ANALYZING THE VALUE OF MIXED USE URBAN INFILL: AN EXPOLORATORY ANALYSIS ON CHANGES IN PROPERTY VALUES AND DEMOGRAPHICS IN LOCAL INITIATIVES OF DALLAS AND FORT WORTH TEXAS

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Abstract

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Mixed-use infill development has gained national attention as a strategy for revitalization and redevelopment for cities. The strategy is viewed by “Smart Growth” proponents and New Urbanists as a potential solution to sprawling urban forms and a potential cure for many problems associated with auto-dependence. However, this strategy is not new, and it has been debated through different disciplines in relation to its true impacts on communities and cities. Yet, the discussion on infill has centered upon measuring the amount of infill occurring, and the economic impacts of residential infill. This thesis utilizes a descriptive analysis to observe property value trends of mixed-use infill oriented districts within Dallas and Fort Worth Texas. Demographics are also analyzed to provide context and to add to the discussion of changing property values.

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Chapter 1

Introduction

Infill development has long been a strategy used by cities to promote growth in urbanized areas. Within the past decade infill has been looked upon by planners, architects, and politicians as a solution to sprawl, a guide to creating green and compact cities, and a tool to help revive depressed areas. Mixed-use infill has been emphasized in cities throughout the nation due to its adaptive nature, complementary building forms, and often times, location near public transportation. Dallas and Fort Worth began their own programs for infill development in the early 2000's. Dallas, in turn, created a variety of city districts designated as Tax Increment Financing (TIF) or Public Improvement Districts (PID). Fort Worth selected specific corridors within the city for redevelopment to work in concert with their Neighborhood Empowerment Zone (NEZ) financing and abatement program. The city deemed these corridors Urban Villages. These Dallas initiatives and Fort Worth Urban Villages have stimulated investment by incentivizing private development through the TIF, PID, and NEZ policy designations, and the areas have, in some cases, become thriving parts of the city with vibrant night life and increased number of residents.

Infill has been written upon by many different authors from many different disciplines, but most studies have focused on the residential type of development. This thesis will extend the scope of the previous studies and explore the changing property values and demographics of mixed-use infill developments in the Dallas-Fort Worth (DFW) area.

1.1 Infill Studies

The literature is broadly divided into theoretical perspectives and empirical research. From a theoretical perspective, infill is entwined with four topics, “Smart Growth”, “New Urbanism”, vacant properties, and sprawl. These topics are diverse and defined loosely.

However, infill development is a significant strategy used throughout these topics. Infill is looked upon as a cure to sprawl in “Smart Growth” and a revitalizing mechanism when combined with New Urbanism. The theoretical literature also cites the many barriers to infill development. These range from negative perceptions from residents to difficulties in land assembly and infrastructure.

Empirically the research is mixed between measuring infill development's national trends over time and cataloging the potential infill that can accommodate the coming increases in population to cities. Studies that measure economic impacts of development are limited. Ryan and Weber (2006) examine New Urbanist style residential infill and its influence on property values in low income neighborhoods in Chicago. Wiley (2009) measures infill trends, and he examines residential infill's effect on property values in suburbs of Maryland. Finally Becker, Bernstein and Young (2013) examine the change in value over-time in transit-oriented development infill and properties near rail stations.

Nearly all of the reviewed material focuses strictly on residential development. None of the reviewed materials consider mixed-use impact in regard to property values or social changes. However, the term mixed-use infill is raised in many of the studies (Brookby, 2000; Farris, 2001; Steinacker, 2003; ULI, 2008; Cortright, 2009; Becker, Bernstein, & Young, 2013; Zali et. al., 2013). The theory and implementation of mixed-use infill has been gaining favor in recent years, and this study intends to add knowledge to the true value of mixed-use infill. The results of the studies provide mixed impressions on infill, but the underlying mentality is that mixed-use infill, or infill in general, is a necessary strategy for the future of cities.

1.2 Study Objective(s)

This thesis will address the limited research regarding the economic value of mixed-use infill development. The exploration will focus on the cities of Dallas and Fort Worth, Texas. Analysis gained from this exercise will help provide essential knowledge regarding the importance and value of mixed-use infill implementation. Six sites have been selected in the DFW area

based off their size, the percentage of vacant properties and land, and their designation for policy intervention. The policy interventions could be Tax Increment Financing, or Public Improvement District designations. The areas may also be subject to a Neighborhood Empowerment Zone in Fort Worth. These terms will be more fully explained in the methodology section of this thesis.

The sites consist of a mixture of uses and potentially mixed use buildings built vertically. These parcels will be linked with property value data ranging from 2004 to 2013 for Dallas, and 2005 to 2013 in Fort Worth. A descriptive analysis will then be conducted to discern changes in value. Also descriptive statistics of demographics based on block groups that contain the sites will be utilized to provide context to the study.

The goal of this study is to provide analysis of a growing trend in cities that utilizes *mixed-use* infill development as solutions to revitalize and grow areas economically and socially by creating vibrant places. The analysis will be useful for future land use planning throughout cities across the nation.

1.3 Significance

Since the early 2000's and the cities of Dallas and Fort Worth, Texas have been working on many infill sites seeking to economically and socially revitalize parts of their respected cities.. In 2001 Fort Worth began the Urban Village program. Currently, sixteen urban villages have been selected around the city. These sites have been deemed significant corridors, significant cultural areas, and places prime for adaptive reuse and investment. Urban villages place high emphasis on New Urbanist and walkable design. Fort Worth has designated these sites as Neighborhood Empowerment Zones (NEZ) which enables business owners and developers to apply for special financing policies that help to offset costs of construction, facade improvements, or other costs of development. Urban villages must meet certain requirements to qualify for the NEZ designation that include: creation or rehabilitation of affordable housing, area must be 75 percent within the community development block grant, or central city, mixed use zoning must be

applied to NEZ's involving an urban village. These criteria are part of the selection process for application, but city council may also designate areas as NEZ if they deem necessary (City of Fort Worth, 2006).

Dallas has focused on similar locations in their city, but Dallas has designated these areas to be Tax Increment Financing (TIF), or Public Improvement Districts (PID) districts that encourage re-investment. Dallas began utilizing these investment incentives in the early 1990's and has continued to use them, with relative success, into the present (Dallas County Commissioners Court, 2013). The pros and cons of these developments differ among locations, but significant changes to the surrounding neighborhoods and areas is undeniable. Aside from TIF's and PID's, Dallas employs many other forms of property financial incentives. Tax abatements, economic development grants, and Freeport exemptions for businesses are just a few examples of strategies that aid in enhancing the quality of the city for its residents and businesses (City of Dallas Economic Development, 2013). Sites selected in Dallas will qualify for one or more of the previously stated TIF or PID incentive programs.

Fort Worth and Dallas, Texas are unique case studies for mixed-use development. They are very similar cities given their proximity and mutual dependence in trade, employment, and residents, but they are also very different in culture, leadership, and transportation. Many of the Dallas sites that fall under the area of study will be served by light rail transit which could factor into the analysis. Comparatively Fort Worth has a blossoming bike share program, but there is no light rail, or metro that directly serves the urban villages. The point is that mixed-use infill in Dallas and Fort Worth is unique to its city and location. There are few true transit oriented developments in the area with the exception of Mockingbird station in Dallas, and a few in the northern suburbs. The results of this thesis will provide valuable insight into the true value of mixed-use infill developments that are popping up in not only the central cities of DFW but also

the surrounding suburbs. The results may have national implications as well as this analysis could be recreated in cities throughout the United States and abroad.

1.4 Structure of the Thesis

This thesis is organized into seven chapters. It is prepared in an order that gives due diligence to the roots of the debate on infill development, prepares a literature review based on relevant sources, outlines a methodology, conducts a descriptive analysis that provides findings and results, and finally, it notes limitations of the study followed by a brief conclusion.

Chapter one begins by introducing an emerging trend utilizing mixed-use infill development in central cities. Chapter one is intended to provide context for the latter discussion. It also serves to set the scene for an analysis of mixed use infill development in Dallas and Fort Worth, Texas. The section sets objectives that this study will accomplish, and briefly outlines the significance of this study.

Chapter two digs into the theoretical and empirical literature surrounding the topic of infill development. First theoretical perspectives are covered that detail the important link between infill development and topics such as “Smart Growth”, New Urbanism, vacant properties, and sprawl (Duany et. al. 2000; Dietrick & Ellis, 2004; Ryan & Weber, 2008; Fung, 2012, Becker, Bernstein, Young, 2013). Next, studies that emphasize empirical analysis are reviewed and synthesized. Farris (2001), Steinacker (2003), Landis et. al. (2006), and Wiley (2009) are some of the most influential in establishing scale, and definitions of infill development. While others like Ryan & Weber (2008) and Wiley (2009) aid by providing empirical analysis on the impacts of residential infill. These studies assist in creating the criteria in which to study mixed-use infill development. Appendix A provides a chart with studies, year, and very brief summaries of their findings.

Chapter 3 begins the analysis of mixed-use infill development. This section defines infill and mixed-use infill with the assistance of the previously cited studies. A scale of examination is

set that focuses the analysis's extents on districts within Dallas and Fort-Worth, Texas. Next, the selected sites are highlighted and introduced. Finally, the statistical analysis is outlined followed by methodology and processes that will be utilized via Geographical Information Systems.

Chapter 4 enters into the heart of the descriptive analysis by examining trends in total parcel values, residential total parcel values, and changes within vacant properties. All of the values are weighed against changes that occur in the districts larger city and county. The chapter also provides an examination of trends in demographical changes based on block groups that contain the selected mixed-use districts, and also changes within Dallas and Tarrant County.

Chapter 5 provides commentary on the results observed through the descriptive analysis. The chapter discusses potential trends within values in the districts, the district's peripheries, and also with the demographics in the areas. Chapter 5 makes comments about the depth of this study, and observations within the data.

Chapter 6 highlights the potential limitations of this study based on weaknesses caused by unknown variables, issues of data variability, and discrepancies with scale and demographic data. The section also recommends the need for future research relating to mixed-use infill and highlights the exploratory and introductory nature of this thesis regarding measuring the effects of variables on property values.

Chapter 7 concludes the thesis with a brief recount of important literature, findings, and results. Chapter 7 hopes to answer or summarize findings relating to key research questions highlighted throughout this thesis. The chapter also details the significance of this thesis to the larger discussion of infill development, and it outlines the need for further research on mixed-use infill.

Chapter 2

Infill Studies in the United States

This chapter will discuss reviewed literature regarding infill development. The chapter is split into theoretical perspectives and empirical research. Section 2.1 will outline the theoretical importance of infill development to the future of cities. It will also highlight the role infill development plays within the greater debate of sprawl, “Smart Growth, and New Urbanism. Finally, it will highlight market opportunities for infill development, and also, political, social, and economic barriers to infill.

Section 2.2 will summarize the empirical research reviewed for this study. The section will detail definitions, scale, and analysis technique. Lastly, research findings and conclusions will be highlighted and discussed.

2.1 Theory of Infill Development, Why infill?

Infill is a significant strategy to the topics of sprawl, “Smart Growth”, New Urbanism, and vacant properties. Its utilization is perhaps one of the most important factors in changing development trends and growth of cities. Sprawl, “Smart Growth”, New Urbanism, and vacant properties are complex issues on their own. Each has been researched by a multitude of writers, and each has enjoyed a wealth of knowledge contributed to their respected discussion. However these topics are not mutually exclusive and they, in fact, overlap on many fronts.

Infill is vital to the future of cities. Sprawling urban forms are unsustainable due to deteriorating environmental conditions. The transportation sector is one of the largest contributors of greenhouse gasses due to congestion, long commutes, and increased trips (Ewing, 2008). Sprawl is socially destructive by disconnecting people from place, and emphasizing development that is more suited for the automobile than the pedestrian. (Duany Plater-Zyberk, Speck, 2000 ;). Infill has been viewed as an excellent solution to combat sprawl.

Infill has the ability to utilize vacant properties caused by “leap frog” development, reconnect places, and provide amenity, or economic benefit to depressed areas. A key benefit to infill is its versatility. Infill can be adaptive reuse, new development on vacant, or underutilized parcels, and it can incorporate strong design features that add value, walkability, and security to a place (Urban Land Institute, 2008; Congress for the New Urbanism, 2001; Cortright, 2009; Dietrick & Ellis, 2004; Larsen, 2004). Some of these ideas are still theoretical. However some studies have shown correlation between design features and property values. The resulting trends have been noted to show safer and livelier places (Dietrick & Ellis, 2004; Ryan & Weber, 2006).

The costs of sprawling cities is becoming too much for public works infrastructure, air quality, transportation congestion, and social equity. Water lines are branching further from reservoirs. Energy costs are become exorbitant in some areas of the nation, and pollution caused by energy generators is one of the largest producers of greenhouse gasses (Ewing, et. al., 2008). Auto-dependence is a large factor in these issues, as well. Vehicle miles traveled leads directly to lower air quality, sprawling infrastructure, and rising transportation costs, In his book, *Growing Cooler*, Reid Ewing states, “vehicle miles traveled in the United States have growth three times faster than population, and almost two times as fast as vehicle registrations” (Ewing et. al. 2008, p. 21). The need to curb sprawl is key to the future of cities, and better implementation of infill can help to work toward a solution to these problems.

As previously mentioned, infill has been cited by much of the literature I have reviewed as a solution for sprawl (Duany, Plater-Zyberk, Speck, 2000; Farris, 2001; Steinacker, 2003; McConnell & Wiley, 2010), but the argument could be made that “Smart Growth” is the overarching theory in which infill resides. Smart Growth is a grand idea with many implications toward cities and development that emphasize focusing growth in existing communities. New developments should seek underutilized or vacant properties in efforts to avoid sprawling urban forms. The philosophy began gaining momentum in the early 1990's from various planning

organizations, and it began garnering recognition from United States President Bill Clinton and Vice President Al Gore (Farris, 2001). As years have passed Smart Growth has expanded in its definition from simply guiding development to become more encompassing of quality design, emphasizing a mix of land uses, and trumpeting multi-modal transportation options with the pedestrian in mind (Smart Growth Network, 2005)

Infill should be cognizant of design. The context of the developments must be kept in mind. Infill should not be out of scale of its neighboring structures. Infill that is well connected, and is developed in context with its neighborhood can help to reunify disconnected areas, and solve issues with vacant properties in neighborhoods (Dietrick & Ellis 2004). Infill developments should also promote travel that is not centered on automobile use by creating destinations that are walkable and accessible by public transportation. Auto-dependence is an unsustainable future for cities (Duany, 2000), and environmental concerns are no longer mysteries, but real problems (Ewing et. al, 2008). Infill fits all of the qualities for creating more compact cities that are focused on preserving the environment and the lives of their residents. The benefits of infill as a strategy for Smart Growth are numerous and, in some ways, “Smart Growth”, in its boiled down form, is essentially “Smart Infill”.

Infill as a Strategy for Urban Revitalization and New Urbanism

Much like the philosophy of “Smart Growth”, the ideals and strategies of New Urbanism fall into similar lines. New Urbanism's focus is on planning at an appropriate scale, ensuring connectivity by fostering community, and emphasizing design that is conducive to multi-modal transit. The reviewed material measuring infill's economic impact has focused almost exclusively on residential infill, but nearly all the studies, theoretical and empirical, have mentioned at least some element of the importance of design. Jane Jacobs originally preached the importance of diverse streets with quality design (Jacobs, 1961), but Andres Duany has furthered the idea into levels of development based on the context of the area. New Urbanists favor infill development

because of its unique ability to reconnect places and prevent social isolation (Duany, 2000). Studies by Wai Man Fung (2012) and Zali, et. al., (2012) are in agreement to New Urbanism having a cohesive effect on connecting places in urbanized areas by emphasizing urban design that is connective rather than divisive. Fung (2012) examines, "... how infill as a response to high density living, catalyzes vivid urban life formation" (p.19). He also defines infill as, "temporary, or permanent, legal or illegal structure created among buildings which usually are small retail shops or stalls for local convenience or services" (p.18). The study's context may be different from cities in the United States, but his findings on the effects infill has on connecting places seems applicable. Fung deems Hong Kong split into "fractals' that are adjacent to each other, but disconnected socially, "self-similarity in clustering, fragmentation of spatial patterns at different scales, hierarchical organization, sinuosity of borders and nonlinear dynamics (Tannier and Pumain, 2005)" (Fung, 2012, p. 20). The fractals are disconnected by city life and transportation networks, and he states that infill in Hong Kong is in response to the need for human scale development that helps to connect these fractals. Fung argues that trips in Hong Kong are strongly utilitarian, and that leisure has suffered from high density development out of scale with the human element. Fung analyzes the Sheung Wan district through a pattern measure that evaluates aesthetic interest. He contends that infill in Hong Kong has helped produce exciting urban fabric that catalyzes social behavior and interaction.

Zali et. al. (2012) analyzed the behaviors of citizens based on travels throughout cities. The group argues that cities are the center of human interaction, and cities are the enablers of social, economic, and technical development. Urban life is dictated by the urban environment and this fact dictates human behavior. From this stance, New Urbanism and urban design have a significant effect on the behavior of humans living in urbanized areas. The groups article is mostly theoretical, but their assertions hold significant weight, and they provide studies that have found correlation with quality urban design and changing behaviors of citizens. Zali et. al. (2013) note

residential density, accessibility, physical design of neighborhoods to be essential factors in determining behaviors, and the effects of New Urbanist philosophies.

Finally, vacant and underutilized properties pose a serious concern to cities, citizens, and economic viability (Leigh, 2003). There is an extensive list of research on the issue of vacant properties. For the purposes of this paper I have only highlighted a few select articles that pertain to the necessity of infill development as a strategy. Vacant properties are equivalent to a break in the chain; they are the weak link in development that becomes isolated, disconnected, and often times becomes blighted. Infill development is the antithesis of vacant and underutilized property, and because of its malleable nature, infill can become the adaptive reuse of existing structure, or a new development on vacant parcels. Another option is not necessarily building, but returning the parcels to a more natural state by "greening". A study in Philadelphia was conducted on the process of planting grass and trees on vacant lots as an attempt to improve communities (Heckert & Mennis, 2012). Further research on this topic is necessary, but early returns positively increased surrounding property values, and physical and mental benefits were noted. This type of infill is not typical of what is classified as infill, but it falls under the overarching philosophies of "Smart Growth" and New Urbanism by creating a place, emphasizing design, and connecting the location.

Market Opportunities

The market for infill development would appear to vary depending on location, but some believe that the changing demographics of the housing market and the increase in singles reflect a changing lifestyle that desires amenity, walkability, and proximity to urban locations (Brookby, 2000; Farris, 2001; Cortright, 2009; Becker, Bernstein, & Young, 2013). Demographics in the United States are changing. The population has shifted from 81 percent of housing as families with children in 1970, to just 70 percent in the late 1990s, and 60 percent of the remaining 30 percent of households consist of people who live alone (Farris 2001). Population returns to

central cities has been felt across the nation. Dallas, as an example, in the 1980's had as few as 5,000 residents, but in 2010 the population has rebounded to over 35,000. (City of Dallas, 2012).

