REGULATORY BARRIERS TO AFFORDABLE HOUSING: AN ANALYSIS OF THE EFFECTS OF LOCAL LAND USE REGULATIONS ON HOUSING COSTS IN THE GREATER SACRAMENTO AREA

Kiana L. Buss
B.A., California State University, Chico, 2003

THESIS

Submitted in partial satisfaction of
the requirements for the degree of

MASTER OF PUBLIC POLICY AND ADMINISTRATION

at

CALIFORNIA STATE UNIVERSITY, SACRAMENTO

SPRING
2011

REGULATORY BARRIERS TO AFFORDABLE HOUSING: AN ANALYSIS OF THE EFFECTS OF LOCAL LAND USE REGULATIONS ON HOUSING COSTS IN THE GREATER SACRAMENTO AREA

A Thesis

by

Kiana L. Buss

Approved by:

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

__________________________________, Second Reader
Peter M. Detwiler, M.A.

____
Date

Student: Kiana L. Buss

I certify that this student has met the requirements for format contained in the University format manual, and that this thesis is suitable for shelving in the Library and credit is to be awarded for the thesis.

________________________________, Associate Dean   ________________________
Edward L. Lascher, Jr., Ph.D.   Date

College of Social Science and Interdisciplinary Studies

Abstract

of

REGULATORY BARRIERS TO AFFORDABLE HOUSING: AN ANALYSIS OF THE EFFECTS OF LOCAL LAND USE REGULATIONS ON HOUSING COSTS IN THE GREATER SACRAMENTO AREA

by

Kiana L. Buss

Prior to the housing market and economic crash beginning in 2007, the State of California had historically experienced higher housing costs than a majority of other states in the nation, with many of the major metropolitan areas topping the list of most expensive places to live in the county. Housing affordability is of significant concern to policymakers and Californian residents who cannot afford decent affordable housing. It is critical to identify what factors cause housing costs in California to be abnormally high and then address these issues with appropriate state and local government actions. The following thesis is one such attempt to identify what factors drive the cost of housing. Given the changed conditions in the housing market following the burst of the housing bubble in 2007, this thesis attempt to determine what effect, if any, and how strong an affect, local land use ordinances have on the cost of housing in a post-housing market crash environment.

I use a regression analysis with data set on the sale of over 33,000 individual housing units in a six-county, 16-city area in the Sacramento region. The regression controls for factors such as house size characteristics, house structural characteristics, house vintage characteristics, neighborhood characteristics, foreclosure characteristics, location characteristics, and land use ordinance characteristics. The key explanatory variable in this thesis is a proxy for the stringency of the local land use regulatory environment. I developed the proxy by dividing the number of building permits issued by a city or county in the 2008 calendar year by one year worth of state regional housing need (Regional Housing Needs Allocation or RHNA).

Results indicate a statistically significant and theoretically sound regression model consistent with existing literature. For every one-unit increase in building permits issued to meet required regional housing need within a jurisdiction, the cost of housing decreases by 0.8%. The more building permits issued in a jurisdiction has an even greater effect on homes in the bottom of the housing market. Specifically, for every one-unit increase in building permits, the cost of a home below the median price decreases by 1% and by 5% for those homes one standard deviation away from the average-priced home in the greater Sacramento area. This thesis supports previous findings on the relationship between local land use ordinances and housing costs with new insights into a post-housing market crash environment. The results of this thesis should serve as useful information for local elected officials in the greater Sacramento region when considering the impacts of local land use decisions on the development of housing and ultimately on housing affordability.

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

____
Date

DEDICATION

I am truly blessed to have so many wonderful people who have helped shape me into the person I am today and have helped me get to this point in my education. I will begin with my parents, all four of them! Each of you has a unique place in my heart and has had a distinct influence in my life.

To my mother – may we always be each other's biggest fans.

To my father – for always having the best advice in any situation.

To my stepmother – because of you I know what it means to be a strong woman.

To my stepfather – don't worry, you don't have to tell me, I know you love me.

I must also thank my brother and sister. A.J., without a little sibling rivalry, I would not have been this motivated to become mom's #1. Savannah, since the day you were born I have had an extra drive and motivation to be a good person, to make you proud. I love you both so much.

To my grandmother – for taking me to Washington D.C. for the first time and sparking my interest in public policy. And for always calling to check in on me and making me feel all the love in the world.

To my grandfather – I have never been able to put into words what you mean to me. I am grateful I found a way to show it to you however – by letting you watch your political pundit shows on the television.

To my girlfriends…My tremendously intelligent, amazingly crazy, marvelously beautiful, and outstandingly compassionate girlfriends. I cannot imagine my world with out each and every one of you.

Finally, I would be remiss if I did not also thank Diana Dwyre, my brilliant professor and mentor. Without you, I would not have found my calling. Your encouragement, support, and guidance made me believe in myself and all that I could accomplish.

TABLE OF CONTENTS

LIST OF TABLES

Chapter 1

INTRODUCTION

In 1991, the U.S. Housing and Urban Development Department (HUD) (as cited in HUD, 2005) released a comprehensive report detailing the regulatory barriers to the development of affordable housing. The HUD Advisory Commission on Regulatory Barriers to Affordable Housing (Commission) concluded that millions of Americans were being priced of out decent livable housing across the country and that regulatory barriers at all levels of government were in large part responsible for a widespread housing affordability crisis. In 2005, HUD reaffirmed the 1991 Commission's finding and further asserted that the housing affordability crisis was particularly acute with respect to lower income households (HUD, 2005).

Until the housing market crash beginning in late 2007 drastically reduced the cost of housing across the nation, the affordability crisis was present and more pronounced in California than in other areas of the country. Many large U.S. metropolitan areas had experienced significant increases in housing prices and rents leading up the burst in the housing bubble. Quigley and Raphael (2004) found that between 1995 and 2002, the median home price increased, in nominal terms, 65% in the San Francisco Bay Area and 54% in San Diego. Further, rents increased 76% and 61%, respectively, for a standard two-bedroom apartment in the same metropolitan areas. The California Department of Housing and Community Development (HCD) reported in May 2000 that both homeowners and renters had to allocate more of their financial resources to housing than other states. The housing burden was even higher for low-income renters in the state as more than 2.5 million low-income renters (income is less than 80% of the area median income) had to dedicate over 50% of their income to secure housing compared to the “gold standard” of applying approximately 30% of income to housing costs (HCD, 2000). The 2010 California Regional Progress Report found that, when also using the 30% of income for housing threshold, renters were more negatively affected by a high housing burden than homeowners, although large portions of each housing classification were affected, 55% and 44% statewide, respectively (California Strategic Growth Council, 2010). Between 2005 and 2008, while the amount of renters facing a high housing burden decreased or remained steady in six regions in California, the percentage of high housing burden homeowners actually increased in almost every region across the state.

The *Sacramento Business Journal* (Thomas, 2010) reported that, according to data collected before the housing market crash, the greater Sacramento area was one of the least affordable housing markets out of 451 major metropolitan markets in the U.S. Prior to the housing market crash, the median home price in the Sacramento region was $390,500 and, based on a ratio of the home value per $1,000 of income, the lack of affordability was triple that of other regions in the country with a ratio of mortgage affordability of $6,400 for every $1,000 in income (Thomas, 2010). Minimum wage earners would have to work approximately 86 hours in the Sacramento region to afford the market rate rent on a two-bedroom apartment (HCD, 2000).

While the cost of housing is only one gauge of affordability – affordability is also a factor of housing quantity, the overall distribution of housing prices, the availability of long-term financing, income distribution, laws and regulations affecting housing markets, and individual-level economic decisions related to how much housing people are willing to consume in relation to other goods – this thesis focuses on the cost of housing as a measure of affordability (Quigley & Raphael, 2004). Given the changed conditions in the housing market following the burst of the housing bubble in 2007, the thesis determined what effect, if any, and how strong an affect, local land use ordinances have on the cost of housing in a post-housing market crash environment. The remainder of this introductory chapter describes the importance and timeliness of this research, the public policy implications of a lack of affordable housing, and provides a context for the Sacramento area focus of the research. This chapter concludes with a description of the remaining four chapters.

Timeliness of the Issue: The Crash of the Housing Market

Conventional wisdom measures the successful achievement of the "American Dream" by home ownership – the ability to buy a four-bedroom, two and a half-bathroom home surrounded by a white picket fence in a quiet suburban neighborhood. Prior to the housing market crash, the same conventional wisdom stressed that buying a home was economically, and oftentimes culturally preferable, than renting (Jackson, 1985). It was this motivation that ultimately led to the housing market crash. Lenders, especially in the very risky sub-prime mortgage market, extended credit opportunities to segments of the population that did not previously have access to the long-term housing credit market or the knowledge to understand the risks involved with variable rate loans (Gerardi, 2010). Buyers signed sub-prime mortgages on the notion that housing values would continue to appreciate into the future bringing valuable equity for homeowners. The Federal Reserve System reports that more than half of the rise in boom-era ownership is because of sub-prime mortgages (*The Economist*, 2009). Home buyers in the U.S. created the housing bubble – artificially high housing costs because of the expectation that home prices would continue to appreciate and remain high into the future – because there was a demand to purchase, rather than rent, based upon cultural values and the notion of building a financial stable future from gains in equity (*The Economist*, 2009; Gerardi, 2010).

As I demonstrate in the forthcoming literature review, local land use ordinances affect the cost of housing. However, this research occurred before the largest housing market and economic crash in the country since the Great Depression. Since 2007, housing prices across the country have fallen by over 30% and California was one of a handful of states hit the hardest (*The Economist*, 2009). Nevertheless, it is important to understand how local land use ordinances influence housing prices, regardless of the real estate market cycle.

The Greater Sacramento Area

Thomas (2010) reported that by April 2010, the average home price in the Sacramento region dropped to $175,000, or less than half the average price in 2008 before the crash. Home sales in Sacramento in the last two months of 2010 increased significantly from the prior months; however, total sales were still down 7% compared to 2009 (Lewis, 2011a). Lewis (2011b) also reports that foreclosure activity is slowing in the Sacramento region. Specifically, the foreclosure rate dropped 25% from the third quarter of 2010 in Sacramento County. While these are signs the market is beginning to stabilize in the greater Sacramento area, in February 2011, the Case-Shiller home price index was still predicting home prices to drop in the region by another 8.3%. However, housing market experts presume home prices in the region will stabilize by the end of 2012 and other regions in California such as San Francisco are already showing signs of stabilization (Shaw, 2011).

Table 1 provides data on the decline of the median home price in parts of the greater Sacramento area since 2007. Some areas, such as Davis, have only experienced a relatively modest decline in housing costs, 16.1%, when compared to other areas in the region. Parts of the City of Sacramento have experienced a 62.4% drop in the median price of a home. Table 2 presents foreclosure data for the same 29 areas in the greater Sacramento region.

Table 1

Annual Home Resale Data by Defined Area

CITY/COUNTY	MEDIAN SALES PRICE				DECREASE IN MEDIAN SALES PRICE
	2007	2008	2009	2010	
Arden Arcade	$330,000	$224,000	$180,000	$179,500	45.6%
Auburn	$386,750	$335,000	$268,000	$271,500	29.8%
Citrus Heights	$283,500	$200,000	$165,500	$160,500	43.4%
Davis	$524,500	$489,000	$430,750	$440,000	16.1%
El Dorado County	$355,000	$257,750	$210,000	$191,000	43.0%
El Dorado Hills/Cameron Park	$524,500	$440,000	$393,500	$375,000	28.5%
Elk Grove	$350,000	$250,000	$215,000	$212,500	39.3%
Fair Oaks/Carmichael/Orangevale	$360,000	$270,000	$227,000	$221,000	38.6%
Folsom	$458,000	$404,000	$351,000	$333,000	27.3%
Galt	$315,000	$205,000	$165,000	$170,000	46.0%
Granite Bay/New Castle	$734,000	$607,500	$510,000	$472,500	35.6%
Lincoln	$401,000	$315,000	$265,000	$257,000	35.9%
Loomis	$450,000	$394,500	$325,000	$332,500	26.1%
North Highlands/Rio Linda/Elverta	$265,000	$160,000	$137,000	$135,000	49.1%
Placer County	$393,500	$313,000	$253,000	$240,000	39.0%
Rancho Cordova	$327,000	$231,000	$212,000	$200,000	38.8%
Rocklin	$410,000	$325,750	$285,000	$269,000	34.4%
Roseville	$385,500	$320,000	$270,000	$250,000	35.1%
Sacramento City C	$430,000	$390,000	$360,000	$348,000	19.1%
Sacramento City N	$344,500	$238,000	$195,000	$189,000	45.1%
Sacramento City NW	$218,750	$100,000	$78,000	$82,250	62.4%
Sacramento City S	$263,000	$127,000	$103,000	$115,000	56.3%
Sutter	$265,000	$195,000	$158,000	$159,250	39.9%
Vineyard South Sac	$295,500	$182,000	$155,000	$160,000	45.9%
West Sacramento	$335,000	$261,000	$217,250	$208,000	37.9%
Wilton/Rancho Murieta	$535,000	$425,000	$370,000	$320,000	40.2%
Woodland	$355,000	$250,000	$215,000	$215,000	39.4%
Yolo County	$485,000	$422,000	$330,000	$340,000	29.9%
Yuba	$230,000	$173,500	$142,000	$140,000	39.1%

(SACOG, 2011)

Table 2

Annual Notices of Default and Foreclosures by Defined Area

	NOTICES OF DEFAULTS				NOTICES OF FORECLSOURES			
CITY/COUNTY	2007	2008	2009	2010	2007	2008	2009	2010
Arden Arcade	502	638	779	683	212	437	378	370
Auburn	117	156	293	252	31	100	102	149
Citrus Heights	974	1,282	1,422	1,041	411	867	688	698
Davis	11	24	37	40	5	6	6	21
El Dorado County	218	350	500	427	84	175	247	249
El Dorado Hills/Cameron Park	464	681	1,051	793	180	348	368	409
Elk Grove	1,928	2,464	2,753	1,942	834	1,781	1,335	1,173
Fair Oaks/ Carmichael/Orangevale	1,061	1,238	1,518	1,337	339	746	636	734
Folsom	376	561	780	637	126	284	409	309
Galt	463	582	567	407	174	434	298	275
Granite Bay/New Castle	150	244	344	285	46	115	116	111
Lincoln	596	946	1,144	797	233	610	531	516
Loomis	86	119	170	143	19	63	48	64
North Highlands/Rio Linda/Elverta	2,454	3,023	3,051	2,195	1,135	2,313	1,527	1,479
Placer County	248	381	565	479	99	190	223	248
Rancho Cordova	639	937	1,045	826	267	643	523	528
Rocklin	472	617	858	705	191	419	305	345
Roseville	1,162	1,557	2,005	1,568	468	959	751	824
Sacramento City C	175	190	264	350	64	94	148	113
Sacramento City N	1,655	2,351	2,399	1,832	666	1,739	1,225	1,206
Sacramento City NW	1,168	1,583	1,380	919	565	1,385	841	687
Sacramento City S	3,258	4,443	4,081	2,655	1,464	3,626	2,308	1,945
Sutter	755	1,133	1,221	965	326	811	622	569
Vineyard South Sac	2,067	2,794	2,824	1,989	911	2,161	1,401	1,361
West Sacramento	517	782	911	637	214	501	417	352
Wilton/Rancho Murieta	151	194	250	168	47	125	95	90
Woodland	423	668	725	493	150	473	340	306
Yolo County	119	214	234	197	30	133	105	126
Yuba	802	1,216	1,313	914	370	893	760	667
TOTAL	23,011	31,368	34,484	25,676	9,661	22,431	16,753	15,924

(SACOG, 2011)

Negative Consequences Resulting from a Lack of Affordable Housing

A lack of affordable housing has numerous negative problems, including longer commute times and corresponding environmental affects, loss of scarce time and financial resources, and hampered economic growth (HCD, 2000). Land use regulations have an important role in protecting the natural environment and the health and welfare of local governments and the citizens they serve. However, to the extent that decision-makers care about the cost of housing as a matter of important public policy, the study of regulatory barriers to determine the extent and depth of their effects on affordable housing is in order.

