entire metropolitan area and assist future studies by uncovering previously unknown effects associated with neighborhood change.

4.2 Introduction

Anyone who has recently visited Chicago’s vibrant Loop or Riverwalk might be surprised to learn that Chicago is a shrinking city. Its population peaked at 3,620,962 in 1950 and by 2010 the city had lost almost a million of its population. The 2010 population level of 2,695,598 represents a nearly 26% decline over that 60-year period. Conversely, during that same 1950-2010 period the seven-county Chicago metropolitan area, as defined by the Chicago Metropolitan Area for Planning (CMAP), gained over 3 million residents and grew by over 62% (Author’s calculations based on census data retrieved from Manson et al., 2018). During the 1990-2010 period many of Chicago’s suburbs increased dramatically in population, while within the central city of Chicago some neighborhoods grew but many others declined. Many central cities in the U.S. experienced similar patterns of population change during this same period. Underlying the contrasts between population change within and between central cities and their suburbs is the phenomenon of gentrification. The study of gentrification within the context of a shrinking city is contentious, with some arguing that gentrification can save shrinking cities (Wynn & Deener, 2014), and others arguing that it drives an already disadvantaged class of “low income residents away from the resources and efficiencies found in urban density” (Brasuell, 2014). By examining gentrification in the Chicago region for the period 1990-2010, this study
does not weigh in on its pros and cons, rather, it examines its spatial manifestation. Specifically, using change in per capita income as a proxy for neighborhood change, the purpose of this research is to identify the associations if ever between gentrification and commonly used explanatory variables and to determine whether those associations exhibit spatial nonstationarity (i.e., spatial variation) across the Chicago region.

The theoretical framework for this study is primarily centered around the work of Burgess' (1925) invasion-succession model and Hoyt's (1939) filtering model. These time tested models are useful for understanding class-based processes whereby working class residents move into areas previously abandoned by higher-income middle class residents. This research also extends upon the work of Farley et al. (1978) and Hwang and Sampson (2014) who describe how white residents prefer not to move into areas with a threshold level of minorities. This research contributes to the field of gentrification studies by investigating gentrification and neighborhood change within the context of an entire metropolitan area, rather than a central city. The foundational underpinning for choosing the entire metropolitan area is provided by Davidson & Lees (2005) who note that gentrification happens not only in the central cities but in the suburbs as well.

To achieve its research goals, this study uses Geographically Weighted Regression (GWR), a spatial regression technique that models the relationship based on neighboring observations rather than all observations in a study area. GWR allows the explanatory coefficients to vary from the global values derived from traditional Ordinary Least Squares (OLS) regression and can thus demonstrate the varying spatial effects of the independent variables. The explanatory variables used relate to age, race, ethnicity, education, nativity,
distance from downtown, housing stock, and household type. Specifically, the eight variables used in this study include the 1) change in percent of persons aged 22 to 34 from 1990-2010; 2) percent African-American population in 1990; 3) percent Hispanic population in 1990; 4) change in percent of college graduates from 1990 to 2010; 5) change in percent of foreign-born from 1990 to 2010; 6) distance from the areal unit centroid to downtown; 7) median age of built structures; and 8) change in percent of female-led families from 1990 to 2010.

This study is divided in five sections. After this general introduction, Section 2 contains a literature review which examines the ever growing literature of gentrification and neighborhood change. Section 3 discusses the data and methodological steps used in this study. This is followed in Section 4 by a presentation of the results along with a discussion. Finally, a summary of this study’s main conclusions is contained in Section 5.

4.3 Literature Review

Glass (1964) is given credit for developing the term “gentrification” during her observations of social structure and housing markets in London where she noticed the influx of a “gentry” into lower income neighborhoods. A simple definition describes gentrification as “a cyclical process driven largely, but not completely, by investment flows” (Lees, 2000). Lees et al. (2008) further developed the definition as “the transformation of a working-class or vacant area of the central city into middle-class residential and/or commercial use” (xv). Kolko (2007) describes it as “the upgrading of urban neighborhoods, especially neighborhoods starting from low average income, low housing values, or high poverty rates (p. 1). The role of government relating to gentrification is also controversial, since they essentially make policies and plans for
urban space, not necessarily the people who inhabit it. Gentrification brings higher property values and thus benefits owners and city tax coffers to the detriment of low income residents who must flee the neighborhood due to rising rents. Increasingly, community activists are having to battle the deep pockets of city hall and their political donors, the developers, in an often futile attempt to prevent displacement.

4.3.1 Neighborhood Change and Gentrification

The neighborhood change literature, of which gentrification is part, is growing because neighborhoods can acquire upward trajectories in different ways. Owens (2012), identifies nine types experiencing upgrades: affluent neighborhoods, booming suburbs, diverse urban neighborhoods, Hispanic enclave neighborhoods, minority urban neighborhoods, new white suburbs, no population neighborhoods, and upper middle-class white suburbs. The simple difference between gentrification and neighborhood ascent is that the negative outcome of displacement occurs with the former, but not with the latter. While the gentrification literature is large, relative few studies focus on causality by examining gentrification’s determinants. Because the underlying causes can be different across different cities, it is hard to generalize determinants across study areas using traditional OLS models:

Gentrification does not rely on a singular cause. It may emerge when three conditions are present: the existence of a potential pool of gentrifiers, a supply of inner city housing, and a cultural preference for urban living (Hamnett 1991). It is arguably a “chaotic” process, that does not lend itself to binary or linear analysis (Zuk et al., 2015, 12).

Gentrification is commonly described as the displacement of the extant working-class by the in-migration of a primarily white middle-class (Glass 1964; Lees et al. 2008). The pros and cons of the gentrification process has been hotly debated ever since Glass coined the term in
1964, particularly after stated the term began to appear in the literature during the 1970s (Furman Center, 2015). Detractors of gentrification argue that the resultant economic improvement of a neighborhood comes at the expense of rising rents, home prices and property taxes, which serve to force out poorer residents (Lees et al. 2008; Goetz 2011). Proponents generally use the “it is the rising tide that lifts all boats” argument coined by Duany (2001. 36), to support their contention that the economic improvement of these neighborhoods, enabled by high income gentrifiers, creates opportunities for and can raise the wealth of the current lower-income residents (Freeman and Braconi 2004; Bryne 2003; McKinnish et al. 2008). Detractors argue further that low-income residents are ill-equipped to take advantage of opportunities presented or to capitalize on any economic benefits - they simply are forced to move out due to rising costs. Gentrification critics decry the breakup of long-standing neighborhood communities whose residents are forced out and independent businesses are replaced, yet proponents argue that the infusion of new cultural capital revitalizes neighborhoods. Furthermore, they contend that gentrification is the result of free-market processes and that not much can be done to prevent it. After all, gentrification starts with the government.

Real estate policy and governance in the U.S. falls under the purview of local governments, primarily incorporated cities or otherwise, the counties. Major tax revenues for local governments are generated by property taxes, therefore, it is not surprising to find that most local policies are structured to promote gentrification (Lees and Ley 2008). The developer-driven policies of local governments are forged to induce capital back into the city, for example, via new transportation planning or tax incentives. But governments can also do something to prevent gentrification through rent-controls, zoning ordinances and other anti-growth policies.
Yet, for most large cities, particularly shrinking cities in the former manufacturing belt, the appeal of desperately needed property tax revenues generated by new build or traditional gentrification too enticing to passively ignore.