Transit-oriented development (TOD) has increased exponentially throughout the last decade. Federal policy has even been instituted to encourage growth in this sector (U.S. Department of Transportation, 2014). Transit-oriented development has been praised for contributing too many areas of enhancing cities by helping to derail automobile dependence and creating destinations that are designed with walkability in mind. Studies have proven that most developments occurring within a walkable distance to a public transit station have not only remained steady during the U.S. Recession, but some have also increased in property value. (Becker, Bernstein, & Young, 2013). The study by Becker, Bernstein, & Young also noted that in a survey of 40,000 mortgages from Chicago, Jacksonville, and San Francisco “probability of mortgage default increased as auto ownership rates rose” (2013 p.4). Increased options for travel through rail that is in close proximity to homes and walkability leads to decreased auto-dependence, and by decreasing auto-dependence cities also improve air quality. However, transit-oriented development is not a planning silver-bullet. Many of these stations are very well designed and can fall under the title of “New Urbanist” design standards.

Cities appear to be eager for infill development. This enthusiasm can be seen in their willingness to negotiate on projects and financing. Dallas has extensively used Tax Increment Financing districts (TIF) to help drive private investment into the city (City of Dallas, 2012). The city of Fort Worth has also used creative financing in the forms of tax abatements, various fee waivers, and other financial incentives (City of Fort Worth, 2013) These Texas cities are not unique in their financing options. Many of the reviewed materials reference the strength of using a strategy of TIF's and other financing incentives to overcome infill barriers. (Brookby, 2000; Farris, 2001; Haughey 2001). Briefly, a Tax Increment Financing district is form of financing established by the State of Texas that is described as:

> Tax increment financing involves delineating a specific geographic area (i.e., a "TIF district"), having taxing entities allocate to this district some or all of any increases in tax revenue that results beyond a base level when they are assessed valuation increases (i.e., "tax increment"), and then using this increment to either directly finance certain activities and public improvements (drainage, utilities, street-scaping, historic facade renovation, demolition, environmental remediation, parks, affordable housing, streets, etc.) or to reimburse developers who have undertaken such activities before sufficient increment was available.
>
> (City of Dallas office of Economic Development, 2013).

The TIF district designation gives cities a great tool for negotiating and incentivizing private investment into specific areas of a city. By designating a certain geography the city can target areas that may have a prime market, quality design that may be in need of renovation, or specific areas of blight. Public improvement districts work in a very similar manner to TIF's, but the accrued funds must usually be spent on public infrastructure, or to the public's benefit. Overall cities have been empowered by creative financing that helps facilitate investment and redevelopment.

Barriers to Infill Development

Infill may seem as though a rational, or logical approach to the growth of cities or suburbs, but the topic does not always garner a warm reception by those who have stake in the matter. The very term infill development can put some groups immediately on the defensive because of a negative perception. The range of emotion varies dependent on ones role with infill development. In the following paragraphs I will highlight some of the reviewed arguments and barriers.

Land acquisition and assembly has been cited in the reviewed materials as a great hurdle for infill development (Farris 2001, Haughey 2001). The difficulties in putting together a plan for development may test the will of developers and cause them to seek alternate, and sometimes paths of least resistance on the suburban fringes where costs and administerial tasks may be cheaper and easier, or where there has never been development before (Ding, 2001). However,

as pointed out by Haughey (2001) cities are willing to assist developers in land acquisition and assembly by providing financial incentive, assistance in legal issues such as ownership or zoning incompatibilities. However, he is quick to note that cities are hesitant to use eminent domain powers to acquire parcels as this strategy may be costly, speculative, and politically un-favorable.

Another topic regarding barriers with the physical land arise with infrastructure issues. Streets may be too small, sewer and water lines may need to be moved, or sidewalk improvements may need to be made. These challenges can often detour developers due to added costs, time, and negotiation with the municipality. Again, Haughey (2001) notes that cities are willing to work with developers to find solutions. Public improvement funds can be allocated through the designation of TIF districts, and the addition of property taxes on new development can hold political sway. Often times one of the largest challenges for these types of issues is finding a developer who is willing to negotiate and navigate the hardships in order to achieve his or her vision.

Perhaps one of the largest barriers to infill development is the potential negative perception of infill from political leaders and citizens. Citizens' most often cited argument is centered on the potential loss of open space and increased traffic congestion from infill development (Farris, 2001; ULI, 2008; Wiley, 2009). Increased traffic and congestion is a legitimate concern. Successful infill projects will most likely be desirable and therefore an increased number of people in the area is a logical response. However, the argument that a loss of open space is occurring can be slightly skewed because many times parcels were already slighted for development. Also, Wiley (2009) notes that each infill site is different and that assessment must be made based upon the individual projects plans. Wiley's study focused on suburban residential infill and he goes on to comment on how each neighborhood is vastly different, and while some infill may hurt adjacent home owners by decreasing parking, or open

space, but it may also help the entire neighborhood by increasing property tax values from less vacant lots. (Wiley, 2009).

Citizen arguments often suffer from strong, “Not-In-My-Back-Yard”, NIMBY'ism. Opposition can coalesce around a particular issue that may affect the neighborhood. Zoning changes can be especially polarizing when an infill developer may seek to increase the density of their underutilized property near single family homes. The issue can draw the ire of even the most docile residents. Farris (2001) notes the power of strong residents' influence on city councils against multi-family zoning changes. These issues must be addressed with trust and conversation with current residents. The sudden change brought forth from residents seeing signs for a public meeting can predetermine a person's sentiment toward an issue immediately.

Finally, infill projects can lead toward gentrification if not properly planned, and sometimes, even with all safeguards in place. Gentrification can be as polarizing as NIMBY'ism, but even worse because people can often times become displaced by numerous factors (Farris 2009). Developers must tread softly into projects and work in conjunction with neighborhood and city leaders. Again, every infill project must be assessed based on the context of its surroundings and also upon the type and size of development that will be implemented.

Summary

Infill can be claimed by many philosophies regarding the form of urban development, but many arguments from the research lean on infill as a solution to problems. The reviewed materials seem to be in agreement that these issues are a great challenge to society and that strategies to circumvent their outcomes are related toward compact city form with higher density. Well-designed infill fits as the optimum solution to many of these problems.

2.2. Effects of Infill Developments: Empirical Findings

The former section of literature review focused on theoretical implications of infill, arguments discussing the potential of infill, and also the interconnected discussion of infill with other urban form topics, urban sprawl, “Smart Growth”, “New Urbanism”, and vacant properties. Many of the following studies have overlap into both sections theoretical and empirical, but the following section will focus on the definitions, methods, and empirical findings of these studies.

Researches – a brief recount of empirical studies

The empirical research reviewed for infill development can be separated into two groups. The first group begins by attempting to measure the amount of infill development occurring and also in what location is this development happening. These studies take place at a national level and examine central-cities compared to their surrounding metropolitan areas (Farris, 2001; Steinacker, 2003). Another key study in the same genre is a study by Landis et. al. (2006). This study does not attempt to measure infill at a national level, but it seeks to catalog infill potential in the entire state of California. Through this endeavor a solid definition of infill is established. Finally, Wiley's study (2009) measures suburban residential infill in Maryland, and references the work of Landis et. al..

The next group of empirical infill studies seeks to analyze what, if any, impacts residential infill has on property values and surround property values. These studies are limited and contextual. It is difficult to measure infill's affect due to the complex nature of economic values. Beginning from the largest scale, Becker, Bernstein & Young (2013) measured property values in relation to transit-oriented development stations in San Francisco, Phoenix, Boston, Minneapolis-St. Paul, and Chicago. This study isn't necessarily defined as infill, but the TOD locations fit in with many of the criteria set forth from previous studies. Next, a study by Dietrick and Ellis (2006), and a study by Ryan and Weber (2008) attempted to link design features of infill

development with property values. Dietrick and Ellis (2006) provide less empirical data about their findings, but correlate that design features had a marked improvement on low income neighbor hoods in Pittsburgh Ryan and Weber (2008) focused on New Urbanist style developments at different scales in neighborhoods of high poverty in Chicago. The study corroborates the previous study by Dietrick and Ellis (2006) by citing that urban design has significant impact on property values and also social connectivity. Finally, the study by Wiley (2009) focuses specifically on the impact of infill development on property values, and also the surrounding property values. Wiley, bases his analysis off of definitions from Landis et. Al (2006), and outlines his selected area based off tax assessor data from Maryland. His results are mixed between residential infill being beneficial to surrounding properties often in low-income neighborhoods, and detrimental in other neighborhoods. He also notes that residents felt that a loss of open space was critical, and that more qualitative data on the opinion of residents could have been influential to his study. However, Wiley's (2009) study does emphasize that infill does have a measurable effect on property values.

Data, Definition, Scale, and Analysis Techniques

Much of the reviewed materials differ on definitions of the term of infill itself. The study by Farris (2001) examined infill on a national level by examining the percentages of building permits issued in 22 major the central-cities versus the percentages of permits issued by the surrounding MSA's of these cities. Farris defined all residential development within the central cities as infill and then deemed that all residential development outside of the central cities as non-infill. Overall he found that in 1990, “These central cities included 29.1 percent of the total metropolitan housing stock... …with only 16.4 percent of the metropolitan single-family units but 42.3 percent of multifamily units” (Farris 2001, p.2). Also, from 1989 to 1998 only 5.2 percent of all housing permits were in central cities. 2.2 percent of those permits were for single-family developments, and 14.9 percent of permits were for multifamily developments. The remainder of residential

building permits occurred in the surrounding MSA. Farris concluded that for the 22 surveyed major cities, most residential development was occurring outside of the central cities and not considered infill (Farris, 2001).

Steinacker (2003) also used a loose definition of infill categorized as “residential development occurring within the city limits of the major city(s) in the MSA” (Steinacker, 2003 P.497). From 1996-2000, the study surveyed the 50 largest MSAs in order to measure national trends of infill development. Steinacker developed a measurement of infill development based upon a ratio of the number of residential building permits issued by a central city and the building permits of the MSA. This information was then divided by the land area of the central city and the MSA to form a ratio that is an indicator of residential infill. The ratio was implemented based on the theory that suburban areas and the MSA's had a greater amount of vacant land than central cities. The ratio was intended to place building permit data on a more level comparison. Steinacker explains the significance of the ratio stating:

> Values greater than 1 indicate that the city developed more new housing units given its land area than did the entire MSA, a pattern indicative of infill. Values less than 1 show that it experienced less area-adjusted growth than the rest of the MSA, a pattern indicative of sprawl. Values of 1 show an even or a geographic fair share of new growth, with neither infill nor sprawl predominant
>
> (Steinacker, 2003, p. 498).

She also notes that over 100 metropolitan areas across the nation have experienced increases of 15 percent or more to the populations, and that residential growth should be expected. She concludes her study with findings that denounce reports that MSA's have been growing through rampant sprawl, and she contends that once land area is considered growth in central cities was three times higher than MSA's. Steinacker's study does have limitations due to her findings being reported on a national scale. Data relating to more nuanced specific cities is not presented. The possibility of skewed data, or extraneous variables are not considered. Therefore, the entire picture for infill development is unclear.

Scale is important in determining the definition of infill, and directing the study along certain paths. In the case of Farris (2001) Steinacker (2003) the scale of analysis was on a national level which required a broad and loose definition of infill development for the data to be aggregated and manageable. In order to analyze the complex effects infill development has on surrounding properties the scale must be reduced to a smaller level. The level of detailed analysis is far greater in smaller scaled studies. Again, the influence of scale is evident in the study by Landis et. al. (2006). The group was attempting to catalog the entire infill inventory for the state of California. A task that is substantial in size and admittedly inexact. However, the definition differs from the previous studies by Farris and Steinacker. Landis et. al. (2006) categorize infill as developable and/or potentially developable vacant properties in urban neighborhoods. They also classify parcels that are potentially "refill" parcels. Specifically, refill parcels are defined as "redevelopable parcels, are privately owned, previously developed parcels with a structure valued at $5,000 or more, but for which the improvement-value-to-land-value (I/L) ratio is less than1.0 for commercial and multifamily properties and less than 0.5 for single family properties" (Landis et. al. 2006, p687). The definition assumes that all vacant parcels are infill, and they go beyond limiting the study to central cities. Instead, they used the boundaries derived from the California Farmland Mapping and Monitoring Project. The boundaries constituted varying levels of residential density with varying levels of development. Admittedly, the researchers state that their potential infill sites are likely exaggerated figures, but the inventory is created and the numbers hold potential for accommodating population increases for the future. The Landis study does not specifically address infill and its relation to property value as to relate back to this analysis, but it does help to build a framework of definitions and criteria that adds substance to this thesis.

Further down the hierarchy of scale I have reviewed some case studies by Dietrick & Ellis (2004), Ryan & Weber (2007), and Keith Wiley (2009), these studies are based on central cities and smaller neighborhood level developments as opposed to a national review, or even a

statewide review. Their study areas could be construed as already within an urbanized area due to their places in central cities such as Pittsburgh and Chicago. However, Wiley's study is set in the suburbs of Maryland.

Dietrick & Ellis (2004) conduct an analysis of residential infill development on areas of Pittsburgh, PA that were low-income, often predominantly rental or absentee owner, and generally declining in quality of structure and life for residents. The analysis sought to demonstrate the link between quality urban design and community development. Dietrick & Ellis define infill in three categories that characterize the type of redevelopment in these locations: community refill, neighborhood infill, and scattered-site infill. The categories are separated in definition by design aspects. Community refill projects are the largest and are intended to catalyze the neighborhood by driving further investment and revitalization efforts. Neighborhood infill are smaller scale intended to redevelop parcels in context with the existing neighborhood. They are to work in concert with other revitalization efforts. Scattered-site infill is the smallest category, and it is “unit-by-unit development within the neighborhood's density and design context”. The intent is to restore the neighborhood's urban fabric. (Dietrick & Ellis, 2004, p.430). This study is helpful on establishing the link between New Urbanist design, and revitalized neighborhoods, but much of its evidence seems to be theoretical or observational. The author's state that more research needs to be invested on the topic, but they assert that quality in these neighborhoods has risen economically and socially.

For Ryan and Weber (2007) the location of their study is based in high poverty central-city Chicago. They examine types of neighborhoods based on urban design: enclaves, traditional neighborhood developments, and infill, (Ryan & Weber, 2007, p.100). Their categories are similar to Dietrick & Ellis's (2004) study, but they differ by taking into account particular design features of structures. Their categories are broken into ordinal relationships that rate design features, number of units, and levels integration into, high, low, many, few, large or small. Their

analysis utilizes a hedonic-pricing model to analyze construction permit data from 1993 to 2001 in a census tract where “20 % of households had incomes below the federal poverty line in 1990” (p. 103). They excluded properties within 2 miles of the Chicago Central Business District due to heavy public invest which would produce inaccurate results. Combined with parcel data, and tax assessor sales data, the team used aerial photography and GIS to confirm infill clusters and to note the absence or presence of certain design features such as: Parking in front, roadways interior to lot /access, orientation of front doors to walkways, buffering, and facade material. These features were weighted and tested. The researchers concluded that front parking and street buffering had positive impacts while private roadways and non-street-facing entrances had negative impacts (p. 108). They also found that their category of 'infill housing' commanded a value premium compared to traditional neighborhood development and enclaves Ryan and Weber suggest that integrated urban development is significant and correlated to higher value in property.

Finally, Wiley (2009) provides a quality review of the literature defining infill before stating this his study will utilize the definition cited by most planners and researchers, “infill is development occurring on underutilized parcels in already developed, urbanized areas (Municipal Research Services Center, 1997; MDP, 2001; and Northeast Midwest Institute, 2001)” (p. 65).. Wiley continues to clarify however stating that infill is debated as different from renovation, and also that an “urbanized area” is defined by the census through density, “block groups with densities of at least 1,000 people per mile and surrounding block densities of 500 people are classified as urban”(Wiley, 2009 p. 67). In order to filter out excess data, Wiley establishes a study area based on characteristics of density, and tax grid data that delineated by a “Priority Funding Area” for cities. These are designations surrounding existing neighborhoods that project areas of land that will potentially develop. The idea is that cities will attempt to limit growth to these areas in order to reduce infrastructure costs. He sets further restrictions to ensure that

residents are actually inhabiting the parcels by establishing a necessary property value of $40,000 or more and a structure size limit of 400 square feet (Wiley, 2009 p.89). This restriction is useful for Wiley's analysis due to his focus on suburban residential zones, and due to it, many parking spaces, community areas, and non-dwelling units that may affect data quality were removed. This criterion also serves to clarify his use of the term underutilized parcel by establishing a threshold of value and size.

Establishing the analysis scale of this thesis is critical to its success. This study will also establish a firm type of infill to be examined. All of the reviewed material has looked at strictly residential infill, and mostly have analyzed infill trends over time and importance of design. Only a handful of studies, mostly in the study by Wiley (2009), investigate improvement in property values briefly. This thesis seeks to contribute knowledge and research to a gap in the research and a growing trend of infill development consisting of mixed-use commercial and residential development in urbanized central city areas of Dallas and Fort Worth, Texas.

Findings / Effects on Property Values

Throughout this review I have highlighted definitions of infill cited by writers. Also I have detailed the necessities and limitations of scale and size upon the research. However, most of the reviewed material has little hard data on the impacts of infill development, and when there has been hard data it has been focused on the residential type of infill.

Transit-oriented development (TOD) is a strategy of development that has been covered extensively and recently gained national attention. Most TOD development could probably be classified under the previously mentioned definitions of infill development. Some, if not most, TOD's could even be counted as mixed-use infill that pay special attention to design and walkability. While this thesis does not particularly focus on TOD's, empirical studies relating to property values are extremely beneficial. A study by Becker, Bernstein, and Young (2013) recently demonstrated that property values in Chicago, Boston, Minneapolis-St. Paul, San

Francisco, and Phoenix from 2006 to 2011. During this time period the United States entered into a recession and a housing bubble that popped resulting in falling property values nationwide. However the team found that, "...average sales prices for residences in close proximity to fixed-guideway transit were more stable during the recession, supporting the assertion that transit access helped mitigate the effects of the recession on property values" (p. 32). The team also makes a note that better connected transit-oriented developments were more resilient than less connected, or commuter rail transit lines. Sales price data was collected for residential developments within a 1.5 mile radius of transit stations and analyzed over time. Demographics, cost of commuting, type of transit line, and ridership numbers were also considered into the study. Yet, the study never directly addresses infill and its relevance to this thesis is based on one's definition of infill development. Selected areas that will be analyzed later in this thesis will have some TOD options available.

Another informative study was conducted in Fort Worth, Texas by former University of Texas at Arlington graduate John Brookby. Financial feasibility of infill developments is a huge concern, and while this thesis is not necessarily about financing, the findings in Brookby's (2000) thesis were enlightening and helpful to constructing the analysis. He cites the growing issue of sprawl and the two methods poised to combat it as, New Urbanism and Tax Increment Financing. Brookby's thesis centers on the importance of design relating to what he describes as "livable communities". These communities are what we now view as well integrated and connected neighborhoods that emphasize walkability, transit, and a mixture of uses. Brookby views TIF"s as leverage which central cities can utilize to facilitate redevelopment and investment funds into certain areas. To test the relationship between New Urbanism and Tax Increment Financing a comparison is created with a case study from Fort Worth Southside Development District. The site occupies 7.1 acres and is "mostly vacant". Ultimately, the results show that infill is feasible if the project abides by high mixture of uses combined with high density development. In this case,

with or without TIF funds the project was feasible, but TIF funds were added amenity due to the necessity of parking structures coupled with high density. Other scenarios with lower density were feasible but with greater measures of risk and lower “net present value”(Brookby, 2000, p.44).The findings from Brookby illustrate the financial importance of TIF funds in connection with New Urbanist design that encourages infill development. The style of 'livable communities' can be seen throughout Dallas and Fort Worth 14 years after Brookby's study. It is these places in which this study will analyze for impacts on surrounding property values.