The development of affordable housing is in fact a public policy goal for the State of California. The Legislature has codified this priority in law in various sections of the code, including Government Code §65580, which states, "the availability of housing is of vital statewide importance, and the early attainment of decent housing and a suitable living environment for every Californian, including farmworkers, is a priority of the highest order." In an effort to assist local governments with the provision of safe and affordable housing, the Legislature created the Housing Rehabilitation Loan Fund in Health and Safety Code §50661 and states, "the Legislature finds and declares that the rehabilitation of existing housing is necessary to the continued viability of neighborhoods, the elimination of health and safety hazards, the prevention of the overcrowding and the continued availability of a dwindling stock of low-cost housing." In 2008, Senate President Pro Tempore Darrell Steinberg introduced Senate Bill 500, which aimed to create a state fund for local assistance loans and grants to further the development of safe and affordable housing. Former Governor Arnold Schwarzenegger, through efforts at the California Housing and Community Development Department, committed staff time and resources to identifying a permanent source for affordable housing development. While both Senator Steinberg and Governor Schwarzenegger's recent efforts were not successful (SB 500 did not move through the legislative process and become law and HCD's search for a permanent source for affordable housing is ongoing), they highlight the State's commitment to finding solutions to the housing affordability problem. Because state policy promotes affordable housing, policy and decision-makers need to know more about which factors – including local land use regulations – drive the cost of housing.

Research Question and Organization of Thesis

This thesis is an analysis of the relationship between the cost of housing in the greater Sacramento area, a region of six counties and 16 of the cities within those counties in northern California, and local land use ordinances in a post-housing market crash environment.

This thesis is organized into four additional chapters. Chapter 2 is a review of the existing literature on the effects various types of regulatory barriers, in particular local government land use regulations, have on the cost of housing. I also review the body of research on the other factors of the cost of housing including construction costs, labor costs, and the availability of land. The chapter concludes with conclusions about the gaps in the understanding of the issue and how this thesis will assist in filling the knowledge void.

Chapter 3 details the methodology used for my research and analysis. I use an Ordinary Least Squares (OLS) regression model to test and analyze the effect local land use ordinances have on the cost of housing. In Chapter 3, I discuss the data and sources used in this thesis including a detailed description of the factors expected to cause variation in the cost of housing, descriptive statistics for each variable, and correlation coefficients between the multiple independent variables. DataQuick, a national provider of independent real estate data, collected the dependent variable data, the per unit cost of a home, during five quarters between 2008 and 2009, beginning just as the housing market was failing (SACOG, 2011). The key explanatory variable is a proxy for the strength of the local land use regulatory environment within each local jurisdiction. It was created for this thesis project by dividing the number of building permits a city or county issued in the 2008 calendar year by one year's worth of the Regional Housing Need Allocation (RHNA) that the State mandates cities and counties zone for every eight years. I also address how I dealt with potential issues with the analysis such as multicollinearity or heteroskedasticity.

Chapter 4 provides the results of the analysis and which functional form was chosen for the regression model. I provide my conclusion in Chapter 5 and I present the implications of my findings. To conclude, I summarize the results and how they compare to the regression model as well as what they mean from a policy perspective.

Chapter 2

LITERATURE REVIEW

Many factors affect the cost of a home, including, but not limited to, the availability of land, the cost of construction materials and labor, the physical characteristics of a house such as the number of bedrooms, bathrooms, and the size lot it sits on, and neighborhood characteristics such as whether or not a home is part of a homeowners association. Furthermore, the overall housing stock, the availability of long-term financing, and laws and regulations affecting the housing market can add even more to the cost of a home. In the following literature review, I summarize existing research findings regarding the effect local land use ordinances have on the cost of housing and whether these regulations, therefore, affect housing affordability by increasing the cost of housing. The first two sections of the literature review regard the issues of land availability and construction costs. The sections that follow focus on different types of land use regulations and how they affect the cost of housing. The literature on land use regulations follows these categories: 1) studies that examine multiple types of land use ordinances simultaneously by looking at the regulatory environment as a whole; 2) studies specific to zoning codes; and 3) studies specific to urban growth boundaries.

Land Availability

According to Euchner and Frieze (2003), land availability is one of three factors in housing cost and production, in addition to regulations and construction costs. Two studies on land availability in Boston, Massachusetts concluded there was sufficient land available to meet the housing needs for the greater Boston area (Euchner & Frieze, 2003; Glaeser & Ward, 2006). The California Department of Housing and Community Development (HCD) (2000), in a survey of all cities and counties in the state, found that California has more than enough available land (even considering lands where development cannot occur because of environmental, geographical, and service capacity reasons) to provide housing for all current and future residents. Specifically, HCD found that within the 35 metropolitan counties in California, 8 million acres of developable land suitable for housing production exist, three times the amount of land necessary to build housing to meet the State's needs by 2020.

While land availability varies by region, the most constraints on land occur in Los Angeles, Orange, and Santa Clara counties. Other counties will face land constraint issues after 2020, including Alameda, Contra Costa, San Diego, and Ventura counties (HCD, 2000). However, the HCD survey data is over a decade old at the time of this writing. Population and growth trends over the last 10 years could have underestimated the demand for land. HCD asserts that local officials could alter land availability and development capacity to increase or decrease housing production through land use ordinances that set housing development densities. If local governments zoned land at higher densities, the 8 million acres available for development as of May 2000 could accommodate more housing. In summary, none of the literature considered for this thesis found evidence that a lack of available land contributes to the housing affordability crisis. If there is more than enough total land in the state to provide adequate housing supply, the literature suggests that construction costs are too high or that local governments are responsible for regulation that limits the use of this available land for housing development.

Construction Costs

A study of 37 cities in the U.S. compared data on construction costs and affordability measures to assess whether there was a gap between the sale price of housing and the actual cost of building housing (Glaeser & Gyorurko, 2003). Results suggest that while a majority of houses sell at near their construction costs, there are areas of the country with unusually expensive housing costs. Researchers believe that regulatory barriers created large gaps in the actual cost of constructing housing and the housing prices. Through a hedonic pricing model, Glaeser and Gyoruko did not find evidence that higher marginal costs of land led to home sale prices greater than the actual construction costs.

The regression analysis conducted by Glaeser and Gyouuko found a strong correlation (82%) between housing price and land use controls and it is statistically significant at the 95% confidence level. The National Association of Home Builders (1998) reports that survey data from home builders in 42 housing markets across the nation regarding regulatory requirements indicate government regulations add approximately 10% to construction costs, which homebuilders then pass on to the homeowner in the cost of the home. The existing body of research does not point to construction costs as the main culprit for the rising housing costs and decreases in affordability before the 2007 housing market crash.

Local Land Use Regulations

The literature indicates that construction costs and the availability of land were not the primary suspects behind the increasingly unaffordable housing prices in the U.S. before the housing market bubble burst. Thus, a logical assumption is that local government land use regulations are barriers hindering the development of housing by decreasing available land supply and increasing demand.

While local land use regulations may have negative externalities on the cost of housing, the regulation of land use serves a positive purpose in society. Dating back to 1863 when the State of California passed the first land use regulation law allowing San Francisco to enact, “all regulations which may be necessary or expedient for the preservation of the public health and the prevention of contagious disease” (Fulton & Shigley, 2005, p. 41), California’s cities and counties have been enacting land use regulations for the protection of the heath and safety of people and the environment. Local land use regulations take many forms, from zoning ordinances that separate residential land from industrial uses or dictate minimum lot size for development, to more specific types such as subdivision ordinances that require specific streets and roads, utilities, and other infrastructure requirements for housing. Cities and counties enact land use regulations to shape the character of their communities and to organize future growth. While some cities and counties have and continue to use land use regulations to exclude certain populations – i.e., to segregate populations by class or race – land use regulations are not inherently negative, but merely tools that can be used for both good and bad purposes.

Studies on Multiple Simultaneous Land Use Regulations

Based on data from two statewide surveys in California, Levine (1999) found that by 1992, communities in California had over 1,500 local land use ordinances in place. Using the survey data, Levine developed a model to test net housing change – all new housing units after subtracting all demolished units. Results suggest that for every new growth control measure enacted between 1979 and 1988, net housing in a jurisdiction declined by 884 units. The net loss associated with enactment of a growth control measure has a larger affect on a smaller jurisdiction that builds less housing overall than on a large jurisdiction that constructs a larger number of housing units. Levine notes, however, that net housing loss in a jurisdiction does not necessarily suggest that the housing units were not built. Levine found that displacement accounted for at least 9% of the loss of all new housing units in a jurisdiction.

Malpezzi and Green (1996), in an analysis of whether the bottom of the housing market works efficiently and effectively in 59 U.S. metropolitan areas, including Sacramento and four others in California, found that when local governments enact strict land use measures, the supply of low-income housing constricts and prices increase. Specifically, they found that rents would increase 17%, home values would increase

51%, and lower homeownership rates by 10% when moving from a lightly to a heavily regulated environment.

Malpezzi and Green (1996) created an index of the number of local land use ordinances, ranging from 13 to 29 per jurisdiction, from U.S. Census American Housing Survey data. The regulation index created for this analysis is statistically significant with an R-squared of 0.82. Quigley and Raphael (2004) reported similar findings from an examination of factors such as changes in income distribution, rental quality, land use regulations, zoning, and growth control ordinances on rental burdens. This study, which used data for U.S. households, not specific to a state or metropolitan region, found evidence that housing is unaffordable due to the high cost of housing, not lower incomes, caused by government regulations hindering development. Finally, Schilling, Sirmans, and Guidry (1991) found evidence from a data set assessing new single-family residential land values over a three year period in 37 states across the U.S. that comprehensive land use controls have a statistically significant affect (at the 95% confidence level with an R-squared of 0.64) on aggregate demand on housing, and that for every land use control measure adopted, demand goes down 0.09%.

Somerville and Mayer (2003) studied the effects of local land use regulations on the "filtering" process in six U.S. metropolitan areas including Los Angeles, San Francisco, and San Jose in California. Filtering is the process whereby housing units move in and out of income categories as the quality of the housing increases or decreases. Their research indicates that greater regulation puts constraints on new development;

therefore, landlords will improve existing housing units to meet increased demand so the units move up the quality and income ladder making them unavailable for low-income segments of the population. Most of the regression specifications used in the study produced negative and statistically significant findings that each additional local land use regulation resulted in a decline in residential construction by 7%.

An additional study comparing new construction data against varying degrees of land use regulation in 44 U.S. metropolitan areas found that land use regulations increase the length of the development process. Longer development processes constrain development and cut housing production (Mayer & Somerville, 2000). Specifically, they found that an increase from 1.5 months to 4.5 months for obtaining development approval and the addition of two growth control measures decreased construction by 45%.

These studies suggest that local land use regulations result in higher housing costs. Other studies, however, question this relationship. The Public Policy Institute of California (PPIC) questions the depth of the effect government regulation has on housing costs in its report on a survey of 279 California cities (as cited in Lewis & Nieman, 2002). Lewis and Nieman (2002) found that, on average, cities only adopted 2.7 out of the 16 regulations measured. They concluded that other factors such as the overall health of the California political economy and the desirability of living in the state were at fault for high housing costs.

Studies on Zoning Codes

Most of the above studies focused on multiple types of land use regulations simultaneously; however, a few studies focus on specific types of measures. Euchner and Frieze (2003) conducted a “buildout” analysis in 155 communities in the greater Boston area to gather evidence on the impact of zoning codes. Results indicate that 95 of the local governments require one-acre minimum lots and minimum lot size requirements and other zoning ordinances suppress the development of affordable housing. Glaeser, Schuetz, and Ward (2006) add to these results with data that the median priced home in the Boston area would be as low as $276,100, rather than the median priced home of $431,900, if local governments decreased the minimum lot size ordinance by just ¼ acre.

They also found that land use regulations result in a decline of building permits issued, which can affect housing prices by 23% to 36%. These regression results for various types of land use ordinances were statistically significant at the 90%, 95%, and 99% confidence levels. In a study of six metropolitan areas in the U.S., including the Sacramento region, Chakraborty, Knapp, Nguyen, and Shin (2009) report that zoning hinders development of housing, specifically multi-family housing, which negatively impacts low-income populations more significantly that middle- to high-income segments. Ultimately, as HCD (2000) reports, local governments can use zoning to either spur or obstruct the development of housing.

Studies on Urban Growth Boundaries

A majority of studies of Portland, Oregon's urban growth boundary (UGB) conclude that government regulations have not caused increases in housing costs. Portland's UGB set limits on where growth and development can occur. First, Phillips and Goodstein (2000) found that while the UGB did result in increased land costs, it also affected the density of development. Housing units on smaller lot sizes counteract the increase in cost of the land. Overall, the study found weak evidence that the UGB directly increased the cost of housing. They found that physical climate and the construction cost index were significant at the 5% error level while the regulatory index was significant at the 10% error level but possible omitted variable bias makes the result unreliable.

A similar study found that during the period of 1980-2000, housing prices only increased as a result of the UGB from 1990 to 1994 (Downs, 2002). Finally, an additional regression study found that the UGB had little or no effect on where housing was built in the Portland area, which suggests that the land use regulations do not constrain supply and increase the cost of housing (Jun, 2006). In contrast, Stanley and Mildner (1999) conclude that the UGB is responsible for a rise in housing costs in the Portland area. Specifically, they assert that because the amount of developable land has decreased, Portland is facing a housing shortage to meet current and future population growth, as even in the face of increased densities in the area, housing costs have still increased. However, these results are now over 20 years old whereas Jun performed the regression study only five years ago.