4.3.2 Urban Models and Gentrification

The Chicago School of sociology developed an “ecological” view of urban studies. Central to their approach were the concepts of invasion and succession in which movement into or out of an area affected surrounding areas. These areas were defined by Burgess (1925) to be concentric zones, or rings. The Concentric Zone Model was empirically based on the city of Chicago, a natural study laboratory owing to the large number of immigrants who settled there. Burgess’ model theorized that five different zones existed: the Loop (CBD), Zone of Transition, Zone of Workingmen’s Homes, Residential Zone, and Commuter Zone. The key zone in the model was the Zone of Transition, which is where new immigrants first settled upon arrival due to the low cost of housing and proximity to low-skilled jobs available in the nearby industrial sector. This “invasion” set off successive waves of movement as other people moved out of the Zone of Transition into the next outer zone in a pattern which would replicate itself throughout all of the zones (the process can be conceptualized as a rock thrown into a pond which causes subsequent wave movement). Empirical studies of modern Chicago have revealed that though the highest-density immigrant neighborhoods are still located within Chicago, the foreign-born in the area have also followed the path of job growth to the northwestern city suburbs, as well as elsewhere (Greene, 1997).
The concentric zone model later was amended into the Sector Model by Hoyt (1939) and still later into the Multiple Nuclei Model by Harris and Ullman (1945). In the latter model, monocentric city was replaced by polycentric city, whereby multiple nodes exert pull factors according to their function, thus influencing the urban spatial process. Notwithstanding their criticism, the classic urban development models have withstood the test of time. The monocentric model predicts that higher-income groups with lower housing demand and no children will locate closer to the city center, or transit stations, to minimize work commutes (Kolko, 2007). In particular, studies have shown that aging baby boomers (Myers, 1990) and gay people (Knopp, 1997) prefer to live close to the city center, which is why distance to the city center is often used as an independent variable in gentrification studies, as it is used herein.

As it pertains to the gentrification literature, Burgess's (1925) invasion-succession model and Hoyt's (1939) filtering model are useful for studies focused on neighborhood decline involving the in-migration of poorer residents move into older housing recently abandoned by wealthier residents seeking to move further away from the central city. These models are useful for explaining the phenomenon of the decline of inner-ring suburbs in the U.S. They also have utility for explaining settlement out on the urban fringe of metropolitan areas. However, they are less useful for the process of gentrification, which typically, but not always, involve the in-migration of wealthier residents into poorer areas of a central city, accompanied by widespread reinvestment into these older urban areas. But gentrification can happen outside the central city as well and has been used for some time to “describe changes in the suburbs of some cities and even rural areas” (Davidson & Lees, 2005).
4.3.3 Gentrification in Minority Neighborhoods

Racial or ethnic composition is a major contributing factor in neighborhood change and gentrification patterns. In many studies race or ethnicity appears as a control factor. However, in an innovative study using Google Street View to detect neighborhood change in Chicago, Hwang and Sampson (2014) made race their central point of analysis. They found that “the pace of gentrification in Chicago from 2007 to 2009 was negatively associated with the concentration of blacks and Latinos in neighborhoods that either showed signs of gentrification or were adjacent and still disinvested in 1995.” They further found that when the share of blacks was greater than 40%, gentrification prospects diminished for that neighborhood while gentrification favored neighborhoods with a white population above 35%. Similarly, Farley et al. (1978) found that 40% of whites stated they would move out of a neighborhood once the African-American population reached 33% and almost none would move into a neighborhood with more than 15% African-Americans. Clark (1992) found that whites prefer neighborhoods which are at least 70% white. The preference for particular neighbors is well documented within the racial dynamics and tipping point model studies, as with Schelling (1978) who found that even minor differences can alter neighborhood choice.

4.3.4 Gentrification in Chicago

Much of the remarkable growth around Chicago’s downtown has been driven by new construction rather than the in-migration/displacement process customarily associated with gentrification. Davidson and Lees (2005) argue that these new-build residential developments do indeed represent gentrification because they involve “middle-class resettlement of the central city, the production of a gentrified landscape, and lower income displacement in the adjacent
residential communities” (Davidson & Lees, 2005, 1169). New build gentrification notwithstanding, Chicago has experienced large-scale, traditional gentrification across many of its neighborhoods. The Voorhees Center (2014) developed an index to identify Chicago neighborhoods showing signs of neighborhood change, specifically to identify gentrification. Using 13 socioeconomic variables, the report measured variable and index change over a period of four decades, 1970 to 1980, 1980 to 1990, 1990 to 2000, and 2000 to 2010. While their report identified notable instances of neighborhood gentrification, it is perhaps more notable for finding “that decline is more prevalent in the City of Chicago as a whole” (Voorhees Center, 2014).

Several studies have documented the recent widespread level of gentrification in Chicago’s neighborhoods (Hwang & Sampson, 2014; Vorhees Center, 2014, among others). The issues caused by Chicago’s gentrification and population loss are multidimensional and these problems have affected the city’s minority population particularly hard. Gentrification has displaced many Hispanics and African-American from previously affordable neighborhoods, while severe population loss has forced the closure of many schools and has led to the reduction of other city services. The duality of these problems has led to accusations that policies instituted by the city serve as a “selective containment” of poor minorities, particularly inside the predominantly black communities of the South and West Side neighborhoods (Garcia, 2018). In addition, Chicago’s demolition of most public housing surrounding downtown has led to significant white population growth nearby (McDonald, 2017). As for Chicago’s suburbs, several observations are worth noting. First, like their central city counterpart, Chicago’s inner-ring suburbs continue to decline in both per capita income and population, thus producing similar problems. Second, “Chicago has a much larger Hispanic population than is typical for major
northern metro areas in the USA” and many live in the poorer inner ring suburbs (McDonald, 2017).

This research contributes to the literature by examining the spatially varying patterns of gentrification and its associated factors across a metropolitan area. It is to the author’s knowledge that no gentrification studies have attempted to model such non-stationarity. This study also contributes by using a methodology that incorporates both central city and suburbs into the analysis, rather than solely examining the former as most studies do.

4.4 Data and Methodology

4.4.1 Study Area

The study area for this research is the contiguous grouping of census-defined places located within the seven-county metropolitan area defined by the Chicago Metropolitan Agency for Planning (CMAP). Specifically, the study area includes all 77 Chicago neighborhoods as well as 238 contiguous Chicago suburbs located within Cook, DuPage, Kane, Kendall, Lake, McHenry and Will counties in northeastern Illinois. Figure 23 shows the study area as well as population change from 1990 to 2010. Note how severe population decline was within the South Side of Chicago and how dramatically the outer edges of the urban fringe grew.
For purposes of running the GWR model, contiguity is required. While the places included in this study do not comprise all of the incorporated places within the entire seven-county area, it includes the vast majority of them. Identifying Chicago’s 238 contiguous suburbs
for this research required inputting all place geographies within the seven-county CMAP metropolitan region into GeoDa 1.10 (Anselin, Ibnu & Kho, 2006), where they were checked for Rooks-contiguity using a connectivity histogram. The results indicated that 238 Chicago suburbs had at least one contiguous neighbor and were thus included in the research. It is worth noting here that the 335 Chicago areas included in this study had a total population in 2010 of 7,833,813, while the entire population of the seven-county CMAP region was 8,431,386, yielding a 93% coverage rate.

