PUSHED OUT:

THE IMPACT OF RESIDENTIAL LAND PRICES ON COMMUTING TIMES AND GEOGRPAHICAL MOBILITY

A Project

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MASTER OF PUBLIC POLICY AND ADMINISTRATION

by

Anna Meier

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Anna Meier

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Department of Public Policy and Administration

Executive Summary

of

PUSHED OUT:

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Chapter 1: Introduction

The affordable housing crisis has hit record levels, with a significant number of American households being rent burdened. While the consequences of high housing costs such as increased homelessness, increased evictions, and decreased available household incomes for other necessities are clear, the full impacts of this crisis are not fully understood. The purpose of this paper is to investigate the potential relationship between residential land prices, average travel to work times, and geographic migration, as well as explore the policy implications of the findings.

Chapter 2: Literature Review

Research investigating the connection between housing costs and the impact on available labor and economic growth is in its early stages. A review of the current literature reveals that researchers have found connections between rising housing costs and decreased employment rates, stifled GDP growth, and increased employee spatial mismatch. The current literature, however, is lacking in making connections between housing prices and increased commute times or new state residents. Newly available data from the Federal Housing Finance Agency detailing residential land prices by acre allows research in this area to be further examined.

Chapter 3: Methodology

I applied the fixed-effects-data-regression derived from the STATA-provided XTSCC command. The data set used in this analysis contains average residential land price per acre, travel to work times divided into three time measurements (45 to 59 minutes, 50 to 89 minutes, and 90 minutes or more), and the number of new state residents for 348 MSAs representing major job centers in all 50 states between 2012 and 2015. Since the impact of rising housing prices is delayed, this analysis uses the panel data to investigate the impact of residential land prices between 2012 and 2014 on mobility and commute times between 2013 and 2015.

Chapter 4: Results

All dependent variables had a statistically significant quadratic relationship with residential land prices within Metropolitan Statistical Areas. The effect increased at a decreasing rate until a residential land price per acre inflection point is reached, at which point the effect began to decrease. For every $100K increase in residential land prices per acre, travel times to work increased by 80 (45 to 59 minutes), 120 (60 to 89 minutes), and 54 (90 or more minutes). This effect began to decrease at $1,383,966 per acre (45 to 59 minutes), $1,843,405 per acre (60 to 89 minutes), and $2,258,264 per acre (90 or more minutes). For every $100K increase in residential land prices per acre, new state residents increased by 44 until $2,255,949 per acre, at which point the effect turned negative.

Chapter 5: Conclusion

The findings of this study have multiple policy implications, including social, economic, and environmental impacts. It is critical for policy makers to take steps to mitigate the impacts of high housing costs. First, it is necessary for state and federal governments to intervene in local control of housing amounts and types. Additionally, policy makes can create incentives for

companies to allow work from home options to alleviate the spatial mismatch of labor and jobs. Lastly, policy makers should prioritize public transportation options, such as buses and trains, to connect low-priced housing areas with high-priced housing areas in which jobs are concentrated.

_____, Committee Chair
Robert W. Wassmer, Ph.D.

_____
Date

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TABLE OF CONTENTS

Page

LIST OF TABLES

Tables Page

LIST OF FIGURES

Figures Page

1. INTRODUCTION

The affordable housing crisis has hit record levels, with 38 percent of American households being rent burdened in 2015 (Ryssdal, 2018). Rent burdened is defined as 30 percent or more of a household's income going towards housing (HUD, n.d.). The impacts of this crisis are broad, ranging from increased homelessness, increased evictions, decreased income available for other necessities such as food and healthcare, and decreased ability to save for retirement. In addition to individual impacts, the affordable housing crisis has potential influences on the nation's economic health. Researchers Hsieh and Moretti argued in a *New York Times* opinion piece that the continuing problem of affordable housing in the more productive areas of the United States smothers the American economy (Hsieh, Moretti, 2017). Their research found that the national gross domestic output (GDP) is 9 percent lower than it could be as a result.

However, few researchers have investigated the link between housing affordability, economic output, and worker migration. The continued problem of affordable housing raises important questions about productive areas' economic outputs and the impact of individuals increasingly moving to more affordable, less productive areas. Such questions are the focus of my research.

In this thesis, I will investigate the impacts of residential land prices on worker migration and commute times. To better understand why this is an appropriate topic to investigate, this first chapter offers an introduction to the factors contributing to housing prices generally, housing prices in high economic areas, and housing prices related to migration trends. The final section describes what is covered in the remaining chapters.

Factors contributing to housing prices

There are many historical and policy factors that have contributed to the affordable housing crisis. The Great Recession of 2007-2009 pushed many Americans out of their homes and into the rental market (Ryssdal, 2018). Additionally, the Great Recession decreased the housing supply because the crashing housing market dissuaded homeowners from selling their homes and decreased new housing construction. With a decrease in supply of housing and an increase in demand for rental properties, prices increased as they adjusted to the market.

Existing literature identifies land use regulations, permitting requirements, environmental laws, density, geographical limitations, and public opinions as the main drivers of high residential land prices. These factors can be amplified depending on the state, county, and city. California, for example, has some of the highest construction costs in the country due to state zoning restrictions, permit costs, and environmental laws (Kang, 2019). The Terner Center for Housing Innovation at the University of California Berkeley identified multiple components contributing to California's high housing costs. These include land values, construction costs, material and labor costs, development fees, delayed permitting and development timelines, and regulatory requirements. Development fees in California are particularly high. In 2015, California's average impact fees were three times the national average, with the average impact fees being $23,455 for a single-family home and $19,558 for a multi-family unit. Local land use regulations in California, such as environmental regulations and minimum parking

requirements, have also been shown to increase housing costs. Los Angeles, a city with some of the highest housing prices in the country, has stringent green building standards which have increased construction costs by 10.8 percent (Terner Center for Housing Innovation, 2020).

Affordable housing construction falters in states with high regulation and costs, which are typically the ones that need it the most due to high housing prices. According to the Affordable Housing Cost Study conducted by the California Department of Housing and Community Development (HCD), the California Housing Finance Agency (CalHFA), and the California Debt Limit Allocation Committee (CDLAC), the cost of affordable housing construction in California is particularly vulnerable to high construction and development costs. The study found that the cost of building a 100-unit affordable project in California increased from $265,000 per unit in 2000 to almost $425,000 per unit in 2016. The increase in costs are attributed to the same trends that increase costs for market-rate housing, such as land pricing, construction costs, and regulation, with the additional factor of local scrutiny. Local scrutiny, known as the Not in My Back Yard (NIMBY) movement, delays development timelines and further inflates costs. The Affordable Housing Cost Study found that community opposition, measured by holding four or more community meetings about the project, increased the project's expenses by five percent (HCD, CalHFA, and CDLAC, 2014).

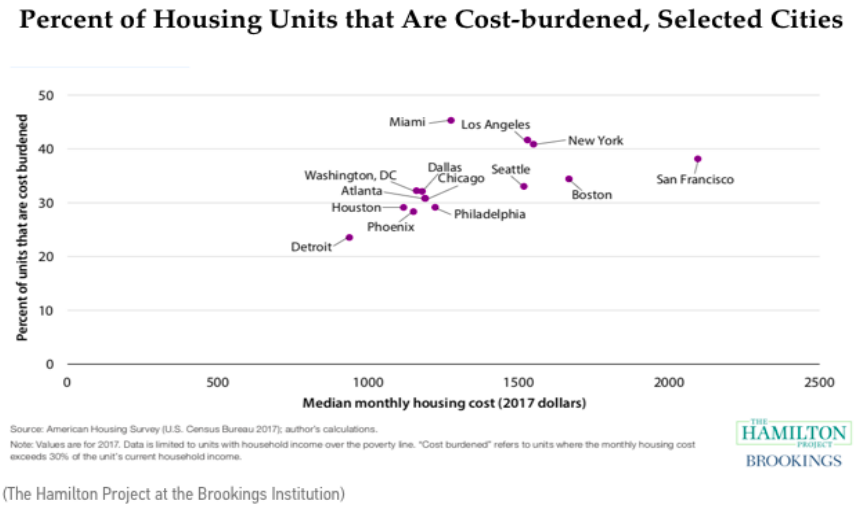
While strict housing regulations increase development costs and stifles supply, it is important to acknowledge the benefits of zoning regulations. Limiting housing construction through stricter zoning may prevent fires, floods, and rodent infestation,

while preserving the environment. In addition to stifling housing development and increasing housing costs, strict housing regulations also mitigate other potential problems.

Housing Prices in High Economic Production Areas

Areas particularly impacted by increased housing prices are those of high economic production, including San Francisco, New York, Boston, Los Angeles, Seattle, and Miami (Balint, 2018). The number of rent burdened households in these, and other highly productive areas, are higher than the 38% national average, as illustrated in Figure 1.1.

