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HEDONIC ANALYSIS OF HOUSING PRICES NEAR THE PORTLAND URBAN GROWTH BOUNDARY, 1978-1990

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ABDULLAH ALKADI

A dissertation submitted in partial fulfillment of the requirements for the degree of

DOCTOR OF PHILOSOPHY in URBAN STUDIES

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DISSERTATION APPROVAL

The abstract and dissertation of Abdullah Alkadi for the Doctor of Philosophy in Urban Studies was presented May 6, 1996 and accepted by the dissertation committee and the doctoral program.



ABSTRACT

An abstract of the dissertation of Abdullah Alkadi for the Doctor of Philosophy in Urban Studies presented May 6, 1996.

Title: Hedonic Analysis of Housing Prices near the Portland Urban Growth Boundary, 1978-1990.

The cornerstones of Oregon's 1973 Senate Bill 100 are the preservation of farm, forest, and other resource lands and the containment of urban development within urban growth boundaries (UGB). The UGB is a boundary around each incorporated city containing enough land to meet projected needs until the year 2000.

The Land Conservation and Development Commission (LCDC), charged with adopting and implementing state planning policy, sought to keep UGBs small enough to contain urban sprawl. To avoid the potential effects of land price inflation, LCDC allowed UGBs to include more land supply than the forecasted demand. The Portland-Metropolitan region was allowed to have a 15.3-percent surplus.

Policy makers are unsure what effect UGBs have on housing costs. The common belief is that by restricting the amount of land available for residential construction the market drives prices up. Contrasting opinions suggest that by substituting low-density with high-density development, per-unit construction costs are lower, thus reducing the costs of owning a home.

Efforts to dispel some of the mystery about the relationship between UGBs and housing prices are needed. The objective of this research is to provide empirical evidence of the relationship between the Portland-Metropolitan area's UGB and housing prices. The study uses a hedonic model to conduct a time-series analysis for the years 1978 to 1990 for Washington County.

This study found no relationship between housing price and the imposition of the UGB. In fact, the rate of increase in price for single-family housing after UGB implementation was found to be much less than before. Proximity as measured by distance of sale to the UGB was the only variable that was associated with a higher rate of increase in housing prices.

All of these results, with the exception of those related to proximity, were unexpected but may be explained by several factors: imposition of the Metropolitan Housing Rule in 1981, a severe recession during the 1980s, and excess land supply. These influences do not support a conclusion that UGBs lead to an increase in housing prices, at least prior to 1990, when the UGB did not constrain the supply of land.

المنورة الفاجنة الله The Opening مِاللَّهُ الرَّمْزِ الرَّجْبَي (1) In the name of God, the بنہ Compassionate, the Merciful All praise belongs to God, ٱلْحَصْدُيَنَهِ رَبِّ ٱلْعَسَلَمِينَ Lord of all world, ٱلرَّحْمَنِ ٱلرَّحِيمِ ٢ the Compassionate, the Merciful, مَالِكِ يَوْمِ ٱلدِّينِ Ruler of Judgment Day. It is You that we worship, إِيَّاكَ نَعْبُدُ وَإِيَّاكَ نَسْتَعِينُ ﴾ and to You we appeal for help. آهدِنَا ٱلصِّرَطَ ٱلْمُسْتَقِ Show us the straight way, the way of those You have graced, صِرَط ٱلَّذِينَ أَنْعَمْتَ عَلَيْهِم غَيْرِ not of those on whom is Your wrath, ٱلْمَغْضُوب عَلَيْهِ مُوَلَا ٱلضَّالَيْنَ not of those who wander astray.

The Arabic text is the first Surat (chapter) of the Holy Qur-an and the English is the translation of the meaning by Thomas Cleary from his book The Essential Koran.

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This Dissertation Is Dedicated To

The memory of my beloved father, Hussain who was the force behind my education. May Allah shower His Mercy on him and grant him paradise

My mother, Noorah, who nurtured me

My wife for her love and devotion

My children, Noorah, Abrar, Mohammed, and Mariam for their patience and support

My brothers and sisters, for their encouragement

and

My friends who inspired confidence in me

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CHAPTER I INTRODUCTION

The United States post-World War II population growth has significantly shifted away from the central cities, with the automobile, federal highway programs, and federal housing policies lessening the individual's reliance on the central city. The rate of population growth in the suburbs, compared to population growth in the central cities, has been extraordinary. Populations in the 1950s and 1960s in the suburbs surrounding the nation's largest metropolitan areas grew by 53.9 percent while the central cities added only 1.5 percent to their population. Between 1960 and 1985, the population increase in the United States was estimated to be 73 million persons with almost 80 percent of this growth (58 million persons) estimated to live in suburban communities. Furthermore, the total suburban population rose from 41 million in 1950 to 115 million in 1990, an increase of 181 percent compared with a 65 percent increase in total population (Downs 1994).