4.4.2 Data
The dataset for this study was compiled from the Minnesota Population Center (2017) which provided data from the decennial U.S. Census enumerations of 1990-2010, and the American Community Survey (ACS) 5-year set for 2008-2012 (U. S. Census Bureau, 2018). The dependent variable used to measure growth or decline is the change in per capita income for each Chicago neighborhood or suburb during the 1990-2010 period relative to the level of income change for the overall metropolitan area. The explanatory variables used in the study are commonly found in the gentrification and urban resurgence literature and relate to age, race, ethnicity, human capital, immigration, family status, housing stock, and distance to the central business district. In their report on Chicago gentrification, the Voorhees Center (2014) used 13 variables to build a gentrification index. Five of those 13 variables were used for this research: % Black, % Latino, % College Education, % Female Households, and income (note that Vorhees used median family income while this research uses per capita income). It should be noted that the Vorhees Chicago report used an index-based approach to identify gentrification and decline, rather than an empirically tested model as this research does. Their report is upfront about this
fact: “none of the aforementioned variables could be considered a priori in identifying a neighborhood’s socioeconomic status and thus, capable of determining in a cause and effect way that a neighborhood has upgraded or declined over time” (Voorhees Center, 2014). For this reason, this research did not use all 13 variables by Vorhees, specifically to avoid inevitable model issues with multicollinearity (e.g., using %Hispanic, % Black, and % White), but also for lack of data continuity over census periods, for example with % Manager Occupations. The descriptive statistics for the variables used in the regression models for this research on Chicago neighborhoods and suburbs (neighborhoods (77); suburbs (258), N=335) are found in Table 8.

Attribute data and geographies were collected by census tract within the city of Chicago and then were aggregated to the 77 neighborhoods identified by the City of Chicago’s GIS portal. The aggregated neighborhoods were then joined in a GIS to the contiguous census-defined places within the Chicago metro area. As such, the research here places the neighborhoods of Chicago in comparison to their metro areas, rather than considering the city of Chicago as a single entity. This allows for individual examination of contextual neighborhood effects rather than having the city dwarf its suburbs in the analysis. All 77 neighborhoods were aggregated perfectly, except for the O’Hare neighborhood which proved problematic due to overlapping census tracts belonging to different cities. For this reason, the O’Hare community area is excluded from the analysis. The removal of O’Hare from the analysis does not significantly affect the model output since it is primarily an industrial and commercial center rather than residential.
Table 8. Descriptive Statistics for Variables used for OLS Run on Chicago Neighborhoods and Suburbs (N = 335)

<table>
<thead>
<tr>
<th>Variable</th>
<th>Name</th>
<th>Mean</th>
<th>Std Dev.</th>
<th>Min.</th>
<th>Max.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Change in per capita income: 1990 to 2010 (Dependent)</td>
<td>PERCAPINC</td>
<td>-.000</td>
<td>.144</td>
<td>-.390</td>
<td>.870</td>
</tr>
<tr>
<td>Change in percent of college graduates: 1990 to 2010</td>
<td>COLL</td>
<td>.102</td>
<td>.082</td>
<td>-.110</td>
<td>.570</td>
</tr>
<tr>
<td>Change in percent of female-led families from 1990 to 2010</td>
<td>FEMLED</td>
<td>.036</td>
<td>.074</td>
<td>-.540</td>
<td>.290</td>
</tr>
<tr>
<td>Change in percent of foreign-born from 1990 to 2010</td>
<td>FB</td>
<td>.070</td>
<td>.069</td>
<td>-.120</td>
<td>.300</td>
</tr>
<tr>
<td>Change in percent of persons aged 22 to 34</td>
<td>C22TO34</td>
<td>-.052</td>
<td>.046</td>
<td>-.280</td>
<td>.170</td>
</tr>
<tr>
<td>Distance from the areal unit centroid to downtown</td>
<td>CBDDIST</td>
<td>33.00</td>
<td>19.78</td>
<td>.000</td>
<td>82.49</td>
</tr>
<tr>
<td>Median age of structures built</td>
<td>AGEBUILT</td>
<td>39.07</td>
<td>12.067</td>
<td>14</td>
<td>61</td>
</tr>
<tr>
<td>Percent African-American population in 1990</td>
<td>PCTBLK</td>
<td>.151</td>
<td>.293</td>
<td>.000</td>
<td>.994</td>
</tr>
<tr>
<td>Percent Hispanic population in 1990</td>
<td>PCTHIS</td>
<td>.075</td>
<td>.121</td>
<td>.000</td>
<td>.881</td>
</tr>
</tbody>
</table>

4.4.3 OLS and GWR Models

This study first builds an OLS model upon the dependent variable for Chicago’s neighborhoods and suburbs (N = 335). Many urban empirical studies use traditional OLS regression analysis to discern relationships between variables. The OLS model is a global model which assumes homogeneous and stationary relationships between the dependent and explanatory variables. It assumes that the residuals are independent and randomly-distributed rather than spatially variant, which can sometimes be an unlikely premise when dealing with
urban demographic and income variables. Alternatively, local regression models such as Geographically Weighted Regression (GWR) allow for consideration of Tobler’s First Law of Geography, whereby “everything is related to everything else, but near things are more related than distant things” (Tobler, 1970). This notion is referred to as spatial heterogeneity (or nonstationarity) and models such as GWR are used to test the OLS assumption of constant relationships between variables across space.

Spatial heterogeneity is a phenomenon in spatial modelling where variable relationships vary over space. GWR can capture spatial heterogeneity across study areas by estimating local parameters for each geographic location (Brunsdon, Fotheringham, & Charlton, 1996; Fotheringham, Brunsdon, & Charlton, 1997; Brunsdon, Fotheringham, & Charlton, 1998a, 1998b; Fotheringham, Brunsdon, & Charlton, 2002). By extending the traditional OLS model, Fotheringham, Brunsdon, and Charlton (2002) represent the GWR equation as:

$$y_i(u) = \beta_{0i}(u) + \beta_{1i}(u)x_{1i} + \beta_{2i}(u)x_{2i} + \ldots + \beta_{mi}(u)x_{mi}$$

where the first term describes the statistical relationship at location u for parameter B based on a weighting scheme known as a Kernel.