Figure 1.1: Percent of Housing Units that Are Cost-burdened, Selected Cities



Source: American Housing Survey (U.S Census Bureau 2017), retrieved from Florida, 2019

With high production areas experiencing the highest housing prices, private sector companies have begun to take action to increase the housing supply in impacted areas. In

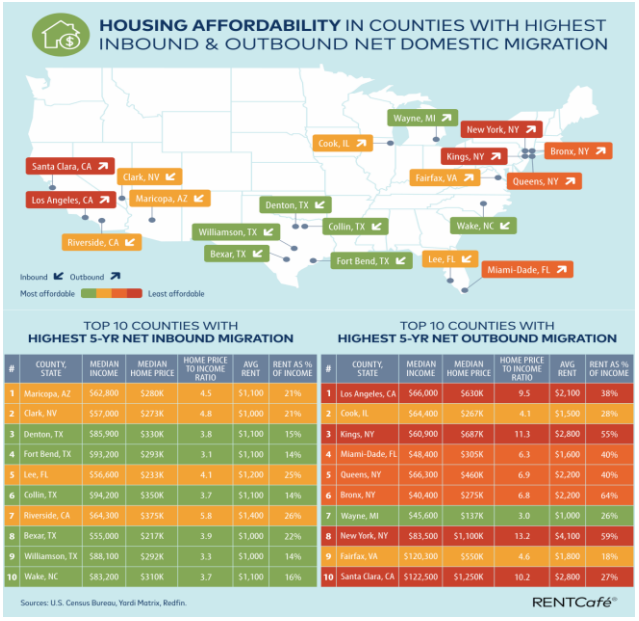
2019, tech companies pledged to invest $4.5 billion in land and loans towards stimulating the production of affordable housing in California (Kang, 2019). In January 2019, Microsoft pledged $500 million to help develop affordable housing and address homelessness in Seattle (Romo, 2019). While announcing the investment, Microsoft President Brad Smith noted the long-term aim of the company is to ensure lower- and middle-income workers are not priced out of the housing market and can continue to live close to where they work. In June 2019, Google pledged to invest $1 billion in land and money to ease the Bay Area's housing crisis (Wakabayashi and Daugherty, 2019). The company plans to repurpose at least $750 million worth of commercially zoned land it owns over the next ten years and plans to work with local governments to allow developers to lease the land to build homes. Additionally, Google created a $250 million investment fund to provide incentives for developers to create more affordable homes in the area. In October 2019, Facebook announced it would provide $1 billion in grants and land to build 20,000 housing units for middle- and lower-income households (Dougherty, 2019).

Housing Prices and Migration Trends

Areas with high housing prices are experiencing high levels of migration away to areas with more affordable housing options, such as Phoenix, Arizona. Examining the top 10 counties where people are moving to (inbound) and the top 10 counties where people are moving from (outbound), housing prices range dramatically. The price of a house in the top 10 inbound counties is between 3.3 times to 5.8 times the median income, while

the price of a house in the top 10 outbound counties is between 3.0 to 13.2 times the median income (Balint, 2018). The median house price in the top 10 inbound counties is $295,000, while the median house price in the top 10 outbound counties is $566,000. Figure 2.2 illustrates movement from counties of high housing prices to counties with more affordable housing options.

Figure 1.2: Housing Affordability in Counties with Highest Inbound and Outbound Net Domestic Migration



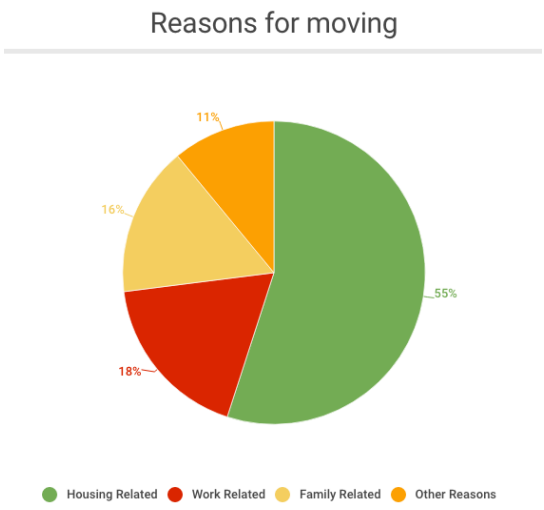
#	COUNTY, STATE	MEDIAN INCOME	MEDIAN HOME PRICE	HOME PRICE TO INCOME RATIO	AVG RENT	RENT AS % OF INCOME
1	Maricopa, AZ	$62,800	$280K	4.5	$1,100	21%
2	Clark, NV	$57,000	$273K	4.8	$1,000	21%
3	Denton, TX	$85,900	$330K	3.8	$1,100	15%
4	Fort Bend, TX	$93,200	$293K	3.1	$1,100	14%
5	Lee, FL	$56,600	$233K	4.1	$1,200	25%
6	Collin, TX	$94,200	$350K	3.7	$1,100	14%
7	Riverside, CA	$64,300	$375K	5.8	$1,400	26%
8	Bexar, TX	$55,000	$217K	3.9	$1,000	22%
9	Williamson, TX	$88,100	$292K	3.3	$1,000	14%
10	Wake, NC	$83,200	$310K	3.7	$1,100	16%

#	COUNTY, STATE	MEDIAN INCOME	MEDIAN HOME PRICE	HOME PRICE TO INCOME RATIO	AVG RENT	RENT AS % OF INCOME
1	Los Angeles, CA	$66,000	$630K	9.5	$2,100	38%
2	Cook, IL	$64,400	$267K	4.1	$1,500	28%
3	Kings, NY	$60,900	$687K	11.3	$2,800	55%
4	Miami-Dade, FL	$48,400	$305K	6.3	$1,600	40%
5	Queens, NY	$66,300	$460K	6.9	$2,200	40%
6	Bronx, NY	$40,400	$275K	6.8	$2,200	64%
7	Wayne, MI	$45,600	$137K	3.0	$1,000	26%
8	New York, NY	$83,500	$1,100K	13.2	$4,100	59%
9	Fairfax, VA	$120,300	$550K	4.6	$1,800	18%
10	Santa Clara, CA	$122,500	$1,250K	10.2	$2,800	27%

Source: U.S. Census Bureau, Yardi Matrix, Redfin.

According to Figure 1.3 from the U.S. Census Bureau, the number one reason people list for moving is housing related (55%). Housing reasons outweigh work related (18%) and family related (16%) reasons for moving by three times.

Figure 1.3: Top Reasons Listed for Moving



Source: U.S Census Bureau (Population Estimate and Demographic Components)

A 2019 survey conducted by the public relations firm Edelman found the majority of Californians (53%) said they are considering moving out of the state, citing the cost of housing and the overall cost of living as the most likely reasons (Brinklow, 2019). California is one of the most economically productive states in the United States. It is possible the migration away from this economic hotspot will have negative impacts on the state's economic production.

Purpose of This Research

It is evident that high housing prices in high production areas are causing households to find alternative locations to live. However, the full impact of housing prices on worker migration and economic output is not fully understood. As it will be discussed in Chapter 2 of this thesis, the current literature on this topic is lacking. To

better understand the impacts of housing prices on workers' abilities to live in high production areas, as well as the impact this ability has on local and national economic output, it is necessary to explore migration and commute trends throughout the country related to residential land prices. Currently, it is unclear how large the impact of the unaffordable housing market is having on workers' abilities to live in areas of high production. It is possible that housing prices in high production areas are unattainable for certain segments of the worker population, forcing employees to move to areas of lower economic output or move to the outskirts of high economic areas, therefore increasing commute times. The effect could have multiple impacts, including decreased employment opportunities, stagnant wages, decreased ability to participate in the local economy, and negative environmental impacts. Without first understanding the extent to which housing prices are impacting where workers are able to live and work, it is difficult to understand how housing prices influence the economic health and stability of major metropolitan areas, as well as how they impact workers and their families' ability to participate in the local and national economy. By understanding the impacts of housing prices on worker migration and commute times, we can better understand housing costs impacts on GDP output resulting from unfilled positions, decreased collaboration, and lower economic activity.

To answer these questions, I used regression analysis to test the connection between residential land prices, worker migration, and commute times in major Metropolitan Statistical Areas in all 50 states. Using newly available data from the Federal Housing Finance Agency and the Bureau of Economic Analysis, along with data

from the United States Census Bureau, I helped build a comprehensive data set examining residential land prices by acre, county GDP output, county migration, commute time, and demographic information for 358 metropolitan areas over a period of four years (2012 to 2015). This unique data set allowed me to examine the impact of various explanatory variables on worker migration trends in Metropolitan Statistical Areas across the United States.

To achieve this examination, this thesis will first explore the existing research connecting housing prices, economic output, and worker migration, as well as outline the gaps in knowledge about these relationships in Chapter 2. The research surrounding this topic is sparse. In chapter 3, I outline the model used to execute the regression. This chapter describes the dependent and explanatory variables, along with my reasoning for choosing each variable and the source of each variable. Additionally, I discuss limitations and weaknesses of my dependent and explanatory variables. Chapter 4 includes the regression results. This section will identify the variables with statistically significant results. In addition, I provide a description of the diagnostic tests used to further understand the relationships observed in the regression. These diagnostic tests include checking for multicollinearity and heteroskedasticity. Finally, Chapter 5 summarizes and discusses the results. It includes a description of the statistically significant variables, as well as opportunities to strengthen similar research in the future and public policy implications.