The most influential material reviewed was Wiley's (2009) study on the effects of residential infill. Wiley's study was conducted on a parcel level scale and used a definition of infill that had been cited throughout the literature. Infill is the development of underutilized or vacant property in an urbanized area (Landis et. al. 2006) and a modification of those early definitions from Farris (2001) and Steinacker (2003). Throughout his essay his criteria for site selection are clearly defined by his definition of infill, and his data is collected on a parcel level. He narrows his site selection process with these criteria: specific year built (1975-2004), must be in a residential subdivision, must have no other major developments including infill in the immediate area during the study, and surrounding home sales must be sufficient in number for his hedonic pricing model for reliable estimates (Wiley, 2009). Wiley (2009) states many results beginning with the national trend that most (70%) of residential development since the 1990's is considered infill. He also notes the diverse nature of infill, some with larger lot size, some smaller, and most being condominiums in the inner city, but also detached and attached housing on urban fringes (p. 212). As for economic impacts, Wiley's results “consistently found negative home price effects for units near infill development sites” (p. 214). He qualifies this comment by stating that the results may be related to the economic condition of the receiving neighborhood. Therefore, in higher income neighborhoods there was often decreases in value due to lost open space, or in low-income neighborhoods there was some revitalization, but Wiley notes that it is not significant (p.

215) Ultimately, Wiley calls for further research on the topic of infill development, and he admits that his study suffers from a less than ideal size of sampled units due to constraints such as recorded sale prices. Also he states that he would have liked to have more detailed data on the parcels and open space concerning residential opposition.

Summary

The empirical evidence reviewed for this thesis focused on different measures of infill, national trends, and also economic and social impacts on a smaller scale. Much like the theoretical perspectives the challenge seems to be centered on the question of what is considered infill, and how effective is it in curbing the effects of sprawl while creating “livable communities”.

The national measures of infill seem to agree that more infill is occurring in the central cities, but more residential growth is occurring outside the central cities (Farris, 2001; Steinacker, 2003). However these studies fail to tell us anything about the effectiveness of residential infill on property values. Ryan and Weber's (2006) study on residential infill in impoverished areas of inner city Chicago have some detail on property values, but the context of their study cannot be adapted to other regions of the country. The same fact holds true for Wiley (2009). Wiley's study examined surrounding property values of suburban residential infill and had mixed resulted. With some values rising in the context of the neighborhoods in which they were developed. Higher income neighborhoods saw decreases in values because of a negative perception of infill, and a potential loss of open space, but well-designed infill in lower-income neighborhoods saw a property value increase. However, these studies must be considered within the context of their areas, and their results are merely one piece of the infill picture. However, the majority of research reviewed was limited in regard to mixed-use infill and economic impacts.

Chapter 3

Methodology

3.1 Definitions: Infill & Mixed-use

This study will begin by establishing two definitions. First, the definition for infill development will be taken from elements of the previously reviewed material. The second definition establishes what will be considered mixed-use.

Landis et. al. (2006) define "infill sites as vacant and/or potentially re-developable parcels located within existing urban neighborhoods" (p.686). They clarify vacant parcels by tax assessor definition that: no inhabitable structure or building exists or that no extractive purposes such as mining or drilling are occurring. Infill is further defined by Wiley (2009). For his study, Wiley (2009) uses "...the definition most commonly cited by planners, developers, and researchers..." (p. 65). Infill is defined as development occurring on underutilized parcels in already developed, urbanized areas. In this case, underutilized essentially means that the parcel was underdeveloped or the site of a refurbished or torn down development, and that the parcel may be located in a central city, suburb, or rural village and consist of residential, commercial, or industrial buildings (Wiley, 2009, p 65-66). The term urbanized is area is defined by the U.S. Census Bureau as:

> An urban area will comprise a densely settled core of census tracts and/or census blocks that meet minimum population density requirements, along with adjacent territory containing non-residential urban land uses as well as territory with low population density included to link outlying densely settled territory with the densely settled core. To qualify as an urban area, the territory identified according to criteria must encompass at least 2,500 people, at least 1,500 of which reside outside institutional group quarters. The Census Bureau identifies two types of urban areas:
>
> - Urbanized Areas (UAs) of 50,000 or more people
> - Urban Clusters (UCs) of at least 2,500 and less than 50,000 people
>
> (U.S. Census Bureau, 2013)

The selected sites exhibit the qualities outlined by both of the covered definitions for infill development.

Hoppenbrouwer and Louw (2005) created a typology of mixed-use from a spatial perspective. The typology considers four dimensions: “(I) the shared premise dimension, (II) the horizontal dimension, (III) the vertical dimension, and (IV) the time dimension. They symbolize mixed-use at a particular point, on a flat surface, vertically clustered and in sequential order” (p. 974). A shared premise example could be someone who has a home business and shares uses among a single point or structure. The horizontal dimension can be viewed as a mixture of uses varying from structure to structure. The vertical dimension is one may typically think of a mixed-use building where various uses are stacked (I.E. retail at ground level with residential on the second.). The temporal function would define uses in terms of time within a single structure. Hoppenbrouwer and Louw's dimensions are versatile in defining mixed-use based on scale from a single building using the vertical dimension, or an entire district using the horizontal dimension. This definition is useful for this study because the areas to be examined are large at a district scale with properties that mix uses horizontally and vertically.

”Mixed-use infill development” in this study refers to *development that occurs in an urbanized area on vacant, or underutilized properties. Underutilized properties are determined as underdeveloped, torn down (fully or partially), refurbished or adaptively reused. These sites occur on vertical, horizontal, and temporal dimensions at various scales and feature a mixture of uses. The developments emphasize complementary uses at contextual intensities. They also promote walkable areas that are pedestrian oriented.*

The definition is flexible, and depending on its locational implementation can be exclusive or modestly inclusive. For the purposes of this study, the definition will be fitting to measure mixed-use in terms of urbanized districts within Dallas and Fort-Worth.

3.2 Scale and Location

As noted in the previous section, scale can be determined on different dimensions. The areas to be studied are large districts that have been areas of focus for Dallas and Fort Worth, Texas. The scale would be smaller than city level, but with the potential to examine a large number of parcels that constitute the entirety of the redevelopment district. The proposed areas are a blend of mostly horizontal mixing of uses. Most buildings are single story, but low and mid-rise buildings are spread intermittently throughout the districts.

The Dallas locations consist of districts categorized by the Dallas 360 plan (2012). These districts have been marked for revitalization and reinvestment. They are located mostly in the core and directly abutting areas of Downtown Dallas. However, an exception will be the Fort Worth Avenue TIF district. This area is on the west side of Downtown Dallas and is not present in the 360 plan. Although it is not in the downtown plan, Fort Worth Avenue has been selected for reinvestment and revitalization that emphasizes a large mixture of uses commercial and residential. All locations have unique character and are served by Dallas Area Rapid Transit rail and bus lines. The districts are classic areas of the city with small blocks that emphasize pedestrian accommodation. However, as the city has aged these areas have degraded and have accrued many vacant or underutilized properties. As a result, Dallas has sought to encourage private investment in the districts through the use of Tax Increment Financing or Public Improvement District designations (City of Dallas, 2012). Most of the districts highlighted throughout the Dallas 360 plan had their TIF's and PID's established years before the adoption of the 360 plan. Data in this thesis will analyze in the years pre and post TIF and/or PID designation.

In 2001 Fort Worth created the Urban Village program that targeted economically significant corridors of the city for reinvestment and redevelopment. The primary policy incentive used for redevelopment is the Neighborhood Empowerment Designation (NEZ). At this time, at

least twelve of the Urban Villages have NEZ designation that emphasizes residential development, mixed-use growth centers, and public improvement (City of Fort Worth, 2006). A significant difference in Fort Worth from Dallas is the presence of public transportation. Dallas has the DART Light Rail that serves most of the core business district. However, Fort Worth has no sufficient rail system to serve the center of the city. The city does have extensive bus routes that are very effective, but can be inconsistent. Although, Fort Worth does have a recently implemented Bike Share program that appears to be blossoming.

These urban villages and Dallas districts will be analyzed at a parcel level to determine property value changes in the core areas, and also within a quarter-mile distance from their boundaries. Sites in Dallas will be analyzed pre and post policy intervention with data from 2004 to 2013. The exception will be for the Dallas Uptown Public Improvement District as it was established in 1993, and then renewed in 2000 and 2005. Fort Worth data will range from 2005 to 2013. These years are prior to Neighborhood Empowerment Zone designation for some Fort Worth sites. The exception would be Ridglea Urban Village when the NEZ was designated by still in its infancy.

3.3 Selected Areas

The districts and urban villages emphasize mixed-use developments and a mixture of single land use properties distributed throughout the areas. Fort Worth sites will consist of the West Seventh, Magnolia, and Ridglea urban villages. For Dallas, the districts will be Uptown and Deep Ellum, and the Fort Worth Avenue TIF district on the West side of downtown. Figures B and C in Chapter 4 provide maps of the Dallas and Fort Worth selected sites.

Areas have been selected because they have at least 70% of their total land area, by parcel, developed in 2013. Significant infill has occurred in redevelopment, and planned development in the past decade throughout these areas, and there is large potential to view

significant impacts on properties values within the district and adjacent to their boundaries. The zones are also large and diverse with each having unique character and uses. Also, zones have all been designated for policy intervention to help assist in re-development.

3.4 Data

This thesis will utilize mostly quantifiable data for properties and demographic composition. For Dallas, property data will be acquired from the Dallas County Appraisal District. Fort Worth property data will be acquired from the Tarrant Appraisal District. The data will be analyze change over time from 2004 to 2013 for Dallas and 2005 – 2013 for Fort Worth. All data that is in dollar value has been adjusted for inflation in 2013 through the United States Consumer Price Index.

Demographic and travel commute data will be acquired from the United States Census Bureau during a concurrent time frame. The data will be aggregated at the block group level and utilize the American Community Survey2008- 2012, 5 Year and the American Community Survey 2005-2009, 5 Year. Demographics will help to analyze the social and population changes for the districts. Block groups have been selected because they contain parcels involved in the districts core boundaries, and its peripheral quarter mile radius to be studied. However, block group level data is based on a larger scale than the selected sites, and many parcels have been left out of the block groups due to limitations in this analysis. This has made some of the data not entirely representative of demographic changes occurring within the selected districts. Yet many times in the block groups, areas that have gone un-analyzed are largely open space, or industrial and would have little bearing on the goals of this study. This discrepancy will be more fully detailed within the limitations section, but the important take away from demographic data is primarily to add context to the economic analysis. The demographic data also suggests that there are many complex factors contributing to value that cannot be accounted for within this exploratory thesis.

City boundaries and district boundary data are supplied from their respected cities. This data will help in delineating parcels that fall under policy intervention and also are helpful in the extrusion of parcels through the GIS process.

3.5 Descriptive Analysis

This thesis will employ an exploratory descriptive analysis to observe trends within the mixed-use districts. The data will be compared and analyzed to view observable changes between mixed use infill and changing property values over time. Mixed use infill district boundaries will be used to create a quarter mile buffer that will be used to select parcels that may potentially show changes in value that could be attributed to mixed-use infill, or other factors in the abutting areas. This process is displayed in Figure A. Parcels within the quarter-mile buffer will be analyzed over time to examine if significant change has occurred in their property value. The quarter-mile distance was selected based on a typical walkable distance for desirable destinations (Cortright, 2009)

Figure 1 Methodology example.

The image above shows what I will refer to as the “core” of the Urban Village, or Dallas District, as parcels within the designated boundaries laid out by the city. The surrounding buffer of parcels shaded differently represent what I will be referring to as the “periphery”. Value changes will be calculated and graphed to analyze trends within the selected sites and their potential impacts on property values within a quarter mile from the mixed-use zone.

Values will be taken from Tarrant Appraisal district data for Fort Worth, and Dallas County Appraisal District Data for Dallas. The values will be based on the “Total Value” field for parcels within their databases. “Total Value” as designated by the TAD and DCAD represents the land value plus the ‘improved’ land value. Improved land value refers to structures or other construction that has taken place on the parcel. The percent of vacant property will be analyzed

using the appraisal districts' land data. The vacant land of all parcels within the districts will be calculated and divided by the “Total Area” of all of the parcels. Each city’s land use code will be used to determine which parcels are designated as vacant. Residential value will also be analyzed over time within the districts. Similar to the vacant property analysis, residential use codes have been selected and their accompanying values will be analyzed overtime for each district. All of the analyzed values, total and residential will be examined against changes at a city level, and county level. The results are will aid in valuing the potential of mixed use infill development as a revitalization strategy. Empirical data will also add to the discussion of infill development as a solution to sprawling cities, congestion, and deteriorating environmental conditions due to increased auto-dependence.

Age, income, and race, gross rent, and means of transportation to work by age will be analyzed throughout the zones at a block group level. American Community Survey 2005-2009 5 Year and American Community Survey 2008-2012 5 Year will be utilized. This data will be sourced from the United States Census Bureau, and it will be utilized to provide descriptive statistics about the locations. Demographics will help to add context to the complexity of property values, and to help aid in viewing the changing characteristics of the populations of the districts over time. Again, the districts only occupy a percentage of the block group, and the demographic data is not entirely representative. The importance is to show that demographic change is occurring and that helps to portray a more complete picture of complex variables that may relate to property value.

3.6 Geographic Information Systems Methodology

Geographic Information Systems (GIS) technology will aid in visualizing the spatial distribution of mixed-use infill development. GIS will be used in creating parcel maps that enable tax assessor data to be spatial linked to geographical locations for Dallas and Fort Worth. GIS

will also be a significant tool in sorting the extremely large data sets sourced from the appraisal districts.

The GIS process involves acquiring data from both Dallas and Fort Worth regarding parcel information, city limit boundaries, and identifying features such as highways, and building footprints. Dallas County Appraisal District provided parcel maps and property value data. They have also provided Tax Increment Financing District Boundaries. The Tarrant Appraisal District supplied parcel maps, city boundaries, and policy intervention district boundaries for the city of Fort Worth.

GIS was used heavily in visualizing the change in value over time, and an appendix of maps will be provided in the notes of this thesis. Functions within GIS were essential to the completion of this analysis, based on parsing immense amounts of parcel data at a county level down to manageable districts for each city.

Chapter 4

Findings

This chapter is separated into three facets of the analysis. The first section will provide a brief introduction to the mixed-use infill districts of Dallas and Fort Worth, Texas. The introduction will provide location, history, and context, and it will highlight the timeline in which policy designation was placed upon each district.

The second part of this chapter will discuss trends in property vacancy percentages. These changes provide a foundation in which to view trends in property value changes. Next, value changes in the mixed-use core districts and their accompanying periphery with be observed. The analysis will explore what changes property value changes occurred within the mixed-use cores and their accompanying peripheries. These trends will be viewed against baselines from the district's respective cities in Dallas and Fort Worth, and also the changes in their larger counties.

The third part will begin the discussion of demographic trends seen in block groups that hold selected mixed-use districts. Changes viewed in age, median income, gross rent, and transportation methods will be discussed. Demographic information will help to add to the complex picture that is property value.

4.1 Selected Mixed-Use Sites in Dallas and Fort Worth

The selected districts in Dallas and Fort Worth, Texas have all been targeted by their cities for redevelopment. The desired character of these districts is mixed-use, residential, commercial, areas that become lively and desirable places for living and recreation. All of the districts are significant areas within their cities with unique character and history. This section will begin by introducing the Dallas Sites followed by the Fort Worth Urban Villages.

Dallas Sites

The following map (Figure B) provides an overview of the Dallas central business district. The map shows the location of each district in relation to the core of downtown and each other.

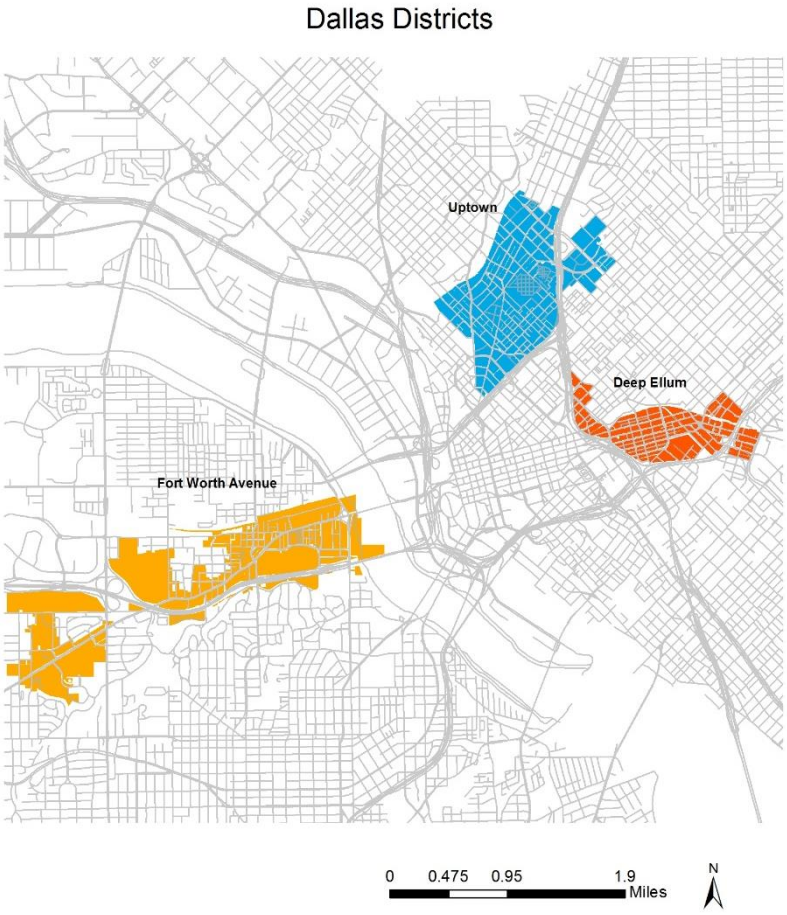

Figure 2 Selected Dallas sites.

From North to South, the districts are Uptown, Deep Ellum and Fort Worth Avenue. The Uptown District is abutting the core central business district of downtown Dallas, it is served by interstate 75 on the East, and it is sectioned by Woodall Rodgers Spur 366 to the South. Spur 366 has recently been traversed by a deck park that spans roughly five acres called Klyde Warren Park. Uptown has no official Dallas Area Rapid Transit station, but it is served by the

McKinney Avenue Trolley. The trolley system is a free service provided by a subsidies from DART and the Uptown PID. Uptown has been praised as one of the most walkable and New Urbanist parts of Downtown Dallas. (Uptown Dallas Inc., 2012). The Uptown public improvement district initiated in 1992, and was renewed in 2000 and 2005. The district is home to upscale commercial and residential real-estate.