Conclusion from Existing Literature

Local land use regulations can increase the cost of land, which in turn increases the cost of housing. Land use regulations can also limit the supply of housing and indirectly affect housing prices by raising the price of land and subsequently improving the quality of housing units available. However, the research is not conclusive in demonstrating that these land use regulations are widespread barriers to the construction of affordable housing. Research has come to mixed results as to whether or not local growth control measures have been effective in restricting development and there is no consensus among the experts. However, a majority of the evidence seems to support a relationship between regulation and an increase in housing costs. As such, further research is necessary.

Schill (2005) noted that the impacts of various types of land use regulations are cumulative; therefore, future research should attempt to quantify the effects of multiple simultaneous regulations on housing. Moreover, several of the studies indicated that their results were merely suggestive and not definitive because of methodological limitations. For instance, many studies had only moderately robust sample sizes or relied on indicators that could not be controlled for all confounding effects and independent variables. Future research should aim to improve methodology and fill in research voids existing in the current body of literature.

The following regression analysis creates a new proxy for stringency of the local land use regulatory environment, testing multiple ordinances simultaneously within the greater Sacramento area. The data set is very robust with over 33,000 units of measurement. Therefore, it will contribute to the existing body of research and hopefully clarify some of the contradictory findings to date.

Chapter 3

METHODOLOGY

This chapter includes a discussion of the theoretical model developed for the regression analysis, including an explanation of the broad causal factors that affect the dependent variable, a justification of the selected dependent and explanatory variables, and the anticipated direction of the effect each independent variable will have on the dependent variable.

Dependent Variable, Theoretical Model, and Expected Effects

The dependent variable, the cost of a home in the greater Sacramento area, is a measure of housing affordability. The previous literature supports my use of housing affordability as the dependent variable in regression studies. Housing affordability reflects several factors, including the overall stock of housing; the distribution of housing prices; long-term financing; income, laws, and regulations affecting the housing market; and individual economic choices. However, this thesis focuses on the cost of housing to measure affordability. The theoretical model for the regression analysis includes the price of housing as a function of house size characteristics, house structural characteristics, house vintage characteristics, neighborhood characteristics, foreclosure characteristics, location characteristics, and land use ordinance characteristics as general causal factors that affect the cost of housing. The earlier literature review showed how regression research supports my choices of independent variables that affect the cost of housing.

Cost of Housing = f [house size characteristics, house structural characteristics, house vintage characteristics, neighborhood characteristics, foreclosure characteristics, location characteristics, local land use ordinance characteristics] where, (expected direction of effect denoted in parentheses):

Cost of Housing = f [home sales data for the greater Sacramento area]

Local Land Use Ordinance Characteristics = f [proxy for land use ordinance stringency: number of building permits issues by a city or county towards meeting required regional housing need and state housing goals (-)]

House Size Characteristics = f [house square feet (+), lot square feet (+)]

House Vintage Characteristics = f [age (-)]

Foreclosure Characteristics = f [bank owned property (-)]

House Structural Characteristics = f [the number of bedrooms (?), the number of full bathrooms (?), the number of half bathrooms (?), the number of stories (?), presence of a pool (+), presence of garage (+), presence of a fireplace (+), septic system (?), the type of exterior (?), type of roof (?)]

Neighborhood Characteristics = f [homeowners association (?)

Location Characteristics = f [zip code where house is located (?)]

Independent Variables

Local Land Use Ordinances

The key explanatory variable that is the focus of this thesis is the potential effect local land use ordinances have on the cost of housing. In the regression equation, I created a proxy for the stringency of local land use ordinances by city and county with data on single- and multi-family building permits issued in the 2008 calendar year in cities and counties in the greater Sacramento area. California law (Government Code §65580) mandates that the Department of Housing and Community Development (HCD) generate a statewide housing need number to provide housing for the existing population and future growth. HCD allocates the statewide housing need number to Councils of Governments (COGs), which are regional planning agencies, known as the regional Housing Need Allocation (RHNA). The COGs further allocate housing needs to each city and county within their region. State law requires each city and county to update the housing element of its general plan and to zone for the housing need in its jurisdiction every eight years.

While state law does not mandate that cities and counties ensure enough housing is built to meet the housing needs, the intent of the law is to ensure cities and counties do not hinder the construction of housing for all income levels. Cities and counties can make home building easy or difficult through the regulatory environment. Therefore, the number of actual building permits issued in a given calendar year, in this case 2008, divided by one year's worth required regional housing need is a good proxy for the stringency of an individual jurisdiction's land use regulatory environment. If a city or county has issued permits for 80% of the needed housing, I predicted it is in part due to a lenient regulatory environment whereas a jurisdiction that has only issued building permits to construct 7% of the housing need likely has a strict land use regulatory environment. Because other demand trends in the real estate market that effect the cost of housing, such as thriving versus static housing markets due to consumer demand to live in a certain region in the state (i.e., costal areas over rural areas), are not included in the model, the regression analysis provides an estimate of how much of the variation in the cost of housing is predicted by the model. Further, I predicted that the fewer homes being built in the jurisdiction leads to higher prices resulting from a restricted supply. Therefore, I expected the key explanatory variable of required regional housing need to have a negative directional effect on the dependent variable.

Table 3 provides information on the number of building permits by city and county within the greater Sacramento area, each jurisdiction's 7.5-year regional housing needs allocation, and the percentage of building permits issued in 2008 to meet one year of RHNA. I excluded the cities of Colfax, Galt, Isleton, Live Oak, South Lake Tahoe, Wheatland, Winters, and the County of Sutter from the table and the regression analysis as there was either no information provided by the Multiple Listing Service (MLS) data used for this thesis or too few occurrences within the data to support the analysis. I organized the table from lowest to highest with respect to a city or county issuing building permits to meet the RHNA.

Yuba City, Sacramento County, and Marysville are the three lowest achieving jurisdictions with respect to issuing enough building permits to meet their share of the regional housing need. These findings are consistent with conventional wisdom about growth in the greater Sacramento area. The Sacramento Area Council of Governments

(SACOG), the COG for the greater Sacramento area, allocates regional housing needs based on population growth projections. Yuba City and Marysville are not burgeoning high-growth urban areas, which provides insight as to why they are not issuing building permits consistent with the regional need. Sacramento County, on the other hand, is a high-growth area. It received the largest share of the regional housing need of all six counties in the region and the second highest total next to the City of Sacramento. Meeting a high RHNA allocation is more difficult than meeting a lower target, perhaps why the County shows up in the bottom three of the data set.

The top three localities are Placer County, the City of Roseville, and the City of Woodland. Again, these findings are consistent with growth trends in the region. The County of Placer and the City of Woodland both received a relatively small regional housing needs allocation compared to other jurisdictions making it easier to meet their need. The City of Roseville is a high-growth area, one of the largest suburbs outside Sacramento. While it received a high housing need allocation, the fourth highest allocation for all cities in the area, the demand to live in the city remains high even after the housing market crash.

Table 3

Building Permits and RHNA Data by City and County

CITY/COUNTY	BUILDING PERMITS (BP)	7.5-YEAR RHNA	1-YEAR RHNA	% of BP to 1 YEAR RHNA in 2008
Yuba City	54	4741	632	9%
Sacramento County	211	15160	2021	10%
Marysville	2	137	18	11%
Lincoln	165	10095	1346	12%
West Sacramento	95	5347	713	13%
Placerville	8	388	52	15%
Yuba County	157	6636	885	18%
Davis	14	498	66	21%
Yolo County	40	1402	187	21%
Auburn	11	307	41	27%
Rancho Cordova	377	10395	1386	27%
Folsom	132	3601	480	27%
Loomis	8	148	20	41%
El Dorado County	484	8044	1073	45%
Elk Grove	775	11314	1509	51%
Citrus Heights	20	262	35	57%
Rocklin	178	2238	298	60%
Sacramento	1619	17649	2353	69%
Woodland	189	1871	249	76%
Roseville	984	8933	1191	83%
Placer County	312	2113	282	111%

House Size Characteristics

The size of the house and the land it sits on is a causal factor in the cost of housing. Larger lots demand a higher price, which is shown in the cost of housing. The larger the house in terms of square feet, the more raw materials, time, and labor required to build it, which shows in the cost of a home. Therefore, as the square footage of the home and the square footage of the lot it is built on increase, I anticipated the price of the home would increase having a positive affect on the dependent variable.

House Vintage Characteristics

The age of a house affects the selling price as all of the structural characteristics, without remodeling and replacing, lose value over time. The older a home is, the less it costs, and newer homes are more valuable. An important caveat is that neighborhood trends change over time and an older home in a more established neighborhood might be more valuable or preferred by certain buyers in the housing market. The theoretical model does not take into consideration personal preference. Therefore, I expected that as a home aged, it lost value. In other words, the newer the home, the higher the cost, signifying a positive affect on price.

Foreclosure Characteristics

When a homeowner loses a home to foreclosure and the bank takes on ownership, home prices are negatively affected. Foreclosure properties are often physically damaged or neglected during the foreclosure process, which lowers home values in the surrounding neighborhood. Additionally, foreclosures can cause an imbalance in the supply and demand within a neighborhood housing market. As a result of foreclosures in a neighborhood, other homeowners experience reduced housing values and are more likely to default, which creates a spiral affect further increasing foreclosure rates and reduced property values. Therefore, the predicted effect on the bank owned, or Real Estate Owned (REO), explanatory variable on the cost of a home is negative in the regression equation.

House Structural Characteristics

The effect of structural aspects on the cost of a home is uncertain. The regression holds overall square footage of a home constant. As the number of bedrooms or bathrooms increase and the size of the home remains unchanged, the size of the rooms decrease which likely has a negative effect on the cost of a home. Buyers tend to prefer, even in smaller homes, open and spacious living areas. Buyers are likely to prefer a smaller number of larger bedrooms than a larger number of smaller bedrooms within their price range. The expected directional effect of the number of stories of a home is unknown. None of the previous research reviewed detailed the structural characteristics of a home in a way to provide insight into this issue and the number of stories of a home may or may not be desired by potential buyers depending on personal preference.

I expected the presence of specific structural characteristics including a pool, a garage, and a fireplace to have a positive affect on the price of a home as these are added features that provide increased value to a home. Sewer connections can be more expensive should local governments have high sewage service rates, but a poorly maintained septic system can also have high costs associated with it. It ultimately comes down to buyer preference and health of the specific home's infrastructure and, as such, it is difficult to say what the effect may be on the dependent variable. While the projected effect of a given home's type of exterior is unknown, as personal preference dictates the value of a brick exterior over vinyl, for example, certain types of roofing have a positive affect on the value of a home. For instance, metal roofs are more expensive to build and have a longer life span than a shake roof. A more durable roof has a significant positive effect on the dependent variable than a roof of lesser quality.

Neighborhood Characteristics

The variable used to proxy neighborhood characteristics is a dummy variable indicating whether the home is within a homeowners association or not. The expected direction of the effect of this explanatory variable on the dependent variable is unknown. While some potential buyers will not want to pay additional fees into an association, others might be looking for a home with this feature and it once again comes down to personal choice.

Location Characteristics

I created 61 dummy variables representing local effects on the cost of housing. Each dummy variable represents a zip code in the greater Sacramento area within the data set. The variables rely on zip codes as boundaries to determine dependent variable effects as they provide a more accurate reflection of housing markets within a city or county than analyzing housing markets within an entire jurisdiction. Certain areas within a community are more valuable because of their proximity to good schools, jobs, amenities, and parks and open space. There are low-, middle-, and upper-income neighborhoods within a city or county; therefore, zip code data provides a more micro-level analysis of the cost of housing and location effects. These dummy variables allow comparisons by holding constant location effects.

I withheld the 95819 zip code from the regression analysis to provide a basis of comparison. The 95819 zip code is within the City of Sacramento, specifically East Sacramento including the Riverpark neighborhood and California State University, Sacramento, so the results of the regression indicate how home values increase or decrease compared to homes in the 95819 zip code. I chose to use this zip code for comparison purposes because it includes well established neighborhoods where the homes are not brand new yet appear well-kept and within the median price range of the market. Residents have easy access to amenities such as open space and parks like the American River Bike Path, as well as schools, grocery stores, and other shopping. The 95819 zip code includes what I consider typical established Sacramento neighborhoods which seem to be in demand regardless of other trends in the housing market.

Data

Data for the regression analysis comes from a few key sources – MLS Data Quick from 2008 supplied data for the dependent variable and all independent variables excluding the key explanatory variable. I gathered information on building permits by jurisdiction SACOG and the Construction Industry Research Board (CIRB). SACOG (2011) is the state designated regional agency charged with implementing the regional housing needs allocation for the greater Sacramento area. As such, it collects data on housing needs and population growth trends and uses these data to project and assign housing growth to cities and counties in the region. The CIRB is a non-profit association, which collects statistical data on the construction industry and housing construction in

California. I invested a significant amount of time into cleaning up the data set and this process resulted in a total of 33,561 usable observations for the analysis. I created three tables to present information on the dependent and independent variables used in the regression equation including the source of the data, descriptive statistics that will allow for a better understanding of the results of the regression analysis, and simple correlation coefficients between all of the key explanatory variables.

The three charts separate the dependent variable and the categories of independent variables consistent with the theoretical model described above including variables used to proxy local land use ordinance characteristics, house size characteristics, house vintage characteristics, foreclose characteristics, structural characteristics, neighborhood characteristics, and location characteristics. The variable used to proxy land use stringency is the percentage of building permits issued in a jurisdiction to meet the required regional housing need and is a continuous variable ranging between 9% and 111%. The square footage of the house and lot the house sits upon are proxies for house size characteristics and are continuous in nature. I used age of the home to proxy the house vintage characteristics in continuous format. I created a dummy variable to proxy the foreclosure characteristics representing whether a house is bank owned or not. The number of bedrooms, full bathrooms, and half bathrooms are three explanatory variables under the structural characteristics category that are continuous in nature while dummy variables signify whether an observation is one-story or more, has a garage, fireplace, and pool, whether it is on a septic system or has sewer connections, the type of exterior (e.g., brick, lap, vinyl, or wood), and what type of roof it has (e.g., metal, shake, slate, or tile). I also created a dummy variable indicating whether a house is in a homeowners association to proxy neighborhood characteristics. Finally, I developed 61 dummy variables for each of the zip codes in the greater Sacramento area in the data set to control for location effects.

Table A1 in the Appendix provides the source of the data for each variable and a description of the dependent and explanatory variables, how they were created, and their type (i.e., continuous or dummy variable). Table 4 provides descriptive statistics for the dependent variable and all explanatory variables including the zip code dummies. I include only the portion of the table related to the key explanatory variables while the entire table, including statistics for the zip code dummies, can be found in the Appendix. The table provides the minimum and maximum values for each variable as well as the mean and standard deviation. I provide a portion of the table for the key explanatory variables while the entire Table A2 including the zip code dummy variables is in the Appendix.