2. LITERATURE REVIEW

High housing prices in a metropolitan area or region of the United States exert a burden on low-income households that live in that region and must bear them. Furthermore, they also take away the opportunity for a currently low-income household to migrate to a high income and high housing pricing region to raise their income. This issue has been a concern for academics, including economists, who have offered explanations for this occurrence, and for policymakers trying to solve the problem. Housing affordability varies substantially across regions in the United States for various reasons, but one most often pointed to is limited supply. Restrictions on housing supply can include land use regulations, permitting processes, geographical terrain, and growth control measures (Glaeser & Gyourko**,** 2018).

The reasons for these housing price discrepancies are well researched. Additionally, it is well documented that high housing prices and rental costs put a considerable strain on the less affluent that must pay them. What is less well researched is the impact of high housing prices to the overall economic development/activity of a region. Economists know that a greater availability of workers (particularly educated) in a region exerts a positive effect on the economic productivity of the region. Therefore, it is critical to connect economic activity and availability of labor in an area. Very little research, however, connects the possibility of reduced regional economic development due to regional policies that raise housing prices. A review of the past literature on the impacts of land use regulations and the housing supply, as well as population growth and economic development, is necessary to better understand how these factors influence and

interact with each other. In this review, I will explore existing research investigating causes and economic impacts of the housing shortage and identify gaps in the knowledge for future research. I have identified three themes to guide this review: (1) impacts of land use regulations on the housing supply, (2) impacts of reduced population on regional economic development, and (3) empirical studies of housing affordability and regional economic growth. An examination of the previous literature in these areas will help me develop my own empirical investigation of the influence of residential land prices on worker migration and commute trends over time in United States' Metropolitan Areas.

Land Use Regulations, Building Permits, and the Housing Shortage

Extensive research investigating the causes of housing prices has connected housing supply to land use regulations. Land use regulations refer to ordinances of governments setting standards for the use of land for purposes (Gyourko, 2008). These ordinances include urban growth boundaries, regulation of development densities, building requirements, and other regulations. Land use regulations can create barriers to housing construction by affecting costs through building delays, design restrictions, and court suits used to challenge development rights (Gyourko, 2008). To compare differing land use regulations, Gyourko et al (2008) created the "Wharton Index" using the Wharton Regulatory Database. The Index provides rankings for metropolitan areas based on their land use regulation stringency and measures how many standard deviations the area is from the national mean score (Gyourko, 2007). The database uses three main components of land use regulations: urban growth boundaries, regulation of development densities, and cost-increasing regulations. Land use restrictions' impact on housing prices

can investigated by comparing these regulation indexes and housing prices. For example, in 2007 the Cleveland area received one of the lowest indexes, -0.16 standard deviations away from the national mean (Gyourko, 2008). The San Francisco area received one of the highest indexes, 0.90 standard deviations away from the national mean. In the same year, the median sales price of a single-family home in the Cleveland area was $130,000, compared to a median price of $805,400 in the San Francisco area (Chakrabarti, 2015). Additionally, home values appreciated 122% in the Cleveland area compared to 354% in San Francisco from January 1987 to January 2007. While land use regulations are not the only reason for these drastic housing price differences, the correlation between the Wharton Index and housing costs suggests land use regulations play a significant role in housing affordability.

All major studies found that increased land use regulations restrict housing construction and increase housing costs. In general, existing research agrees that local land use regulations result in decreased housing supply due to a reduction in the ability of home builders to respond to increased demand for housing (elasticity). According to Gyourko and Molloy (2015), increased land use regulations reduce the elasticity of the housing supply, which results in increased housing prices and slower growth in housing quantity as demand increases. Increased land use regulations increase costs for developers and decrease profits. Glaeser and Ward (2006) examined land use regulations related to housing density in the Boston area, finding that minimum lot requirements restrict the housing supply and decrease housing density. In an analysis of issued permits and minimum lot size requirements between 1980 and 2002, results suggest the number

of new permits decline by 50% as the minimum lot size increases by one acre. In a regression examining the relationship between lot size and housing price, controlling for other factors that influence prices, housing prices increased by 15.6% for every additional lot acre.

In addition to minimum lot requirements, building permit approval, historical preservation policies, growth controls, and state housing regulations can restrict housing production. To evaluate the impact of these regulations on housing supply, Saks (2005) compiled data from the Wharton Urban Decentralization Project, the Fiscal Austerity and Urban Innovation Project, and the National Register of Historic Places. Between 1980 and 2000, all 4 types of regulation were positively correlated with growth in housing prices (Saks, 2005).

Population Density and the Housing Shortage

Population density and housing costs are intricately connected. As population density increases, the demand for housing increases. A housing market that does not keep up with demand experiences a housing supply shortage, which can have a negative impact on population growth. An extensive amount of research investigating the connection between rising housing costs and population density exists. Specifically, many researchers have examined the connection between elastic and inelastic housing markets and the impact on population increases. Researchers generally agree that inelastic housing markets (where a rise in housing price does not yield much of an increase in housing supply) fail to supply enough housing for growing populations,

leading to higher housing costs. Glaeser and Gyourko (2018) assessed the impact of housing construction on population density. In a regression of the number of housing units on the metropolitan populations in the decades between the years 1970 and 2000 in 316 metropolitan areas in the United States, a tight correlation between population and housing units is found (R^2 of 0.99 in each regression). Glaeser and Gyourko discuss other possible explanations, such as vacancy rates and household size, to strengthen this correlation. Vacancy rates can impact population growth or decline, but the change does not explain most of the population change. Among the 316 metropolitan areas, the average vacancy rate was 9.1%, with a standard deviation of 5.4%. Further, the differences in vacancy rates between high and low vacancy areas show minor correlation with population decline. If a metropolitan area's housing market switched from being in 90th percentile for least vacant areas to the 10th percentile for most vacant areas, the total population decline would be 9.9%. In addition, they found changes in household size does not explain a significant amount of housing shortage. A regression examining the relationship between household size and population finds a statistically significant but weak relationship with an R^2 of 0.06. These results indicate the connection between housing units and population are explained by other factors.

GDP, Employment Growth, and the Housing Shortage

While impacts of population density and land use regulations on housing prices have been established, research connecting the housing supply to economic development is in its early stages. The availability of affordable housing, or lack thereof, has

significant impacts on an individual's ability to live in an area of economic activity. As educated and skilled workers move out of economic activity zones to more affordable areas, GDP growth and employment growth may be negatively impacted. Some researchers have begun to investigate these connections. In general, researchers found that housing supply potentially impacts on the economic growth and employment rates in an area. Most research examining this link focuses on the housing affordability and employment rates. Chakrabarti and Zhang (2014) conducted an analysis on the relationship between the housing affordability ratio and employment growth rates at the California city level between 1993 and 2004. While controlling for variables that could impact location desirability, such as average precipitation and average temperatures in January, they reported a very small negative coefficient (-0.3) between the housing affordability ratio and employment growth rate between cities. In other words, the simple comparison across cities does not reveal slower employment growth in less-affordable cities. By contrast, they observed a statistically significant negative relationship between city-level employment growth and the housing affordability ratio when focusing within cities rather than between cities. Lack of affordable housing has a significant impact on employment growth rates such that an increase in the housing affordability ratio by one-unit results in a 2 percent decrease in the two-year employment growth rate. As mentioned by Chakrabarti and Zhang, this 2 percent change is significant considering the employment growth rate in the average city grows about 3.9% in a two-year period.

Chakrabarti and Zhang took their analysis a step further and conducted an analysis of the affordable housing ratio and employment growth rate in metropolitan areas and counties across the United States. Both analyses saw a statistically significant link between housing unaffordability and slower employment growth rates. Focusing within metropolitan areas, the 10-year employment growth rate sees a 9.8 percent decline with one-unit increase in the housing affordability ratio. Focusing within counties, the 10-year employment growth rate sees an 8.3 percent decline with one-unit increase in the housing affordability ratio.

High housing costs have also been linked to employee spatial mismatch. High housing prices due to restrictions on the housing supply limit workers from moving to areas of high economic productivity and high wages (Glaeser & Gyourko**,** 2018). This spatial mismatch may negatively impact economic output for high housing cost areas. Few studies have investigated the elasticity of labor and the connection to economic output. Beaudry, Green, and Sand (2014) found wage gaps result in population mismatch and productivity losses. Their estimates found city-industry-level labor elasticity to be -1.0. This implies that areas of high housing costs, where incomes do not go as far as other areas, could see negative impacts on their economic output, although more research is needed in this area.

An examination of housing affordability and national economic growth was conducted by Hsieh and Moretti (2017). They looked at 220 metropolitan areas in the US from 1964 to 2009 and quantified the effect of spatial misallocation. This was then compared to each city's contribution to economic growth in the country. Their analysis

found lower housing supplies leads to shifts in labor location and lowered aggregate growth by almost 50% between 1964 and 2009. Additionally, Hsieh and Moretti found areas with fewer housing restrictions contributed more to aggregate GDP growth. Southern cities were responsible for 32.9% of aggregate GDP growth. They also found that high economic production areas with high housing supply regulations could increase their contribution to GDP by adopting similar housing regulations to the median US city. Looking at New York, San Francisco, and San Jose, aggregate output would increase 87% (from 0.795% to 1.49 % per year) if they adopted housing supply regulations of the median US city. These three areas are both extremely economically productive and are experiencing record housing costs. Changing the regulations in these three areas could result in an 8.9% increase in aggregate US GDP (Hsieh and Moretti, 2017). This implies that the low supply of housing in these three markets impact the nation's economic output as a whole.