The substantial increase in the areas surrounding central cities has resulted in a sprawling pattern of urban development with huge amounts of rural/farm land being transformed to accommodate this urban expansion. Rural landscapes, which once were dominated by agricultural uses, have been converted into housing, shopping centers, roads, industrial facilities and office spaces. Urban sprawl has consumed land at a much faster rate than the population (Toulan 1965), an example being that during the 1960s, total_urban population increased by 21 percent while the consumption of land for urban uses increased by 36 percent (Nelson 1984). The state of Oregon has not been immune to this migration from urban areas to the rural environs. The state has been a popular destination for people from other states, which has exacerbated urban sprawl and resulted in the loss of open space. In the 1960s, the ability of Oregon's fiscal base and environment to manage the sprawling development started to become a growing concern among lawmakers, with the provision of sewer, water and other necessary infrastructure services to the low-density suburban developments generating additional costs that the state's natives were reluctant to pay. The result was a strained relationship between long-time residents and new arrivals, who received much of the blame for the perceived ills of rapid urban development. This anti-growth sentiment was voiced by then-Governor Tom McCall and his not-so subtle greetings at the California border pleading for visitors to "enjoy your visit, but don't stay."

Environmental concerns focused on the diminishing amount of forest and agricultural land, the backbone of the state's economy, with the greatest loss occurring in the fertile Willamette Valley, which stretches south from Portland for approximately 100 miles. The Willamette Valley accounts for only a small percentage of the state's land area, yet it is home to nearly 75 percent of the state's population (Howe 1993). There was a widespread fear that the tide of urban development would eventually wash over the Willamette Valley if the state did not take strong measures to guide, direct, and control the quality of this growth (DeGrove 1984).

Despite the anti-growth atmosphere in the state, its legislators acknowledged the reality of the growth and were prepared to confront the issue with the result that in 1969, the Oregon legislature passed Senate Bill 10, an initiative which required all cities and counties to

adopt and apply comprehensive planning and zoning ordinances addressing nine statewide goals, including growth management (Toulan 1994; Knaap & Nelson 1992). The plans were to be reviewed and approved by the Governor. This first attempt at legislatively controlling development failed, as there was insufficient staff to push local governments and no penalties for noncompliance (Nelson 1992).

In 1973 the legislature tried again, passing Senate Bill 100. The cornerstones of this initiative were the preservation of farm, forest, and other open space or environmentally sensitive land and the containment of urban development within urban growth boundaries (Nelson 1992). The urban growth boundary (UGB) was to be established around each city or urbanized area, containing enough land to meet projected development needs until the year 2000. All land in the state was to be either inside UGBs or classified for exclusive resource uses. With some exceptions, for example large acreage lots, residential development outside UGBs was to be stopped. Land within the boundary, even undeveloped and agricultural land, was available for conversion into urban use.

Determining how much land was to be included within UGBs was often controversial. Localities fought to include enough land in order to avoid land price inflation. The commission that was created with Senate Bill 100, the Land Conservation and Development Commission (LCDC), was charged with adopting and implementing state planning policy and sought to keep UGBs small enough to contain urban sprawl (Knaap & Nelson 1992). However, to avoid the potential effects of land price inflation, the LCDC made sure that UGBs contained more land than forecasted for the year 2000; for example, the Portland metropolitan region was allowed to have a 15.3 percent land surplus (Nelson 1994).

Even if UGBs contain more than enough land for future development, policy makers are unsure what effect these boundaries have on housing costs. The common belief is that by restricting the amount of land available for residential construction the market would drive prices up. Contrasting opinions suggest that by substituting low-density development with high density, costs associated with the provision of public services would be reduced, thus lowering the cost of owning a home (Abbott, Howe, Adler 1994).

Efforts to dispel some of the mystery about the relationship between UGBs and housing prices are needed. The objective of this research is to conduct a hedonic analysis of detached single family housing prices near the Portland metropolitan area's UGB.