Deep Ellum is one of the oldest neighborhoods in Dallas. It was developed in the late 1800's for residential and commercial use. It was home of a Ford automobile plant in the early 1900's, and it was also home to one of the largest manufacturers of cotton processing equipment (Deep Ellum Community Association, 2010). The area has seen highs and lows throughout its life span. In the late 80's and 90's many commercial buildings were renovated into loft apartments, and Deep Ellum experienced a renaissance of art and music that became the trademark of the district. However, the district still experienced high vacancy, crime, deteriorated structures and infrastructure. In 2005, Deep Ellum was designated a Tax Increment Financing District. The TIF goals aimed to, "… assist in the transformation of the Deep Ellum area into a more diversified, pedestrian friendly, mixed-use neighborhood…" (City of Dallas 2006). Ellum has all of the quality characteristics needed for mixed-use infill. The district has character in architecture, walkability, and accessibility through major arterials and three DART rail stations.

Fort Worth Avenue is located to directly across the Trinity River from Downtown Dallas. It is bounded by the West Commerce Street Bridge in the East, and it follows Fort Worth Avenue to the South-West towards Pittman Street. The location has historically been home to commercial real estate, and multi-family residential. Fort Worth Avenue has great natural amenity in some of the best views of Downtown Dallas. However, over its lifespan the area's infrastructure and buildings have become obsolete, dilapidated, and inadequate. The Fort Worth Avenue Tax Increment Financing District was designated in 2008 in hopes to incentivize reinvestment by providing funds for infrastructure improvements, adaptive reuse, and redevelopment. In 2008

Fort Worth Avenue's residential land use occupied less than ten percent of available land (City of Dallas, 2008). The TIF seeks to produce more owner operated residential real estate, and to create a more pedestrian friendly area that is punctuated by mixed use retail, commercial, and residential. Public transportation in Fort Worth Avenue is under represented, there are no DART Rail lines, but there are bus services.

Fort Worth Urban Villages

The following map (Figure C) provides reference and location for the three Fort Worth Urban Villages. The map shows the boundaries of the districts in relation to the Downtown Fort Worth core, and the spatial relation to each of the other urban villages.

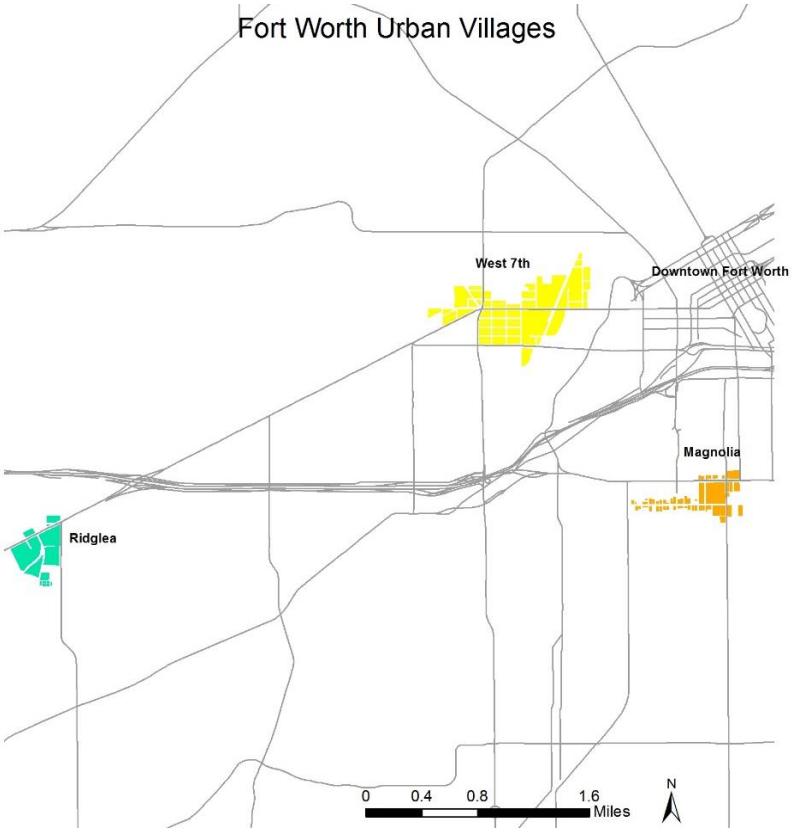

Figure 3 Selected Fort Worth sites.

From North to South, the urban villages are West Seventh, Magnolia, and Ridglea. These sites all correspond with corridors that have been designated for redevelopment and investment by the City of Fort Worth. Like Dallas, each of the sites have unique character and inherent amenity.

West Seventh Urban Village is a few miles west of Downtown Fort Worth and is part of the larger cultural district that is home to the Fort Worth Museum of Modern Art and the Kimbell Art Museum. The village is separated from downtown by the Trinity River, but West Seventh is an integral part of the future Trinity River Redevelopment Project. Before being designated an urban village, West Seventh was home to some of the largest manufacturing and industrial buildings near Downtown Fort Worth. However, since 2004 the area has focused on adaptive reuse of the large industrial buildings and creating pedestrian friendly mixed-use. The urban village is currently home to many high end retail shops with lively entertainment and nightlife bars and restaurants. Fort Worth has bus routes that serve West Seventh, but there is no rail transit available. The city recently began operating a bike share program that calls West Seventh home to one of its key stations.

Next, the Magnolia Urban Village is located south of Downtown Fort Worth. Magnolia provides a historic 'main street' feel that is accompanied by live/work units and historic architecture. Magnolia was designated an urban village in 2002, and it was given policy designation of a Neighborhood Empowerment Zone (NEZ) in 2010. Magnolia's past has primarily been in commercial and industrial uses that have limited the number of residential units in the area. The NEZ designation aimed to facilitate residential investment and development, increasing density, providing greater connectivity to neighborhoods, and to decrease vacant parcels and buildings in the corridor (City of Fort Worth, 2002). Like West Seventh, there is no public rail system that directly serves Magnolia, but there is bus service provided by the "T" Fort

Worth's transit authority. Also, the aforementioned bike share program has three stations along the Magnolia Avenue corridor (Fort Worth Bike Sharing, 2014).

Finally, Ridglea Urban Village is located South East of Downtown Fort Worth along the Camp Bowie Corridor. It is furthest from Downtown and exhibits slightly different characteristics than the other urban villages. Ridglea Urban Village is in the center of strong urban anchors that include entertainment, retail, and residential spaces. The Ridglea Theatre, high quality neighborhoods, and Spanish Revival / Mediterranean architecture provide historic character to the village. In 2002, Ridglea was one of the thirteen originally identified corridors to be designated urban villages. Since then, significant development has occurred. The Ridglea plan called for increased residential uses in conjunction with mixed use retail and residential lofts at gateway points and key anchor buildings. The plan also indicated the need for improved pedestrian amenities to foster a safe pedestrian friendly atmosphere (City of Fort Worth, 2007). However, connectivity is again an issue for this urban village. Again, there is no rail line that directly serves the site, and in this case, the bike share is not available either. The main public transportation is in the form of two bus routes that have stops on the perimeter of the urban village.

4.2 Property Vacancy and Value Trends

This property value analysis utilized an approach that explored change in total value of all parcels, change in total value of parcels designated as residential by state use codes, and the percent change in vacant properties designated by state use codes. The following section highlights the recorded data for the districts. Data has also been recorded for the overall city changes in Fort Worth and Dallas, as well as, Tarrant and Dallas County.

Mixed-Use Districts' Trends in Vacant Parcels

The definition utilized for this thesis designated infill as potentially vacant or underutilized parcels. Mixed-use infill throughout the districts have done just that by utilizing adaptive reuse in

Deep Ellum or West Seventh, addressing vacancy on underutilized parcels in Magnolia, or Fort Worth Avenue, and even building new structures on vacant land in Ridglea, or Uptown. The percent in vacancy according the state use codes has fluctuated throughout the districts. The following figures represent recorded and analyzed data for Dallas from 2004 to 2013 and Fort Worth from 2005 to 2013

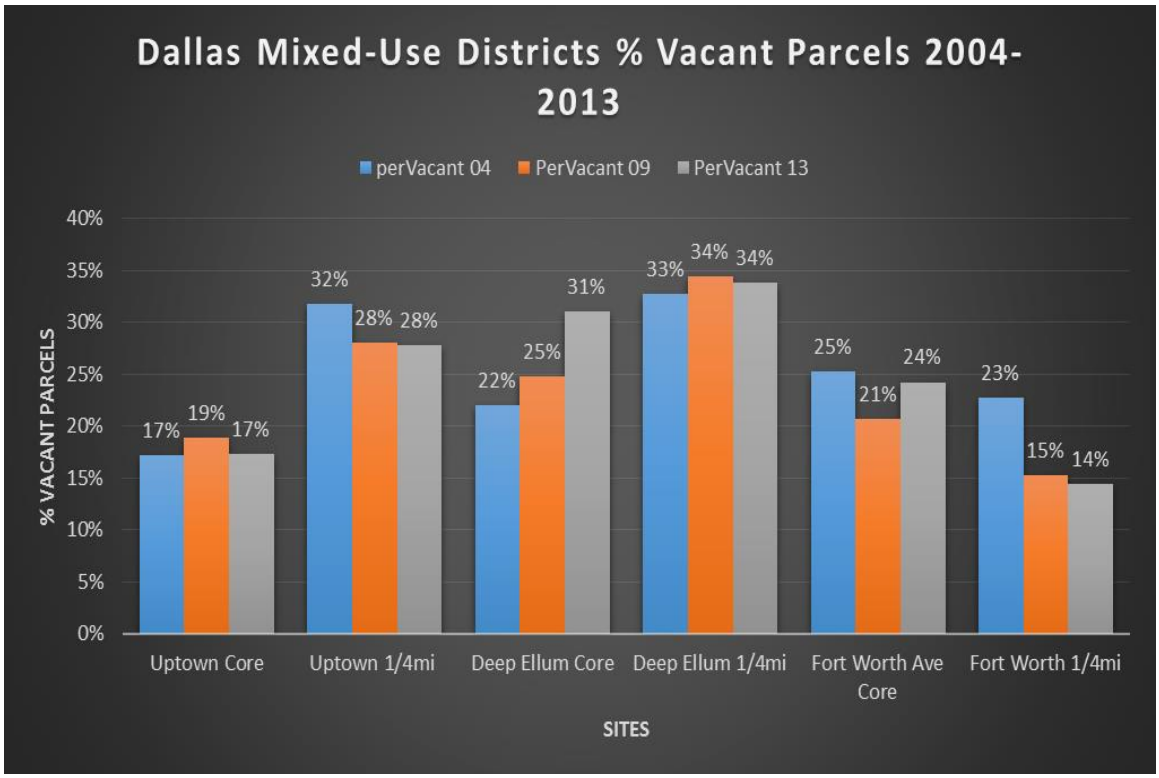

Figure 4 Dallas Mixed-Use Districts % vacant parcels 2004-2013 (U.S. Census Bureau, 2012).

Dallas's vacancy percentages appear to fluctuate in connection with total value changes seen in prior sections. In the following section we will see that values in the Uptown Core and Periphery rose significantly from 2005 to 2009, and in 2009 to 2013 the area reported much smaller gains. Similarly, the core and periphery both lost vacancy, or became more occupied with infill, at the same times value changes increased and decreased. The Fort Worth Avenue

Core and Periphery both experience large decreases in vacancy in the 2009 period. This data is similar to total value changes occurring in the core and periphery from 2005 to 2009, but differences occur in the quarter-mile periphery from 2009 to 2013. The Fort Worth Avenue core rose three percent in vacant parcels, and the periphery decreasing one percent. Vacancy rates remain low in the periphery of FWA, but total value loses 23 percent from 2009 to 2013 contrasting the continued decrease in vacancy.

Overall, trends of vacancy seem to reflect the rising of property total values in 2005 to 2009. Vacant parcel percentages then proceed with a levelling or decline of total value from 2009 to 2013 that will be highlighted in the following value sections. Although decreases in vacancy around the periphery of the mixed use districts seems to remain steady. Once the vacant parcels have been occupied they have appeared to stay occupied, or not vacant, for the duration of this study period.

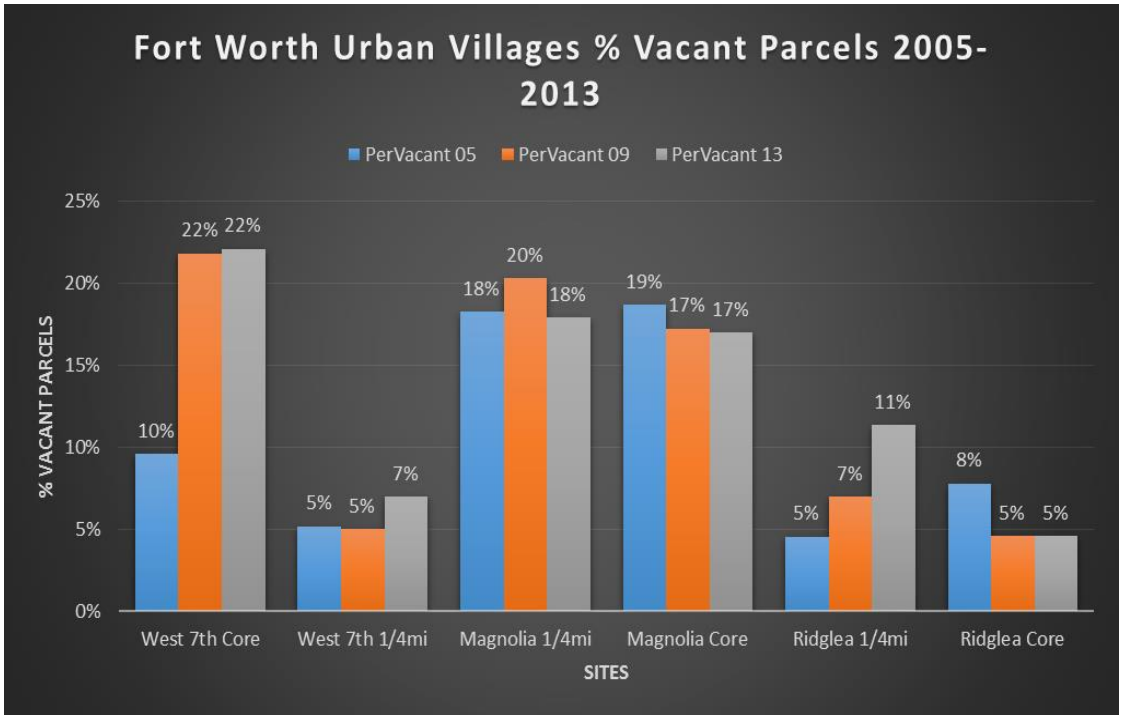

Figure 5 Fort Worth Urban Villages % vacant parcels 2005-2013 (U.S. Census Bureau, 2012).

Fort Worth's percent of vacant parcels graph looks slightly different than Dallas. West Seventh quarter-mile periphery, Magnolia's Core, and Ridglea's Core became less vacant in 2009. As the following section will show, these sites gained in total value from 2005 to 2009. From 2009 to 2013 two of these sites lost value and become more vacant, the West Seventh areas and the Ridglea Periphery. The exception is the Magnolia Core which still gained total value at 10 percent, and retained about the same level of vacancy. The vacancy for West Seventh's core area is an unexpected pattern. However, it can be explained by the transformation of the urban village. West Seventh utilized adaptive reuse of massive industrial buildings to establish mixed-use residential and commercial sites. Also, much of the land that was previously occupied by large industrial buildings and processing sites,was opened up for parking and open space. The Ridglea Periphery is an interesting case due to its steady increase in vacancy. The quarter-mile buffer surrounding the Ridglea Urban Village is primarily single family and some multi-family residential, but it is anchored to the south by an expansive country club. The lots and structures on this property are large and open, but the pattern of increased vacancy is difficult to explain. Overall, most of the Fort Worth Districts do not necessarily correspond with the changing of total values through the urban villages.

Total Value Trends Pre and Post Policy Designation

The Dallas Districts have been evaluated in a time frame that analyzes parcels previous to their designation under a financial incentive policy. The exception is with the Uptown Public Improvement District that was designated originally in 1992. However, the district was renewed in 2000, and 2005. The Dallas data begins at 2004 and is a year prior to renewal. For Fort Worth, the data predates policy intervention by 2-5 years for West Seventh and Magnolia, but Ridglea was designated in 2002 and that data was unavailable.

Trends have been measured by percent change in the years 2004 to 2013 in Dallas, and 2005 to 2013 in Fort Worth. The following figures show the mixed-use districts', cities' and counties' change in total value over those time periods.

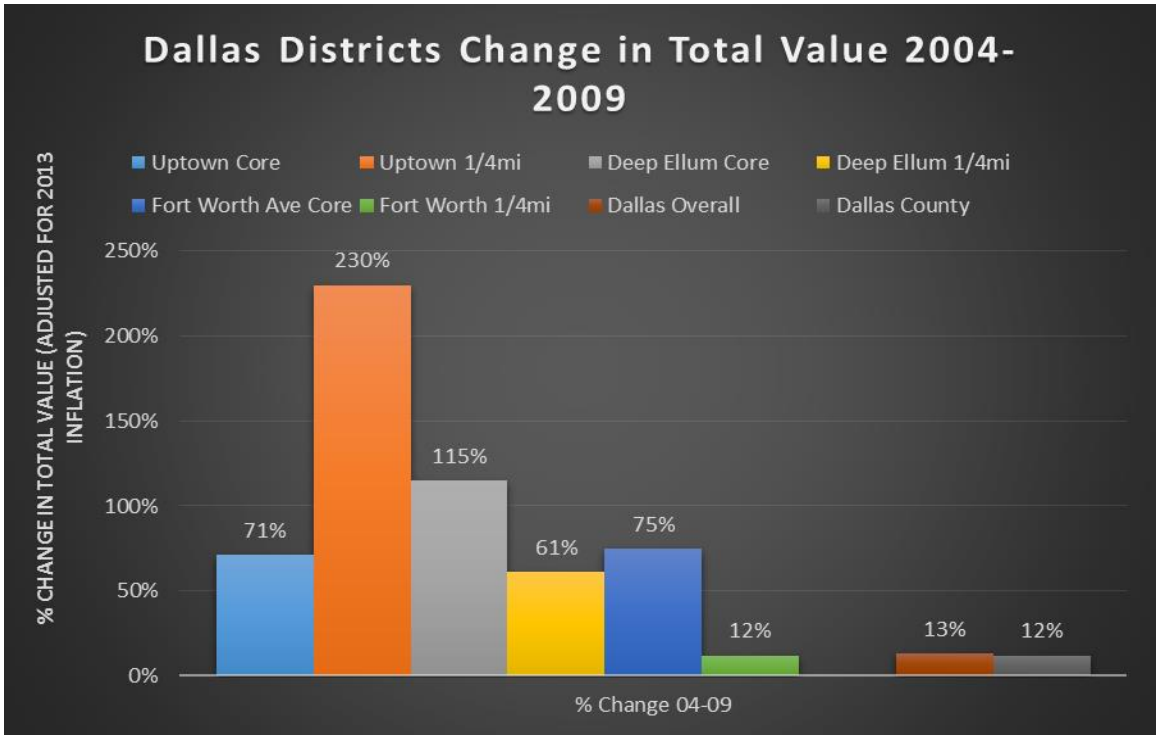

Figure 6 Dallas Districts change in total value 2004-2009 (Dallas County Appraisal District, 2014).