Taking Hsieh and Moretti's findings a step further, Wassmer (2020) looked at housing prices' impacts on various economic factors. Using the same data set I will be using in this analysis, Wassmer examined the influence of differences in acre residential land prices (housing cost) on economic output, individual earnings, total employment, and income distribution measures. Comparing residential land prices by acre and the annual *Metro Area GDP* and *Metro Area GDP Per Capita* from years 2012 to 2015, Wassmer found the influence of residential land price to be positive for all metropolitan areas in the sample. This positive influence, however, declined in magnitude as residential land prices increased.

Summary and Further Research

Previous research has mostly focused on causes of the housing supply shortage and causes slowing down economic growth as unrelated topics. Very few researchers have bridged the gap between these two fields, leaving opportunities for future research. Glaeser and his colleagues have done extensive research on the causes of the housing shortage, population impacts of the housing shortage (Glaeser & Ward, 2006), and most recently, connections between the housing shortage and economic development (Glaeser & Gyourko**,** 2018). Their research found high housing prices decreased workers' ability to move into high production areas, causing spatial mismatch between employers and employees. In recent years, some researchers have begun furthering the investigation between housing shortages and decreased economic growth. Chakrabarti and Zhang (2015) investigated the connections between housing shortages, employee mismatch, and employment growth, finding that an increase in the housing affordability ratio by one-unit results in a 2 percent decrease in the two-year employment rate. Hsieh and Moretti (2017) made the most progress connecting housing shortages and aggregate GDP growth. Their research found housing shortages could be impacting the nation's GDP output, specifically focusing on the impacts of San Francisco, New York, and San Jose's housing shortages and their contribution to the national GDP output. Connections between housing prices and GDP growth in other specific areas, however, is lacking and requires further research.

Research connecting relationships between worker spatial mismatch and local housing prices will further the pool of knowledge to understand the impacts of the

housing shortage in specific areas. Newly available data from the Federal Housing Finance Agency detailing residential land prices by acre allows research in this area to be furthered. To contribute to the existing research on this topic, I investigated the relationship between residential land prices, worker migration, and worker commute times. As illustrated by previous research, the available labor in surrounding areas influences the GDP output by the area. Comparing worker migration and commute times to housing costs in high production metropolitan areas allows an accurate examination of housing prices on the available labor pool and economic growth. It is important to look at regional areas, instead of city or county level data, because regions work as a unit for economic development. Suburban sprawl, the ability to commute by car to work, and the growth of telecommuting means many people live in different counties than the one they work in. Additionally, high population density leads to numerous counties existing relatively close to each other. The Bay Area, for example, is one of the largest and most productive economic centers in California and there are nine counties within commuting distance of business centers. Residential land prices per acre by county, worker migration trends by county, and commute times by county is transformed into regional data to correctly represent the relationship between housing and employee spatial mismatch.

3. METHODS

Numerous factors impact worker's ability and desire to live in certain areas, including, but not limited to, job opportunities, educational opportunities, climate, demographics, recreational opportunities, and affordability. As discussed earlier, affordability is increasingly becoming a leading factor in a family's decision of where to live. The ability to live near job centers has both personal and economic impacts. Living in job centers increases job opportunities, growth, and salaries at the personal and family level. Additionally, having a large trained and skilled labor pool available increases public and private sectors' opportunities to hire collaborative, creative, and effective employees.

As outlined in the literature review, there is a gap of knowledge exploring the connections between residential land prices, where employees can live, and the impact on economic growth. Previous research has mostly focused on the potential connections between housing affordability and employment growth. While employment growth is an important factor in this discussion, focusing solely on employment growth leads to an incomplete understanding of the impacts of residential housing prices on the availability of labor. In this analysis, I attempt to fill in these gaps by examining how residential land prices impact mobility into an area and its impact on commute times, which both represent the labor pool's ability and desire to live in certain areas. This section outlines the methodology used to develop my analysis to further examine this topic.

Quantitative Research Method

This analysis tests two general hypotheses; higher priced residential land in a metropolitan area increases travel times to work (commute), and higher priced residential land in a metropolitan area decreases mobility into the area. Consequences of rising housing prices take time to take effect; therefore, it is critical to take a lagged response into account when testing these hypotheses. This analysis uses panel data to investigate the impact of residential land prices between 2012 and 2014 on mobility and commute times between 2013 and 2015. This creates concerns regarding compounding variables, autocorrelation, and heteroskedasticity. To accurately examine my independent variable's (residential land prices) impact on my dependent variables (mobility and commute times), it is necessary to use a regression tool taking both the lagged dependent variable and fixed effects into account. Following the advice of Wassmer (2020), the fixed-effects-data-regression results derived from the STATA-provided XTSCC command is the optimal choice for this analysis. XTSCC is the most appropriate estimator in this analysis because it accounts for possible heteroskedasticity, autocorrelation, and cross-sectional dependence by calculating the Driscoll and Kraay standard errors for regression coefficients.

The dynamic model below allows for the determination as to whether residential land prices in a metropolitan area, in a given year, influences labor mobility into the metropolitan area and average commute times for workers already living in the area in the following year:

$Mobility_{i,t+1}$, $Mobility\ Per\ Capita_{i,t+1}$, $Commute\ Time\ 45\ Minutes\ Per\ Capita_{i,t+1}$, $Commute\ Time\ 60\ minutes\ Per\ Capita_{,t+1}$, $Commute\ Time\ 90\ minutes\ Per\ Capita_{i,t+1}$

$$= f\ (Housing\ Cost_{i,t},\ Controls_{i,t})$$

where,

i = 1 to 348 United States Metropolitan/Micropolitan Statistical Areas,
t = 2012, 2013, and 2014;

and,

$$Housing\ Cost_{i,t} = f\ (Acre\ Residential\ Land\ Price_{i,t})$$

$$Controls_{i,t} = f\ (Appropriate\ Lagged\ Dependent\ Variable_{i,t},\ Fixed\ Metropolitan\text{-}Area\ Effects_{i},\ Fixed\ Time\ Effects_{t})$$

After controlling for the mobility and commute times in the previous year and any metropolitan-area and time fixed effects, higher residential land prices in the current year may impact the number of people moving into the area and the average commute times in the following year. Below is my rationale for the inclusion of each factor, as well as the specific variables I used to represent each factor.

Data

Recently released data allows this analysis to focus on more specific locales than previous research, specifically at the county and Metropolitan Statistical Area (MSA) level. The new data set, published in 2019, includes approximations of the selling price for an acre of land zoned for residential housing for all U.S. counties for years 2012 to 2015 (David, Larson, Oliner, and Shui, 2019). Using the 2010 Census definition of counties making up U.S. metropolitan and micropolitan areas, individual county values

yield multi-county metropolitan area values through aggregation based upon relative county population for the entire multi-county area. The unit of analysis in this thesis is the Metropolitan Statistical Area to account for people living in one county and working in another. Cross-county commuting patterns are a defining factor for metropolitan area designation, therefore examining the commuting and mobility patterns in an entire MSA, instead of individual counties, will provide a more accurate representation of residential land price influence on these patterns.

To achieve the correct unit of analysis, I aggregated county level data into 348 MSAs, each representing major job centers in all 50 states. To standardize each result, I transformed the aggregated data using the MSA's working adult population to represent each variable as per capita. Below is my rationale for the inclusion of each variable, as well as the sources for the variables used in this analysis.

Independent Variable

Housing Cost

Housing prices affect the ability of individuals to live in a specific area. Increased housing prices can negatively impact the number of individuals who live in those areas. Unaffordable housing can therefore negatively impact the human capital available to industries that exist in that area. In addition, individuals in particular career fields with average incomes that cannot support the local housing prices may leave the area for locations with more affordable housing options. By decreasing human capital availability

and driving out critical players in certain industries, housing unaffordability can stifle economic growth and limit upward mobility for the labor force.

To represent the local housing prices within counties, I used county averages for residential land prices in the year 2012 as reported by the Federal Housing Finance Agency. Residential land prices are per acre amounts in real dollars. To increase impacts of resident land prices per acre in the results, I divided each value by 1,000. This does not change the influence of residential land prices on mobility or commute times. It will instead change the impact on the dependent variables by every $1,000 increase in land price instead of every $1 increase in land price. I used 2012 residential land prices per acre to examine housing costs' impact on the following three years (change in mobility and commute times change between 2013 and 2015).

Using average residential land prices per acre is appropriate because land prices play a crucial role in housing prices. Since construction costs are relatively stable across the country, the scarcity of land due to space and/or zoning restrictions drive up the cost of the land. Therefore, the price of the land will significantly impact the housing price. It is important to note, however, that while construction costs play a smaller role in housing prices, they do alter the final cost of housing. This variable does not capture those costs. Considering constructions costs would strengthen this variable.