RESEARCH OBJECTIVES

The primary objective of this research is to examine changes in the detached single-housing prices that occurred shortly after the implementation of the Portland metropolitan area's UGB. There are many factors that can influence the housing market. This study attempts to examine the relationship of UGBs and housing price, while holding other important variables affecting price constant. These other variables include factors such as interest rates, accessibility, housing site and structure, and neighborhood characteristics. To examine the changes in the detached single housing prices, this research utilizes hedonic analysis, which simply measures a relationship between housing unit attributes and market prices.

The examination of the changes in the detached single-housing prices that are concurrent with UGBs has several implications for policy makers. A better understanding of the behavior of the housing

market concurrent with UGBs would help planners and public officials in analyzing the desirability of adopting such a program for a particular community. In addition, this research should help policy makers develop an economic rationale for the need for extending UGBs to other areas designated as non-urban. Finally, the study should enrich the growth management literature as it will dispel some of the ambiguities about changes in the market for single-family houses associated with UGBs.

This study is focusing only on the market for the detached single-family home for two main reasons. First, the rental market is different from the ownership market. Second, UGBs are imposed to control urban sprawl and low densities, which are fueled by singlefamily housing.

The Portland metropolitan area's UGB was implemented in October 1980. As a result this study examines the changes in the detached single-family housing market for a few years before (back to January 1978) and a few years after (up to 1990, the midpoint of the UGB's designated period).

The Portland area was chosen because it is one of the fastest growing areas in the U.S., and the UGB has been in place long enough for any changes in the housing market to become apparent. However, the Portland area is too large an area to be examined; therefore, Washington County was chosen from the Portland area. This research is focusing on Washington County because it is the fastest growing of the three counties, Multnomah, Clackamas, and Washington. In addition, the data for Washington County is computerized and <u>well established</u>.

The Portland area in general and Washington County in particular have a history of rapid growth in population and

employment during the last few decades. A brief historical background about some trends should help the reader to understand the forces behind the dynamics of the housing market.

HISTORICAL BACKGROUND

The purpose of this section is to give a brief discussion about population, employment, and housing trends for Washington County and the Portland metropolitan area. Portland is, comparatively speaking, a young city. Portland was incorporated only 150 years ago. In 1860 the population did not exceed 2,844 people. The increase in railroad connections, streetcar lines, paved roads and electric lights, made the area start to grow significantly after the turn of the century. As a result of World War II, the metropolitan area population grew from about 500,000 in 1940 to over 660,000 in 1944 (Abbott 1983; Friedman 1993).

In 1950, the Portland region was home to 620,000 people. The area kept increasing at a rapid pace to 822,000 in 1960 and 1,007,130 in 1970. This increase was fueled by the immigration of many Californians who moved north to escape smog, traffic, crowds, earthquakes, crime, the drought, and economic woes.

After 1970 the region's population grew at an even faster rate, As shown in Figure 1, from 1970 to 1990 the population of the Portland metropolitan area increased from 1,007,130 to 1,495,548 almost 50 percent. Washington County's population increased from 157,920 to 311,554— almost 98 percent.

This increase in population was associated with a growth in the regional economy. As shown in Figure 2, the total employment of the Portland metropolitan area increased from 518,200 in 1979 to 636,900 in 1990—an increase of over 22 percent. However, employment in

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Washington County had a greater expansion. The total employment went from 33,324 in 1960 to 172,008 in 1990— an increase of 416 percent.



POPULATION TRENDS

<u>Figure 1.</u> Population Trends for the Portland Metropolitan Area and Washington County for the Period 1970-1990. Source: RMLS 1990.

The region's economy was hit by a very severe recession in early 1980s, but it rapidly regained its strength as employment went up by 28,800 (5.2 percent) in 1988, 31,200 (5.4 percent) in 1989, and 22,500 (3.71 percent) in 1990.

The median family income for the Portland area increased throughout the 1960-1990 period. The median family income for Washington County was even higher than in the metro area. The difference between the two adjacent areas peaked in 1990, when Washington County enjoyed a median income in the \$40,000-\$45,000 range versus a metropolitan area median of just over \$30,000.