Weighting assumptions are critical to the GWR results. A Kernel may be fixed or adaptive, the former is appropriate when observations are regularly positioned across similar areal units, the latter is used when observations are clustered so that observation density varies greatly (Fotheringham, Brunsdon, and Charlton 2002). The Kernel coefficient is dependent upon the chosen bandwidth method, of which there are three choices. The AICc bandwidth minimizes
the Akaike Information Criterion, the CV minimizes the Cross Validation score, while a third option is to specify a specific bandwidth. Since observation densities and areal study units vary greatly across the Chicago metropolitan area, this paper uses an Adaptive Kernel that minimizes AICc bandwidth. GWR has limitations related to multicollinearity (correlation among predictor variables) so diagnostics are used before determining the final variables (Wheeler & Tiefelsdorf, 2005).

The mapping of GWR results has proven challenging in past research. However, recent contributions have made the presentation of GWR results more decipherable and meaningful (Mennis, 2006; Matthews & Yang, 2012). Mennis (2006) takes issue with the common approach of presenting GWR results where numerous class intervals are used with coefficient estimates, often without distinguishing between all important differences of negative or positive relationship divergence. Mennis (2006) also states that the presentation of GWR results without accordant t-values render the model output meaningless since the reader cannot distinguish between significant and non-significant results. Matthews and Yang (2012) tackle this problem by mapping coefficient relationships in combination with a t-value transparency layer in the GIS. This paper borrowed from both authors by masking out coefficients with non-significant t-values.

Despite the issues mentioned, GWR is considered a useful tool for discovering spatially varying relationships. It also is useful for possibly identifying missing variables within a model, which makes GWR a valuable exploratory research tool as well.

The overall methodology as implemented is summarized as follows. The analysis begins by running the OLS model with SPSS 22.0 (IBM Corp., Armonk, NY, USA) to observe the
relationship between relative change in per capita income and the explanatory variables. The OLS results are analyzed with various diagnostic checks, specifically, the variance inflation factor (VIF) to test for variable multicollinearity, the Condition Index to check for overall model multicollinearity, and the Wald statistic to test the model for overall statistical significance. It is customary practice to examine whether the residuals of the OLS model are spatially autocorrelated using a global Moran’s I analysis, which would indicate whether the OLS model has violated the assumption of independent and normally distributed residuals (Charlton & Fotheringham, 2009). After the OLS checks are complete, the GWR model is run within ArcGIS (ArcMap, version 10.5; ESRI Inc., Redlands, CA, USA). The coefficients of each explanatory variable, the R-square value, and the AICc value for both the OLS and GWR runs are compared and summarized. Finally, the residuals and variable coefficients produced by the GWR run are mapped in ArcGIS with only the significant values being shown.

4.4.4 Model Evaluation

Both OLS and GWR are estimated in ArcGIS 10.5. The measures of AICc and adjusted R2 are used to evaluate the performance of OLS and GWR, according to the evaluation criteria proposed by Fotheringham et al. (2002). A lower AICc value between two models, and a higher adjusted R2 value indicates a better fit. The Moran’s I tool is used to test for spatial autocorrelation in the OLS and GWR model residuals. A larger Moran’s index indicates a greater dependency on the residuals, whereas the model with the lower Moran’s index is considered to be a better model.
4.5 Results and Discussion

4.5.1 Change in Per Capita Income from 1990-2010

Figure 24 shows the distribution of the dependent variable, the change in per capita income from 1990 to 2010, across the study area. The green shaded areas indicate gentrification while the red shaded areas indicate a decline in per capita income over the study period. Note how the largest increases in per capita income change occurred in the peripheries of the suburban extent while decline is seen in the inner-ring suburbs surrounding the central city of Chicago (e.g., Berwyn). This accords with Hanlon (2008) who found a general pattern of decline in selected older, inner-ring suburbs. Note also the green shaded neighborhoods in the northern portion of Chicago proper (e.g., Uptown, West Town, Logan Square, among others) indicating heavily gentrified areas, while widespread decline in per capita income can be seen in the far southerly portion of the city (with the sole exception of Morgan Park) as well as in the impoverished neighborhood of Austin in the west.

It must be acknowledged here that there exists no perfect measure of gentrification in the literature (Kennedy & Leonard, 2001). Though it has been used before (Kolko, 2007), the use herein of per capita income as a proxy measure for gentrification will not be universally accepted. Thus, in order to buttress the locational evidence of gentrification argued herein, maps of two other variables associated in the literature with gentrification are provided in Figures 25 and 26, namely, change in median home value and change in the college educated. In addition, it should be noted that other studies have used a compiled index for a gentrification proxy (e.g., Voorhess Center, 2014, Furman Center, 2015), however, index-based research is not considered
“capable of determining in a cause and effect way that a neighborhood has upgraded or declined over time” (Voorhees Center, 2014).

Figure 24. Change of per capita income from 1990-2010.
Figure 25. Change of median home value from 1990-2010.
Figure 26. Change of persons 25 and over with bachelor’s degree, 1990-2010.
4.5.2 OLS Results

The OLS run for the Chicago metro area (N=335) included the 77 Chicago neighborhoods and 258 of its contiguous suburbs. Table 9 shows some of the diagnostic measures. The adjusted R2 value was .66, meaning that OLS model accounts for 66.4% of the change in per capita income over the study period. The Condition Index is a measure of the multicollinearity in a regression model. Multicollinearity occurs when a model includes multiple variables that are correlated to other explanatory variables, producing redundant effects and unstable parameter estimates, which in turn make it difficult to assess the effect of independent variables on dependent variables. The OLS results show that the Condition Index was 18.46, which is less than the suggested threshold level of 30, indicating no issues with multicollinearity among the variables. The Wald statistic had a significant chi-squared value (397), indicating overall model significance.

Table 9: Diagnostic Results from the OLS Model (N = 335)

<table>
<thead>
<tr>
<th>Model Diagnostics</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>R2</td>
<td>0.672</td>
</tr>
<tr>
<td>Adjusted R2</td>
<td>0.664</td>
</tr>
<tr>
<td>AICc</td>
<td>-700.68</td>
</tr>
<tr>
<td>Condition Index</td>
<td>18.46</td>
</tr>
<tr>
<td>Wald</td>
<td>397</td>
</tr>
</tbody>
</table>
The OLS model results assume that each of the coefficients have the same universal effect on change in per capita income throughout the entire study period. Table 10 shows the coefficients estimated. The following variables were positively associated with the dependent variable, change in per capita income: 1) change in percentage of college graduates from 1990 to 2010, 2) distance to downtown, 3) percentage African-American population in 1990, and 4) percent Hispanic population in 1990. Thus, for every unit increase in these variables, there would be an accompanying increase in the change in per capita income (1990 to 2010), holding all other variables constant. Conversely, two variables were negatively associated with per capita income change: 1) change in percentage of female-led families, and 2) change in percent of foreign-born from 1990 to 2010. Thus, as an area’s percent of female-led families increased, its change in per capita income fell. Similarly, as an area’s percent of foreign-born population increased, the area’s change in per capita income dropped. Also, the Variance Inflation Factor (VIF) for each individual variable ranged between acceptable values of 1.2 and 1.8. A suitable VIF should not exceed a value of 4 to 10, otherwise serious multi-collinearity issues may arise because the coefficient variance becomes inflated due to linear dependence with other predictors (O’Brien, 2007). For example, a VIF of 1.6 indicates that the square of the standard error (variance) of a particular coefficient is 60% larger than it would be if that predictor was completely uncorrelated with all the other predictors. Of the eight explanatory variables, two were not significant at the 0.05 level: 1) change in percent of the 22-34 year-old cohort, and 2) median age of built structures. Thus, these two variables were dropped from the GWR run.
Table 10: Results from the OLS model (N = 335)