All of the Dallas districts showed dramatic gain in total value during the 2004 to 2009 period. It is important to note that the year 2004 predates all of the tax incentive policy designations for the districts with the exception of the original Uptown PID. From 2004 to 2009 the City of Dallas and Dallas County total values rose roughly 13 percent, but values in the more concentrated districts rose an average of 94 percent. The Uptown quarter mile periphery showed the most explosive increase at 230 percent. Respectively, the Uptown core also raised heavily at 71 percent. The Deep Ellum Core also experienced large increases in 2004 to 2009 at 115

percent. The district was designated in 2005, and up to 2009 and after, Deep Ellum saw significant change and re-investment.

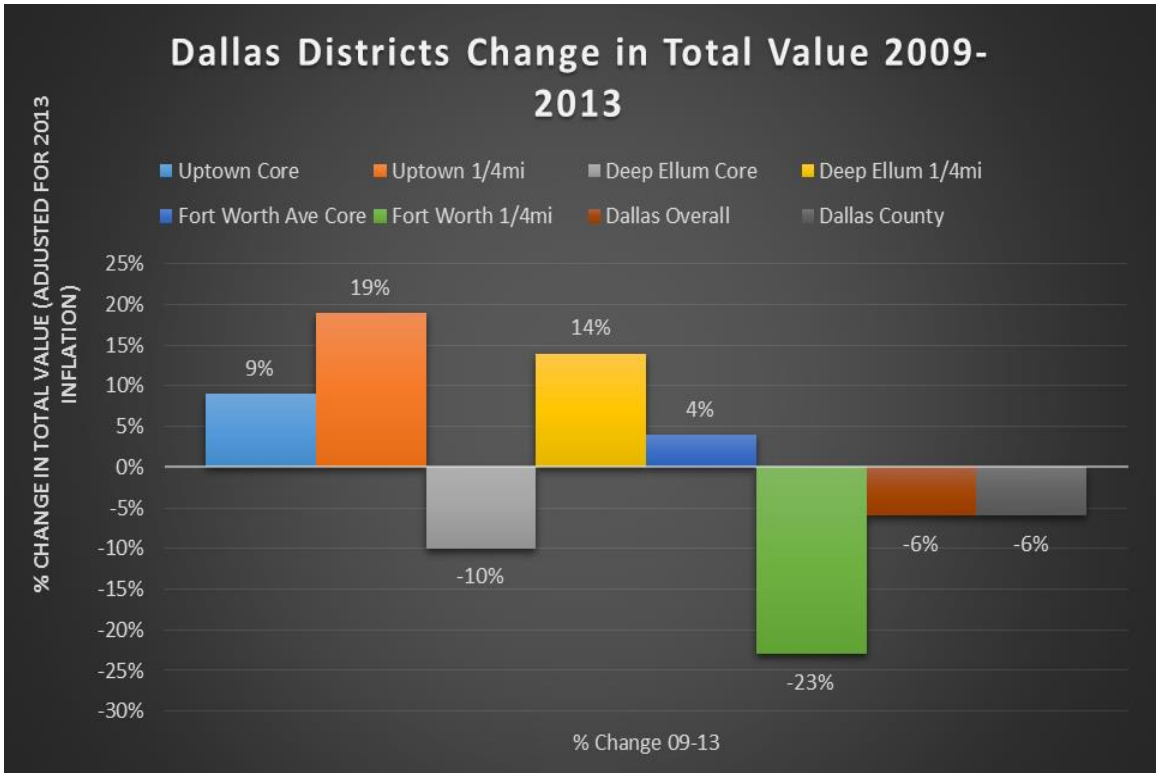

Figure 7 Dallas Districts change in total value 2009-2013 (Dallas County Appraisal District, 2014).

During the 2009 to 2013 time period gains are much less drastic, but are still present. The City of Dallas and Dallas County both see declines in value at minus 6 percent. Yet, values in the mixed-use districts remain relatively strong. Interestingly, the largest gains at 19 and 14 percent are in the periphery of the mixed-use districts, Uptown and Deep Ellum quarter-mile areas.

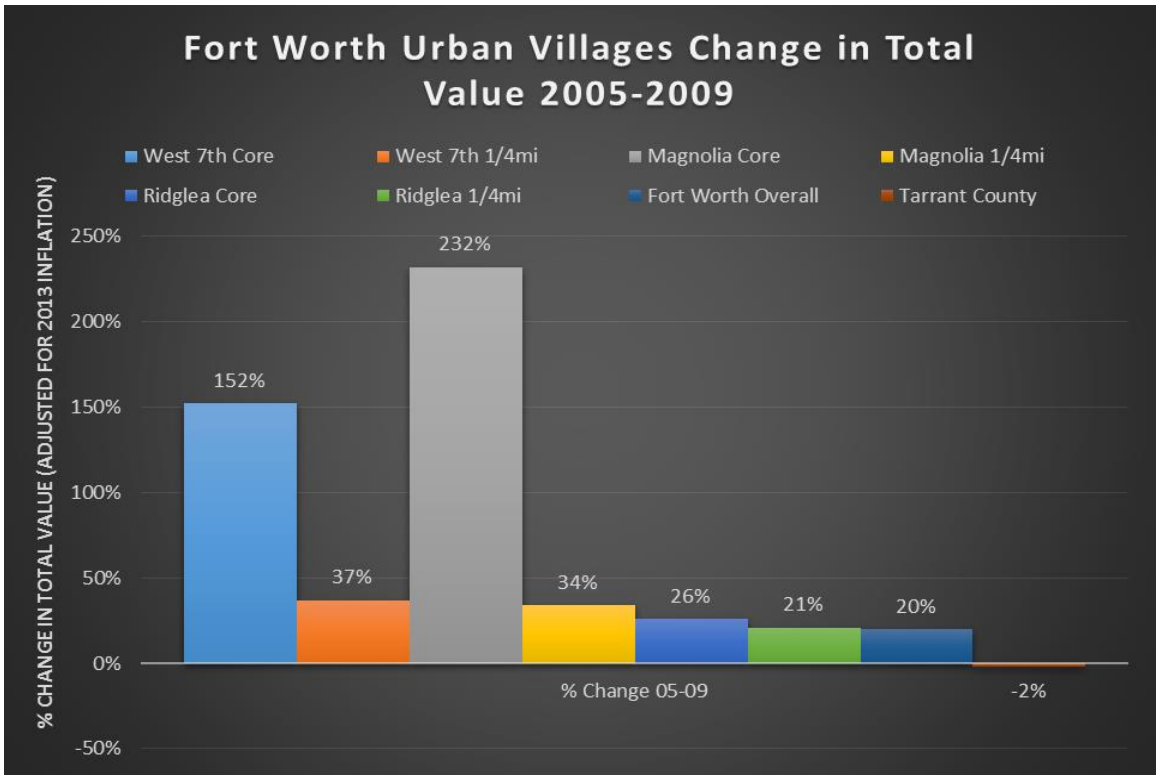

Figure 8 Fort Worth Urban Villages change in total value 2005-2009 (Tarrant County Appraisal District, 2014).

Value changes in Fort Worth were similarly volatile. Large percentage gains are seen in two of the urban villages from 2005 to 2009. West Seventh and Magnolia core parcels show gains of 152 and 232 percent. Both of these sites have their histories based in industrial and commercial uses, and since urban village designation West Seventh has been a shining star of mixed-use development within the city of Fort Worth. Strong urban amenities in scenic views, high end real estate, and a lively vibrant night life have helped to bolster property values. Magnolia's large increase shares similarities to West Seventh between 2005 and 2009, only four percent of parcels were designated for residential use. The rest was designated as commercial, industrial, and vacant parcels. Magnolia Urban Village has a strong focus on creating owner

operated residential, emphasizing mixed use development, and adaptive reuse to historic buildings along its 'main street'.

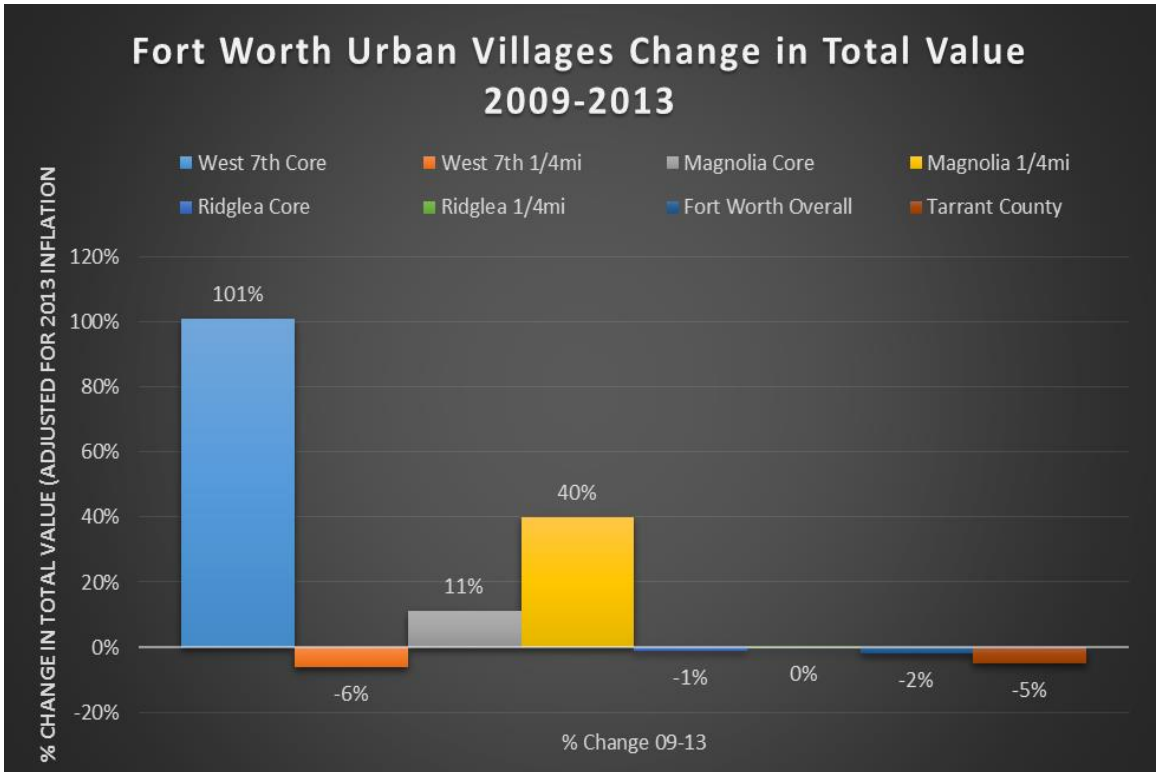

Figure 9 Fort Worth Urban Villages change in total value 2009-2013 (Tarrant County Appraisal District, 2014).

In the period of 2009 to 2013, total values continued to increase in the core West Seventh and Magnolia Districts, but at a slower pace. However, like in Dallas, there is a levelling of value and a decrease in some of the core districts and peripheries. The declines reflect the overall city of Fort Worth and Tarrant County total value declines.

Total values in the periphery of the mixed-use districts fluctuated depending on location. But the trends of total values are similar to the mixed-use cores. On average, all of the periphery areas surveyed rose 66 percent in total value from 2005 to 2009 compared to the City and County averages of 16.5 percent and 5 percent. Yet from 2009 to 2013 the peripheries

experienced the same levelling, and, in some cases, decline with an average rise of only 7 percent. Also as seen in the respected cities and counties, there were marked declines.

Mixed-Use Districts Residential Value Trends 2004 to 2013

Separating parcels by residential uses through state use code for the two cities helps to shine a different light on the total value numbers. "Residential" uses in this sense specifically means codes that signify single family, multi-family, condominiums, duplex, and triplex, and residential planned unit developments (Dallas County Appraisal District, 2014 ; Tarrant County Appraisal District, 2014). The following figures display residential changes throughout the districts in Dallas and Fort Worth, and they also show changes for the Cities and Counties.

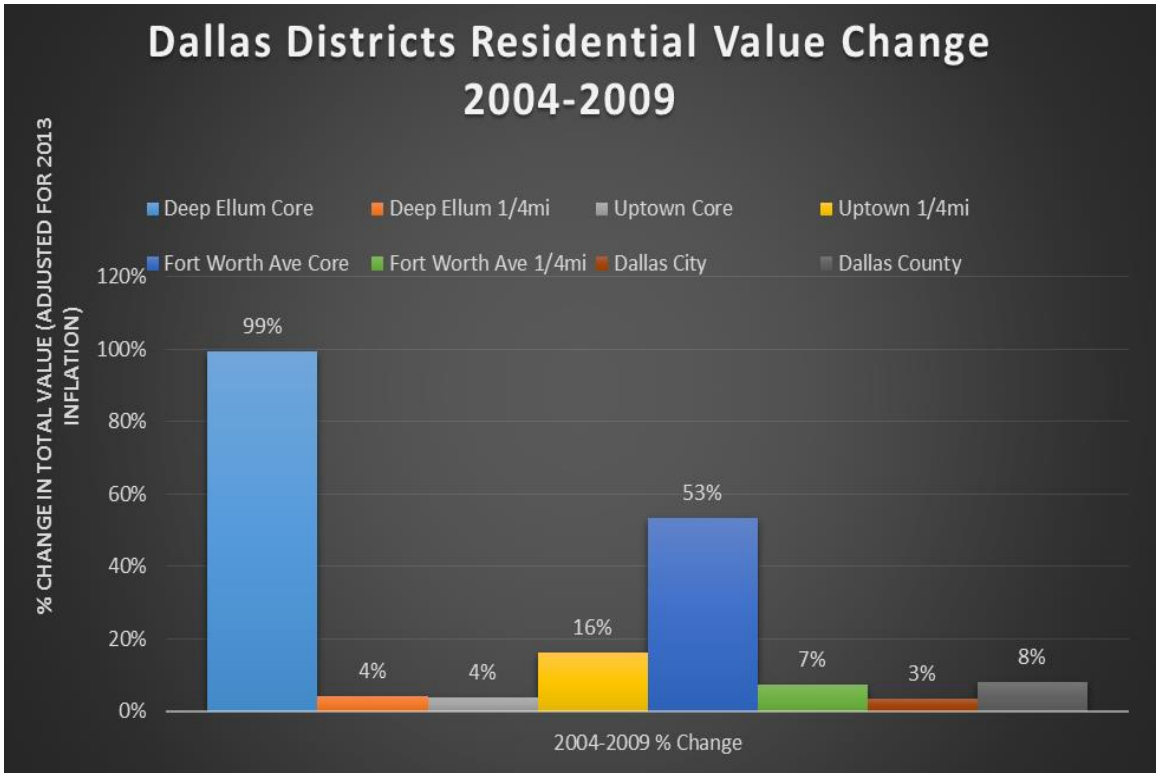

Figure 10 Dallas Districts residential value change 2004-2009 (Dallas County Appraisal District, 2014).

The data displayed in Figure J and Figure K, in some ways mirrors the Dallas total change in values. Strong property value gains in the cores of the mixed use districts. Specifically the Deep Ellum and Fort Worth Avenue districts. Previously, the Uptown Periphery values gained heavily, but the residential value shows that the largest gains must have come from property other than residential. Residential value rises were much weaker than total value changes for 2005 through 2009. Sites: Deep Ellum Quarter-mile Periphery, the Uptown Core, and the Fort Worth Avenue Quarter-mile Periphery were showed similar change as seen throughout Dallas, and Dallas County.

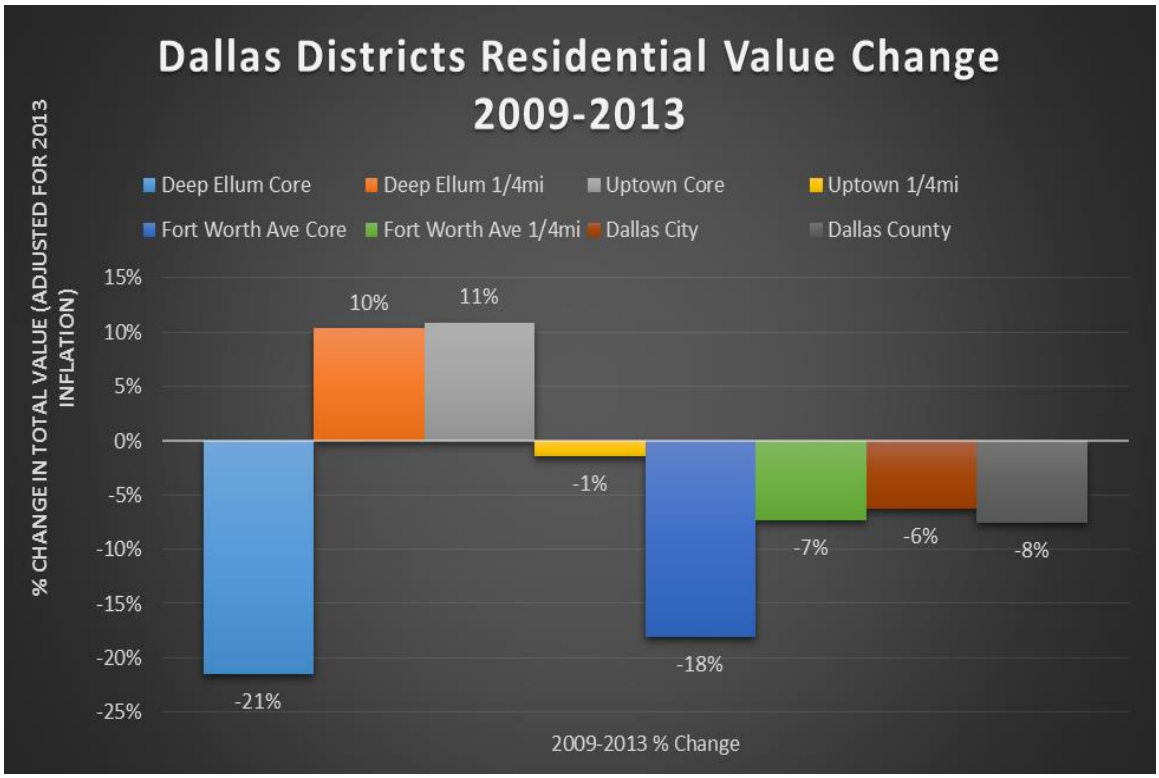

Figure 11 Dallas Districts residential value change 2009-2013 (Dallas County Appraisal District, 2014).

Again, 2009 through 2013 trends for residential change show a levelling off in gains, but there are mostly declines. Figure K displays that only the Deep Ellum Periphery and the Uptown Core gain in residential total Values. The Deep Ellum Core and the Fort Worth Avenue Core lose

significant value at negative 21 percent and negative 18 percent. These values are triple the loss of the City of Dallas.