Table A3 shows the results of correlation analysis of all key explanatory variables used in the regression equation and can be found in the Appendix. While the first two tables provide data on the 95819 zip code dummy variable, the sewer dummy variable, the wood exterior dummy, and the tile roof dummy, these independent variables do not appear in the correlation analysis as they were left out of the regression analysis and serve as the basis for interpreting the results of the other dummy variables in the same category. Multicollinearity is a potential and somewhat common error that can occur within a regression equation. Multicollinearity exists when two explanatory variables move too closely together as they are significantly related to one another and is a violation of one of the classical assumptions that “no explanatory variable is a perfect linear function of any other explanatory” (Studenmund, 2006, p. 246). As one changes, the variable it is significantly related to has a tendency to change as well. As a result, the statistical software used for the regression analysis cannot identify which of the correlated variables causes the change in the dependent variable (Studenmund, 2006, pp. 245-273). While multicollinearity exists in every regression equation to a small extent, this analysis includes a review of simple correlation coefficients to determine the severity and the direction of the relationship, the potential correlation is between the key explanatory variables. Results of this analysis, included in Table A3, indicate that none of the independent variables are strongly correlated (threshold for concern is an absolute value greater than 0.80).

Table 4

Descriptive Statistics

VARIABLE LABEL	MINIMUM VALUE	MAXIMUM VALUE	MEAN	STANDARD DEVIATION
Dependent Variable				
Sales Price	6,053	3,500,000	255,554	168,611
Independent Variable: Land Use Ordinance Characteristics				
Required Regional Housing Need	0.090	01.110	0.503	0.250
Independent Variables: House Size Characteristics (in thousands)				
House SQFT	0.400	11	1.796	0.781
Lot SQFT	0	866,408.400	189,611.670	8.223
Independent Variables: House Vintage Characteristics				
Age	1875	2009	26.521	122.072
Independent Variable: Foreclosure Characteristics				
REO	0	1	0.612	0.487
Independent Variable: Structural Characteristics				
Bedrooms	0	9	3.390	0.804
Full Bathrooms	0	7	2.090	0.678
Half Bathrooms	0	5	0.220	0.426
1 Story	0	1	0.671	0.470
Garage	0	1	0.802	0.399
Fireplace	0	1	0.781	0.414
Pool	0	1	0.138	0.345
Septic	0	1	0.028	0.166
Sewer	0	1	0.972	0.166
Brick Exterior	0	1	0.079	0.270
Lap Exterior	0	1	0.070	0.255
Vinyl Exterior	0	1	0.026	0.160
Wood Exterior	0	1	0.171	0.377
Metal Roof	0	1	0.004	0.064
Shake Roof	0	1	0.056	0.229
Slate Roof	0	1	0.413	0.492
Tile Roof	0	1	0.413	0.492
Independent Variables: Neighborhood Characteristics				
HOA	0	1	0.151	0.358

Chapter 4

RESULTS

In this chapter, I present the results of the regression analysis. I also discuss testing and choosing the correct functional form and testing for and addressing heteroskedasticity. Testing different functional forms is important to ensure accurate regression results. Relationships between the dependent and independent variables can take many shapes. Some relationships are linear, some are curved, while others can peak at a given point and then decrease (Studenmund, 2006, p. 203). I tested three functional forms – linear, linear-quadratic, and log-linear – to determine the relationship of the independent variables on the cost of housing. Also, because regression models cannot estimate the behavior of the variables perfectly – regression equations almost always have omitted independent variables – a regression equation includes an error term to account for all the variation in the dependent variable that cannot be explained by the independent variables (Studenmund, 2006, p.10). Heteroskedasticity exists when the error terms do not have a constant variance or when error terms have a larger or smaller variance for some values of the dependent or independent variables. Heteroskedasticity can cause the regression to incorrectly estimate the variable coefficients and, if present, can be addressed in the regression analysis as discussed in further detail below.

Table 5 presents the results of the regression analysis for three functional forms, Table 6 provides the corrected regression results after correcting for heteroskedasticity, and Table 7 contains the final key explanatory variables that have a significant effect on home prices in the greater Sacramento area. The tables provide only partial results, excluding data on the zip code variables. Full tables including zip code variables are included in the Appendix. I conclude this chapter with a discussion about the overall fit of the regression equation to the theoretical model, the strength of the statistically significant explanatory variables on the dependent variable, and whether the direction of the effects of the coefficients meet the directional expectations.

Functional Form

To choose the correct functional form for the regression equation, I performed a linear, linear-quadratic, and log-linear regression analysis. The functional format of the regression equation should be chosen based on the underlying theory of the model (Studenmund, 2006, p. 232). The consequences of using an incorrect functional form include incorrect results that identify key explanatory variables as insignificant, the incorrect direction of influence of an independent variable on the dependent variable, and results that lead to a generally incorrect interpretation of the data (Studenmund, 2006, p. 203-233).

In a linear functional form, the relationship between the independent variables and the dependent variable has a constant slope. A one-unit increase in Xi (independent variable) causes a one-unit change (either increase or decrease) in Y (dependent variable) holding all other independent variables constant (Studenmund, 2006, p. 207).

In a linear-quadratic form, also known as a polynomial form, the slope of the relationship between the independent variables and the dependent variable takes a U or inverted U shape. The slope represents a relationship to the dependent variable that changes as the independent variables change (Studenmund, 2006, p. 216). I used a linear-quadratic form to test the relationship between the required regional housing need key explanatory variable and the age of the home on the cost of housing. I created a quadratic variable for required regional housing need and the age of a home and the format tested whether these two variables had a non-linear, increasing but at a decreasing rate, effect on the cost of the home. In other words, the quadratic form determines whether the number of building permits issued by a city or county to meet the required regional housing need, or the age of the home, has a positive or negative effect on the cost of a home but at a decreasing rate. A one-unit increase in Xi causes a one-unit increase or decrease in Y holding all other independent variables constant.

A log-linear form, or semi-log form, expresses some, but not all of the variables in their natural logs. "A log is the exponent to which a given base must be taken in order to produce a specific number" (Studenmund, 2006, p. 210). This equation is a useful format to use for two reasons. First, the natural log reduces the absolute size of the numbers without changing the meaning of the results. Because this thesis uses the cost of housing, expressed in terms of tens and hundreds of thousands of dollars, the log price of the home provides for an easier interpretation of the results. Second, using natural logs in a regression equation generates results in terms of percent change rather than unit change. A one-unit change in Xi causes a percent change (increase or decrease) in Y, represented by the magnitude of the coefficient, holding all other independent variables constant.

The linear-quadratic functional form regression analysis did not indicate that a non-linear relationship exists between required regional housing need and the age of the home on the cost of housing. Therefore, I selected a log-linear form for the final regression equation as it produced the most independent variables with a significant effect on the dependent variable at the 90% confidence level. Because regression analysis cannot prove that a hypothesis, or anticipated relationship between an independent variable and a dependent variable, is correct, the confidence level indicates how closely a sample conforms to a hypothesis (Studenmund, 2006, p. 113). In other words, the confidence level indicates the extent to which the sample departs by chance from the total population. For this regression analysis, the confidence level indicates how much the sample of housing data I used is similar to the overall population of housing in the Sacramento area. The log-linear form also allows for easy interpretation of the regression results in terms of a percentage change on the cost of housing from one unit increase in the independent variables.

Table 5

Ordinary Least Squares Regression Results

Variable	Linear-Linear β (Standard Error)	Linear-Linear Quadratic β (Standard Error)	Log-Linear β (Standard Error)
Independent Variables: Land Use Ordinance Characteristics			
Required Regional Housing Need	-1763.994*** (243.739)	-519.881 (621.275)	-0.008*** (0.001)
Required Regional Housing Need Quadratic	- -	-26.949** (12.760)	- -
Independent Variables: House Size Characteristics			
House SQFT	146841.271*** (1097.721)	147092.636*** (1097.416)	0.299*** (0.004)
Lot SQFT	0.009 (0.049)	0.006 (0.049)	0.0000002248 (0.000)
Independent Variables: House Vintage Characteristics			
Age	0.268 (3.397)	-215.036*** (30.768)	-0.00004838*** (0.000)
Age Quadratic	- -	-0.027*** (0.004)	- -
Independent Variables: Foreclosure Characteristics			
REO	-44082.052*** (896.793)	-43930.015*** (896.369)	-0.196*** (0.003)
Independent Variables: Structural Characteristics			
Bedrooms	-21245.189*** (749.865)	-21424.336*** (749.735)	-0.001 (0.003)
Full Bathrooms	24220.461*** (1125.172)	22464.739*** (1150.605)	0.093*** (0.004)
Half Bathrooms	27116.305*** (1176.445)	26165.510*** (1182.905)	0.065*** (0.004)

Table 5 continued

Variable	Linear-Linear β (Standard Error)	Linear-Linear Quadratic β (Standard Error)	Log-Linear β (Standard Error)
Independent Variables: Foreclosure Characteristics			
1 Story	51597.419*** (1220.231)	51350.534*** (1219.758)	0.076*** (0.004)
Garage	-35597.032*** (1015.411)	-35529.703*** (1014.669)	-0.165*** (0.003)
Fireplace	1570.487 (1100.362)	978.034 (1102.945)	0.117*** (0.004)
Pool	25325.780*** (1205.350)	25866.399*** (1206.679)	0.066*** (0.004)
Septic	47260.012*** (2791.648)	47788.397*** (2790.553)	0.159*** (0.010)
Brick Exterior	3818.567*** (1527.749)	4390.378*** (1528.873)	0.048*** (0.005)
Lap Exterior	1743.542 (1581.618)	1865.971 (1580.786)	0.021*** (0.005)
Vinyl Exterior	-3635.491 (2496.260)	-2591.021 (2499.079)	-0.010 (0.009)
Metal Roof	16049.838*** (6032.816)	15879.365*** (6029.035)	0.101*** (0.021)
Shake Roof	16302.935*** (1864.459)	15247.112*** (1870.091)	0.101*** (0.006)
Slate Roof	18096.028*** (1258.718)	14497.608*** (1359.673)	0.158*** (0.004)
Independent Variables: Neighborhood Characteristics			
HOA	8145.576*** (1422.576)	7229.669*** (1429.261)	0.021*** (0.005)

*Significant at the 90% confidence level. **Significant at the 95% confidence level.
***Significant at the 99% confidence level.

Addressing Errors in Regression Results

Another test for multicollinearity, in addition to the correlation analysis performed in Chapter 3, is to use the Variance Inflation Factor (VIF) associated with every explanatory variable to determine if multicollinearity has increased the variance of an estimated regression coefficient (Studenmund, 2006, p. 258). The VIF values indicate the extent to which one explanatory variable can be explained by the other explanatory variables in the regression equation. The generally accepted rule of thumb when interpreting VIF values is a value greater than 5 is cause for concern if the regression coefficient is not statistically significant. The required regional housing need variable has a VIF value greater than 5 but because it is statistically significant it is not an issue.

Twenty-three of the zip code dummy variables have VIF values greater than 5 indicating severe multicollinearity between these variables and that the other explanatory variables in the equation are responsible at some level for the zip code variables. The problem is most likely because the zip code dummy variables can have the same required regional housing need value in the data set as each city and county may have more than one zip code within their jurisdictional boundary. For example, the 95814 and 95818 zip codes are both located within the City of Sacramento and, therefore, have the same value of required regional housing need of 69%. As such, both these zip codes move closely together and have the same effect on the dependent variable, which makes it impossible for the statistical software to determine which of the zip codes is affecting the dependent variable and the strength of the effect.

It is possible to correct for multicollinearity in a regression equation by removing duplicative explanatory variables or by finding a different indicator to use within the regression equation. However, because the zip code dummy variables are only meant to control for location and all of the variables are significant, none of the variables were removed from the equation. Additionally, when I applied the regression without the zip code dummy variables, the VIF value for building permits was under the critical threshold.

Heteroskedasticity is evident when the variances of the error terms of observations in a regression equation are not constant. This problem violates the classical assumption that, "the observations of the error term are drawn from a distribution that has a constant variance" (Studenmund, 2006, p. 346). While heteroskedasticity does not cause bias in the estimation of regression coefficients (although this lack of bias does not necessarily assure accurate estimates), it can cause the Ordinary Least Squares (OLS) estimation technique to incorrectly estimate variable coefficients and unreliable hypothesis testing by increasing the likelihood of a Type I Error (i.e., more likely to reject a true null hypothesis).

The method for testing for the presence of heteroskedasticity is known as the Park Test and includes the following three steps. First, determine the residuals of the estimated regression coefficients. Second, create a new dependent variable in log form of the square of the residuals. Third, perform a second regression analysis with the new log dependent variable and test the significance of a Z factor (i.e., a continuous explanatory variable that seems less likely to vary significantly from the error term) (Studenmund, 2006, p. 355-235). If the result of the second regression is significant then there is a likelihood of heteroskedasticity.

The Park Test, using the explanatory variable house square footage, resulted in statistical significance and the likelihood that heteroskedasticity is an issue in the regression equation. As such, a Weighted Least Squares (WLS) estimation technique, which provides for more accurate estimated coefficients as observations with the least amount of variability to be given more weight in the model, was used to correct for this issue. The results of the WLS regression are in Table 6 (Studenmund, 2006, p. 363-365). The table provides the VIF score for each variable provided in the OLS regression results as well as the 90% confidence intervals.

Table 6

Weighted Least Squares Regression Results

VARIABLE	β (Standard Error)	VIF	90% CONFIDENCE INTERVAL	
			Lower Bound	Upper Bound
Independent Variables: Land Use Ordinance Characteristics				
Required Regional Housing Need	-0.008 (0.001)	251.792	-0.009	-0.006
Independent Variables: House Size Characteristics				
House SQFT	0.280 (0.003)	4.608	0.293	0.305
Lot SQFT	0.0000002247 (0.000)	1.006	0.000	0.000
Independent Variables: House Vintage Characteristics				
Age	-0.00004390 (0.000)	1.027	0.000	0.000
Independent Variables: Foreclosure Characteristics				
REO	-0.179 (0.003)	1.220	-0.201	-0.191
Independent Variables: Structural Characteristics				
Bedrooms	-0.009 (0.002)	2.306	-0.005	0.003
Full Bathrooms	0.068 (0.003)	3.632	0.086	0.099
Half Bathrooms	0.053 (0.003)	1.599	0.058	0.071
1 Story	0.059 (0.004)	2.106	0.069	0.083

Table 6 continued

VARIABLE	β (Standard Error)	VIF	90% CONFIDENCE INTERVAL	
			Lower Bound	Upper Bound
Independent Variables: Structural Characteristics				
Garage	-0.145 (0.003)	1.017	-0.171	-0.159
Fireplace	0.111 (0.004)	1.291	0.110	0.123
Pool	0.073 (0.004)	1.130	0.059	0.072
Septic	0.162 (0.090)	1.361	0.143	0.174
Brick Exterior	0.042 (0.005)	1.075	0.039	0.056
Lap Exterior	0.019 (0.005)	1.055	0.012	0.030
Vinyl Exterior	-0.025 (0.009)	1.035	-0.024	0.005
Metal Roof	0.112 (0.020)	1.017	0.067	0.135
Shake Roof	0.111 (0.006)	1.180	0.090	0.111
Slate Roof	0.158 (0.004)	2.462	0.151	0.165
Independent Variables: Neighborhood Characteristics				
HOA	0.030 (0.004)	1.630	0.013	0.029

Initial Analysis of the Regression Results

Table 7 details the specific findings for the statistically significant variables at the 90%, 95%, and 99% confidence levels. With one exception, lot square footage, all key explanatory variables are statistically significant at the 99% confidence level. While many of the zip code variables are statistically significant, I omitted those data from Table 8 because the dummy variables were only meant to control for location effects in the regression equation. The zip code dummies are not of particular interest for the purpose of this study with respect to the effect each zip code has on the cost of housing. The table also includes the percent change in the dependent variable caused by each independent variable as this provides an easier way for interpreting the results of the regression coefficients. For instance, the key explanatory variable for required regional housing need has a coefficient of -0.008, which is more understandable when translated to mean that a one unit increase in the independent variable causes an approximately 0.8% decrease in the dependent variable, or cost of a house.