<table>
<thead>
<tr>
<th>Variables</th>
<th>Coefficients value</th>
<th>Std. Error</th>
<th>t-statistic</th>
<th>Sig. (P-val)</th>
<th>VIF</th>
</tr>
</thead>
<tbody>
<tr>
<td>Constant</td>
<td>-.153</td>
<td>.031</td>
<td>-4.88</td>
<td>.000002</td>
<td>----</td>
</tr>
<tr>
<td>COLL</td>
<td>.864</td>
<td>.070</td>
<td>12.435</td>
<td>.000</td>
<td>1.54</td>
</tr>
<tr>
<td>FEMLED</td>
<td>-.626</td>
<td>.075</td>
<td>-8.362</td>
<td>.000</td>
<td>1.48</td>
</tr>
<tr>
<td>FB</td>
<td>-.570</td>
<td>.073</td>
<td>-7.812</td>
<td>.000</td>
<td>1.20</td>
</tr>
<tr>
<td>C22TO34</td>
<td>.019</td>
<td>.122</td>
<td>0.156</td>
<td>.876</td>
<td>1.47</td>
</tr>
<tr>
<td>CBDDIST</td>
<td>.002</td>
<td>.000</td>
<td>6.871</td>
<td>.000</td>
<td>1.74</td>
</tr>
<tr>
<td>AGEBUILT</td>
<td>.0004</td>
<td>.0005</td>
<td>0.838</td>
<td>.403</td>
<td>1.82</td>
</tr>
<tr>
<td>PCTBLK</td>
<td>.145</td>
<td>.019</td>
<td>7.781</td>
<td>.000</td>
<td>1.40</td>
</tr>
<tr>
<td>PCTHISP</td>
<td>.273</td>
<td>.045</td>
<td>6.08</td>
<td>.000</td>
<td>1.40</td>
</tr>
</tbody>
</table>

Prior to comparing the OLS model to the GWR model, some final diagnostic checks were performed to ensure the need for running GWR. The Jarque-Bera statistic returned a significant chi-squared value (43.60), indicating that the residuals were not normally distributed. The chi-squared value (52.35) of the Koenker statistic was also statistically significant, indicating evidence of non-stationarity. The values of the Jarque-Bera and Koenker metrics indicate that the relationship between some or all of the explanatory variables in the OLS model were not constant throughout the study area. Furthermore, the residuals were mapped and checked for spatial autocorrelation using Moran’s I and the results showed the residuals to be clustered, with a positive z-score (2.39) and significant p-value (p = 0.017), indicating the presence of spatial
autocorrelation (Figure 27). A strong tendency of OLS model residuals toward clustering is noticeable on the residuals map indicating the presence of spatial autocorrelation. When spatial autocorrelation is present in the residuals, the OLS assumption of the residuals’ independence is violated. Thus, the use of GWR is warranted because it is more effective than OLS in explaining the relationship between the change in per capita income and its associated factors. The next step was to perform the GWR model using only the six significant explanatory variables identified from the OLS model (it is noted here that the original 8-variable model was also run in GWR, but the 6-variable model performed better and is thus presented here).

4.5.3 GWR Results and Model Comparison

The diagnostics from the OLS run show that the global model explains about 66 percent (adjusted R² = 0.664) of the variation in per capita income change across Chicago’s 335 neighborhoods and suburbs for the period 1990 to 2010. The GWR model accounts for 73.6% of the change in per capita income over the study period, which is 7.2% higher than OLS. The AICc is a measure of model performance useful for comparing different regression models, with the lower AICs value indicating a better model fit to the observed data. The AICc is -701 for the OLS model and -762 for the GWR. As evidenced by their higher adjusted R2 values and lower AICc values, the GWR model provides a better fit for explaining relative per capita income variability in the Chicago metro region than the OLS model. The residuals of the GWR model are not clustered or dispersed and thus show no spatial autocorrelation, which also means that their parameter estimates are more reliable than those derived in the OLS model. Furthermore, the condition numbers for the GWR model were less than 30, indicating no problems with local multicollinearity.
Figure 27. OLS Residuals Map.
The GWR model also calculates an individual R2 for every location within the study area (Figure 28). Mapping R2 provides an opportunity to see where GWR predicts well or poorly, but it can also provide clues about missing variables due to model misspecification. For example, the R2 results for the GWR model show stronger model performance within the City of Chicago than in the suburbs, indicating a higher spatial dependency of the observed income change in the neighborhoods. This may also be likely attributed to the variables chosen for the analysis, which are commonly found in the literature. However, the gentrification literature primarily uses central cities for the study area rather than entire metropolitan areas. Hence, it is reasonable to assume that the variables operationalized herein may perform better in the city than in the suburbs.

Table 11 compares the coefficient values for the six explanatory values for both the OLS and GWR models and Figure 29 shows the mapped coefficients. The GWR model coefficients are mapped to visualize spatial variations. As aforementioned, a simple mapping technique is used to show only significant coefficient values. Here, a bivariate color scheme is used whereby gradational hues of green represent a positive association between the mapped variable and the dependent variable, while red hues indicate a negative association. All coefficient values shown are significant at the 95% level.
Figure 28. Variability of Local R2 from the GWR model.
Table 11: Coefficient Comparison for the OLS and GWR Models (N = 335)

<table>
<thead>
<tr>
<th></th>
<th>OLS</th>
<th></th>
<th>GWR</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Coefficients</td>
<td>t-values</td>
<td>Sig.</td>
<td>Coefficients</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Low Range</td>
</tr>
<tr>
<td>COLL</td>
<td>.861</td>
<td>12.392</td>
<td>.000</td>
<td>0.37</td>
</tr>
<tr>
<td>FEMLED</td>
<td>-.631</td>
<td>-8.430</td>
<td>.000</td>
<td>-0.82</td>
</tr>
<tr>
<td>FB</td>
<td>-.570</td>
<td>-7.807</td>
<td>.000</td>
<td>-0.74</td>
</tr>
<tr>
<td>CBDDIST</td>
<td>.002</td>
<td>6.863</td>
<td>.000</td>
<td>0.001</td>
</tr>
<tr>
<td>PCTBLK</td>
<td>.144</td>
<td>7.781</td>
<td>.000</td>
<td>0.07</td>
</tr>
<tr>
<td>PCTHISP</td>
<td>.272</td>
<td>6.08</td>
<td>.000</td>
<td>0.19</td>
</tr>
</tbody>
</table>

Multiple studies have shown that in-migrants to gentrifying neighborhoods are college-educated (Freeman and Braconi, 2004; Freeman, 2005; Furman Center, 2015). The GWR model results show that the coefficients of the college educated (COLL) are statistically significant throughout Chicago and its suburbs (Figure 29a). The relationship of COLL to change in per capita income is strongest in the city, where the affluent and gentrified neighborhoods of the north contain large numbers of college graduates, while the poorer southern portion of the city have lower rates of college education. Overall, the coefficients range from 0.37 to 1.19. As would be expected, the relationship is positive, meaning that as the share of college graduates in an area increase, so does the increase in per capita income. This result accords with the common use of the variable within the gentrification literature.
Figure 29. GWR coefficients: (a) college education (COLL); (b) change in female-led households (FEMLED); (c) change in foreign-born population (FB); (d) distance to downtown (CBDDIST). (continued on following page)
A high percentage of female-headed households has been negatively associated with affluence since female-led households are more than often associated with lower levels of income (Freeman, 2005; Vorhees Center, 2014). The GWR results show that this relationship holds across the central to south and west areas, with varying effects (Figure 29b). However, the coefficients for FEMLED are not significant in the wealthy northern suburbs. This may mean that the level of affluence there dwarfs the effect of the variable.