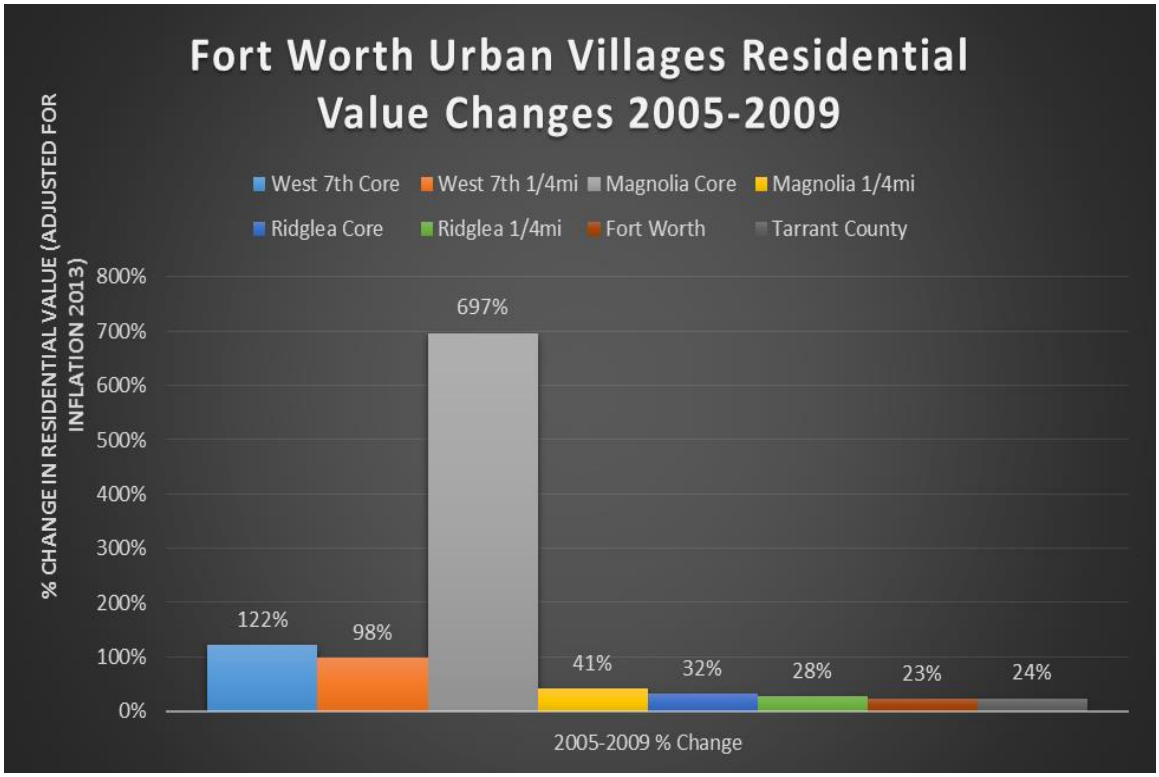

Figure 12 Fort Worth Urban Villages residential value changes 2005-2009 (Tarrant County Appraisal District, 2014).

Residential value changes for Fort Worth appear to be slightly more uniform. The 2005 to 2009 period follow the trend of the overall city, and county values at roughly 23 and 24 percent increases. The urban village cores rise in value greater than their peripheries. The striking anomaly on Figure L is the Magnolia Urban Village Core area. The gain is 697 percent from 2005 to 2009. This value is most definitely an anomaly. However, the previous section described the significant jump this same area took in total value change due to high vacancy, and being largely commercial and industrial. Again, the Magnolia Urban Village Core in 2004 only had 4 percent of its parcels dedicated to residential use. The urban village designation in 2002 sought to remedy

vacant parcels, underutilized parcels, and under-represented residential real estate quickly. The data suggests that investment into the area was heavy even before the designation of Magnolia's Neighborhood Empowerment Zone in 2010.

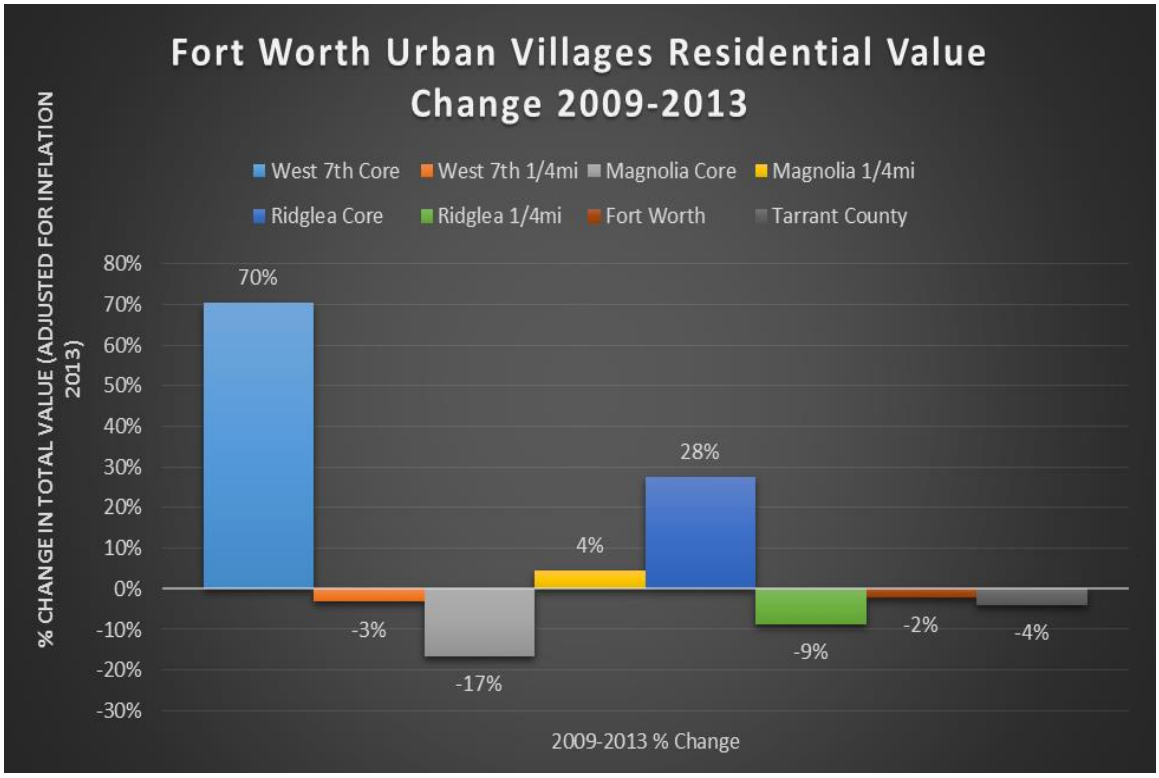

Figure 13 Fort Worth Urban Villages residential value change 2009-2013 (Tarrant County Appraisal District, 2014).

From 2009 to 2013, residential data mirrors West Seventh's strength in the total value changes. Fort Worth and Tarrant County both saw declining values overall, and the declining trends are also seen by the urban villages and their peripheries. However, the Ridglea Urban Village core remained steady hovering around 30 percent for both years. Ridglea was had very little vacant space, and has utilized mixed use infill heavily. The village benefits from strong adjacent neighborhoods, southern neighborhoods, and connectivity to Downtown Fort Worth.

Again, the overarching long term trend from 2005 to 2013 is the initial value boom prior to policy designation, and later the following leveling and minor decline in value.

Summary

Dallas and Fort Worth both exhibit characteristics in their property value and vacancy rates that suggests large value increases prior to and soon after the designation of incentive financing policy. The focused mixed-use district cores seem to exhibit the highest and most consistent value increases, but their peripheries do show marked increases in total value, residential value, and decreases in vacancy percentages. However, the value changes seem to occur on a bubble and within five years of development values have levelled, or decreased within the majority of cores. Also, vacancy rates began to rise correspondingly. The data suggests that district peripheries remain more stable after their initial bubble of property value rises. The data also contributes by suggesting that there are more factors contributing to changing values than simply mixed-use infill.

4.3 Demographic Trends

Property values are extremely complex and dynamic, and statistical change over time cannot show the entire picture. The descriptive statistical analysis provided in the previous section provides a cursory exploration in which to view changing property values. However, in order to add context, and another perspective, about changing values and the influence of mixed-use infill, the following section will provide descriptive demographic statistics. The data is sourced from the United States Census Bureau (ACS) American Community Surveys 2009 five year and the 2012 five year. The ACS conducts five year estimates creating a range from 2005 to 2009, and 2008 to 2012. The following discussion will analyze trends in income, age, rent, transportation, and racial complexion at a block group level. It is important to note that the block groups selected cover the entire mixed-use cores and their peripheries.

Trends in Income, Gross Rent, and Median Age

Figure N displays the median income for block groups containing the mixed-use districts in Dallas and Fort Worth, Texas. Only two of the sites, Fort Worth Avenue in Dallas and Ridglea Urban Village in Fort Worth, display negative change in median income from 2005 to 2009 and 2008 to 2012.

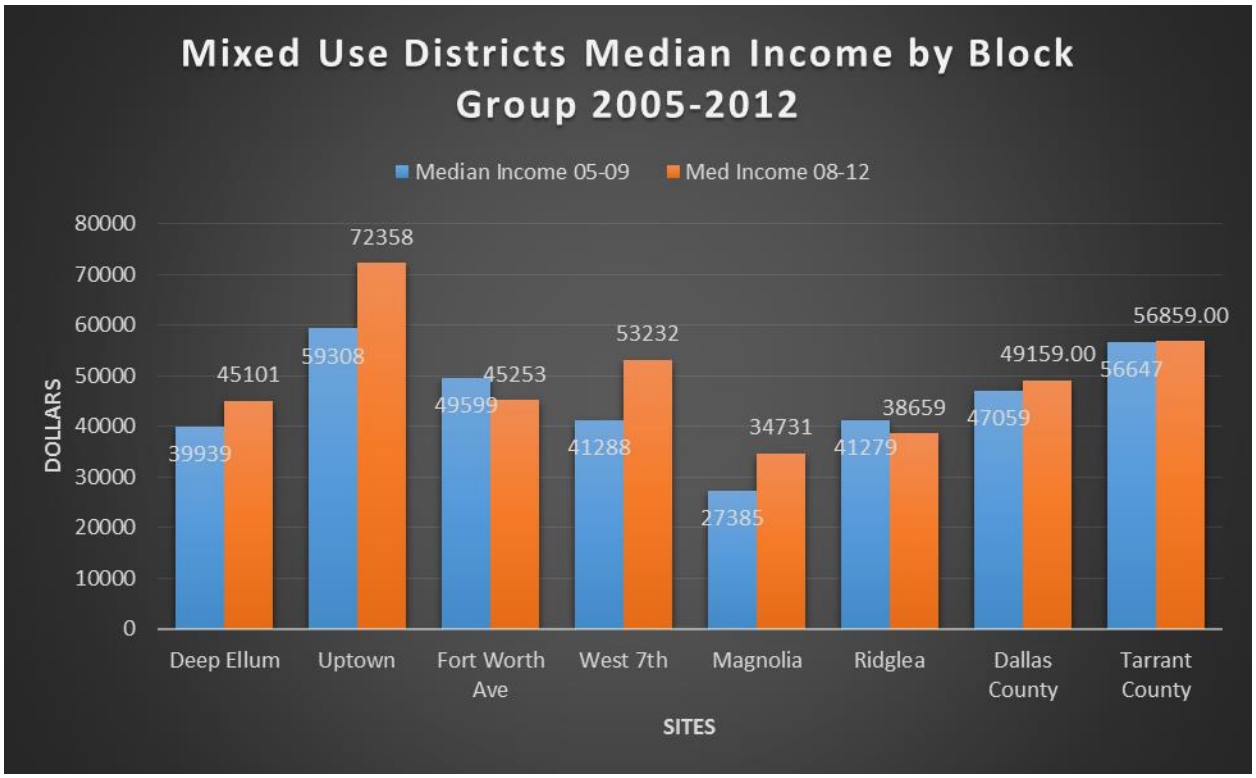

Figure 14 Mixed-use districts median income by block group 2005-2012 (U.S. Census Bureau, 2012).

All other sites accounted for an average increase of 16 percent. Comparatively, on average, total value changes in property for Dallas Districts from 2005 to 2009 rose 94 percent, and in 2009 to 2013 rose only 2 percent. Fort Worth Urban Villages rose 84 percent on average from 2005 to 2009, and 24 percent from 2009 to 2013. The trends in income changes correspond to cost of

living within the districts, and the increased total value. Figure O displays gross rent among block groups containing the mixed-use districts.

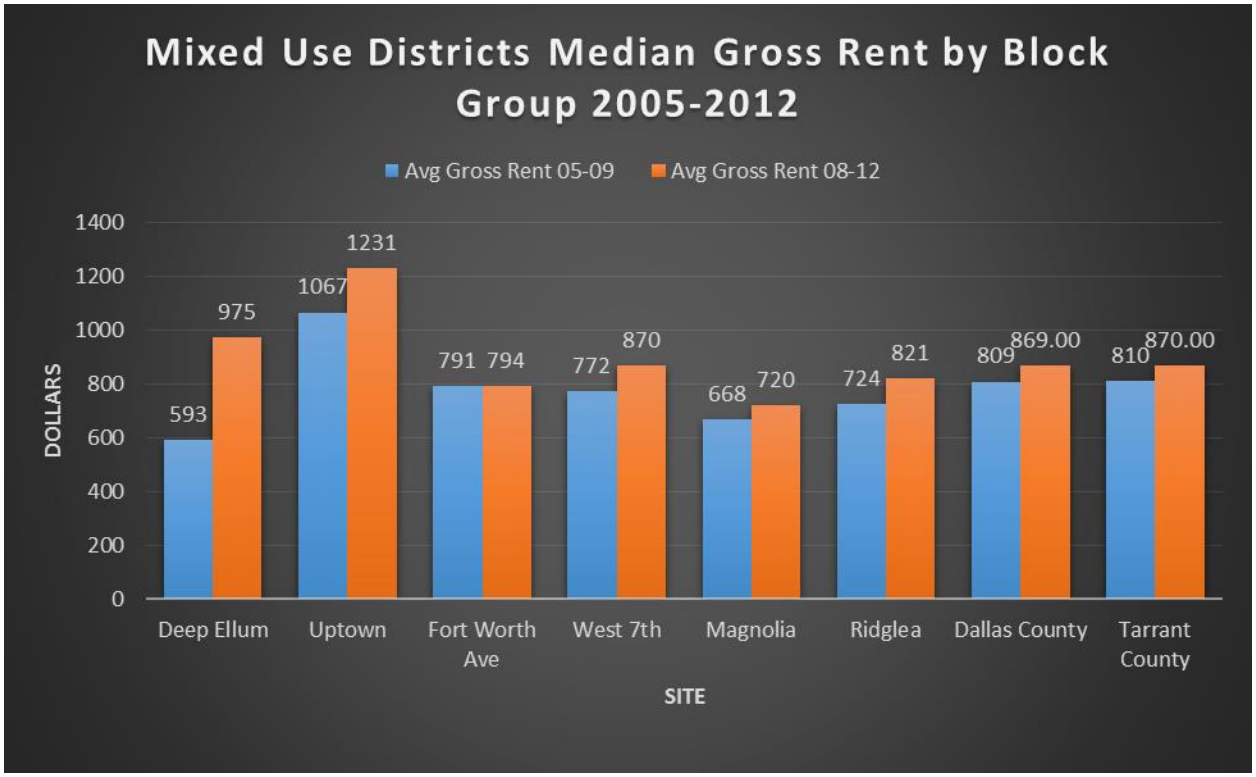

Figure 15 Mixed-use districts median gross rent by block group 2005-2012 (U.S. Census Bureau, 2012).

Data for gross rent within the block groups containing mixed-use districts shows virtually mirrored increase to median income. The average increase in gross rent for all block groups is also 16 percent. However the unusually large increase in the Deep Ellum District block groups may reflect other factors. The Uptown block groups also display an increase slightly above the remaining areas. Coincidentally, Deep Ellum and Uptown show the largest increases in median age, from 28.3 years to 32.6 years in Deep Ellum, and 30.9 to 35.1 in Uptown. Figure P highlights the change in median age from 2005 to 2008 and 2009 to 2012 American Community Surveys.

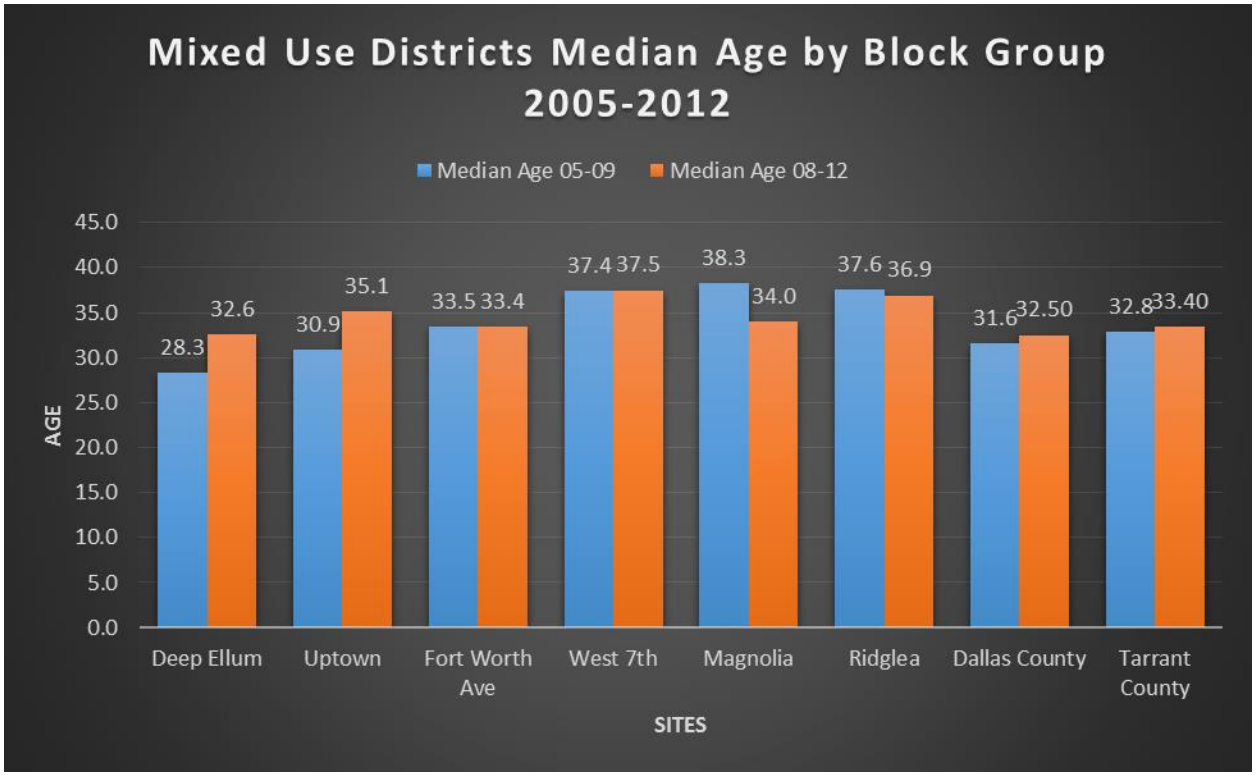

Figure 16 Mixed-use districts median age by block group 2005-2012 (U.S. Census Bureau, 2012).