Table 7

Percent Change in Cost of Housing from Statistically Significant Variables

VARIABLE	β (Standard Error)	% CHANGE on HOUSE PRICE from ONE-UNIT CHANGE in EXPLANAOTRY VARIABLE
Independent Variable: Land Use Ordinance Characteristics		
Required Regional Housing Need	-0.008*** (0.001)	-0.8%
Independent Variable: House Size Characteristics		
House SQFT	0.28*** (0.003)	28.0%
Independent Variable: House Vintage Characteristic		
Age	-0.00004390*** (0.00)	0.004390%
Independent Variable: Foreclosure Characteristics		
REO	-0.179*** (0.003)	17.9%
Independent Variable: Structural Characteristics		
Bedrooms	-0.009*** (0.002)	-0.9%
Full Bathrooms	0.068*** (0.003)	6.8%
Half Bathrooms	0.053*** (0.003)	5.3%
1 Story	0.059*** (-0.004)	5.9%
Garage	-0.145*** (-0.003)	-14.5%
Fireplace	0.111*** (0.004)	11.1%
Pool	0.073*** (0.004)	7.3%
Septic	0.162*** (0.009)	16.2%
Brick Exterior	0.042*** (0.005)	4.2%
Lap Exterior	0.019*** (0.005)	1.9%

Table 7 continued

VARIABLE	β	% CHANGE on HOUSE PRICE from ONE-UNIT CHANGE in EXPLANAOTRY VARIABLE
Independent Variable: Structural Characteristics		
Vinyl Exterior	-0.025*** (0.009)	-2.5%
Metal Roof	0.112*** (0.020)	11.2%
Shake Roof	0.111*** (0.006)	11.1%
Slate Roof	0.158*** (0.004)	15.8%
Independent Variable: Neighborhood Characteristics		
HOA	0.03*** (0.004)	3.0%

***Significant at the 99% confidence level.

The regression equation developed to fit the theoretical model and run with the WLS estimation technique produced an R-Squared value of 0.855. This result means that approximately 86% of the variation in the cost of a home in the greater Sacramento area around its mean value can be explained by the independent variables in the regression equation. Using the R-Squared value is the standard for assessing overall fit of a regression equation in addition to how closely it fits with the theoretical underpinnings of the regression model. The R-Squared values range between zero and one, with values closer to one demonstrating a better fit than those regression models with a value closer to zero (Studenmund, 2006, p. 50). While the overall fit of the model is rather robust, there is always room for improvement. Future research could include a revision to the regression equation to include even more variables predicted to affect the cost of housing such as bank-owned properties within a certain distance of an observation, style of home variable, and access to amenities such as open space and park land.

Another important aspect to consider when analyzing the results of a regression analysis is whether the direction of the effect is consistent with the predicted effect based on logic, theory, and previous research. When holding all other variables constant, does the explanatory variable have the anticipated directional effect on the dependent variable? All but one variable acted in the same manner I predicted in the regression equation developed for this thesis. I predicted that the key explanatory variable in this study, building permits to proxy local land use ordinance stringency, would have a negative effect on the cost of housing. I expected that for every one-unit increase in the building permits issued in a specific city or county in the greater Sacramento area, the cost of housing would decrease. In other words, jurisdictions with fewer building permits issued in a calendar year compared to jurisdictions with more building permits experience higher housing costs. The regression results allow us to reasonably conclude that the more stringent the land use regulatory environment, the fewer permits issued, the fewer homes built to meet the required regional housing need, and the higher the housing costs, having a negative effect on housing affordability.

The magnitude of the effects of the independent variables on the dependent variable are consistent with the findings of previous regression studies and are reasonable considering the theoretical model developed for this thesis. The key explanatory variable – the number of building permits issued in a jurisdiction as a percentage of overall required regional housing need to proxy local land use stringency – is statistically significant and modest in the magnitude of the coefficient. A one-unit increase in the number of building permits issued in a city or county to meet required regional housing need causes a 0.8% decrease in the cost of a home in that same jurisdiction. Further, with 90% confidence, the regression results indicate that a one-unit increase in building permits causes a decrease in the cost of housing within the range 0.6% to 0.9%.

Other independent variable coefficients are reasonable with respect to their effect on the cost of housing. The overall square footage of a house has the biggest effect on the dependent variable. For every one-unit increase in the size of a home (measured in the thousands), the cost of housing increases 28%. While the regression results indicate that the age of the home is a statistically significant variable, the magnitude of the effect was minimal. As discussed in Chapter 3, it is difficult to ascertain the effect age has on the cost of housing due to changing demographics within an area and consumer preference. Whether a home is bank owned had a negative effect on the cost of housing, as I predicted in the theoretical model. The results indicate that a bank-owned property creases the cost of housing by 17.9%.

The number of bedrooms, holding constant the overall square footage of a home, decreases the cost of housing by a modest 0.9%. The number of overall bathrooms and half bathrooms, however, increased the cost of housing by 6.8% and 5.3%, respectively. The type of roof also has an effect on the cost of housing ranging from 11.1% to 15.8% with a slate roof producing the largest coefficient. Two of the statistically significant variables have either the opposite directional effect or an unanticipated magnitude. I expected the garage variable to increase the cost of housing. However, the coefficient indicated that the presence of a garage decreases the cost of housing by 14.5%. I was unable to predict the direction of the effect from the presence of a septic system in the regression analysis and while its positive effect is plausible, the magnitude seems unreasonably high compared to the other coefficients – 16.2%.

Chapter 5

CONCLUSION

In this final chapter, I present the results of additional regression analysis I deemed necessary to perform to better understand my findings in Chapter 4, provide further analysis of all the regression results, and present policy implications resulting from this study. I also discuss the limitations of the regression analysis and how to improve my model for future research.

Purpose of this Study – Revisited

Cities and counties use land use decision-making power to shape and control the character and physical nature of their communities. Local land use measures serve an important role in society – to protect the health, welfare, and safety of people and the environment. For instance, cities and counties adopt zoning regulations to segregate different kinds of land uses so residential areas are not next to commercial enterprises such as oil refineries or manufacturing plants. However, land use decisions can serve malevolent purposes, sometimes protecting the vocal interests of the existing residents in a community. Cities and counties can use land use regulations to segregate certain populations such as minorities or low-income residents by zoning multi-family housing away from moderate- and high-income single-family housing. As previous research demonstrates, even benevolent land use ordinances, such as the requirement that development pay for the necessary infrastructure to support housing, can have a negative impact on the cost of housing.

Regulations, such as zoning land for open-space or critical-habitat areas or zoning low-density housing development on large lots, can restrict the supply of available land for development, driving up prices by restraining the overall supply of housing. Other local measures require specific infrastructure, such as streets and roads or utilities, for development approval. The developer provides the required infrastructure, but passes the financial burden on to homeowners in the cost of the home.

Before the 2008 housing market crash, the U.S. Department of Housing and Urban Development and the California Department of Housing and Community Development asserted that the negative effects of land use regulations on the cost of housing led to a housing affordability crisis in California and across the nation. In this thesis, I set out to determine whether local land use regulations still have a negative impact on the cost of housing after the burst of the housing bubble. Specifically, this study focused on the cost of housing in cities and counties in the greater Sacramento region. Even though the cost of housing has decreased significantly since 2008 across the region (see Table 1), do local land use ordinances still increase the cost of housing in the post-market crash market? What does this mean for housing affordability in the region?

To test my hypothesis, that land use regulations have a negative effect on the cost of housing in the greater Sacramento area in a post-housing market crash environment, I created a proxy for local land use stringency. The key explanatory variable uses building permit data for the 2008 calendar year and data on the needed housing in each city and county as developed by the State and the Sacramento Area Council of Governments through the state mandated Regional Housing Needs Allocation process. California's Housing Element law, beginning with Government Code §65580, requires every city and county to update its housing element of its general plan at least every eight years. The housing element must, among other things, assess the housing needs and the resources and constraints pertinent to meeting the needed housing, an analysis of population and employment trends and household characteristics, and an identification of land suitable for the development of the necessary housing. Furthermore, housing element law requires a city or county to rezone land, if necessary, to meet its share of the regional housing need. The key explanatory variable, therefore, tests how meeting state housing goals can affect the cost of housing. If a city or county meets its share of the regional housing, how does this affect the cost of housing?

Analysis of Regression Results

The regression results, which are statistically significant and theoretically sound, indicate that in a post-housing market crash environment, the more building permits a city or county issues towards meetings its housing needs, the lower the cost of housing in that same jurisdiction. The key explanatory variable, the number of building permits issued in the 2008 calendar year divided by one year's worth of state mandated housing need, is an aggregate measure of how well a city or county is meeting the state required regional housing need. On a scale of 0 (strict regulatory environment) to 100 (lenient regulatory environment), I predict that if a city or county has issued building permits to build 80% of the needed housing, it is the result of a lenient regulatory environment that encourages housing development. If a city or county has only issued building permits for the construction of 7% of the housing need, I suggest that a highly regulated land use environment discourages housing construction. Even if a city or county has a lenient land use regulatory environment, housing will not get built if there is not a high demand to live in that particular area. Specifically, for every one-unit increase in building permits issued as a percent of the required housing to meet the region's need in a calendar year, the cost of the typical house of any type goes down by 0.8%. While this decline is the direction I anticipated in the theoretical model, the magnitude of the effect is not large. For instance, if a city or county meets 50% of its housing needs one year and then meets 50% plus 10% more in the next year, the typical housing price in that community will fall by 8%.

Because this study focused on housing affordability, measured by the cost of housing, I decided for the sake of my conclusion to perform additional regression analysis to determine whether this finding is the same for, or can be shown to have a different effect on, low- and moderate-priced housing. For this final review, I created two additional independent variables to test the interaction of a community's share of required regional housing and low-income and median-income housing. The first interaction dummy variable indicates whether the selling price of a home is below the average price ($255,554) of all homes in the Sacramento region. The second interaction dummy variable indicates whether the selling price of a home is one standard deviation ($168,611) less than the average price, or less than $86,943.

After running two new log-linear Ordinary Least Squares (OLS) regressions, performing the Park Tests for heteroskedasticity and finding it present in both, and then rerunning Weighted Least Squares (WLS) regressions to correct for heteroskedasticity present in both, the results clearly indicate that the number of building permits issued by a city or county towards meeting the required regional housing need has a greater effect on home prices in the bottom of the housing market. Specifically, I found that the first interaction variable, testing the effect on homes less than the median price, has a -0.3% effect on the cost of housing. In other words, the total effect of building permits on the homes priced under the average home price is -1% (the share of required regional housing need coefficient (-0.7%) plus the interaction one coefficient (-0.3%). The second interaction variable indicated an even greater effect on homes priced one standard deviation away from the average priced home. Specifically, the share of required regional housing variable has a -5% total effect on the cost of the lowest priced homes in the area (required regional housing need coefficient (-0.8%) plus the interaction two coefficient (-4.2%).

The additional regression results suggest that while the issuance of building permits to meet the required regional housing need in a jurisdiction has a minor effect on the overall cost of housing in a city or county, it has a much more significant effect on houses in the bottom of the market which happens to be where affordability is of most concern. The results from the additional regression analysis indicated that the interaction between the share of required regional housing needs and homes under the average price in the region is not much different than the general effect found in the original regression analysis – 1% compared to 0.8%. However, the interaction between homes priced one standard deviation below the average priced home and the share of required regional housing is significantly greater – a -5% effect compared to a -0.8% effect. Over time, the issuance of building permits to meet regional housing needs can have a significant effect on home prices, especially those in the lower-income price point. For instance, if a typical city or county in the Sacramento region increases its share of required regional housing by just one percentage point every year for five years, houses in the bottom of the market could drop as much as 25% (the -5% total effect determined by the additional regression analysis, i.e., -0.8% from the original regression plus the -4.2% from the interaction variable, for each percentage point increase multiplied by the five years it is done).

Table 8

WLS Regression Results: Low- and Median-Priced Home Interaction Variables

	WLS Regression	WLS Regression with Interaction One Variable	WLS Regression with Interaction Two Variable
VARIABLE	β (Standard Error)	β (Standard Error)	β (Standard Error)
Independent Variable: Land Use Ordinance Characteristics			
Share of Required Regional Housing	-0.008*** (-0.001)	-0.007*** (0.000)	-0.008*** (0.001)
Interaction Variables			
Interaction One: Share of Required Regional Housing multiplied by a dummy if home is less than $255,554	- -	-0.003*** (0.00)	- -
Interaction Two: Share of Required Regional Housing multiplied by a dummy if home is less than $86,943	- -	- -	-0.042*** (0.001)

*Significant at the 90% confidence level. **Significant at the 95% confidence level.
***Significant at the 99% confidence level.

The 2008 housing data used for this thesis adds to the existing literature on the subject with new insights into the effects of land use decisions in a more current housing market than previous research. Table 9 shows what the median home sales price would be in specific areas of the greater Sacramento region if there were a 1%, 5%, and 10% increase in additional required regional housing provided in the respective communities. The base price for my projections is the 2010 median home sales price by defined area provided by SACOG.

The projections are useful in determining what additional housing being built means for the cost of housing in the greater Sacramento area. In the first column, representing a 1% increase in additional required regional housing, the cost of a home over the average price would experience a 0.8% decrease in price. Homes below the average price would experience a 1% decrease. The cost of housing would decrease by 5% for homes one standard deviation below the average priced home, or those houses in the bottom of the market. If 5% additional required regional housing need was provided for in a jurisdiction, above average priced homes would decrease by 4%, below average priced homes would decrease by 5%, and houses in the bottom of the market would experience a 25% decrease. The decrease in housing costs after an additional 10% of the required regional housing need is provided would decrease the cost of housing by 8%, 10%, and 50% for above average priced homes, below average priced homes, and the lowest priced homes, respectively.