EMPLOYMENT TRENDS

<u>Figure 2.</u> Employment Trends for Portland Metropolitan Area for the Period 1979-1990. Source: RMLS 1991

Growth in population and economic prosperity led to a strong regional housing market and a concomitant rise in housing prices. Single-family housing permits for the four-county area (Multnomah, Washington, Clackamas, and Clark County) went up from 5,756 in 1980 to 8,315 in 1990— an increase of 45 percent. As shown in Figure 3, the average housing value in 1979 was \$65,500 for the metropolitan area, while the median sales price was \$59,900. These figures went up to \$96,000 for the average housing value in 1990, while the median sales price was \$79,700. The same figure shows a decline in the average housing values during 1982, 1983, 1984, and 1985. This decline was a natural reflection of the recession in the economy that took place in early 1980s.



HOUSING PRICES TRENDS

<u>Figure 3.</u> Single-Family Home Prices for the Portland Metropolitan Area, 1979-1990. Source: RMLS 1990.

ORGANIZATION OF THE STUDY

This study is organized into five chapters. Chapter I, the introduction, discusses the general scope of the problem, the study objective, the historical background of the area of study, and the study outline. Chapter II gives a brief review of related literature in two sections.

The first section consists of two parts which review the dynamics of the housing market. Part one spells out most of the factors that affect the supply-demand framework. Part two discusses land use and housing price theories. This second part deals mainly with factors that affect housing prices from a spatial point of view.

The second section reviews empirical studies that address variables which affect housing prices. This section focuses mostly on studies dealing with housing prices and land use controls. Sections one and two pave the way for this research to develop a model that – could be used to test the relationship between UGBs and housing prices.

Chapter II concludes with a brief summary of empirical studies about urban growth controls and housing prices. Chapter III discusses the methodology used for this research in terms of the necessary approaches to problem examination and research design.

Chapter IV presents the empirical analysis of the research questions. In particular, it analyses the data of the study, it discusses the research findings, and then it gives a brief summary of the main analysis in this chapter. Chapter V presents the major research findings and concludes with policy implications and some suggestions for future research.

CHAPTER II LITERATURE REVIEW

The purpose of this chapter is to present a theoretical perspective on the relationship between land use controls and housing prices. There have been various studies of housing prices and land use controls. In order to establish the connection between housing prices and UGBs, it is necessary to explore the findings of these studies to identify relevant variables.

The exploration is in two sections with the first providing a theoretical foundation of the housing market by examining the supply-demand framework and then land use and housing price theories. The second section analyzes the empirical studies which integrate land use controls and housing prices. This is followed with a conclusion.

THEORETICAL FOUNDATION OF THE HOUSING MARKET

The housing market is fairly complex with numerous variables playing significant roles in determining its behavior. Many participants contribute to the housing market, including land developers, builders, Realtors, financial institutions, and local governments; these participants provide the inputs necessary for housing development (Knaap and Nelson 1992). Another part of the housing market equation is housing characteristics, including the quality of the dwelling itself, the size of the dwelling, and site characteristics (Kain and Quigley 1970). Each single house and the lot

on which it is located is unique in terms of size, location, topography, subsoil conditions, public regulations, supporting services, ownership, and future utility. Housing prices vary with these attributes and with the conditions of sale (Black and Hoben 1985).

Given this complexity, this research utilizes economic theories, such as the supply-demand framework and the bid-rent function, in determining the factors that affect the housing market. Recognizing the multiplicity of participants in the housing market, the following discussion analyzes the housing market from two perspectives. The first employs the supply-demand framework and the second a land use approach.

1. Housing Prices from the Supply-Demand Framework

Supply-demand functions determine the basis for the housing market with the supply function being represented by the standing stock in the housing market, while the demand function is represented by the consumers' desire and ability to have a certain type of housing. This interaction of supply and demand factors determines housing prices (Black and Hoben 1985; Manchester 1987). However, there are factors that influence each side of the supply-demand framework and the following is an analysis of the supply-demand framework and the variables that could influence each side.

a. Supply-Side Factors

On the supply side, the cost of housing inputs (land, labor, capital, and materials) could affect the quantity supplied. Regulatory restrictions, restrictions on service facilities (infrastructure), natural restrictions, environmental restrictions, ownership characteristics and tax policy could exacerbate the cost of housing inputs (Black and

Hoben 1985; Deakin 1991). In fact, land use controls influence the housing market primarily through the market for land, an example being that a parcel of land cannot be used for housing construction until the parcel has been zoned by local governments for residential use (Landis 1986; Niebanck 1991; Lowry and Ferguson 1992; Knaap and Nelson 1992; Downs 1994).