Dependent Variables

Mobility

There are multiple implications emerging from rising housing costs. One potential implication includes the increased or decreased ability for people to move in or out of

areas due to housing affordability or lack thereof. I hypothesize that as residential land prices increase, migration and population flow into the area decreases. The population's capacity to move in and out of major metropolitan areas both increases the labor pool and talent pool to improve the economy through a competitive labor market and increases individual and families' abilities for upward mobility and economic security.

To analyze the connection between housing affordability and population mobility, I used the U.S. Census Bureau's 5-year American Community Survey estimates for geographic migration in the past year. These measurements are period estimates that measure where people live when surveyed (current residence) and where they lived 1 year prior (residence 1 year ago) (U.S. Census, 2020). The Census Bureau collected this data continuously over a 5-year period to provide a large enough sample for estimates in small geographic areas. The data is a population estimate for those who are living in a different state than they were one year prior. For this analysis, I gathered the geographic migration in the past year at the county level and then aggregated to the Metropolitan Statistical Area level.

Geographic migration allows this analysis to observe any potential connections between residential land prices and population flows in and out of metropolitan areas. Population flows in and out of areas represent growing or shrinking labor markets. It cannot, however, consider other factors related to population flows, such as educational opportunities, extended family locations, and personal preferences. Additionally, the geographic mobility variable does not capture the population actively in the labor market and the labor market growth or decline can only be estimated.

Travel Time to Work

Another potential implication of high residential land prices is increased travel times to work. I hypothesize that as residential land prices increase, more workers will have high travel times to work due to living further away from job centers. With fewer affordable housing options near job centers, the workforce may need to look at alternative areas with more affordable options. Areas with more affordable housing options are more likely to be further away from economic centers.

To analyze the connection between residential land prices and commute times, I used the U.S. Census Bureau's 5-year American Community Survey estimates for travel time to work. This measurement breaks travel time to work into twelve groups, ranging from less than 5 minutes travel time to 90 or more minutes and quantifies the number of workers in each travel time group. For this analysis, I used three of the travel time groups; 45 to 59 minutes, 50 to 89 minutes, and 90 or more minutes. The Census Bureau defines workers as workers 16 years and older who did not work from home.

Sources of Data

Tables 3.1 and Table 3.2 identify the sources of information for the dependent and independent variables respectively. All data sources are federal government published information. The residential land use prices per acre (Table 3.2) are available from the Federal Housing Finance Agency. This source uses county-level aggregate estimates to standardize land values per acre from land under single-family residential units between 2012 and 2017. Geographic migration and commute times (Table 3.1) are available from

the U.S Census bureau through the American Community Survey and the agency's quick facts website using census data.

Table 3.1: Sources of Data for Dependent Variables

Dependent Variable	Description	Source of Data
Geographical Migration in the past year	The number of people who live in a different state than they did the previous year	United States Census Bureau, American Community Survey, 5-year estimates for 2013, 2014, 2015
45 to 59 Minute Commute	The number of people who drive between 45 and 59 minutes to work	United States Census Bureau, American Community Survey, 5-year estimates for 2013, 2014, 2015
60 to 89 Minute Commute	The number of people who drive between 60 and 89 minutes to work	United States Census Bureau, American Community Survey, 5-year estimates for 2013, 2014, 2015
90 or More Minute Commute	The number of people who drive between 90 minutes or more to work	United States Census Bureau, American Community Survey, 5-year estimates for 2013, 2014, 2015

Table 3.2: Source of Data for Independent Variable

Independent Variable	Description	Source of Data
Residential Land Use Prices	Residential land prices per acre in real dollars	Federal Housing Finance Agency

Data Set and Variable Descriptions

The data set created for this analysis consisted of 348 Metropolitan Statistical Areas (MSA's) between 2012 and 2015. Table 3.3 shows the descriptive statistics for the dependent and independent variables for years 2012 to 2015.

Table 3.3: Descriptive Statistics: Dependent and Independent Variables for years 2012 to 2015
(348 U.S. Metropolitan/Micropolitan Areas)

Name	Mean	Std. Dev.	Minimum	Maximum
Dependent (Years 2013, 2014, and 2015)				
Geographical Migration in the past year	8,452.0	10,527.0	336.8	90,048.0
Travel Time to Work: 45 to 59 minutes	9,826.2	25,146.99	2.3	356,329.1
Travel Time to Work: 60 to 89 minutes	7,029.0	21,468.46	0.4	321,656.8
Travel Time to Work: 90 or more minutes	3,402.3	7,898.5	0.1	116,394.4
Independent (Years 2012, 2013, and 2014)				
Acre Residential Land Price	188,179	303,825.9	6,928.0	3,698,475

In addition to the independent and dependent variables (residential land use prices, geographical migration over the past year, and travel to work times), the data set

included estimates for the working adult population for each MSA between 2012 and 2015. Since MSAs widely range in population size, I used the working adult population to standardize the dependent variables. This calculation transformed geographical mobility and travel times to represent the number per 100 working adults**.** Table 3.4 identifies the descriptive statistics for the population data for all MSA's.

Table 3.4: Descriptive Statistics: Metropolitan Statistical Areas' Population 2012 to 2015
(348 U.S. Metropolitan/Micropolitan Areas)

Name	Mean	Std. Dev.	Minimum	Maximum
Working Adult Population	400,500	922,544.2	17,041	10,888,603
General Population	685,862	1,547,628	28,449	18,350,443

Summary

Newly available data from the Federal Housing Finance Agency allows this analysis to take a closer look at overreaching impacts of rising residential land prices. As mentioned earlier in this thesis, there is a gap in knowledge of housing affordability's true impacts on the labor market's ability to move into economic centers and their ability to live close to their jobs.

To analyze residential land prices' potential impact on worker migration and commute times, I used the fixed-effects-data-regression derived from the STATA-

provided XTSCC command. This method is the most appropriate estimator in this analysis to account for possible heteroskedasticity, autocorrelation, and cross-section dependence by calculating the Driscoll and Kraay standard of error. I had one independent variable, residential land use prices, from the Federal Housing Finance Agency and two dependent variables (geographic migration in the past year and travel times to work) from the U.S. Census Bureau's American Community Survey 5-year estimates. I used the working adult population to standardize each variable for analysis.

4. RESULTS

This chapter provides the results of the method described in Chapter 3. Each of the four fixed effects data regression using the STATA-provided XTSCC command contained 1044 observations among 348 MSAs. The choice to use the XTSCC command for a fixed effects data regression was driven by the possibility of heteroskedasticity in the panel data from a linear regression model. As seen in Tables 4.1 and 4.2, the independent variable's (residential land price) effect on all four dependent variables (geographical mobility and three travel to work ranges) was statistically significant. In addition to the fixed effects regression results, Tables 4.1 and 4.2 display each dependent variable's inflection point, derived from calculating the maximum derivative from the regression results. As illustrated in Figures 4.1 through 4.4, residential land use prices' effect on geographical mobility and travel times to work are concave, where the effect increases as residential land prices increase until an inflection point where the effect begins to decrease.

Tables 4.1 and 4.2 contain the results from all 348 MSAs, with state mobility (Table 4.1) and travel time to work (Table 4.2) as the dependent variables. Table 4.1 lists the results of how higher home prices (estimated using residential use land prices per acre) in a U.S. metropolitan area between 2012 and 2014 influence migration into the state (estimated by the number of people living in a different state than the previous year) between 2013 and 2015. Table 4.2 lists the results of how higher home prices in a U.S. metropolitan area between 2012 and 2014 influence travel times to work between 2013 and 2015. Both results tables illustrate statistically significant results along with the

Driscoll and Kraay robust standard errors. Additionally, the results tables list the R-squared (within) value found to exert a statistically significant influence. The R-squared (within) value measures how well the explanatory variable accounts for the changes in the dependent variables within each household over time. Lastly, the results tables list the inflection point at which the effect begins to decrease along with the metropolitan areas whose average residential land price falls beyond the inflection point. The remainder of this chapter goes into detail of each regression result.

Geographical Migration Results

Residential land use prices had a statistically significant effect on state mobility. The influence of housing prices on geographic mobility is positive, although the effect is relatively small. For all 348 MSAs, Table 4.1 indicates that rising residential land prices increase mobility into the state by 44 new state residents for every $100K increase in the per-acre residential land price.

Table 4.1: State Mobility and Residential Land Use Prices Regression Results for 348 Metropolitan/Micropolitan United States Areas^
(1,044 observations, t = 2012, 2013, and 2014)

Dependent Variable **Explanatory Variable**	**State Mobility $_{t+1}$**
Lagged Dependent Variable$_t$	0.3611** (0.1206)
Acre Residential Land Price$_t$ (1,000s)	0.000443** (0.000189)
Acre Residential Land Price^2_t (1,000s)	-9.83e-8** 4.48e9
Year 2013 Dummy	0.0460*** (0.0480)
Year 2014 Dummy	0.0496*** (0.00316)
Constant	2.742*** (0.5256)
R-Squared (within)	0.1197
Illustration of an increase in Acre Residential Land Price **Inflection Point** **Metro Areas Beyond Inflection Point**	 $2,255,849 SF-Oakland-Hayward Urban Honolulu

^ Driscoll and Kraay Robust Standard Errors in parentheses.