Singer (2004) notes that the foreign-born population in metropolitan Chicago was 17% in the year 2000, with 22% in the city and 15% in the suburbs. Figure 29c shows the coefficients for the change in the foreign-born population (FB). Immigrants are less apt to become
gentrifying in-migrants and thus its relationship to gentrification is negatively associated (McKinnish, Walsh & White, 2010). The results show this relationship holding for the entire study area. The coefficients for the foreign-born variable are stronger in the suburbs than in the city, supporting the finding of Greene (1997) that Chicago is still a gateway city for immigrants, but they are increasingly moving to Chicago’s suburbs. Greene, among others, has also noted that immigrants in the Chicago metropolitan area have chosen to settle beyond the city’s border into the suburbs.

The effect of the distance-to-downtown variable (CBDDIST) was strong in the outer fringe of the northern suburbs and in a centrally located pocket of the city (Figure 29d). In fact, a view of the mapped output of Local R2 distribution in Figure 28 above would indicate a strong association with distance to downtown. However, distance-to-downtown was not significant for most of the city. This is not necessarily surprising as the relationship of distance to gentrification is muddled in the literature. In studies of central city gentrification there is “strong evidence that gentrification in these cities was much more likely to occur in neighborhoods close to the central business district” Timberlake & Johns-Wolfe, 2017). This evidence is partially supported by the GWR results. Anyone who has studied neighborhood change knows that it is far from a gradual and orderly process … neighborhoods can go up and down very quickly and land values can fall off a cliff at the boundary between two neighborhoods (Webber & Swanstrom, 2014, 3). This helps explain why distance is not significant for most of the city. The strong effect of the variable in the northern suburban fringe helps support the invasion-succession process described by the concentric zone model of Burgess (1925) whereby the wealthy move out further and further away from the central city.
Two variables held significant and positive throughout the study area, the percent black and percent Hispanic population in 1990 (Figures 29e and 29f). This indicates that neighborhoods with large percentages of black and Hispanic in 1990 did indeed rise in relative per capita income between 1990 and 2010. In the city of Chicago, for instance, eight of the top eleven neighborhoods in relative income growth were over 60% black or Hispanic in 1990. Evidence of this gentrification can also be seen in the maps of change in median home value (Figure 25) and college educated (Figure 26). In addition, the Voorhees Center (2014) report confirms these areas as gentrifying. The gentrifying neighborhoods with a black population over 60% in 1990 were the Near South Side, Near West Side, Grand Boulevard, Douglas, Oakland, and Morgan Park. The gentrifying neighborhoods that were above 60% Hispanic in 1990 were West Town and Logan Square. These findings contrast with the tipping point arguments of Farley et al. (1978) who found that whites prefer to live in neighborhoods where whites are the majority. Undoubtedly, the fact that changes in the Near South Side and Near West Side were the result of new build gentrification rather than traditional gentrification processes partially contribute to this dichotomy.

A prominent example of a Chicago neighborhood that has experienced significant gentrification since 1990 is the South Loop, which had a very high African-American population in 1990. The South Loop is located in the Near South Side neighborhood of Chicago. In 1990 the population of the Near South Side neighborhood was a mere 6,828 and was 92.3% African-American, but by 2010 the population had climbed to 21,390 while the African-American population had fallen to 27.6% (Author’s calculations based on census data retrieved from Manson et al., 2018). McClelland (2012) notes that the South Loop, the heart of Chicago’s old
Black Belt, had been represented by a black alderman since 1915 until the election of a white alderman in 2003. In 1990 the South Loop consisted of dilapidated old warehouses, known as Printers Row, and a large collection of homeless people. However, starting with the 72-acre Central Station development in 1990, the area attracted huge investment from developers (McClendon, 2005). In fact, new build, high-rise gentrification began occurring along around Chicago’s central business district around this time. The three neighborhoods surrounding Chicago’s Loop, the Near North Side, Near West Side, and Near South Side, together form an area of high rise residential and commercial buildings known as the Super Loop. Since 1990, the population of the Super Loop had increased by more than 82,000 residents to nearly 229,000 residents by 2010 (Kamin, 2017). Though the remarkable growth around Chicago’s downtown has been driven by new construction rather than the in-migration/displacement process customarily associated with gentrification, Davidson and Lees (2005) argue that these new-build residential developments do indeed represent gentrification because they involve “middle-class resettlement of the central city, the production of a gentrified landscape, and lower income displacement in the adjacent residential communities” (Davidson & Lees, 2005, 1169).

4.6 Conclusion

This paper examined the spatial variations of gentrification and neighborhood change at a metropolitan scale. GWR proved to be an effective method of analysis since it had a considerably better fit with empirical data than the global model. The strength and direction of association between the explanatory variables and neighborhood change was spatially heterogeneous at the metropolitan level.
“Existing literature on gentrification has failed to arrive at a consensus definition of what
the (gentrification) process entails” (Kennedy & Leonard, 2001). A consensus definition in the
literature is lacking, though there is largely an agreement that displacement of persons belongs in
the definition. That said, “the greatest empirical difficulty in assessing gentrification is
determining what would have happened to individuals had gentrification not occurred” (Vigdor,
Massey, & Rivlin, 2002). Thus, an admitted weakness of the research presented here lies with
the choice of the dependent variable used to measure neighborhood change/gentrification. Per
capita income was used as a proxy measure, thus following Kolko (2007), who used median tract
income as the dependent variable to examine “the determinants of gentrification”. Admittedly,
per capita income it is not nearly a perfect measure of measurement of gentrification as it is a
multidimensional process involving displacement having varying definitions. To buttress
evidence of areas identified by this research as ‘gentrified’, maps of the change in median home
value (Figure 25) and percent of college educated (Figure 26) are provided. Many papers use an
index to measure gentrification (e.g., Voorhess Center, 2014; Furman Center, 2015), however,
index-based research is also not “capable of determining in a cause and effect way that a
neighborhood has upgraded or declined over time” (Voorhees Center, 2014).