Returning to the examples used in Chapter 1, in parts of the City of Sacramento where the burst of the housing bubble caused a 62.4% decline in the median home price since 2007, from $218,750 to $82,250, a 1% increase in required regional housing need would drop the median priced home in that jurisdiction to $78,549. A 5% increase in additional housing in this area would cause the median home price to drop to $63,744. The home prices would drop even further to $45,238 with 10% additional required regional housing development. The City of Davis, with a 2010 median home price of $440,000, a 16.1% decline from 2007, would experience a decrease in the cost of housing bringing prices to $436,480, $422,400, and $404,800 with a 1%, 5%, and 10% increase in additional required regional housing need. Interestingly, had the housing market not crashed, none of the communities in the Sacramento region would have median priced homes one standard deviation below average priced homes in the data set and, therefore, the gains in affordability in the lowest part of the housing market would not be as significant.

Table 9

Median Home Sales Price with Additional Required Regional Housing

City/County	Median Home Price in 2010	Sales Price if Increase in Required Regional Housing Need		
		1%	5%	10%
Arden Arcade	$179,500	$177,705	$170,525	$161,550
Auburn	$271,500	$269,328	$260,640	$249,780
Citrus Heights	$160,500	$158,895	$152,475	$144,450
Davis	$440,000	$436,480	$422,400	$404,800
El Dorado County	$191,000	$189,090	$181,450	$171,900
El Dorado Hills/Cameron Park	$375,000	$372,000	$360,000	$345,000
Elk Grove	$212,500	$210,375	$201,875	$191,250
Fair Oaks/Carmichael/Orangevale	$221,000	$218,790	$209,950	$198,900
Folsom	$333,000	$330,336	$319,680	$306,360
Galt	$170,000	$168,300	$161,500	$153,000
Granite Bay/New Castle	$472,500	$468,720	$453,600	$434,700
Lincoln	$257,000	$254,944	$246,720	$236,440
Loomis	$332,500	$329,840	$319,200	$305,900
North Highlands/Rio Linda/Elverta	$135,000	$133,650	$128,250	$121,500
Placer County	$240,000	$237,600	$228,000	$216,000
Rancho Cordova	$200,000	$198,000	$190,000	$180,000
Rocklin	$269,000	$266,848	$258,240	$247,480

Table 9 continued

City/County	Median Home Price in 2010	Sales Price if Increase in Required Regional Housing Need	City/County	Median Home Price in 2010
		1%	5%	10%
Sacramento City N	$189,000	$187,110	$179,550	$170,100
Sacramento City NW	$82,250	$78,549	$63,744	$45,238
Sacramento City S	$115,000	$113,850	$109,250	$103,500
Sutter	$159,250	$157,658	$151,288	$143,325
Vineyard South Sac	$160,000	$158,400	$152,000	$144,000
West Sacramento	$208,000	$205,920	$197,600	$187,200
Wilton/Rancho Murrieta	$320,000	$317,440	$307,200	$294,400
Woodland	$215,000	$212,850	$204,250	$193,500
Yolo County	$340,000	$337,280	$326,400	$312,800
Yuba	$140,000	$138,600	$133,000	$126,000

As the additional regression results indicate, the interaction effects on the lowest priced homes provide for significant decreases in the cost of housing in areas with median priced homes in the bottom on the housing market. By providing additional housing, cities and counties can clearly begin to assist with housing affordability problems. The results of this thesis should serve as useful information for local elected officials in the greater Sacramento region when considering the impacts of local land use decisions on the development of housing and, ultimately, on housing affordability.

Limitations and Future Research

The cost of housing is only one measure of overall housing affordability. Affordability is also measured by the total stock of housing, the distribution of housing prices, the availability of long-term financing, laws and regulations affecting housing markets, and individual economic choices people make about how much to spend on housing in relation to other spending decisions. The regression analysis I performed in this thesis looks at only one of these measures – the cost of housing. Future research should look at various segments of the overall housing market, such as low-, moderate-, and high-income housing markets. The most common measure of housing affordability – the 30% of income standard, places a greater burden on lower-income populations than on middle- or high-income segments. The data set I used, and other data sets of a similar nature, can be further broken down by low-, moderate-, and high-income housing to determine whether the provision of required regional housing need has the same impact on housing affordability as measured by income.

This thesis supports the need for additional research into this policy issue. Specifically, future researchers should conduct studies of the same nature throughout various regions in California such as the San Francisco Bay Area, the Central Coast, or the Southern California area to see if findings are similar or how the differ and why. Regional studies could focus on comparing local housing markets that vary in intensity such as the booming real estate markets found in Riverside and San Bernardino counties before the housing market crash and more rural areas where there is not a high demand for new construction. Future research could bolster my model by adding additional factors that affect the cost of housing and housing affordability such as whether a homeowner is subject to Mello-Roos taxes, the quality of schools in the neighborhood, the access to amenities such as shopping centers, and parks and open space.

Land Use Regulations in the Context of the Housing Affordability Problem

Housing affordability depends on various factors at the state and local levels. As shown in this thesis, a greater provision of needed housing in a city or county can lower the cost of housing, especially low-income housing. In as much as local land use regulations encourage or discourage housing development, the regulatory environment can have a positive or negative impact on the cost of housing and, therefore, housing affordability. However, local land use regulations are only a part of the equation.

HCD (2000) concluded, in its report on housing development, projections, and constraints that California will need to build more than 200,000 new owner occupied and rental housing units to meet a broad range of housing needs from low-income multifamily housing, infill housing, single-family housing, and senior housing. While the burst of the housing bubble has caused a significant decline in the overall cost of housing around the state, the demand for new housing units because of continued population growth remains strong. Unless developers build enough housing to meet this demand, a restricted supply could lead to an increase in prices over time even in a post-housing market crash environment and could negatively affect affordability. Regulations that make housing development more difficult also make housing less affordable. The HCD report also found that the existing development process is flawed and will not be able to produce the housing necessary to meet the demand. This conclusion applies to the local planning, land use decisions, the development process, and the housing finance system.

To aid in making housing development easier, cities and counties must consider local land use regulations and potential unintended negative consequences on housing development and housing affordability. Even though HCD reports that California has enough developable land after considering environmental, geographical, and service capacity issues, local governments can increase the density requirements at which development can occur to provide more housing overall. Cities and counties can offer incentives to developers to provide a range of different kinds of housing to serve all segments of the population, including infill development to provide housing in already urbanized areas of the state.

The development approval process is also the most difficult to navigate in the nation (HCD, 2000). The State mandates many steps in the development approval processes. Local governments implement local requirements legislatively. Communities also add additional hurdles to the process through the initiative process. HCD found that while market rate housing projects took on average 4.9 months to process, affordable housing projects took nearly twice as long at 9.8 months due to excessive requirements to process affordable housing projects. To develop enough housing to meet demand, the State, cities, and counties must ensure these processes do not hinder development but encourage it.

Local planning and land use decisions are inherently political. To meet the State's housing goals, it will take a comprehensive and concerted effort at the state and local levels to encourage robust housing development that provides decent and safe housing for all segments of the population. Ultimately, it is up to each community and the elected officials they chose to represent them at the state and local levels to make land use decisions that protect the health and welfare of people and the environment but do not burden housing affordability or a person's ability to secure decent and safe housing.

When cities and counties do not implement zoning decisions adequate to meet housing demand, community groups will often challenge a housing element. While citizen enforcement of local land use decisions can play an important role in ensuring appropriate local land use decisions, these groups often challenge local decisions that are more inclusionary in nature from a housing perspective. Residents in established middle- to upper-income neighborhoods challenge zoning decisions, or development approvals, for multi-family housing development aimed at providing affordable housing in their neighborhood. Local elected bodies or citizen groups will pass local ordinances or initiatives to restrict any further development in a community. Challenges to the housing element or development approvals also impede development while battles play out in court. Residents themselves are also responsible for hindering development in their communities. As long as these delays continue to happen, housing development will not meet the overall housing need, and housing prices may continue to cause affordability issues for some segments of the population. The State of California might consider legislation to limit a city's or county's ability to hinder housing development, especially low-income housing. However, cities and counties will undoubtedly strongly object to any limitations on local land use decision-making authority – the highly guarded ultimate power coveted by local elected officials.

APPENDIX

Complete Tables for Data, Correlation Analysis, and Regression Results

Table A1

Variable Labels, Descriptions, and Data Sources

VARIABLE LABEL	DESCRIPTION	SOURCE
Dependent Variable		
Sales Price	Continuous variable: final sales price of a house	California Real Estate DataQuick MLS Data
Independent Variable: Land Use Ordinance Characteristics		
Required Regional Housing Need	Continuous variable: percentage of building permits issued in a city or county for new home construction to meet their Regional Housing Needs Allocation (RHNA) number: divided the number of new homes (single and multi family) built during the 2008 calendar year by one year's worth of RHNA.	Sacramento Area Council of Governments Regional Housing Needs Allocation Plan (2006-2013); Construction Industry Research Board Residential Building Permits (2008) Data
Independent Variable: House Size Characteristics		
House SQFT	Continuous variable: the size of the house measured in square feet	California Real Estate DataQuick MLS Data
Lot SQFT	Continuous variable: the size of the lot the house sits on measured in square feet	California Real Estate DataQuick MLS Data
Independent Variable: House Vintage Characteristics		
Age	Continuous variable: the age of the house	California Real Estate DataQuick MLS Data
Independent Variable: Foreclosure Characteristics		
REO	Dummy variable: 1 = if the house is bank owned, 0 = if the house is not bank owned	California Real Estate DataQuick MLS Data
Independent Variable: Structural Characteristics		
Bedrooms	Continuous variable: the number of bedrooms in the house	California Real Estate DataQuick MLS Data
Full Bathrooms	Continuous variable: the number of full bathrooms in the house	California Real Estate DataQuick MLS Data
Half Bathrooms	Continuous variable: the number of half bathrooms in the house	California Real Estate DataQuick MLS Data
1 Story	Dummy variable: 1 = if the house is one story, 0 = if the house is not one story	California Real Estate DataQuick MLS Data

Table A1 continued

VARIABLE LABEL	DESCRIPTION	SOURCE
Independent Variable: Structural Characteristics		
Garage	Dummy variable: 1 = if the house has one or more garage units, attached or detached, 0 = if the house does not have a garage, attached or detached	California Real Estate DataQuick MLS Data
Fireplace	Dummy variable: 1 = if the house has one or more fireplaces, 0 = if the house has no fireplaces	California Real Estate DataQuick MLS Data
Pool	Dummy variable: 1 = if the house has a pool, 0 = if the house does not have a pool	California Real Estate DataQuick MLS Data
Septic	Dummy variable: 1 = if the house has a septic system, 0 = if the house does not have a septic system	California Real Estate DataQuick MLS Data
Sewer	Dummy variable: 1 = if the house is hooked up to a sewer system, 0 = if the house is not hooked up to a sewer system	California Real Estate DataQuick MLS Data
Brick Exterior	Dummy variable: 1 = if the house has a brick exterior, 0 = if the house does not have a brick exterior	California Real Estate DataQuick MLS Data
Lap Exterior	Dummy variable: 1 = if the house has a lap exterior, 0 = if the house does not have a lap exterior	California Real Estate DataQuick MLS Data
Vinyl Exterior	Dummy variable: 1 = if the house has a vinyl exterior, 0 = if the house does not have a vinyl exterior	California Real Estate DataQuick MLS Data
Wood Exterior	Dummy variable: 1 = if the house has a wood exterior, 0 = if the house does not have a wood exterior	California Real Estate DataQuick MLS Data
Metal Roof	Dummy variable: 1 = if the house has a metal roof, 0 = if the house does not have a metal roof	California Real Estate DataQuick MLS Data
Shake Roof	Dummy variable: 1 = if the house has a shake roof, 0 = if the house does not have a shake roof	California Real Estate DataQuick MLS Data
Slate Roof	Dummy variable: 1 = if the house has a slate roof, 0 = if the house does not have a slate roof	California Real Estate DataQuick MLS Data
Tile Roof	Dummy variable: 1 = if the house has a tile roof, 0 = if the house does not have a tile roof	California Real Estate DataQuick MLS Data

Table A1 continued

VARIABLE LABEL	DESCRIPTION	SOURCE
Independent Variable: Neighborhood Characteristics		
HOA	Dummy variable: 1 = if the house is in a Homeowners Association, 0 = if the house is not in a Homeowners Association	California Real Estate DataQuick MLS Data
Independent Variable: Location Characteristics		
Zip Code	Dummy variable 1 = if a house is in a particular zip code, 0 = if the house is not in a particular zip code. 61 zip codes in total from the Greater Sacramento Area.	California Real Estate DataQuick MLS Data

Table A2

Descriptive Statistics (from Table 4)

VARIABLE LABEL	MINIMUM VALUE	MAXIMUM VALUE	MEAN	STANDARD DEVIATION
Dependent Variable				
Sales Price	6,053	3,500,000	255,554	168,611
Independent Variable: Land Use Ordinance Characteristics				
Required Regional Housing Need	0.090	01.110	0.503	0.250
Independent Variables: House Size Characteristics (in thousands)				
House SQFT	0.400	11	1.796	0.781
Lot SQFT	0	866,408.400	189,611.670	8.223
Independent Variables: House Vintage Characteristics				
Age	1875	2009	26.521	122.072
Independent Variable: Foreclosure Characteristics				
REO	0	1	0.612	0.487
Independent Variable: Structural Characteristics				
Bedrooms	0	9	3.390	0.804
Full Bathrooms	0	7	2.090	0.678
Half Bathrooms	0	5	0.220	0.426
1 Story	0	1	0.671	0.470
Garage	0	1	0.802	0.399
Fireplace	0	1	0.781	0.414
Pool	0	1	0.138	0.345
Septic	0	1	0.028	0.166
Sewer	0	1	0.972	0.166
Brick Exterior	0	1	0.079	0.270
Lap Exterior	0	1	0.070	0.255
Vinyl Exterior	0	1	0.026	0.160
Wood Exterior	0	1	0.171	0.377
Metal Roof	0	1	0.004	0.064
Shake Roof	0	1	0.056	0.229
Slate Roof	0	1	0.413	0.492
Tile Roof	0	1	0.413	0.492
Independent Variables: Neighborhood Characteristics				
HOA	0	1	0.151	0.358