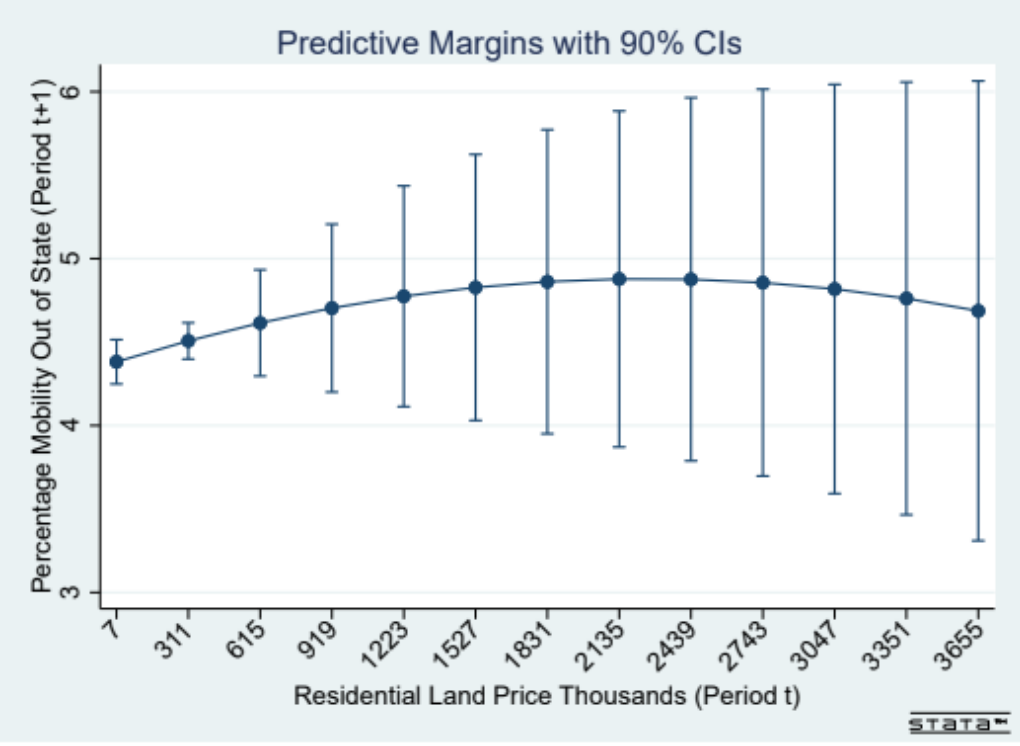
^Statistical significance in two-tailed test: ***p<0.99, **0.95 <p< 0.99, *0.90 <p< 0.95.

This positive influence, however, decreases when residential land price per acre reaches the inflection point of $2,255,949. At this point, the positive effect of residential land prices on state mobility begins to decrease, resulting in smaller numbers of migration into the state. Only two metropolitan areas (SF-Oakland-Hayward and Urban Honolulu) have average residential land prices per acre above the inflection point. For

these two metropolitan areas, the average per-acre price for residential land results in fewer new state residents than if their residential land prices were below the inflection point. For the remaining 346 MSAs, per-acre residential land price has a positive effect on migration.

Figure 4.1 provides an illustration of this concave relationship between residential land prices per acre and migration into the state in the following year. The diagram below represents the simulated effects of a one-standard-deviation increase in residential land cost per acre (a little over $303K) for a hypothetical average U.S. metropolitan area on migration from another state. As illustrated, the effect is positive until the inflection point, at which point the effect slowly begins to decrease.

Figure 4.1: Simulation Results of One-Standard Deviation Increases in Residential Land Per Acre's Effect on State Mobility at Sample Average Values for all 384 Areas and all Years



The R-squared (within) value is relatively small at 11.97%, which suggests a weak estimation for this analysis. R-squared (within) measures how well the explanatory variable (residential land price per acre) accounts for the changes in the dependent variable (mobility into the state) within each of the households over time. As mentioned earlier, there are multiple factors other than housing prices involved in moving, including education opportunities, climate, family location, and job opportunities. Since this analysis does not include alternative factors involved in the choice to move to a different state, it is reasonable to assume that these factors have large impacts on the decision to move in addition to residential land prices.

Travel Time to Work Results

Residential land price per acre had statistically significant effects on all three travel to work time ranges (45 to 59 minutes, 60 to 89 minutes, and 90 or more minutes). Table 4.2 lists the regression results for each time range. For all time ranges, residential land prices had positive effects on travel times to work, with concave results indicating an inflection point where the effect begins to decrease. As the travel time to work ranges increase, the inflection point at which the positive effect begins to decrease also increases. Results for each time range differ in both magnitude of effect and inflection points, indicating residential land price per acre has a large effect on longer commute times.

Table 4.2: Travel Time to Work and Residential Land Use Prices Regression Results for 348 Metropolitan/Micropolitan United States Areas
(1,044 observations, t = 2012, 2013, and 2014)

Dependent Variable **Explanatory Variable**	**Travel Time to Work – 45 to 59 Minutes$_{t+1}$**	**Travel Time to Work – 60 to 89 Minutes$_{t+1}$**	**Travel Time to Work – 90 or More Minutes$_{t+1}$**
Lagged Dependent Variable$_t$	1.485*** (0.0863)	1.388*** (0.0761)	0.2762 (0.122)
Acre Residential Land Price$_t$ (1,000s)	0.000802*** (0.000125)	0.00120*** (0.00268)	0.0005465*** (0.0000264)
Acre Residential Land Price^2_t (1,000s)	-2.90e-7*** (1.04e-8)	-3.26e-7*** (4.17e-8)	-1.21e-7*** (2.49e-9)
Year 2013 Dummy	0.1810*** (0.00791)	0.0842*** (0.00623)	0.0153*** (0.00199)
Year 2014 Dummy	0.1461*** (0.00911)	0.0691*** (0.00810)	0.0336*** (0.00156)
Constant	-3.725*** (0.6197)	-1.666*** (0.2704)	0.9230*** (0.1687)
R-Squared (within)	0.6938	0.7271	0.0946
Illustration of an increase in Acre Residential Land Price			
Inflection Point	$1,383,966	$1,843,405	$2,258,264
Metro Areas Beyond Inflection Point	LA-Long Beach-Anaheim Oxnard-Th Oaks-Ventura SF-Oakland-Hayward Santa Cruz-Watsonville Urban Honolulu New York-Newark-Jersey City	LA-Long Beach-Anaheim SF-Oakland-Hayward Santa Cruz-Watsonville Urban Honolulu New York-Newark-Jersey City	SF-Oakland-Hayward Urban Honolulu

^ Driscoll and Kraay Robust Standard Errors in parentheses.

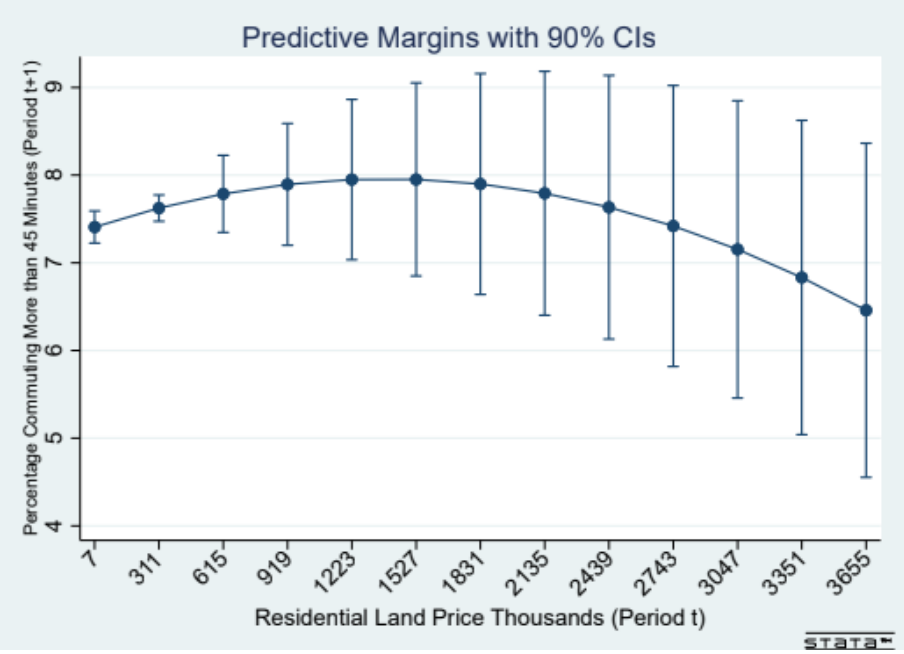
^Statistical significance in two-tailed test: ***p<0.99, **0.95 <p< 0.99, *0.90 <p< 0.95.