In some cases, local governments zone enough land for residential use, but restrict the supply of residential units by placing an annual cap on housing permits. This type of limitation on the residential supply causes housing prices to rise. Schwartz, Hansen, and Green (1984) conducted a study on Petaluma, California, after it placed an annual cap on building permits of a maximum of 500 permits per year, well below recent and expected demand. Their study found that Petaluma's housing prices were 9 percent higher than similar units in nearby Santa Rosa, California, where a limitation on housing supply was not implemented. Katz and Rosen (1987) also analyzed data from Bay Area communities and found that existing housing in communities that placed a cap on building permits were 17 to 38 percent higher in value than those communities without such controls.

Besides policies aimed directly at the supply of housing, cities can reduce supply indirectly by acquiring development rights, an example being the acquisition of land for greenbelt or open space easements which could then be used to limit the amount of land available for development (Correll, Lillydahl, and Singell 1978). Although many methods have been used for several decades to constrain land supply, greenbelts have been known and used for centuries and could be the first tool in history to have been used to constrain developable land. Toulan (1965) analyzed the usage of greenbelts as barriers to limit land available for development and demonstrated that the usage of greenbelts went back to the sixteenth century when Sir Thomas Moore developed his famous utopian scheme. Less than a century later, Elizabeth I of England proclaimed the formation of a greenbelt around the city of London. In 1958 the city of Ottawa in Canada also used greenbelts for limiting the amount of land available for development.

Many local governments use UGBs and urban growth service boundaries to delay conversion of rural land to urban usage (Bruckner 1990; Easley 1992), and this delay reduces the land supplied for development. Whether the constraint on land supply is stringent or not depends on the amount of supplied developable land in relation to targeted time. Time is the key figure in UGB programs: the intent of traditional land use regulations is to specify what, where, and how one can improve land, while UGBs specify when one can improve land (Knaap 1982). However, if local governments restrict developable land for residential uses (which will be represented by an inward curve, showing that lower supplies are provided at all prices) the price of land will increase, all things being equal, and in turn this will affect the price of housing (Fischel 1990).

The empirical work by Segal and Srinivasan (1985) analyzed housing prices among fifty metropolitan areas where some of these metropolitan areas withdrew 20 percent of their suburban developable land. Their study found that areas with land supply constraint had at least 6 percent greater inflation in housing prices than areas that had not. In fact, Landis (1986) argues that a 10-percent reduction in the supply of developable land available for new home construction ultimately may increase the price of new housing by 20 or even 30 percent. It follows that if land supply is constrained by any means in the face of constant demand (with the assumption that other factors are held constant), the price of land will rise and in turn housing prices will escalate.

b. Demand Side Factors

On the demand side, population growth and other demographic changes, increasing incomes, decentralization of population, and interest rates are major factors thought to generate demand for more housing (Beaton 1982; Black and Hoben 1985; Manchester 1986; Dowall 1986; Smith 1989; Fischel 1990; Sullivan 1990; Deakin 1991; Lowry and Ferguson 1992; Malpezzi and Ball 1992; and Knaap and Nelson 1992). Although Beaton (1982) believes that demand variables are the driving force in housing markets, he argues that these variables are national or at least regional factors which tend to transcend a given state and most certainly a given city.

One of the most influential variables on the demand side is interest rate. Many consumers are highly reactive to interest rate changes. Snyder and Stegman (1986) argue that interest rates have historically dominated the demand for more housing. The validity of this argument can be supported by Manchester's 1986 study, in which he tested the housing market of 42 metropolitan areas for the period between 1971 and 1978 and found that a one percentage point rise in the interest rate would cause a significant drop in the quantity of housing demanded. Studies by Singell and Lillydahl (1990), Segal and Srinivasan (1985), and Pollakowski and Wachter (1990) also tested the effect of interest rates and found that they have a significant negative consequence on housing value, which in turn affects the quantity demanded.