Interestingly, the average median age of all the mixed-use districts is slightly higher than the county medians at 34.3 years from 2005 to 2009 and 34.92 years from 2008 to 2012. This trend may be related to the income changes in the districts versus changes within the larger counties. Tarrant County's median income stayed about the same at $56,859, and Dallas County saw an increase of four percent to $49,159. Age and income in this case, seem to have some observable relationship.

Trends in Racial Complexion

American Community Survey respondents who answered, "White Alone" constitute the most numerous group over all the block groups containing mixed-use districts. Differences arises when looking at Dallas Districts versus Fort Worth Urban Villages. Overall, Dallas block groups

became more diversified. Respondents who answered “White Alone” decreased an average of 2.48 percent between the three Dallas sites. Conversely, the Fort Worth sites became more homogenous. The urban villages gained 13 percent in respondents who answered “White Alone”. The population who responded “African American – Black Alone” made the largest gains in the Dallas Districts, and they saw the largest decreases in the Fort Worth Districts. Respondents who answered “Other Race Alone” made up the third significant portion of populations for both Dallas and Fort Worth. In Fort Worth, this group made up an average of 12 percent of the population in the villages, but they saw an average decrease of 9 percent from 2008 to 2012. In the Dallas block groups the “Other Race Alone” respondents constituted less than 5 percent of the population. Tables 2 and 3 in Appendix A provide detailed enumeration of the population make-up for the block groups. Race within the selected sites seems to have little bearing on the changing of values, or no discernable trend is apparent.

Trends in Travel Mode for Commute Trips

Table 1 and 2 show statistics about Dallas and Tarrant County transportation trends. The data shows clear indication that over 90 percent of commuters travelling to work in the counties travel by automobile either alone or within a carpool.

Table 1: Transportation trends for Dallas, ACS 5 Year 2005-2009; 2008-2012 (U.S. Census Bureau, 2012)

	Dallas 2005-2009	Dallas 2009-2012	% Change
Car, Truck or van	90.8	90.5	0.00
Drove alone	77.3	79.2	0.02
Carpooled	13.4	11.3	-0.16
2 person	9.6	8.5	-0.11

Table 1 - *Continued*

3 person	2.5	1.7	-0.32
4 or more	1.4	1.1	-0.21
workers per car, truck, or van	1.2	1.07	-0.11
public transportation	2.8	2.8	0.00
Walked	1.4	1.5	0.07
Bicycle	0.1	0.01	-0.90
taxi, motorcycle, other	1.4	1.4	0.00
worked at home	3.5	3.7	0.06

Table 2: Transportation trends Tarrant County, ACS 5 Year 2005-2009; 2008-2012 (U.S. Census Bureau, 2012)

	Tarrant 2005-2009	Tarrant 2009-2012	% Change
Car, Truck or van	94	92.5	-0.0159574
Drove alone	82.9	82.1	-0.0096502
Carpooled	11.1	10.4	-0.0630631
2 person	8.5	7.6	-0.1058824
3 person	1.7	1.6	-0.0588235
4 or more	0.9	1.2	0.33333333
workers per car, truck, or van	1.14	1.07	-0.0614035
public transportation	0.6	0.7	0.16666667
walked	1.1	1.2	0.09090909
bicycle	0.2	0.3	0.5
taxi, motorcycle, other	1	1.9	0.9
worked at home	3.1	3.5	0.12903226

These stats are reflected in the mixed-use district block groups for Dallas and Fort Worth. Tables 3 and 4, below, show statistics for block groups containing mixed-use districts. Throughout the block groups, automobile travel either alone or in a carpool dominated with 85 percent in Deep Ellum being the lowest percentage. Change between the ACS surveys was almost negligible. Public transportation respondents rated highest in Deep Ellum at 6 percent. This location has the most numerous rail stations served by Dallas Area Rapid Transit. Conversely, no rail serves any of the Fort Worth Urban Villages. Ridglea block groups show the highest percentage at 6 percent from 2005 to 2009, but decreases to 3 percent in 2008 to 2012. Other villages have respondents of less than 2 percent for public transportation.

Respondents who walked scored highest in Deep Ellum for Dallas and Ridglea for Fort Worth. These two sites have the highest percentages for public transportation and walking, but they have also have some of the most notable increases in vacancy from 2009 to 2013. Interestingly, 11 percent of respondents in Deep Ellum from 2005 to 2009 walked for transportation, but 2008 to 2012 showed a 3 percent decrease. Ridglea also experienced a loss going from 7 percent to 1 percent of respondents.

Table 3: Transportation trends for block groups containing Dallas mixed-use districts, ACS 5 Year 2005-2009; 2008-2012 (U.S. Census Bureau, 2012)

	Deep Ellum 2005-2009	Deep Ellum 2008-2012	% Change	Uptown 2005-2009	Uptown 2008-2012	% Change	Fort Worth Avenue 2005-2009	Fort Worth Avenue 2008-2012	% Change
Total:	7921	9037		19709	24137		7157	7210	
Car, truck, or van:	76%	81%	5%	87%	86%	-1%	89%	89%	0%
Drove alone	67%	72%	5%	79%	80%	1%	74%	75%	1%
Carpooled:	9%	9%	0%	8%	6%	-2%	15%	14%	-1%
In 2-person carpool	6%	6%	0%	7%	6%	-2%	9%	9%	-1%
In 3-person carpool	3%	1%	-1%	0%	0%	0%	1%	2%	0%
In 4-person carpool	0%	0%	0%	1%	0%	-1%	4%	3%	-1%

Table 3 - *Continued*

In 5- or 6-person carpool	0%	0%	0%	0%	0%	0%	0%	0%	0%
In 7-or-more-person carpool	0%	1%	1%	0%	0%	0%	1%	0%	-1%
Public transportation (excluding taxicab):	6%	5%	-1%	3%	3%	1%	5%	3%	-2%
Bus or trolley bus	4%	2%	-2%	2%	3%	0%	5%	3%	-2%
Streetcar or trolley car	0%	0%	0%	0%	0%	0%	0%	0%	0%
Subway or elevated	1%	1%	0%	0%	0%	0%	0%	0%	0%
Railroad	1%	2%	1%	0%	0%	0%	0%	0%	0%
Ferryboat	0%	0%	0%	0%	0%	0%	0%	0%	0%
Taxicab	0%	0%	0%	0%	0%	0%	0%	0%	0%
Motorcycle	0%	0%	0%	0%	0%	0%	0%	0%	0%
Bicycle	0%	1%	1%	0%	0%	0%	0%	0%	0%
Walked	11%	8%	-3%	4%	4%	0%	1%	3%	1%
Other means	2%	0%	-1%	1%	0%	-1%	1%	2%	1%
Worked at home	5%	5%	0%	4%	5%	1%	4%	4%	0%

Table 4: Transportation Trends for Block Groups containing Fort Worth Urban Villages, ACS 5 Year 2005-2009; 2008-2012 (U.S. Census Bureau, 2012)

	West 7th 2005-2009	West 7th 2008-2012	% Change	Magnolia 2005-2009	Magnolia 2008-2012	% Change	Ridglea 2005-2009	Ridglea 2008-2012	% Change
Total:	3211	3797		3444	3469		2767	2696	
Car, truck, or van:	90%	86%	-4%	89%	91%	2%	80%	91%	11%
Drove alone	79%	84%	5%	64%	74%	9%	68%	80%	12%
Carpooled:	11%	3%	-8%	25%	17%	-7%	12%	11%	-1%
In 2-person carpool	7%	2%	-5%	16%	13%	-3%	10%	9%	-2%
In 3-person carpool	2%	1%	-1%	2%	1%	-2%	0%	0%	0%

Table 4 – *Continued*

In 4-person carpool	2%	0%	-2%	2%	1%	-1%	1%	2%	1%
In 5- or 6-person carpool	0%	0%	0%	3%	3%	0%	0%	0%	0%
In 7-or-more-person carpool	0%	0%	0%	2%	0%	-1%	0%	0%	0%
Public transportation excluding taxicab):	1%	2%	1%	2%	1%	-1%	6%	3%	-3%
Bus or trolley bus	1%	1%	1%	2%	1%	-1%	6%	2%	-3%
Streetcar or trolley car	0%	0%	0%	0%	0%	0%	0%	0%	0%
Subway or elevated	0%	0%	0%	0%	0%	0%	0%	0%	0%
Railroad	0%	0%	0%	0%	0%	0%	0%	0%	0%
Ferryboat	0%	0%	0%	0%	0%	0%	0%	0%	0%
Taxicab	0%	0%	0%	0%	0%	0%	0%	0%	0%
Motorcycle	0%	0%	0%	0%	0%	0%	0%	0%	0%
Bicycle	1%	0%	-1%	1%	1%	0%	0%	0%	0%
Walked	4%	5%	1%	4%	2%	-2%	7%	1%	-6%
Other means	1%	1%	0%	1%	1%	0%	0%	0%	0%
Worked at home	3%	6%	3%	2%	3%	1%	7%	5%	-2%

Overall, the automobile is the primary means of travel for most Dallas and Tarrant County residents. However, there was statistical evidence that supported the notion that residents walked more when vacancy percentages were lower. The picture is too incomplete to draw solid conclusions, but this evidence does help to examine necessities of the districts.

Summary

Descriptive statistics provided by the demographic analysis is essential to adding context in which to view economic value changes within the mixed-use districts. Overall, median income has increased in near unison with median gross rent throughout the districts and counties.

Discrepancies arise in certain districts, but those districts also show larger increases in median age. Racial constitutions of the districts are mostly homogenous with “White Only” respondents making up over 65 percent of the population and more throughout all districts. The next largest group changes come from the ACS categories of “African American-Black Alone” in Dallas Districts and “Other Race Alone” in Fort Worth Urban Villages. However, trends in racial complexion of the districts seem have little impact on values. Transportation patterns are in near lockstep with the larger counties. Automobile use rates at over 85 percent, and public transportation and walking constitute less than 10 percent even in the strongest walkable and public transit served areas.

Chapter 5

Results

Certain trends have been noted within the previous descriptive analysis, and Chapter 5 will expound on those findings with observable correlations and potential drawbacks. Nevertheless, mixed-use infill development does have some observable effect on the total values of properties within districts and among its peripheries. All be it, this exploration into property values and demographics merely scratches the surface of measuring property values.

5.1 Mixed-Use Infill and Changing Total/Residential Values

Through all the districts there is an observable total value "bubble" that is occurs prior to and during the beginning years of incentive policy designation. It remains for a short time into the incentive financing, but within the past five years, 2009 to 2013, there is significant levelling and decreases in total values. The same trend is apparent in total values of just residential parcels. However, in contrast to the mixed-use district cores, the peripheries appear to be retaining value more strongly and longer

Another uncertainty that can be drawn from the descriptive analysis can be seen through the vacancy changes from 2004 to 2013. The trend appears to follow the same 'bubble' that affects the total and residential values, but the varying vacancy only seems to hold true for half of the studied sites. The vacancy percentages could be subject to numerous other larger variables that are beyond the scope of this study, but future research should also be geared toward this subject.

A development's economic impact on its surrounding parcel's value is a complex problem to measure. An issue that has been identified through the analysis is the undeterminable impact of incentive financing such as TIF's, PID's, and NEZ's. The history of the selected districts are

significant to the future of the districts in varying degrees. All of the sites have unique character, but some also have historic structures and small lots that engender a unique “traditional” feel to the areas. Also, due to the historic nature of some of the mixed-use sites there have traditionally been a mixture of uses in the locations. Deep Ellum probably most typifies this description. Deep Ellum was facing significant decline before the institution of the TIF zone in 2005. Ellum saw a brief resurgence in the period directly after designation, but now, according to Figure D, the district is again seeing increases in vacancies and also decreases in total value. This is important to note because Deep Ellum’s total value and vacancy trends are not unique, but its history is a bit more “traditional mixed-use” than the other districts.

5.2 Mixed-Use Infill and Demographic Trends

Demographic trends largely reflected overall changes seen within the larger Dallas and Tarrant Counties. Income and gross rent throughout all the block groups increased at nearly identical rates on an average of 16 percent. Income stood out as the variable that deviated the most from the larger county trends. Median age remained steady with only slight change between the districts, but constant with county trends. It is interesting to note the observable relationship between increased age within the block groups that have increased income levels.

Racial complexion throughout the block groups containing mixed-use districts was diverse in groups, but homogenous in overall consideration. The majority of respondents in the block groups were listed as “White Alone”, and the next largest category was “African American-Black Alone”. Change from 2005 to 2012 throughout all other categories was minimal. Overall, racial complexion of the mixed-use districts, and observable trends within the racial data appear to have little significance in relationship to property values in this exploitative analysis.

Transportation patterns also coincided with county trends with over 90 percent of commutes occurring by automobile in a single person, or carpool. This number is unsustainable

and speaks to the heart of what infill development is attempting to curtail through “Smart Growth”. Another interesting observation for transportation patterns was the decrease in residents who walked and used public transportation. Decreases were seen in the strongest districts of Deep Ellum and Ridglea. Along with decreases, there are noticeable increases in vacancy percentages for those districts. Many studies have touted the benefits of Transit Oriented Developments, but Deep Ellum shows that mixed-use infill is context sensitive, and there are no ‘one size fits all’ solutions to development.

Summary

The results of this thesis answers some questions, but also desires the need for further research on many others. The findings are clear that mixed-use infill development does have some observable effect on values within its core district and upon its periphery. However, further research and data will be necessary to construct more comprehensive models that can detail the numerous and complex variables that go into analyzing property values. The demographic evidence corroborates the need for further research. Although trends within the demographics are observable, most of the trends appear to mimic the larger trends of the counties. The analysis has also opened a door for questions that have arisen about the relationship between walkability and vacant parcels.

Chapter 6

Limitations

Throughout the preparation of this thesis pitfalls were noted, and solutions were attempted, but occasionally the results were not ideal. This section will highlight future considerations that will be taken as this study progresses, or as others progress the discussion of the economic impacts of mixed-use infill development.

6.1 Weakness of the Study

A primary issue afflicting this analysis is the inherent complexity of measuring property values. By their nature, property values are dependent variables on the receiving end of countless other dependent and independent variables. This study has been designed as an exploration into the intricacies of property valuation. The descriptive analysis provided merely scratches the surface for measuring changes within these Dallas and Fort Worth areas. No, conclusive evidence or notion can be drawn from these numbers, but their value is important to further the discussion. A true hedonic pricing model and numerous other complex models would be needed to measure the correlation between these variables. Wiley's 2009 study uses four models to correct for variables, and to ensure reliability in measuring economic impact on surrounding parcels. This study would be provide a solid foundation in which to go forward with creating a more complete picture for mixed-use infill and its effects.

A second weakness of the study is, again, concerned with unknown variables. Policy designations placed upon the districts have a strong effect on property values. The power of their influence cannot be determined through this basic exploration. Changes in total values vary greatly pre and post policy implementation, and it is difficult to determine how much of the variation is from the nature of mixed-use infill development, or from simply the incentivized investment

policies. However, these descriptive statistics provide evidence that these districts that have utilized mixed-use infill as a strategy have generally shown stronger gains in total values, and they have shown to hold their total values better than their parent cities and counties. The data is clear that from 2009 to 2013 something has occurred to level the initial explosive investment. Additionally, these dates coincide with the larger national economic recession and depression of property values through the country, but again the mixed-use districts hold value greater than their cities and their counties.

Thirdly, the dataset that was used to calculate "total value" of parcels was taken from both appraisal districts is a calculation of the value of the land, and the value of improvements on the land. Land values are relatively consistent, but improvement values can vary greatly. These variations can cause to exaggerate some total values. This can account for the possible extreme gain for the Magnolia Urban Village Core in Figure L. A potential solution to this issue may have been to calculate parcel "total value" and divide it by total land in square feet. This would create a ratio that may provide more consistent results and accounts for very large square foot buildings that were potentially built. Unfortunately, the appraisal districts, do not clarify what is precisely measured by "land area". Additionally, recalculating all of the districts and their peripheries would have pushed the limits of the time frames for this thesis.

6.2 Data Availability

The descriptive analysis of this thesis explored extremely large appraisal district datasets from. In order to retrieve the property value data necessary to calculate each of the districts the data must be pared down from county level to city level and then further to a select few thousand, or hundred, parcels. Part of the limitation was due to my own lack of experience in dealing with datasets of this magnitude. Managing the data into smaller, workable, sets took much more time than I had originally anticipated. Also, working with the large datasets became increasingly

cumbersome and computer intensive.

To source the data, Dallas Country Appraisal District was contacted through open records request for the City of Dallas Data, and Tarrant County Appraisal District was contacted through open records request for Fort Worth Data. Issues arise due to these two counties not having the same time-line of data available. For Dallas County, the appraisal data is only available in a format that is functional with ArcGIS back to 2003. Fort Worth's appraisal data is only available in a digitized format back to 2005, and 2005 is a limited database. Ideally, the timelines for both cities would have aligned more efficiently.

Demographic data was retrieved from the United States Census Bureau, and at the time of this writing certain functions of their databases are inaccessible. Census 2000 SF1 data is currently unavailable on their website. Ideally, demographic and value data could have been pushed to the year 2000 and observed through 2013. Also, many features of the TIGER/Line Shapefiles are inaccessible due to lapses in federal government funding. The addition of TIGER/Line Shapefiles linked with demographic data could have made a more complete analysis of block group level demographic changes for the mixed-use districts.

6.3 Discrepancies with Block Group Data

Finally, the block group demographic analysis occurs at a scale that is larger than the parcels used to create the total value and residential value changes within the districts and peripheries. An issue is created that may misrepresent demographic changes within the mixed-use districts because of excluded parcels in the larger block groups. However, many of the block groups that excluded parcels did so simply because they were largely open space, or industrial/commercial parcels and had little bearing on the analysis. Yet, the issue remains, and the varying scales of measurement create a possible misrepresentation of the data. Essentially, the changes in demographics occurring may not entirely or accurately represent the parcels that are being

analyzed for property value. Again, solutions could have been made by changing the amount of periphery parcels to fill the block groups, or an area weighted spatial join could have been instituted through ArcGIS. The later solution would calculate parcel size and determine what percent of its block group the parcel represents. However, due to time constraints this solution was unavailable.

Chapter 7

Conclusion

Mixed-use infill development is a powerful strategy that has gained recognition from cities all of the nation. Mixed-use has become a go to implementation for cities that are looking to redevelop places that they would like to become lively, retail places where people live and go to enjoy a night out. Fort Worth, alone has 16 urban villages selected for their cities. Nearly all of these are designated for mixed-use infill with policy designation. Dallas currently has 31 Tax Increment Financing and Public Improvement Districts. While it is not fair to dub all of Dallas' initiatives mixed-use endeavors. Mixed-use is mentioned as an element in the majority of these initiatives' plans. With all of these potential investments it is important to have an idea of how these places will fare long term, but that is what is missing from many of the studies on mixed-use.