Travel Time to Work: 45 to 59 Minutes

Residential land price per acre had a positive effect on commute times ranging from 45 to 59 minutes. For every $100K increase in residential land price per acre, the number of adult workers aged 16 and older not working from home spending 45 to 59 minutes travelling to work increases by 80. At $1,383,966 per acre, however, the effect begins to decrease. Six metropolitan areas have residential land prices per acre that are beyond the inflection point (LA-Long Beach-Anaheim, Oxnard-Thousand Oaks - Ventura, SF-Oakland-Hayward, Santa Cruz-Watsonville, Urban Honolulu, and New York-Newark-Jersey City)

Figure 4.2 illustrates the simulated effects of one-standard-deviation increase in residential land cost per acre (around $303K) for a hypothetical average U.S. metropolitan area on 45 to 59 minute commutes. The slope of the concave curve before the inflection point increases gradually, while the slope has a steeper decrease after the inflection point. The gradual increase before the inflection point indicates residential land prices have a small positive impact on the number of workers with 45 to 59 minute commutes. The steeper decline after the inflection point indicates that once the residential land price per acre reaches roughly $1.4 million, the number of workers willing to live 45 to 59 minutes away from work declines at faster rate than those willing to live 45 to 59 minutes way from work when residential land price per acre is under $1.4 million.

Figure 4.2: Simulation Results of One-Standard Deviation Increases in Residential Land Per Acre's Effect on 45 to 59 Minute Travel Times to Work at Sample Average Values for all 384 Areas and all Years



The R-squared (within) value is 69.38%, which indicates a strong measure of estimation for my analysis. This R-squared (within) value means that the regression model explains the variation in 69.38% of the dependent variable around its mean.

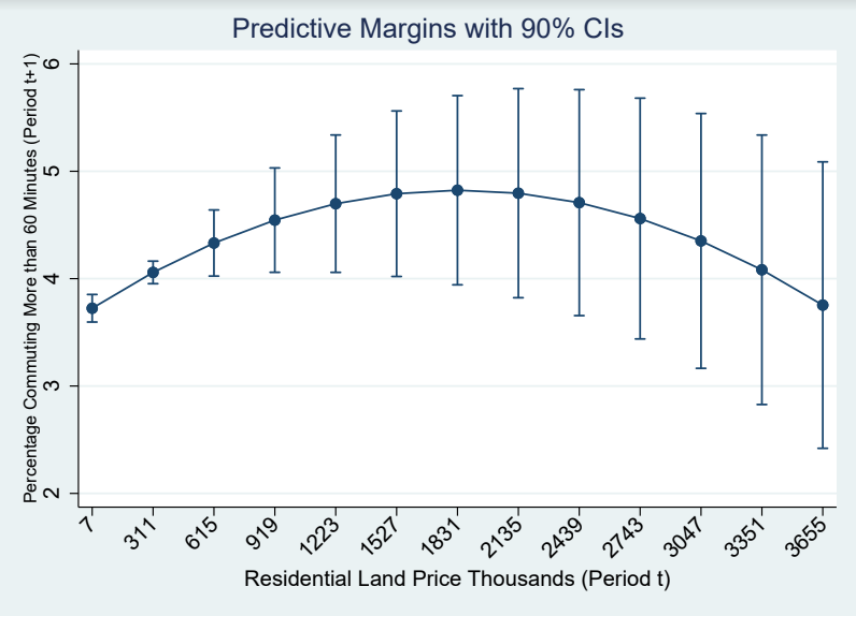
Travel Time to Work: 60 to 89 minutes

Residential land price per acre had the largest effect on commute times ranging from 60 to 89 minutes among the three commute ranges. According to Table 4.2, every $100K increase in residential land price results in 120 more adult workers spending 60 to 89 minutes travelling to work. This effect stays positive until residential land price per acre reaches $1,843,405, at which point the effect begins to decline. Five metropolitan areas have residential land prices per acre beyond this inflection point (LA-Long Beach-

Anaheim, SF-Oakland-Hayward, Santa Cruz-Watsonville, Urban Honolulu, and New York-Newark-Jersey City). The R-squared (within) value at 72.71% indicates a strong measurement of estimation for my analysis.

Figure 4.3 illustrates the simulated effects of one-standard-deviation increase in residential land cost per acre (around $303K) for a hypothetical average U.S. metropolitan area on 60 to 89 minute commutes. The slope before and after the inflection point are very similar, indicating that the positive effect before residential land price per acre reaches roughly $1.8 million increases at a similar rate as the effect decreases after residential land prices reach the inflection point.

Figure 4.3: Simulation Results of One-Standard Deviation Increases in Residential Land Per Acre's Effect on 60 to 89 Minute Travel Times to Work at Sample Average Values for all 384 Areas and all Years

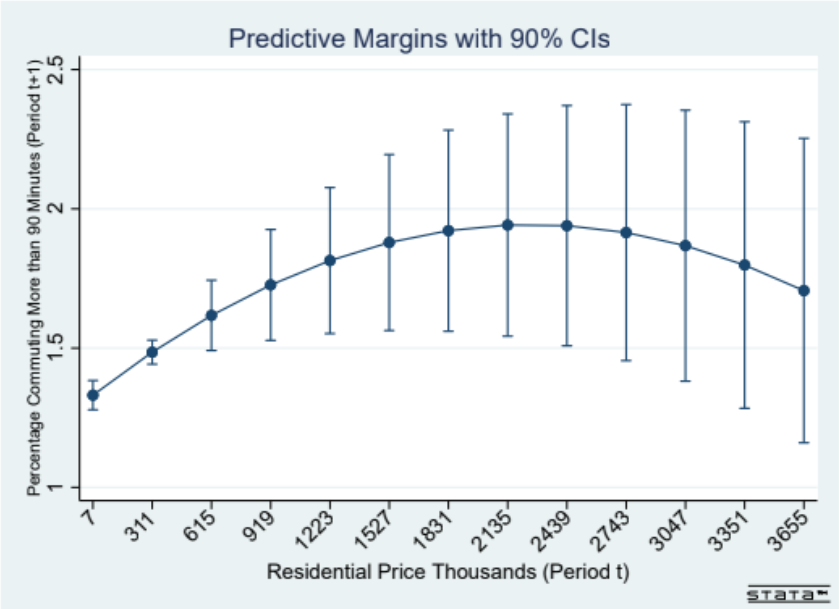


Travel Time to Work: 90 or more minutes

Residential land price per acre had a positive effect on commute times of 90 minutes or more, although the effect was the lowest among the three commute time ranges. For every $100K increase in residential land price per acre, the number of adult workers aged 16 and older not working from home spending 90 minutes or more travelling to work increased by 54. At $2,258,264, this travel time to work range had the highest inflection point at which the effect began to decrease. Only two metropolitan areas (SF-Oakland-Hayward and Urban Honolulu) had residential land prices above the inflection point.

Figure 4.4 illustrates the simulated effects of one-standard-deviation increase in residential land cost per acre (around $303K) for a hypothetical average U.S. metropolitan area on 90 minute or more commutes. The slop before the inflection point (roughly $2.3 million) is steeper than the slope after the inflection point. After residential land prices hit $2.3 million per acre, the positive effect on the 90 minute or more commutes become negative but decreases more gradually than the positive effect.

Figure 4.4: Simulation Results of One-Standard Deviation Increases in Residential Land Per Acre's Effect on 90 or More Minutes Travel Times to Work at Sample Average Values for all 384 Areas and all Years



Summary

Residential land prices had statistically significant effects on all four dependent variables. In general, all impacts were positive, with relatively small increases in state mobility and the three travel time to work ranges. This positive effect, however, turns negative after residential land prices per acre hits a certain price (inflection point). Residential land prices had the biggest impact on travel times to work ranging from 60 to 89 minutes long and the smallest impact on state mobility.

The results outlined in this chapter offer interesting suggestions on the impact of residential land prices on the available labor force in metropolitan areas. The concave relationships present in each result indicates significant policy implications. With many metropolitan areas, many of which are major economic hubs, having residential land

prices beyond the inflection point, residential land prices seem to impact workers' ability to live near job centers. The full policy implications of these results are discussed in the next chapter.

5: CONCLUSION

As discussed throughout the previous chapters, housing affordability has hit crisis levels throughout the United States. Though it is easy to understand that a lack of housing affordability causes decreased income availability, increased homelessness and increased evictions, the full impact of the lack of affordable housing is not fully understood. The aim of this thesis is to investigate the impact of residential land price per square acre in Metropolitan Statistical Areas throughout the United States on travel to work (commuting) times and the amount of migration from another state to the metropolitan area in the past year. I tested two general hypotheses in this analysis: (1) higher-priced residential land in a metropolitan area influences travel times to work (commuting), and (2) higher priced residential land in a metropolitan area influences migration into the metropolitan area from another state. In this chapter, I review the key findings of my analysis, discuss the potential impacts and policy implications of these findings, and explore limitations and potential for future research.

Key Findings

The data set described Chapter 3 contains residential land price per square acre, migration into the metro area from another state in the past year, and three travel times to work groups (45 to 59 minutes, 50 to 89 minutes, and 90 minutes or more) for 348 MSAs representing major job centers in all 50 states between 2012 and 2015. Using a dynamic-panel-data analysis, I tested the impact of residential land prices per square acre on both commutes to work times and mobility out of the state in the following year.