Population increase or decrease which normally affects the number of households plays a significant role in the demand function, with an increase in population creating more demand for housing and in turn on land consumption. This association between population increase and land consumption has been recognized in the literature for some time (George, 1879). This was tested by several empirical studies, such as Segal and Srinivasan (1985), Beaton (1982), and Black and Hoben (1985), all of whom included the population variable in their regression equations to control for housing demand. Segal and Srinivasan (1985) found that after controlling for other demand and supply factors, population changes had a significant influence on housing demand. Similarly, Beaton (1982) found a significant relationship between the quantity of housing demanded and population growth. He increased the explanatory power of his model by adding demand data from national sources and national variables including income, interest rates and national housing prices. He concluded that these demand variables are the force that drives the housing market and are factors which tend to transcend a given state and most certainly a given city. In fact, Deakin (1991) criticized many researchers for failing to account for price increases due to demand shifts that are stimulated by population growth and other factors such as job and income growth.

Increase in income could also cause an upward shift in housing demand and Segal and Srinivasan (1985), Fischel (1991), Black and Hoben (1985), Dubin (1990) and Downs (1994) explain that an increase in income exacerbates the demand for housing! This is consistent with the empirical works of Muth (1960) and Lee (1968), whose studies demonstrate that income is positively associated with housing demand. However, Smith (1989) believes that an increase in income

could also affect the supply side if higher wages result in an increase in the price of housing. He argues that "if income in a city rises primarily because of higher wages, and if it is difficult to substitute away from labor in the construction of housing, then the cost function would shift upward as income increases" (1989, p. 17).

Land use controls could also stimulate the demand for housing. Fischel (1989), Bruckner (1990), Sullivan (1990) and Knaap and Nelson (1992) argue that land use controls improve the quality of the residential environment, increasing the relative attractiveness of the city, causing migration that pushes up the price of both housing and land. As the demand for housing increases (an outward shift of the demand curve, showing that higher demand exists at all prices), the demand for land increases. This increase in the demand for land increases the price of land and hence increases the price of housing.

In short, housing prices could be influenced by factors that affect the supply function, demand function, or both functions simultaneously. The interaction between the supply and demand function is illustrated in Figure 4. After drawing the connection between the supply-demand framework and housing prices, the following section explains the connection between land use and housing prices.

2. Land Use and Housing Price Theories

The relationship between land use and housing prices has long been recognized within the theoretical framework for explaining the distribution of land use and housing prices in urban areas, as derived from the work of <u>William Alonso (1964) which followed</u> that of David Ricardo and Von Thunen.



Figure 4. Factors Theoretically Influencing Residential Land Price Variations. Source: Black and Hoben 1985

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Ricardo, Von Thunen, and Alonso tried to construct theories of land use and land value. Von Thunen and Ricardo limited their analyses to agricultural land, while Alonso went beyond that and included all types of urban uses as well. This section utilizes the work of those theorists as well as the work of other scholars in order to provide a theoretical foundation for the derivation of housing prices. Many studies have identified factors that play a role in the housing market. Miller (1982) discusses comprehensive factors which influence residential property values. He argues that site, quality and quantity, location or environment, locational externalities, and transaction costs are factors which affect the cost of a house.

Kain and Quigley (1970) developed a comprehensive study regarding quality issues which suggested that factors such as neighborhood characteristics, quality of public schools, crime rates, ethnic composition, and proximity to nonresidential usage have an important effect on housing values. These factors are discussed in the following section under four main categories: accessibility factors, public services factors, structure and site factors, and neighborhood factors.

a. Accessibility Factors

One of the first comprehensive analyses of land value was developed in the beginning of the nineteenth century by David Ricardo, who attributed the price of land to the quality of soil and its proximity to the market square (Sullivan 1990). The concept of proximity to the market square was then extensively developed by Von Thunen to explain why land rents increase with the accessibility of land (Lloyd and Dicken 1977; Sullivan 1990). In Van Thunen's model, one of the major factors that affect land value is transportation; he theorizes that transportation cost is directly proportional to the distance between land and the market (Cadwallader 1985; Sullivan 1990). Von Thunen's model was followed that of William Alonso (1964) who emphasizes the locational pattern of the different land uses based on the assumption of the ability of a type of land use to outbid another type. This theory indicates that retailing use outbids residential use in terms of proximity to the central business district (CBD) (Cadwallader 1985). As the distance increases residential use becomes more profitable: than retailing use.

Alonso's model, like Van Thunen's, theorizes that transportation cost is linearally related to distance, but more specifically that transportation costs increase with increasing distance from the city center. In this way the CBD is the most accessible location in the city and accessibility decreases as one moves away from that location. This indicates that when transportation costs at the CBD are zero, then land value is at its highest price. Thus a movement of a land use away from the CBD implies a substitution of transportation costs for more space; as a result, housing firms would respond to lower land prices by using more land per unit of housing (Sullivan 1990). Wingo's work supports this substitution, as he argues that a consumer would spend a fixed amount on the combination of transportation and housing. Further, Meyer, Kain, and Wohl (1965) note that in urban areas, transportation and housing expenditures are substitutable to varying degrees.