Table A2 continued

VARIABLE LABEL	MINIMUM VALUE	MAXIMUM VALUE	MEAN	STANDARD DEVIATION
Independent Variables: Location Characteristics				
95602	0	1	0.003	0.054
95603	0	1	0008	0.090
95605	0	1	0.006	0.077
95608	0	1	0.017	0.128
95610	0	1	0.015	0.120
95616	0	1	0.006	0.076
95618	0	1	0.006	0.078
95621	0	1	0.020	0.142
95624	0	1	0.039	0.194
95628	0	1	0.017	0.129
95630	0	1	0.019	0.135
95648	0	1	0.037	0.189
95650	0	1	0.004	0.066
95660	0	1	0.025	0.155
95661	0	1	0.010	0.102
95662	0	1	0.014	0.117
95667	0	1	0.010	0.100
95670	0	1	0.039	0.193
95673	0	1	0.010	0.099
95677	0	1	0.010	0.101
95678	0	1	0.019	0.137
95682	0	1	0.009	0.097
95691	0	1	0.019	0.138
95695	0	1	0.014	0.117
95742	0	1	0.012	0.110
95746	0	1	0.008	0.088
95747	0	1	0.024	0.152
95757	0	1	0.037	0.190
95758	0	1	0.042	0.201
95762	0	1	0.021	0.144
95765	0	1	0.018	0.133
95776	0	1	0.009	0.095
95815	0	1	0.016	0.125

Table A2 continued

VARIABLE LABEL	MINIMUM VALUE	MAXIMUM VALUE	MEAN	STANDARD DEVIATION
95816	0	1	0.004	0.064
95817	0	1	0.010	0.099
95818	0	1	0.008	0.089
95819	0	1	0.007	0.082
95820	0	1	0.026	0.159
95821	0	1	0.011	0.102
95822	0	1	0.024	0.153
95823	0	1	0.055	0.228
95824	0	1	0.017	0.128
95825	0	1	0.004	0.060
95826	0	1	0.014	0.117
95827	0	1	0.009	0.095
95828	0	1	0.043	0.204
95829	0	1	0.006	0.079
95831	0	1	0.008	0.091
95832	0	1	0.013	0.112
95833	0	1	0.021	0.146
95834	0	1	0.018	0.134
95835	0	1	0.033	0.177
95838	0	1	0.032	0.177
95841	0	1	0.0032	0.05639
95842	0	1	0.0056	0.07473
95843	0	1	0.0326	0.17767
95864	0	1	0.0089	0.09414
95901	0	1	0.0046	0.06792
95961	0	1	0.0097	0.09776
95991	0	1	0.0048	0.0693
95993	0	1	0.0033	0.05734

Table A3

Correlation Coefficients

	Building Permits	Home SQFT	Lot SQFT	Age	REO	Bed	Full Bath	Half Bath	1 Story	Garage	Fire - place
Building Permits	1	0.283	0.013	-0.044	-0.109	0.178	0.255	0.077	-0.169	-0.046	0.155
House SQFT	0.283	1	0.008	-0.092	-0.168	0.674	0.77	0.311	-0.586	-0.046	0.323
Lot SQFT	0.013	0.008	1	-0.001	-0.003	0.005	0.005	0.005	-0.007	-0.001	0.002
Age	-0.044	-0.092	-0.001	1	0.016	-0.067	-0.099	-0.032	0.07	0.013	-0.049
REO	-0.109	-0.168	-0.003	0.016	1	-0.009	-0.103	-0.074	0.042	0.058	-0.08
Bed	0.178	0.674	0.005	-0.067	-0.009	1	0.66	0.17	-0.501	-0.016	0.248
Full Bath	0.255	0.77	0.005	-0.099	-0.103	0.66	1	0.037	-0.537	-0.029	0.318
Half Bath	0.077	0.311	0.005	-0.032	-0.074	0.17	0.037	1	-0.439	-0.022	0.069
1 Story	-0.169	-0.586	-0.007	0.07	0.042	-0.501	-0.537	-0.439	1	0.025	-0.156
Garage	-0.046	-0.046	-0.001	0.013	0.058	-0.016	-0.029	-0.022	0.025	1	-0.029
Fire-place	0.155	0.323	0.002	-0.049	-0.08	0.248	0.318	0.069	-0.156	-0.029	1
Pool	0.098	0.215	0	-0.003	-0.115	0.129	0.17	0.101	-0.114	0.007	0.124
Septic	-0.026	0.045	-0.001	-0.026	-0.065	-0.034	0.006	0.013	0.02	-0.01	-0.015
Brick Ext	-0.003	0.012	0.005	0.015	-0.083	-0.011	-0.002	-0.003	0.031	-0.016	0.076
Lap Ext	-0.02	-0.076	-0.002	0.014	-0.024	-0.064	-0.057	-0.009	0.041	0.003	-0.013
Vinyl Ext	-0.03	-0.094	-0.003	0.028	0.008	-0.06	-0.096	-0.033	0.073	0	-0.04
Metal	-0.019	-0.003	-0.001	0.008	-0.037	-0.028	-0.01	0.002	0.017	0.001	-0.002
Shake	-0.006	0.013	0	0.006	-0.009	-0.007	0.028	0.025	-0.026	-0.017	0.1
Slate	0.031	0.536	0.002	-0.11	-0.112	0.352	0.463	0.189	-0.402	-0.054	0.217
HOA	0.1	0.374	0.005	-0.057	-0.175	0.119	0.282	0.219	-0.264	-0.034	0.037

Table A3 Continued

	Pool	Septic	Brick Ext	Lap Ext	Vinyl Ext	Metal Roof	Shake Roof	Slate Roof	HOA
Building Permits	0.098	-0.026	-0.003	-0.02	-0.03	-0.019	-0.006	0.301	0.1
House SQFT	0.215	0.045	0.012	-0.076	-0.094	-0.003	0.013	0.536	0.374
Lot SQFT	0	-0.001	0.005	-0.002	-0.003	-0.001	0	0.002	0.005
Age	-0.003	-0.026	0.015	0.014	0.028	0.008	0.006	-0.11	-0.057
REO	-0.115	-0.065	-0.083	-0.024	0.008	-0.037	-0.009	-0.112	-0.175
Bed	0.129	-0.034	-0.011	-0.064	-0.06	-0.028	-0.007	0.352	0.119
Full Bath	0.17	0.006	-0.002	-0.057	-0.096	-0.01	0.028	0.463	0.282
Half Bath	0.101	0.013	-0.003	-0.009	-0.033	0.002	0.025	0.189	0.219
1 Story	-0.114	0.02	0.031	0.041	0.073	0.017	-0.026	-0.402	-0.264
Garage	0.007	-0.01	-0.016	0.003	0	0.001	-0.017	-0.054	-0.034
Fire-place	0.124	-0.015	0.076	-0.013	-0.04	-0.002	0.1	0.217	0.037
Pool	1	0.016	0.068	0.01	-0.009	0.016	0.072	0.04	0.136
Septic	0.016	1	0.007	0.033	0.011	0.023	-0.018	-0.076	-0.008
Brick Ext	0.068	0.007	1	-0.081	-0.048	0.032	0.117	-0.099	-0.036
Lap Ext	0.01	0.033	-0.081	1	-0.045	0.004	0.068	-0.149	-0.055
Vinyl Ext	-0.009	0.011	-0.048	-0.045	1	0.011	-0.025	-0.117	-0.058
Metal	0.016	0.023	0.032	0.004	0.011	1	-0.016	-0.054	0.005
Shake	0.072	-0.018	0.117	0.068	-0.025	-0.016	1	-0.204	-0.03
Slate	0.04	-0.076	-0.099	-0.149	-0.117	-0.054	-0.204	1	0.389
HOA	0.136	-0.008	-0.036	-0.055	-0.058	0.005	-0.03	0.389	1

Table A4

Ordinary Least Squares Regression Results (from Table 5)

VARIABLE	LINEAR-LINEAR β (Standard Error)	LINEAR-LINEAR QUADRATIC β (Standard Error)	LOG-LINEAR β (Standard Error)
Independent Variables: Land Use Ordinance Characteristics			
Require Regional Housing Need	-1763.994*** (243.739)	-519.881 (621.275)	-0.008*** (0.001)
Required Regional Housing Need Quadratic	- -	-26.949** (12.760)	- -
Independent Variables: House Size Characteristics			
House SQFT	146841.271*** (1097.721)	147092.636*** (1097.416)	0.299*** (0.004)
Lot SQFT	0.009 (0.049)	0.006 (0.049)	0.0000002248 (0.000)
Independent Variables: House Vintage Characteristics			
Age	0.268 (3.397)	-215.036*** (30.768)	-0.00004838*** (0.000)
Age Quadratic	- -	-0.027*** (0.004)	- -
Independent Variables: Foreclosure Characteristics			
REO	-44082.052*** (896.793)	-43930.015*** (896.369)	-0.196*** (0.003)
Independent Variables: Structural Characteristics			
Bedrooms	-21245.189*** (749.865)	-21424.336*** (749.735)	-0.001 (0.003)
Full Bathrooms	24220.461*** (1125.172)	22464.739*** (1150.605)	0.093*** (0.004)
Half Bathrooms	27116.305*** (1176.445)	26165.510*** (1182.905)	0.065*** (0.004)

Table A4 continued

VARIABLE	LINEAR-LINEAR β (Standard Error)	LINEAR-LINEAR QUADRATIC β (Standard Error)	LOG-LINEAR β (Standard Error)
Independent Variables: Structural Characteristics			
1 Story	51597.419*** (1220.231)	51350.534*** (1219.758)	0.076*** (0.004)
Garage	-35597.032*** (1015.411)	-35529.703*** (1014.669)	-0.165*** (0.003)
Fireplace	1570.487 (1100.362)	978.034 (1102.945)	0.117*** (0.004)
Pool	25325.780*** (1205.350)	25866.399*** (1206.679)	0.066*** (0.004)
Septic	47260.012*** (2791.648)	47788.397*** (2790.553)	0.159*** (0.010)
Brick Exterior	3818.567*** (1527.749)	4390.378*** (1528.873)	0.048*** (0.005)
Lap Exterior	1743.542 (1581.618)	1865.971 (1580.786)	0.021*** (0.005)
Vinyl Exterior	-3635.491 (2496.260)	-2591.021 (2499.079)	-0.010 (0.009)
Metal Roof	16049.838*** (6032.816)	15879.365*** (6029.035)	0.101*** (0.021)
Shake Roof	16302.935*** (1864.459)	15247.112*** (1870.091)	0.101*** (0.006)
Slate Roof	18096.028*** (1258.718)	14497.608*** (1359.673)	0.158*** (0.004)
Independent Variables: Neighborhood Characteristics			
HOA	8145.576*** (1422.576)	7229.669*** (1429.261)	0.021*** (0.005)

Table A4 continued

VARIABLE	LINEAR-LINEAR β (Standard Error)	LINEAR-LINEAR QUADRATIC β (Standard Error)	LOG-LINEAR β (Standard Error)
Independent Variables: Location Characteristics			
95602	-124500*** (10290.881)	-137500*** (10635.303)	-0.262*** (0.035)
95603	-124300*** (8441.175)	-136000*** (8839.991)	-0.257*** (0.029)
95605	-243500.000*** (7757.195)	-243500.000*** (8057.874)	-0.830*** (0.027)
95608	-171400.000*** (5764.244)	-178500.000*** (5951.486)	-0.482*** (0.020)
95610	-126400.000*** (14124.162)	-102200.000*** (20635.212)	-0.226*** (0.049)
95616	71486.101*** (8015.823)	59587.833*** (8598.571)	0.173*** (0.028)
95618	76285.027*** (7900.373)	62377.569*** (8525.598)	0.094*** (0.027)
95621	-135000.000*** (14002.188)	-111000.000*** (20554.797)	-0.319*** (0.048)
95624	-174600.000*** (12811.512)	-161100.000*** (16621.162)	-0.396*** (0.044)
95628	-181900.000*** (5756.543)	-189700.000*** (5955.443)	-0.481*** (0.020)
95630	-92089.619*** (7814.592)	-104500.000*** (8262.015)	-0.239*** (0.027)
95648	-238300.000*** (5509.656)	-249900.000*** (5932.249)	-0.642*** (0.019)
95650	-43453.841*** (11634.017)	-46794.337*** (11819.972)	-0.144*** (0.040)
95660	-249800.000*** (5505.214)	-256900.000*** (5699.793)	-1.014*** (0.019)

Table A4 continued

VARIABLE	LINEAR-LINEAR β (Standard Error)	LINEAR-LINEAR QUADRATIC β (Standard Error)	LOG-LINEAR β (Standard Error)
95661	-38969.650* (20699.360)	61220.675 (55861.108)	0.113 (0.071)
95662	-183100.000*** (5896.171)	-191400.000*** (6098.207)	-0.487*** (0.020)
95667	-209700.000*** (6534.181)	-212300.000*** (6832.680)	-0.561*** (0.022)
95670	-194700.000*** (6725.029)	-205200.000*** (7123.030)	-0.578*** (0.023)
95673	-238900.000*** (6372.823)	-248400.000*** (6581.059)	-0.823*** (0.022)
95677	-92786.426*** (15179.695)	-61456.984*** (24384.236)	-0.104** (0.052)
95678	-67675.687*** (20502.911)	33145.682 (55796.267)	0.014 (0.071)
95682	-100400.000*** (11813.406)	-98090.825*** (13013.707)	-0.133*** (0.041)
95691	-232900.000*** (5880.936)	-244800.000*** (6343.755)	-0.650*** (0.020)
95695	-74245.103*** (18709.929)	1469.945 (43543.232)	-0.038 (0.064)
95742	-250400.000*** (8378.880)	-263800.000*** (8817.975)	-0.628*** (0.029)
95746	54879.002*** (11154.119)	54522.864*** (11504.446)	-0.093** (0.038)
95747	-65832.575*** (20560.378)	33733.516 (55802.941)	0.036 (0.071)
95757	-184800.000*** (12853.701)	-172100.000*** (16657.989)	-0.381*** (0.044)
95758	-160600.000*** (12829.448)	-147100.000*** (16627.802)	-0.393*** (0.044)

Table A4 continued

VARIABLE	LINEAR-LINEAR β (Standard Error)	LINEAR-LINEAR QUADRATIC β (Standard Error)	LOG-LINEAR β (Standard Error)
95762	-62913.079***	-59302.561***	-0.165***
	(11561.727)	(12757.036)	(0.040)
95765	-108600.000***	-77271.990***	-0.180***
	(15064.146)	(243000.014)	(0.052)
95776	-75871.351***	-3458.286	-0.014
	(18873.869)	(43626.080)	(0.065)
95815	-272700.000***	-275100.000***	-1.361***
	(5751.428)	(5757.367)	(0.020)
95816	-24426.641***	-21735.742***	-0.004
	(8042.440)	(8045.283)	(0.028)
95817	-239000.000***	-239000.000***	-1.152***
	(6270.066)	(6265.227)	(0.022)
95818	-47332.156***	-45695.776***	-0.117***
	(6452.667)	(6451.898)	(0.022)
95820	-263300.000***	-265900.000***	-1.272***
	(5391.437)	(5400.504)	(0.019)
95821	-220900.000***	-223400.000***	-0.715***
	(6124.055)	(6130.286)	(0.021)
95822	-259200.000***	-262900.000***	-1.058***
	(5408.403)	(5429.780)	(0.019)
95823	-283300.000***	-289800.000***	-1.095***
	(5096.345)	(5177.763)	(0.018)
95824	-272800.000***	-277200.000***	-1.267***
	(5714.721)	(5743.786)	(0.020)
95825	-220800.000***	-223500.000***	-0.740***
	(8069.667)	(8072.711)	(0.028)
95826	-220400.000***	-225900.000***	-0.670***
	(5813.899)	(5860.227)	(0.020)
95827	-238800.000***	-245100.000***	-0.782***
	(6358.117)	(6416.438)	(0.022)