My findings show that travel to work times in a metropolitan area exhibit a quadratic (increasing at a decreasing rate) relationship with residential land prices within U.S. Metropolitan Statistical Areas. As residential land prices increase, the number of workers with travel times to work ranging from the highest end categories of 45 to 59 minutes, 60 to 89 minutes, and 90 minutes or more increases. To explain this finding, think of higher residential land prices being caused by both a stronger metropolitan economy that is generating likely higher household incomes and higher home prices (especially the with greater the presence of residential land use restrictions) near employment centers in the metropolitan area. The higher incomes allow/encourage more to want to own a home, but the higher residential land prices make it more difficult to accomplish unless moving farther from employment centers and thus, experiencing longer commutes. Many have referred to this as "sprawl" and I have found evidence of it here as being furthered along by high residential land prices.

Geographical migration into a metro area from different states also have a quadratic (increasing at a decreasing rate) relationship with residential land price per acre. This is likely due to a stronger metropolitan economy, driving higher land prices, encouraging more out of state migration into the area for higher paying jobs. However, if the strength of this economy combines with restrictive residential land use regulations, that drive housing prices even higher, this flow of out-of-state residents slows down significantly. Like "sprawl", the lack of new labor to fuel a burgeoning metropolitan area's need for labor is another concern generated by high residential land prices.

Potential Impacts

These findings document the possibility of multiple negative externalities, including economic, environmental, and social impacts. Looking first at the increase in the number of commuters who fall into the three extreme ends of the commute times collected by the U.S. Census, there are two potential effects. One is that the number of hours with active cars on the road increases, leading to increased environmental impacts from commuter cars.

The second effect involves inequities in opportunities. Low income people of color are more likely to be impacted by high housing prices and more likely to be concentrated in low resource neighborhoods or move further away from job centers due to housing prices. The San Francisco Bay Area is a key example of this disparity. According to the Urban Displacement Project and California Housing Partnership (2019), low-income people of color in the Bay Area suffer most from rising housing prices. A 2019 report looking at rising housing costs and re-segregation found that between 2000 and 2015, as housing prices rose, historically Black cities and neighborhoods across the region lost thousands of low-income Black households. Increases in low-income Black households during the same period were concentrated in the region's outer edges that have relatively lower housing prices but fewer resources. Additionally, the report found that low-income households of color were much more vulnerable than low-income white households to the impact of rapid increases in housing prices. In the Bay Area, a 30% tract-level increase in median rent was associated with a 28% decrease in low-income

households of color, while there was no significant relationship between rent increases and loss of low-income white households.

The findings of increased commute to work times with rising housing prices coupled with the knowledge that low income Black households are more likely to be those forced to move further away from job centers implies that Black households are most likely to carry a disproportionate amount of workers with higher commute times. This can lead to higher barriers for Black households to job and education opportunities, which are concentrated in higher housing cost areas.

Looking at the decrease of new state residents in the Metropolitan area after the residential land price per acre inflection point is reached, there are major economic implications. First, decreased new state residents may lead to a decreased labor pool. With rising housing prices, certain incomes become locked out of the housing market. This can lead to labor talent in certain sectors and job titles that fall below the income requirement of the housing market to either leave or be prevented from moving in. This leaves a gap in the labor market, impacting the economic health and growth of the area when companies find it difficult to fill certain positions and potentially decreasing the area's GDP growth. Wassmer (2021) found that once a residential land price per acre inflection point has been reached, GDP per capita begins to drop. Additionally, decreased new state residents leads to decreased local and state tax revenue. With less people in the area, income tax and sales tax revenues can be impacted.

The emergence of the COVID-19 pandemic in early 2020 has provided hints of the tipping point of these findings. With many non-service jobs moving to the virtual

world, areas with high housing prices have witnessed a mass exodus of labor moving to lower housing cost areas. A 2021 report from the United States Commercial Real Estate Services (CBRE) found that as the COVID-19 crisis escalated and social-distancing restrictions expanded, the outflow of people from dense, high-cost urban metro areas accelerated in 2020. San Francisco County, for example, lost a significant number of residents to Sacramento County, where housing prices are significantly lower. People moving from San Francisco County to Sacramento County increased by 70% in 2020. These developments further exemplify the impacts of housing prices on geographic mobility. When provided the option to work from home, many residents are choosing to move to lower cost areas. This will have negative tax impacts on the high housing cost areas, as well as housing price impact on the previously low housing cost areas as demand increases. As people begin to go back to working in person as vaccines become available, many people will have to make the choice whether to stay in low housing cost areas or move back to high cost areas with more job opportunities.

Policy Recommendations

The findings in this study have multiple policy implications. It is critical for the economic, environmental, and social health of society for policy makers to take steps to mitigate these impacts of high housing costs. First, policy makers should tackle the source of the affordable housing crisis. It is necessary for higher levels of state and federal government to intervene, through public policy, in local control of housing amounts and types. Currently, the local control of the amount and type of housing being

built is impeding supply from meeting demand. This restriction can increase housing prices. Wassmer and Williams (2021) find that increased stringency of local land use controls relevant to the development of residential projects exert positive influences on the average price of land per acre zoned for single-family housing. A regression analysis investigating the relationship between local land use controls and average residential land prices per acre found that a one-unit increase in the restrictive residential land use environment for the state in which a metropolitan area is primarily located results in a 26.7% increase in the residential land price standard deviation. Additionally, Wassmer and Williams find that a one-unit decrease in regulatory stringency could cut the price of new residential homes by about one-fourth of the standard deviation observed in resident land prices across the United States.

State and federal governments can increase not only the amount, but the right type of housing, in high cost areas by lowering zoning restrictions. Glaeser (2020) supports this policy intervention, advocating for more active levels of intervention at the state and federal level to encourage or require more residential construction in high-priced housing areas. This recommendation, however, must be executed delicately. A complete lack of residential zoning restrictions does have its costs. Houston, Texas is a key example of the potential dangers of unmitigated growth. Houston is the largest U.S. city to have no zoning laws, calling itself "the city with no limits" (Boburg, Reinhard, 2017). In 2017, the city experienced unprecedented flooding after Hurricane Harvey hit the area. Many urban planners cite the city's unchecked growth, including in flood-prone areas, as a major contributing factor to the flood damage due to the diminished ability of the land's

already limited natural ability to absorb water. Policy makers must execute a delicate dance between encouraging housing growth and mitigating the potential impacts of uncontrolled growth.

While increasing the housing supply in high-priced housing areas is battling the root of the problem, it is not a quick fix. Building more housing takes time, whereas the problems rooted in high housing prices are impacting people every day. For short term solutions while housing is being built, policy makers must intervene in how people work and how people get to work. First, policy makers can create incentives for companies to allow work from home options when appropriate. As the COVID-19 pandemic has shown, working from home creates opportunities for workers to live in low housing cost areas while maintaining the jobs previously only available to those living in high cost areas. By increasing the access to work from home options, workers forced to move to the lower housing cost outskirts of MSAs won't face the extra burden of long commute times and may encourage new residents from other states to move into these areas. Some positions, however, cannot be done from home. Service industry jobs, for example, must be done in person. Additionally, these sectors employ high amounts of minority and low income workers. The need for in person work and the reality of these groups being pushed into more affordable housing areas place an extra burden on these groups. Policy makers should prioritize transportation systems that connect low housing cost areas to more affordable housing areas in which most jobs are located. By increasing access to bus and train transportation options, policy makers can alleviate both the burdens for all workers and the environmental impact from increased car hours on the road.

Limitations and Potential Future Research

While the findings in this study are illuminating, they aren't without concerns. Due to lack of data, the analysis does not include the fluid movement between metropolitan statistical areas. The geographical migration in this study focuses on new state residents but fails to consider people moving from one MSA to another. Looking at this movement would further the understanding of residential land prices on geographic migration. Additionally, the travel times to work do not consider commutes from one metropolitan statistical area to another. A region wide analysis may strengthen this analysis.

The data set created, and method used for this study can be a jumping off point for various extensions of this research involving the social and economic consequences of high housing costs in MSAs. The knowledge base would benefit from further exploration of the influence of high housing prices on homelessness, evictions, economic mobility, and racial/ethnic diversity in U.S. metropolitan statistical areas. Additionally, this research could be furthered by investigating the potential racial disparities in long commute times and movement between states. Further investigations into these potential impacts could inform policy makers on where to target their policy interventions.

Conclusion

The findings in this study illuminate additional potential impacts of the affordable housing crisis beyond the accepted knowledge. High housing prices lead to longer commute times and decreased migration into metropolitan areas. These effects can decrease economic activity, stifle economic mobility, impose disproportionate burdens to education and employment opportunities, and worsen the environmental crisis. Public policy makers must intervene in local housing control to increase housing development, as well as impose policies that change how people work and how they get to work through work from home incentives and increased access to public transportation options. Lack of affordable housing has reached crisis levels. Public policy interventions are necessary to mitigate the negative economic, social, and environmental impacts and to provide opportunities for all members of society.

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