Earlier works have focused on transportation costs as the main factor influencing <u>land and housing prices</u>. This is attributed to the nature of the dominant urban form (monocentric or core-dominated city) before the development of the automobile and the truck in the

early part of the 20th century. However, the development of the automobile, increases in real personal income, urban population increases, changes in household composition, and decline in transportation costs have changed most large metropolitan areas (Meyer and Gomez-Ibañez 1981), with the result that they have become multicentric with suburban subcenters and multi-nuclei centers of activities, such as shopping centers, that complement and compete with the central core area (Sullivan 1990). These subcenters and multi-nuclei centers have added more peaks to the bid-rent gradient of the city.

Many researchers have tried to conduct empirical studies to test the effect of multi-nuclei centers such as employment and shopping centers on housing prices. The conducted research has used both time and distance as proximity measures, while most studies have used distance alone, to measure proximity to employment and shopping Waldo (1974) found that proximity to centers (Miller 1982). employment centers reduces the opportunity cost of commuting time and this in turn is capitalized in housing prices. The empirical work of Harrison and Rubinfeld (1978) suggests that proximity to employment centers has affected Boston's housing prices positively. Similarly, Brookshire et al. (1982) tested property values in the Los Angeles metropolitan area, and Gamble and Downing (1982) tested property values in the Northeastern United States and found a positive shift in housing prices due to time savings because of the proximity to major employment centers.

In fact, time savings in commuting may not be due only to proximity to employment centers but also to proximity to major roads, such as freeways, which reduces commuting time. Wingo argues that a new freeway would make areas in close proximity more desirable for
development than they previously were. Existing housing along the route would rise in value as market forces restore equilibrium with undeveloped land along the route, which would become more economically attractive for development. Hence, when a new road link increases the accessibility of an area, particularly when measured in commuting time, it will significantly influence the behavior of developers and of the consumers whom they ultimately serve (Peiser 1989; Kelly 1992). This can be supported by the empirical work of Johnson and Ragas (1987), whose study demonstrates that major street corridors shift the dominant land value location away from a generally recognized central place.

Another factor which could affect the bid-rent gradient is accessibility to schools, parks, and lakes; proximity to these amenities has been shown to affect housing prices positively (Palmquist 1980; Miller 1982). This is demonstrated in the empirical work of Li and Brown (1980), who found that houses near some amenities, such as schools and recreation areas, are higher in prices than houses that are farther away. In addition, Johnson and Lea (1982) found that the closer a home is located to an elementary school, the greater its value. Brown and Pollakowski (1976) found that the prices of Seattle's singlefamily dwellings are negatively correlated with proximity to the waterfront. This demonstrates that proximity to the waterfront adds more value to the house. Proximity to swimming pools and parks could also add more value to a house, and the empirical work of Gamble and Downing (1982) demonstrates that housing prices fall as the distance to swimming pool areas increases.

It has been <u>discussed earlier that many</u> communities tried to use greenbelts to limit developable land as well as to protect open spaces. However, home buyers consider greenbelts as amenities and because of this, the value of proximity to these open spaces is capitalized in housing prices. Correll et al. (1978) conducted a study to test the effect of Boulder, Colorado's greenbelt on residential property values. Their study included all single-family residential properties which sold in 1975 and which were located within 3,200 feet of the greenbelt. Their regression, after controlling for other factors, demonstrated that houses close to the greenbelt captured higher prices. In fact, the price of a house declined by \$10.20 for every single foot away from the greenbelt.

It is therefore not surprising to see an incremental increase in the prices of houses close to the Boulder greenbelt. What is surprising is to see an increase in land prices close to Salem, Oregon's UGB, even though it was designed only for 20 years. Nelson (1984) found that urban land values closer to Salem's UGB are capturing higher prices than those farther away from it. Like Correll et al. (1978), he attributes his findings to the valuation of proximity to open space, which is on the buffer of Salem's UGB, where urban residents can enjoy the benefits of rural scenery, open space, environmental quality and other rural amenities.

b. Public Service Factors

Public services are the second major factor which contribute to housing prices. Almost forty years ago, Charles Tiebout (1956) recognized that households consider differences in public services as factors in choosing where to live. Several studies after Tiebout's article have confirmed that the price of housing is influenced by the quality of local pub<u>lic services (Jud and Bennett 1986</u>). Sullivan (1990) argues that the market price of housing depends on the characteristics of the dwelling and the site and that among the relevant site

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characteristics is the quality of public services. In fact, many homebuyers pay for better public services indirectly through higher housing prices.