Table A4 continued

VARIABLE	LINEAR-LINEAR β (Standard Error)	LINEAR-LINEAR QUADRATIC β (Standard Error)	LOG-LINEAR β (Standard Error)
95828	-273400.000*** (5173.146)	-280600.000*** (5270.332)	-0.978*** (0.018)
95829	-266600.000*** (6917.509)	-274200.000*** (6995.417)	-0.842*** (0.024)
95831	-174300.000*** (6455.603)	-179700.000*** (6494.569)	-0.468*** (0.022)
95832	-301000.000*** (5971.329)	-307400.000*** (6035.489)	-1.211*** (0.021)
95833	-251800.000*** (5505.090)	-258700.000*** (5587.236)	-0.863*** (0.019)
95834	-253900.000*** (5672.738)	-261700.000*** (5773.918)	-0.792*** (0.020)
95835	-256500.000*** (5391.560)	-263900.000*** (5488.379)	-0.739*** (0.019)
95838	-275500.000*** (5301.642)	-282200.000*** (5382.824)	-1.208*** (0.018)
95841	-236000.000*** (8446.308)	-240700.000*** (8465.249)	-0.706*** (0.029)
95842	-256100.000*** (7037.877)	-262900.000*** (7098.867)	-0.953*** (0.024)
95843	-238000.000*** (5370.937)	-248600.000*** (5647.660)	-0.735*** (0.018)
95864	-63628.562*** (6331.085)	-65931.369*** (6334.570)	-0.333*** (0.022)
95901	-290500.000*** (7656.445)	-301700.000*** (7922.777)	-1.001*** (0.026)
95961	-308900.000*** (7035.800)	-323900.000*** (7705.321)	-0.981*** (0.024)
95991	-298000.000*** (7757.251)	-306200.000*** (7840.524)	-0.985*** (0.027)

Table A4 continued

VARIABLE	LINEAR-LINEAR β (Standard Error)	LINEAR-LINEAR QUADRATIC β (Standard Error)	LOG-LINEAR β (Standard Error)
95993	-292500.000*** (8562.248)	-302000.000*** (8661.778)	-0.870*** (0.029)
R^2	0.815	0.815	0.836
Adjusted R^2	0.815	0.815	0.835

*Significant at the 90% confidence level. **Significant at the 95% confidence level.
***Significant at the 99% confidence level.

Table A5

Weighted Least Squares Regression Results (from Table 6)

VARIABLE	β (Standard Error)	VIF	90% CONFIDENCE INTERVAL	
			Lower Bound	Upper Bound
Independent Variables: Land Use Ordinance Characteristics				
Required Regional Housing Need	-0.008 (0.001)	251.792	-0.009	-0.006
Independent Variables: House Size Characteristics				
House SQFT	0.280 (0.003)	4.608	0.293	0.305
Lot SQFT	0.0000002247 (0.000)	1.006	0.000	0.000
Independent Variables: House Vintage Characteristics				
Age	-0.00004390 (0.000)	1.027	0.000	0.000
Independent Variables: Foreclosure Characteristics				
REO	-0.179 (0.003)	1.220	-0.201	-0.191

Table A5 continued

VARIABLE	β (Standard Error)	VIF	90% CONFIDENCE INTERVAL Lower Bound	Upper Bound
Independent Variables: Structural Characteristics				
Bedrooms	-0.009 (0.002)	2.306	-0.005	0.003
Full Bathrooms	0.068 (0.003)	3.632	0.086	0.099
Half Bathrooms	0.053 (0.003)	1.599	0.058	0.071
1 Story	0.059 (0.004)	2.106	0.069	0.083
Garage	-0.145 (0.003)	1.017	-0.171	-0.159
Fireplace	0.111 (0.004)	1.291	0.110	0.123
Pool	0.073 (0.004)	1.130	0.059	0.072
Septic	0.162 (0.090)	1.361	0.143	0.174
Brick Exterior	0.042 (0.005)	1.075	0.039	0.056
Lap Exterior	0.019 (0.005)	1.055	0.012	0.030
Vinyl Exterior	-0.025 (0.009)	1.035	-0.024	0.005
Metal Roof	0.112 (0.020)	1.017	0.067	0.135
Shake Roof	0.111 (0.006)	1.180	0.090	0.111
Slate Roof	0.158 (0.004)	2.462	0.151	0.165

Table A5 continued

VARIABLE	β (Standard Error)	VIF	90% CONFIDENCE INTERVAL Lower Bound	Upper Bound
Independent Variables: Neighborhood Characteristics				
HOA	0.030 (0.004)	1.630	0.013	0.029
Independent Variables: Location Characteristics				
95602	-0.277 (0.032)	2.036	-0.320	-0.204
95603	-0.259 (0.028)	6.671	-0.304	-0.209
95605	-0.757 (0.026)	1.761	-0.874	-0.786
95608	-0.457 (0.020)	3.439	-0.515	-0.450
95610	-0.196 (0.046)	18.467	-0.306	-0.146
95616	0.183 (0.026)	2.427	0.127	0.218
95618	0.107 (0.026)	2.570	0.049	0.139
95621	-0.294 (0.046)	26.270	-0.398	-0.240
95624	-0.356 (0.042)	41.186	-0.468	-0.323
95628	-0.471 (0.190)	3.448	-0.514	-0.448
95630	-0.219 (0.026)	7.186	-0.283	-0.195
95648	-0.660 (0.019)	7.083	-0.673	-0.611
95650	-0.118 (0.037)	3.578	-0.209	-0.078

Table A5 continued

VARIABLE	β (Standard Error)	VIF	90% CONFIDENCE INTERVAL Lower Bound	Upper Bound
95660	-1.048 (0.020)	4.696	-1.045	0.983
95661	0.189 (0.067)	29.218	-0.005	0.230
95662	-0.488 (0.020)	3.096	-0.520	-0.453
95667	-0.570 (0.022)	2.712	-0.598	-0.524
95670	-0.561 (0.022)	10.840	-0.616	-0.540
95673	-0.831 (0.023)	2.450	-0.859	-0.787
95677	-0.054 (0.049)	15.842	-0.190	-0.018
95678	0.076 (0.066)	51.165	-0.102	0.130
95682	-0.109 (0.038)	8.472	-0.200	-0.066
95691	-0.648 (0.020)	4.051	-0.684	-0.617
95695	0.005 (0.061)	30.717	-0.144	0.068
95742	-0.629 (0.027)	4.551	-0.676	-0.581
95746	-0.049 (0.035)	6.443	-0.157	-0.030
95747	0.099 (0.066)	58.956	-0.080	0.153
95757	-0.340 (0.042)	38.638	-0.454	-0.308
95758	-0.360 (0.042)	44.264	-0.466	-0.320

Table A5 continued

VARIABLE	β (Standard Error)	VIF	90% CONFIDENCE INTERVAL Lower Bound	Upper Bound
95762	-0.124 (0.037)	17.275	-0.231	-0.100
95765	-0.129 (0.049)	24.573	-0.265	-0.095
95776	0.030 (0.061)	20.024	-0.121	0.093
95815	-1.373 (0.021)	3.283	-1.394	-1.329
95816	-0.015 (0.029)	1.526	-0.049	0.042
95817	-1.155 (0.024)	2.357	-1.188	-1.117
95818	-0.142 (0.023)	2.129	-0.153	-0.080
95820	-1.284 (0.020)	4.530	-1.303	-1.242
95821	-0.703 (0.022)	2.473	-0.750	-0.681
95822	-1.047 (0.019)	4.431	-1.089	-1.028
95823	-1.108 (0.018)	8.850	-1.124	-1.066
95824	-1.266 (0.021)	3.313	-1.300	-1.235
95825	-0.746 (0.030)	1.524	-0.786	-0.695
95826	-0.684 (0.020)	3.073	-0.702	-0.637
95827	-0.787 (0.022)	2.318	-0.818	-0.746
95828	-0.968 (0.018)	7.220	-1.007	-0.948

Table A5 continued

VARIABLE	β (Standard Error)	VIF	90% CONFIDENCE INTERVAL Lower Bound	Upper Bound
95829	-0.826 (0.023)	1.979	-0.881	-0.803
95831	-0.461 (0.021)	2.186	-0.505	-0.432
95832	-1.168 (0.021)	2.890	-1.245	-1.178
95833	-0.864 (0.019)	4.138	-0.894	-0.832
95834	-0.791 (0.019)	3.668	-0.825	-0.760
95835	-0.743 (0.018)	5.983	-0.770	-0.709
95838	-1.184 (0.019)	5.530	-1.238	-1.178
95841	-0.700 (0.029)	1.466	-0.754	-0.658
95842	-0.982 (0.026)	1.862	-0.993	-0.913
95843	-0.744 (0.019)	6.005	-0.766	-0.705
95864	-0.249 (0.021)	2.268	-0.369	-0.297
95901	-0.990 (0.026)	1.738	-1.044	-0.957
95961	-0.956 (0.023)	2.801	-1.021	-0.941
95991	-0.980 (0.026)	1.625	-1.029	-0.941
95993	-0.861 (0.027)	1.479	-0.918	-0.821

REFERENCES

California Department of Housing and Community Development (HCD). (2000, May). *Raising the roof: California housing projections and constraints, 1997-2020.* Retrieved from http://www.hcd.ca.gov

California Strategic Growth Council. (2010, November). *2010 California regional progress report.* Retrieved from http://www.calblueprint.dot.ca.gov

Chakraborty, A., Knapp, G. J., Nguyen, D., & Shin, J. H. (2009, October). The effects of high-density zoning on multifamily housing construction in the suburbs of six US metropolitan areas. *Urban Studies, 47*(2), 437-451.

Downs, A. (2002). Have housing prices risen faster in Portland than elsewhere? *Housing Policy Debate*, *13*(1), 7-31.

Euchner, C. C., & Frieze, E. (2003, January). *Getting home: Overcoming barriers to housing in Greater Boston.* Retrieved from http://www.hks.harvard.edu/rappaport/downloads/gettinghome.pdf

Fulton, W., & Shigley, P. (2005, September). *Guide to California planning.* Point Arena, CA: Solano Press Books.

Gerardi, K. S. (2010). *Reasonable people did disagree: Optimism and pessimism about the U.S. housing market before the crash*. Retrieved from http://www.bos.frb.org/economic/ppdp/2010/ppdp1005.htm

Glaeser, E. L., & Gyourko, J. (2003, June). The impact of building restrictions on housing affordability. *Economic Policy Review*, 21-39.

Glaeser, E. L., & Ward, B. (2006, October). *The causes and consequences of land use regulation: Evidence from Greater Boston.* Retrieved from http://www.economics.harvard.edu/faculty/glaeser/files/Glaeser_Ward.pdf

Glaeser, E. L., Schuetz, J., & Ward, B. (2006, January). *Regulation and the rise of housing prices in Greater Boston*. Retrieved from http://www.hks.harvard.edu/rappaport/downloads/housing_regulations/regulation_housiugprices.pdf

Jackson, K. T. (1985). *Crabgrass frontier: The suburbanization of the United States.* New York: Oxford University Press.

Jun, M. (2006). The effects of Portland's urban growth boundary on housing prices. *Journal of the American Planning Association, 72*(2), 239-243.

Levine, N. (1999). The effects of local growth controls on regional housing production and population redistribution in California. *Urban Studies, 36*(12), 2047-2068.

Lewis, P. G., & Neiman, M. (2002). *Cities under pressure: Local growth controls and residential development policy*. Retrieved from http://www.ppic.org/main/publication.asp?i=143

Lewis, R. (2011a, January). 2010 home sales end on high note. *Sacramento Bee*. Retrieved from http://www.sacbee.com/2011/01/21/v-wireless/3340268/2010-homesales-end-on-high-note.html

Lewis, R. (2011a, January). 2010 home sales end on high note. *Sacramento Bee*. Retrieved from http://www.sacbee.com/2011/01/21/v-wireless/3340268/2010-homesales-end-on-high-note.html

Malpezzi, S., & Green, R. K. (1996). What has happened to the bottom of the US housing market? *Urban Studies*, *33*(10), 1807-1820.

Mayer, C. J. & Somerville, C. T. (2000). Land use regulation and new construction. *Regional Science and Urban Economics*, *30*(6), 639-662.

National Association of Home Builders. (1998). *The truth about regulatory barriers to housing affordability*. Retrieved from http://www.nahb.org/

Phillips, J., & Goodstein, E. (2000, July). Growth management and housing prices: The case of Portland, Oregon. *Contemporary Economic Policy*, *8*(3), 334-344.

Quigley, J. M., & Raphael S. (2004). Is housing unaffordable? Why isn't it more affordable? *The Journal of Economic Perspectives, 18*(1), 191-214.

Sacramento Area Council of Governments (SACOG). (2011, February 17). *Changing demographics and demand for housing types.* [White paper]. Sacramento, CA: Author.

Schill, M. H. (2005). Regulations and housing development: What we know. *Cityscape: A Journal of Policy Development and Research*, *8*(1), 5-19.

Schilling, J. D., Sirmans, C. F., & Guidry, K. A. (1991). The impact of state land-use controls on residential land values. *Journal of Regional Science*, *30*(1), 83-92.

Shaw, M. (2011, February 1). Report: Home prices to drop 8.3%. *Sacramento Business Journal*. Retrieved from http://www.bizjournals.com/sacramento/news/2011/02/01/report-home-prices-to-drop-83.html

Somerville, C. T., & Mayer, C. J. (2003, June). Government regulation and changes in the affordable housing stock. *Economic Policy Review*, 45-62.

Stanley, S. R., & Mildner, G. C. S. (1999, October). *Urban-growth boundaries and housing affordability. Lessons from Portland*. Retrieved from http://www.reason.org/news/show/127574.html

Studenmund, A. H. (2006). *Using econometrics: A practical guide.* Boston: Pearson: Addison Wesley.

The Economist. (2009, August). *Where it all began: Signs of stabilization should not obscure the big problems still ahead.* Retrieved from http://www.economist.com/node/14258851

Thomas, G. S. (2010, April). How affordable is the Sacramento housing market? *Sacramento Business Journal*. Retrieved from http://www.bizjournals.com/sacramento/stories/2010/04/19/daily21.html

United States Department of Housing and Urban Development (HUD). (2005, February). *"Why not in our community?" Removing barriers to affordable housing*. Retrieved from http://www.huduser.org/Publications/pdf/wnioc.pdf