Notwithstanding these limitations, the empirical work here presents some striking
patterns. The results also suggest that the classical tipping point view regarding the association
between gentrification suppression and minimum minority population thresholds, originally
proposed generally by Farley et al. (1978) and more recently applied to race by Hwang &
Sampson (2014), may need to be modified. Indeed, the results show that of the eight most
genrified Chicago neighborhoods in 2010, three ranked in the top ten of Chicago neighborhoods
with the highest African-American population in 1990: the Near South Side, Near West Side, and Grand Boulevard.

This research also contributes to the literature by unveiling a gentrification methodology that incorporates both central city and suburbs into the analysis. This helps with the premise argued by Davidson & Lees (2005) that gentrification is not solely a central city issue, but a suburban one as well. Suggestions for improving the model presented herein would include adding more relevant variables to the analysis, particularly those gleaned from the suburban and rural based gentrification literature, rather than relying upon the central city literature as happened here.

A recent report listed the top ten most gentrified cities in the U.S. as, in order, Portland, Washington DC, Minneapolis, Seattle, Atlanta, Virginia Beach, Denver, Austin, Sacramento, and New York (Maciag, 2015). Of these ten cities, only Washington DC and Minneapolis qualify as shrinking cities. Chicago, a shrinking city, ranked as the 24th most gentrified city out of the 50 cities in Maciag (2015) study. A major finding of this research is that the level of gentrification in Chicago is writ large, thus displacing lower income residents mainly into the impoverished pockets of the south and west sides of the city. It is thus hoped that the results of this study may elucidate how neighborhood change evolves in American metropolitan areas generally, and in shrinking cities particularly.
CHAPTER 5
SUMMARY AND CONCLUSIONS

The overarching motivation of this research is to examine U.S. shrinking cities both existentially, in terms of identifying how they differ, and also with a "cities as systems" approach to learn more about the patterns of distribution and interaction of urban processes within a shrinking city. Three separate articles are used to achieve this goal. This dissertation contributes generally to the urban geography literature and specifically to the growing shrinking city literature, as described below.

In the first study (Chapter 2), a typology was developed to differentiate and illustrate heterogenous clusters of shrinking cities to better understand their underlying dimensionality and better align future policy choices. The multidimensionality of urban processes makes “the need for classification techniques, more important than before” (Reibel, 2011). Using a Geographic Information System (GIS) and a K-means cluster analysis, seven different types of shrinking cities were identified in this research: 1) Large Shrinking Central Cities, 2) Inner-Ring Suburbs of Shrinking Central Cities, 3) Outer-Ring Suburbs of Shrinking Central Cities, 4) Inner-Ring Suburbs of Growing Central Cities, 5) Outer-Ring Suburbs of Growing Central Cities, 6) Small Shrinking Central Cities in Small Metropolitan Statistical Areas, and 7) Small Shrinking Cities in Small Micropolitan Statistical Areas. This research extends the existing scholarship in two ways. First, similar methodologies have been used by urban scholars to identify suburban places, (Orfield, 2002; Mikelbank, 2004), inner-ring suburbs (Hanlon, 2009), and urban immigrant
neighborhoods (Vicino et al., 2011), among others. Thus, this research expands the urban classification literature in this regard. Second, the main contribution of this research is that it helps clarify the extant definitional muddiness surrounding the term ‘shrinking city’. The Chapter 2 results also identified a Culturally-Transforming cluster of large shrinking cities where the percent of the foreign-born is unusually large. The average Culturally-Transforming city, of which 16 exist, is 23 percent foreign-born, versus only a 6 percent average for the other 65 large shrinking cities in Cluster 1A. The cities in the Culturally-Transforming cluster have experienced less of an increase in poverty levels than the other shrinking central cities, thus demonstrating how immigrants populations in shrinking cities have perhaps ameliorated both population and economic decline.

An admitted shortcoming of this research methodology is that identified clusters are not wholly homogenous across variable traits within the sub-clusters. For instance, some of the cities in Cluster 7, labeled as Small Shrinking Cities in Small Micropolitan Statistical Areas, contain much heterogeneity within their datasets. Due to methodological constraints, not all identified clusters will contain wholly homogenous members. Despite this shortcoming, this research advances the shrinking city literature by demonstrating that not all shrinking cities are the same. Knowing that identifiable sub-clusters of shrinking cities exist, many with inherent spatial and structural between them, leads to a better understanding of the shrinkage problem. It is hoped that the empirical results of this study may inform the shrinking city literature and public policy by helping researchers and policy makers better understand the subtle differences between groups of shrinking cities and address possible solutions accordingly.
Chapter 3 examined an extant problem within a large shrinking city. Many shrinking city studies could benefit from lessons learned about Detroit’s foreclosure problems. Detroit’s largesse of shrinkage problems, e.g., abandonment, vacancies and, notably, properties sold at foreclosure auctions, exist there at a level that allows study. Elsewhere, other shrinking cities may possess the same problems, but at a scale too small for examination. Thus, the lessons learned from problems in Detroit can be applied elsewhere to shrinking cities either to address budding similar problems, or in a preventative manner. Research on Detroit significantly advances urban studies, “not in spite of Detroit’s decline but rather because of its decline” (Dewar et al., 2015). While urban geography is replete with studies focusing on conditions of growth, few studies examine how cities manage decline (Galster 2012). The Detroit study employed a three-step methodology to examine property foreclosures. It used Kernel Density Estimation (KDE) to visualize hot spots of foreclosure activity, Moran’s I to detect spatial autocorrelation, and the local Getis-Ord Gi* to identify clusters of foreclosure activity. One of the findings of the study is that Detroit property foreclosures are clustered and correlate with neighborhood decay. This finding upholds the results of other studies, e.g., Alm et al. (2016), who examined the impact of property tax delinquency on the sales price of nearby residential properties and found that unsold properties with a tax lien increased neighborhood decay.

An important finding of this research is that the auction process in Detroit is incongruent with the city’s right-sizing planning goals. The stated goal of right sizing in general, and the DFC plan in particular, is to phase out municipal services in large sections of the city by reducing or eliminating population in certain zones for purposes of service provision efficacy. Yet over 50,000 parcels were auctioned rather than retained by the city and in return many of
those parcels were later foreclosed upon again or fell back into tax delinquency. Particularly troublesome is the fact that the City of Detroit has missed numerous opportunities to acquire parcels in the airport neighborhood cheaply, if not for free. The development of the airport could bring huge revenues down the line. The city began parcel acquisition 1994, so it made no sense to let nearly 400 parcels near the airport slip out of the city’s coffers by offering them to the foreclosure auction.

Perhaps the most obvious indictment of the property tax foreclosure system in Detroit is that 7.3% of foreclosed parcels end up being foreclosed upon again. Time and time again the foreclosure system keeps pumping new owners into properties located within clearance zones, while the city planners are working frantically to remove residents from these zones. Simply put, Detroit is operating under a property tax foreclosure system that serves neither its citizens nor its own stated planning goals.

In summary, this research upholds the findings of Dewar (2009) who concluded that programs such as Wayne County’s foreclosure and auction 1) fails to reduce the number of owner-occupants losing their homes, 2) fails to strengthen neighborhoods, 3) encourages multiple auctions on the same properties, and 4) ultimately fails to return individual properties to productive use. The results of this study affirm her findings and further concludes that the overall auction process in incongruent with the City of Detroit’s stated planning goals.