The results and trends seen through this exploratory analysis of property value shows that mixed-use infill has outgained total value in each of the counties and cities. Also, mixed-use infill districts have held their property better than their cities and counties. Clearly, there is some importance to understanding the true long-term value of mixed-use infill development. As previously stated, property values can change relative to numerous variables, and this thesis can only provide evidence of that change. Overall, property values within the mixed-use districts appeared to raise significantly prior to the designation of incentivized financing policy. The trends that have been observed through the descriptive analysis show the prices rise sharply in nearly all districts and then five years later, from 2009 to 2013, the prices level and in many cases decrease. These figures alone are not strong enough to correlate mixed-use with increased property values. A full hedonic pricing model should be embarked upon to fully determine the impacts of key variables on property values. Wiley's 2009 study can provide a strong basis for which models are appropriate for further discussion on mixed-use infill.

Vacant parcels were initially hypothesized to have some sort of correlation with mixed-use infill development within the selected districts. The percentage of vacant parcels were expected to decrease as more infill development occurred. However, observable trends within the vacant parcel data are overall inconsistent. There are some patterns that seem to mirror the 'bubble' of increased property values that occur in the districts from 2004(5) to 2009. Vacancy in the majority of the districts decreases, but increases again in 2013. This is contrasting to the levelling, and decreasing, we see in values from 2009 to 2013. Much like property values, percentage of vacant parcels are affected by numerous variables that cannot be accounted for through this exploitative study. The data does suggest that something is occurring, and that mixed-use infill may play some factor in their trends.

All of these issues align with much of the reviewed material's consensus that infill development is simply difficult to analyze. There is not a uniform way in which to measure infill development, or its impact on surrounding areas. Context is essential within the study. Dietrick and Ellis (2004) and Ryan and Weber (2007) had similar studies measuring the importance of design on infill in low income neighborhoods. However, their results were different due to the uniqueness and differences of their locations, with one being in Pittsburgh and the other in Chicago. Mixed-use infill must be analyzed in terms of its unique context within its respected city. Dallas, and Fort Worth provide an opportunity to measure mixed-use infill due to their large similarities, but even only 30 miles apart the differences are great.

This thesis is intends to provide insight into the economic value of mixed-use infill as a development strategy to combat sprawl and help to revitalize target areas of cities. It is my hope that the results from this exploration are progressed to fully comprehend the long term nature of mixed-use infill and its effect on surrounding areas, socially, economically, and on a larger sense environmentally. "Smart Growth", New Urbanism, and infill appear to go hand in hand, and with increased infill, residential or mixed-use, the urban form becomes more compact and, theoretically,

more sustainable. The results of this study will be beneficial in future planning discussions regarding the value of mixed-use infill. Insight gained will help steer discussions regarding the potential use of mixed-use infill and will help to bolster the argument for mixed-use infill as a strategy for economic stimulation.

Appendix A

Block Group Demographic Tables

Table 5: Race for Dallas block groups 2005-2009 to 2008 to 2012 (U.S. Census Bureau, 2012)

2005-2009	Deep Ellum	Uptown	Fort Worth Ave	2008-2012	Deep Ellum	Uptown	Fort Worth Ave
% White Alone 05-09	63.00%	73.00%	67.00%	%White Alone 08-12	58.00%	69.00%	71.00%
% African American- Black alone 05-09	17.00%	10.00%	11.00%	% African American- Black alone 08-12	27.00%	14.00%	13.00%
% Amer Indian & Alaskan Alone 05-09	0.23%	1.11%	1.05%	% Amer Indian & Alaskan Alone 08-12	0.30%	0.52%	0.66%
% Asian Alone 05-09	4.01%	3.68%	1.17%	% Asian Alone 08-12	4.40%	5.42%	1.13%
% Native Hawaiian & Pac Islander alone 05-09	1.47%	0.24%	0.00%	% Native Hawaiian & Pac Islander alone 08-12	0.51%	0.08%	0.19%
% Other race alone 05-09	9.92%	8.55%	18.56%	% Other race alone 08-12	5.67%	7.23%	13.27%
% Two or More Races 05-09	0.64%	1.20%	0.58%	% Two or More Races 08-12	4.63%	4.41%	1.38%
% Two races including Some other Race 05-09	3.09%	2.05%	0.66%	% Two races including Some other Race 08-12	0.49%	1.28%	0.93%
% Two races excluding Some other race, and three or more races 05-09	3.09%	2.05%	0.66%	% Two races excluding Some other race, and three or more races 08-12	4.14%	3.13%	0.45%

Table 6: Race for Fort Worth block groups 2005-2009 to 2008 to 2012 (U.S. Census Bureau, 2012)

2005-2009	West 7th	Magnolia	Ridglea	2008-2012	West 7th	Magnolia	Ridglea
% White Alone 05-09	70%	62%	66%	%White Alone 08-12	81%	75%	66%
% African American-Black alone 05-09	11%	14%	25%	% African American-Black alone 08-12	6%	11%	27%
% Amer Indian & Alaskan Alone 05-09	1%	0%	2%	% Amer Indian & Alaskan Alone 08-12	0%	1%	0%
% Asian Alone 05-09	1%	5%	3%	% Asian Alone 08-12	2%	1%	2%
% Native Hawaiian & Pac Islander alone 05-09	0%	0%	0%	% Native Hawaiian & Pac Islander alone 08-12	0%	0%	0%
% Other race alone 05-09	15%	18%	2%	% Other race alone 08-12	9%	9%	4%
% Two or More Races 05-09	1%	0%	0%	% Two or More Races 08-12	2%	2%	0%
% Two races including Some other Race 05-09	2%	1%	1%	% Two races including Some other Race 08-12	0%	0%	0%
% Two races excluding Some other race, and three or more races 05-09	2%	1%	1%	% Two races excluding Some other race, and three or more races 08-12	2%	2%	0%

Table 7: County demographics 2005-2009 and 2008-2012 (U.S. Census Bureau, 2012)

	Dallas 2005-2009	Dallas 2009-2012	Tarrant 2005-2009	Tarrant 2009-2012
Median Age	31.6	32.5	32.8	33.4
Median Income	47059	49159	56647	56859
Gross Rent	809	869	810	870

Table 8: Dallas mixed-use districts total value changes 2004-2013 (Dallas County Appraisal District, 2014)

	% Change 04-09	% Change 09-13
Uptown Core	71%	9%
Uptown 1/4mi	230%	19%
Deep Ellum Core	115%	-10%
Deep Ellum 1/4mi	61%	14%
Fort Worth Ave Core	75%	4%
Fort Worth 1/4mi	12%	-23%
Dallas Overall	13%	-6%
Dallas County	12%	-6%

Table 9: Fort Worth Urban Villages total value changes 2005-2013 (Tarrant County Appraisal District, 2014)

	% Change 05-09	% Change 09-13
West 7th Core	152%	101%
West 7th 1/4mi	37%	-6%
Magnolia Core	232%	11%
Magnolia 1/4mi	34%	40%
Ridglea Core	26%	-1%
Ridglea 1/4mi	21%	0%
Fort Worth Overall	20%	-2%
Tarrant County	-2%	-5%

Table 10: Dallas Districts residential value changes 2004-2013(Dallas County Appraisal District, 2014)

	2004-2009 % Change	2009-2013 % Change
Deep Ellum Core	99%	-21%
Deep Ellum 1/4mi	4%	10%
Uptown Core	4%	11%
Uptown 1/4mi	16%	-1%
Fort Worth Ave Core	53%	-18%
Fort Worth Ave 1/4mi	7%	-7%
Dallas City	3%	-6%
Dallas County	8%	-8%

Table 11: Fort Worth Urban Villages residential value changes 2005-2013 (Tarrant County Appraisal District, 2014)

	2005-2009 % Change	2009-2013 % Change
West 7th Core	122%	70%
West 7th 1/4mi	98%	-3%
Magnolia Core	697%	-17%
Magnolia 1/4mi	41%	4%
Ridglea Core	32%	28%
Ridglea 1/4mi	28%	-9%
Fort Worth	23%	-2%
Tarrant County	24%	-4%

Table 12: Dallas Districts percent of vacant properties (Dallas County Appraisal District, 2014)

	Percent Vacant 04	Percent Vacant 09	Percent Vacant 13
Uptown Core	17%	19%	17%
Uptown 1/4mi	32%	28%	28%
Deep Ellum Core	22%	25%	31%
Deep Ellum 1/4mi	33%	34%	34%
Fort Worth Ave Core	25%	21%	24%
Fort Worth 1/4mi	23%	15%	14%

Table 13: Fort Worth Urban Villages percent of vacant properties (Tarrant County Appraisal District, 2014)

	Percent Vacant 05	Percent Vacant 09	Percent Vacant 13
West 7th Core	10%	22%	22%
West 7th 1/4mi	5%	5%	7%
Magnolia 1/4mi	18%	20%	18%
Magnolia Core	19%	17%	17%
Ridglea 1/4mi	5%	7%	11%
Ridglea Core	8%	5%	5%

Appendix B

Tables Summarizing Reviewed Researches

Table 14 Summary of empirical studies measuring infill trends.

Study	Location	Type of study	Findings/Results
Farris, J. Terrance. (2001). The Barriers to Using Urban Infill Development to Achieve Smart Growth. *Housing Policy Debate,* 12(1): 1-30.	22 major central cities	National trends /	Farris examines building permit data from the 1990's and finds that 5.2% of all housing permits went to central cities, 2.2% of single-family permits and 14.9% of multifamily. He measures this data against permit data from the surround MSA and finds that the majority of housing permits are occurring outside of the central cities. Farris also highlights the barriers that are facing infill development, Political, Economic, NIMBYism, infrastructure *residential development occurring within the city limits of the major city(s) in the MSA.
Steinacker, A. (2003). Infill Development and Affordable Housing. Urban Affairs Review, 38(4), 492	50 largest MSA's	National Trends	From 1996-2000, residential building permit and value of construction data were analyzed to construct a measure of infill and affordability. Steinacker found fault with previous studies not factoring in land mass when calculating residential development in the MSA versus the central-city. Finds that less than 20% of MSA permits would be defined as infill, and central cities are much more dense in residential infill than non-infill. *residential development occurring within the city limits of the major city(s) in the MSA.

Table 14 - *Continued*

Landis, J., Hood, H., Li, G., Rogers, T., & Warren, C. (2006). The future of infill housing in California: Opportunities, potential, and feasibility. HOUSING POLICY DEBATE, 17(4), 681-725.	California	Residential inventory/ capacity study	Cataloged California's infill parcel potential. Based on tax assessment data, vacant parcels, and underutilized parcels determined by and Improvement-value-to-land-value ratio. Concluded Californias infill potential can be a solution to their sprawling cities and their growing population *vacant and/or potentially redevelopable parcels located within existing urban neighborhoods.
Wiley, A. Kieth. (2009). An Exploration of the Impact of Infill on Neighborhood Property Values. Retrieved from: UMI Dissertation Publishing. UMI 389028	Maryland	Residential Inventory & Economic impacts	The author estimates that infill accounts for roughly two-thirds of residential development in Montgomery County, Maryland. Over time the proportion of infill has been roughly constant. (McConnell & Wiley, 2010)

Table 15 Summary of studies identifying economic impact of infill developments.

Study	Location	Type of Infill	Findings/Results
Becker, S., Bernstein, S., Young, L. (2013). The New Real Estate Mantra Location Near Public Transportation. *The Center for Neighborhood Technology.* Retrieved from: http://www.cnt.org/resources/the-new-real-estate-mantra/	Chicago, Phoenix ,Boston, Minneapolis -St. Paul San Francisco	Residential, near Transit stations	"Data from all the regions studied shows that average sales prices for residences in close proximity to fixed-guideway transit were more stable during the recession, supporting the assertion that transit access helped mitigate the effects of the recession on property values"
Ryan, D. B. & Weber, R. (2007) Valuing New Development in Distressed Urban Neighborhoods, Journal of the American Planning Association, 73:1, 100-111, DOI: 10.1080/01944360708976139	Chicago	Residential	Their findings indicate that urban design plays a meaningful role in determining housing values in low-income Chicago neighborhoods. Most importantly, infill housing appears to command a value premium. Ryan and Weber find that integrated infill development that is effectively connected to surrounding neighborhoods is more desirable.

Table 15 - *Continued*

Urban Land Institute. (2008). The consequences of Residential Infill Development on Existing Neighborhoods in the Treasure Valley a Study and Conclusions. A paper produced by the Urban Land Institute accessed from: http://www.idahosmartgrowth.org/images/uploads/files/uliisg_infill_report.pdf	Treasure Valley, Idaho	Residential neighborhood	The ULI conducted serveral case studies around neighboods in Idaho addressing issues related to infill. Ultimately they arrived at 7 conclusions from economic impact to barriers to development through their study. There is no evidence that the infill developments studied for this report create harmful traffic impacts on the existing surrounding neighborhoods. Researchers found no evidence that infill lowers surrounding property value. *A development project within city limits on a site that is currently vacant or can be approved for redevelopment for a project where urban services are already available to service the case study project and where at least 80% of property within 300 feet is developed
Wiley, A. Keith. (2009). An Exploration of the Impact of Infill on Neighborhood Property Values. Retrieved from: UMI Dissertation Publishing. UMI 389028	Maryland	Residential, Neighborhood/ Suburban	Measured infill via change in value of sales prices in neighborhoods. Conducted a hedonic pricing model to identify factors contributing to changing prices. "The models consistently found negative home price effects for units near infill development sites"(Wiley, 2009 p234). Infill impact varied by development type and size. Also, infill had a different effect dependent on the neighborhood it is constructed in. "Residential infill built in higher income neighborhoods generated relatively substantial negative home price effects. Meanwhile, lower income neighborhoods home values received a slight positive post-development price impact, but it was not statistically significant." (p235)

Table 16 Summary of studies relating to vacant properties in urbanized areas.

Study	Location/ Scale	Type of study	Findings/Results
Leigh, G. Nancey. (2003). The State Role in Urban Land Redevelopment. *The Brookings Institution Center on Urban and Metropolitan Policy.* Retrieved from: http://www.brookings.edu/es/urban/publications/leighvacant.pdf	State	State initiatives or programs/ powers	Vacant properties pose multiple problems for urban areas. Studies have shown significant economic and social costs. They reduce property values, create blight, and become targets for crime and vandalism. However, vacant properties provide opportunity for development. The study identified the key vehicles that states should use to promote the reuse of their inventory of vacant land and abandoned structures -key to these programs is better information, smart growth initiatives, TIF's or Business improvement Districts -Enterprise zones -Split tax taxation -Reformed judicial tax lien foreclosure system
Heckert, Megan & Mennis, Jeremy. (2012). The Economic Impact of Greening Urban Vacant Land: A Spatial Difference-in-Differences Analysis. *Environment and Planning A 2012,* 44: 3010-3027. DOI: 10.1068/a4595	Philadelphia	Neighborhood, parcel level	Examined change in property values surrounding vacant properties that have undergone a program of 'greening'. Greening, is simple process of removal of debris, planting of grass and trees as a means to improve blighted communities "While property values throughout the city increased during the study period, properties surrounding greened vacant lots had a greater increase in value than properties surrounding nongreened vacant lots." (p.3010) "A report on impacts of a PLC pilot program in Philadelphia, which was limited to one neighborhood, found that greened lots increased the values of adjacent properties by as much as 30%" (p.3011)

Table 17 Summary of studies highlighting the barriers to infill development

Study	Location/ Scale	Type of study	Findings/Results
Farris, J. Terrance. (2001). The Barriers to Using Urban Infill Development to Achieve Smart Growth. *Housing Policy Debate,* 12(1): 1-30.	22 major central cities	National Trends	Farris national survey highlighted barriers to infill economically, socially, and politcally. **Economically**: Land Assembly, site preparation/ infrastructural needs **Socially:** Finding developers willing/financially capable to go through a possibly extensive process, (perception of) Loss of open space, **Politically**: NIMBY'ism, Local power brokers, Gentrification/Displacement
Haughey, Richard. (2001). Urban Infill Housing: Myth and Fact. *ULI- the Urban Land Institute.* Washington, D.C.	N/a	ULI topic discussion	Highlights barriers to infill. Similar to Farris.
Urban Land Institute. (2008). The consequences of Residential Infill Development on Existing Neighborhoods in the Treasure Valley a Study and Conclusions. A paper produced by the Urban Land Institute accessed from: http://www.idahosmartgrowth.org/images/uploads/files/uliisg_infill_report.pdf	Treasure Valley, Idaho	Residential neighborhoods/ case studies	Previously mentioned economic conclusions. This section highlights social and political conclusions from the case studies. -"Providing 'public' amenities [or not] affects perceptions of projects long after they're complete. -Loss of neighborhood open space is strongly perceived as a negative impact. -The quality of design can affect acceptance of a project. -Controversy is intensified by misunderstanding and incomplete implementation of infill goals. When the permit process requires variances or exceptions these are opposed, even when supported by plans and goals -Density did not correlate to perceived acceptance of case study projects" (p.3)

Table 18 Summary of Studies regarding infill, design, and New Urbanism.

Study	Location	Type of study	Findings/Results
Dietrick, Sabina & Ellis, Cliff. (2004). New Urbanism in the Inner City: A Case Study of Pittsburgh. *Journal of the American Planning Association,*70, 4. Retrieved from: http://search.ebscohost.com.ezproxy.uta.edu/login.aspx?direct=true&db=a9h&AN=14539211&site=ehost-live	Pittsburgh,	Residential, neighborhood	New Urbanism had a significant effect on neighborhood cohesiveness and interaction
Ryan, D. B. & Weber, R. (2007) Valuing New Development in Distressed Urban Neighborhoods, Journal of the American Planning Association, 73:1, 100-111, DOI: 10.1080/01944360708976139	Chicago	Residential	Their findings indicate that urban design plays a meaningful role in determining housing values in low-income Chicago neighborhoods. Most importantly, infill housing appears to command a value premium. Ryan and Weber find that integrated infill development that is effectively connected to surrounding neighborhoods is more desirable.
Cortright, Joe. (2009). Walking the Walk How Walkability Raises Home Values in U.S. Cities. *Ceo's for Cities.* August 2009. Retrieved from: http://www.ceosforcities.org/research/walking-the-walk/			This paper explores the connection between home values and walkability, as measured by the Walk Score algorithm. Walk Score measures the number of typical consumer destinations within walking distance of a house, with scores ranging from 0 (car dependent) to 100 (most walkable). By the Walk Score measure, walkability is a direct function of how many destinations are located within a short distance (generally between one-quarter mile and one mile of a home). (p2) strong connection between walkability, as measured by Walk Score, and variations in home values. The relationship holds across most metropolitan markets we've studied, and our hedonic modeling produces results that are consistent with other investigations of housing prices (p 26)
Fung, M. W. (2012). Infill as catalyst for vivid urban fabric formation - a study on increasing walk-ability in Hong Kong. *Urban Design International*, *17*, 18-32. doi: 10.1057/udi.2011.24			Fung examines city form by looking at Hong Kong. He postulates on Hong Kong's "fractals" and that the severed nature of the city serves to disconnect its citizens from each other. This disconnections hampers citizens socially, and economically. Fung finds that through infill development one disconnected places of the city can be reconnected.

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