As for policy implications, this research agrees with the suggestions of Mogk (2014) to 1) reduce the large number of tax exempt properties which are currently receiving costly city services while not contributing to the tax rolls and 2) remove the TIF policies currently benefitting downtown at the expense of the neighborhoods. To these suggestions, this research
adds a third policy suggestion: to place a moratorium, renewable annually, on property tax foreclosures in Detroit. This would allow home owners and/or renters to stay in their homes, give neighborhoods the opportunity to stabilize during the resurgence currently happening in Detroit, remove the market scourge of speculative and absentee owners, and provide a window to policy makers with which to gauge the real estate market and to assess the direction of neighborhood decline or improvement. It also would prevent more properties from being haphazardly accumulated by land banks, the county, the city and derelict owners, all lacking a cohesive plan for right-sizing Detroit.

In the third study presented here (Chapter 4), Geographically Weighted Regression (GWR) was used to examine the spatial variations of gentrification and neighborhood change in the Chicago metropolitan region. GWR proved to be an effective method of analysis since it had a considerably better fit with empirical data than the global model. The strength and direction of association between the explanatory variables and neighborhood change was spatially heterogeneous at the metropolitan level.

A major finding of this research is that the gentrification process operationalized within metropolitan Chicago largely upholds the foundational theories of invasion and succession put forth by Burgess (1925) and Hoyt (1939). However, the results also suggest that the classical tipping point view regarding the association between gentrification suppression and minimum minority population thresholds, originally proposed by Farley et al. (1978) and more recently by Hwang & Sampson (2014), may need to be modified. Indeed, the results show that of the eight most gentrified Chicago neighborhoods in 2010, three ranked in the top ten of Chicago
neighborhoods with the highest African-American population in 1990: the Near South Side, Near West Side, and Grand Boulevard.

This research also contributes to the literature by unveiling a gentrification methodology that incorporates both central city and suburbs into the analysis. This helps with the premise argued by Davidson & Lees (2005) that gentrification is not solely a central city issue, but a suburban one as well. It is thus hoped that the results of this study may elucidate how neighborhood change evolves in American metropolitan areas generally, and in shrinking cities particularly. Suggestions for improving the model presented herein would include adding more relevant variables to the analysis, particularly those gleaned from the suburban and rural based gentrification literature, rather than relying solely upon the central city literature. More importantly, the development of a more reliable proxy for gentrification, rather than per capita income, would be a welcome addition to the literature. Nonetheless, the GWR methodology used for the Chicago research may be applicable to any gentrification study.

In conclusion, This dissertation presents three studies related to shrinking cities in the U.S. Using central cities as the focus, Chapter 2 identified seven clusters of shrinking cities. One of the revelations of that study is that over 25% of America’s shrinking cities are located in just seven metropolitan areas. Two of those metropolitan areas are anchored by the central cities of Detroit and Chicago. Detroit has experienced a level of population loss and economic decline far greater than Chicago. Hence, the focus of Chapter 3 is on examining an intracity process extant on a scale only experienced by cities having undergone severe shrinkage, namely, the tax foreclosure auction of seized properties. The Detroit study shows the inefficiencies of that process relative to the right-sizing planning goals it has adopted. Relative to Detroit, Chicago is
more integrated with its metropolitan area and the effects of its population loss have not been as devastating, nonetheless, it too is a shrinking city as are many of its suburbs. In fact, across the Chicago metropolitan area are 18 shrinking cities. Thus, the focus of Chapter 4 is an intra-metropolitan examination of neighborhood and suburban income change. Specifically, the Chicago study focuses upon the spatially varying effects variables associated with neighborhood change.

The urban shrinkage literature is wide and varied, this dissertation can only examine a mere fraction of its relevant topics. The results of Chapter 2 identified Cluster 1A as shrinking central cities, 1B as shrinking inner-ring suburbs, and 1C as shrinking outer-ring suburbs. Detroit is the iconic example of a Cluster 1A city, having declined in population by over 60 percent since 1950. The right-sizing planning efforts adopted there are also being adopted by other Cluster 1A cities. It is with this in mind that the research contained in Chapter 3 is presented. Chicago, which has declined in population by 26 percent since 1950, has within its metro area 13 shrinking inner-ring suburbs (Cluster 1B) and four shrinking outer-ring suburbs (Cluster 1C). Thus, the research presented in Chapter 4, focusing upon the spatially varying effects of factors associated with neighborhood change across a metro-wide area, may be useful to urban scholars. As mentioned, shrinkage is a multidimensional problem. So care must be shown when generalizing the results of this dissertation since any particular city’s decline is ultimately the result of “economic, historical, cultural, and political circumstances (that) differ from context to context” (Hollander, & Nemeth, 2011).
From a literature standpoint, in addition to contributing to the urban shrinkage discourse, this dissertation helps connect shrinkage to the extensive body work examining gentrification. “While last centuries problem was declining city populations and sprawl, the 21st centuries problem can appear totally opposite” (Silliman, 2016). People are moving in droves to the central city and many are wondering, “Does gentrification harm the poor” (Vigdor, Massey, & Rivlin, 2002). Vigdor et al. (2002) do not answer their own question directly, instead they implore researchers to continue studying the causes of gentrification. Chapter 4 of this research examines gentrification within a shrinking city, Chicago. Chicago is well-recognized as an area of widespread gentrification, but what about gentrification in other shrinking cities? Until recently there has not been much connection between urban shrinkage and gentrification, simply because many shrinking cities were not considered desirable places in which to live. As for Detroit, a 2013 report stated that only 2 percent of its tracts had gentrified (Hartley, 2013). Other scholars have recently argued that gentrification “is connected to the large-scale divides that separate growing from declining cities” (Florida, 2013). But shrinking cities across the country, suffering the economic effects from a shrinking population base, have reinvigorated their downtowns as entertainment venues and that has drawn residents in from the suburbs. As a result, current residents are becoming displaced. Anyone who has recently visited Detroit might easily draw parallels to East Berlin in 1991 - construction booms dominate the downtown landscape. Will that capital investment produce spillover effects that benefit the neighborhoods? If so, policy makers in Detroit and other shrinking cities may soon have to tackle the gentrification issue. Whether it is sprawl in the suburbs or gentrification in the cities, the free market mechanism remains the driving force in this country. Gentrification can bring
substantially needed revenues to a shrinking city, but it also brings displacement and other unwanted change. Similar to other gentrified cities, shrinking city policy makers will have to decide how to provide affordable living communities while achieving sustainable development. As noted by Silliman, “While declining urban populations and now rapid growth appear opposite, they are the result of an inability in American development to create sustainable communities” (Silliman, 2016). Civic leaders, even those in shrinking cities, must decide how to increase accessibility to jobs, social services, and amenities while promoting sustainable growth. Thus, this dissertation helps contribute to the beginning discourse in the blending of the urban shrinkage and gentrification literature, a concept that would have appeared phantasmagorical a short while ago.
REFERENCES