The importance of public services has stimulated many scholars to test empirically their effect on housing prices. Oates (1969) tested the relationship between housing value and school expenditures and found that communities with higher school expenditures witness higher housing prices. In other words, differences in expenditures are capitalized into housing prices. Kain and Quigley (1970) developed a list of variables in order to measure the value of housing quality, and they hypothesized that school quality is positively correlated with housing prices. Even though their study did not find this significant, they argued that better schools attract higher income homeowners who spend more on housing maintenance; this expenditure is in turn capitalized in housing prices.

Most studies that deal with school quality and housing prices one or more measurements to measure school quality. Dubin and Sung (1990) use two measures in order to isolate the effect of school quality on housing prices. The first measure is an input variable of the average teacher's experience in the local elementary schools, while the second measure is an output variable of the average third and fifth grade reading and math achievement test scores in the same local elementary schools. Although Li and Brown (1980) use these input and output variables, they also use expenditure per pupil as an input variable and standard test scores for fourth grade pupils as output variable. Oates (1969) use expenditure per pupil as the measure for school quality while Kain and Quigley (1970) use schools' achievement as the measure for schools' quality, although they did not give further details of how they measured the achievement.

Although the quality of schools is very important to many people, especially single family owners, the quality of other public services, such as parks, police, and fire protection, is important too. Manchester (1987) tried to test the effect of public services on housing prices by using expenditure per capita to measure the quality of the services. He found that the effect of public service expenditure per capita is significant.

Many researchers have used both input and output measures as indicators for public service quality; however, Dubin and Sung (1990) argue that input measures may be deficient for two reasons. First, due to economies of scale and bureaucratic inefficiency, expenditures may not be well correlated with service quality. Second, such researchers usually use data based on small municipalities in a large metropolitan area, which requires that the municipality and neighborhood boundaries coincide. On the contrary, output measures allow the researcher to measure service quality at the neighborhood level.

In addition to the quality of schools and other public services, property taxes play a role in affecting housing prices; several studies have demonstrated the effect of property tax capitalization on housing prices. For example, if two communities have the same level of public services, but one community has higher taxes, the price of housing will be higher in the low-tax community (Sullivan 1990). This is supported by the empirical work of Oates (1969), who found that communities with relatively low tax rates had higher housing prices and by Knaap (1981), who found that the effect of tax on housing prices is highly significant. His study about the effect of the Portland metropolitan area's UGB on land values demonstrates that high land values in Clackamas County, Oregon, are correlated with low taxes. However, Hushak (1975) emphasizes that only with tax rates that vary

widely across many jurisdictions can one expect to estimate significant tax effects on housing prices. The lack of such variability could be the reason behind Knaap's 1981 study, in which he found that taxes had no effect on land values in Washington County, Oregon.

c. Structure and Site Factors

Structure and site factors are major contributors to housing prices. Structure and site factors, such as lot size, interior square footage, number of bedrooms, number of bathrooms, condition, and amenities, affect housing prices positively or negatively. Harrison and Rubinfeld (1978), Singell and Lillydahl (1990), Lafferty (1984), Brookshire et al. (1982), Hughes and Sirmans (1992), Brown and Pollakowski (1977), Kain and Quigley (1970), Gamble and Downing (1982), Palmquist (1980), Nelson, Genereux and Genereux (1992), Johnson and Lea (1982), and Dubin (1992) have all done studies which include variables that affect housing prices. All of these studies have considered housing characteristics such as size of the lot, age of the house, number of bedrooms, area of the interior living area, and the number of bathrooms.

These studies, except for that of Dubin (1992), found that the number of stories was significant; all found that garages and fireplaces also had a positive effect on housing prices. Other researchers did not include these variables because most houses have them and therefore they would not be expected to account for a significant variance in housing prices. In fact, Alkadi and Strathman (1994) included the number of stories as a variable in their regression model testing for effects on housing prices, but whenever the area of the interior space was controlled for, the effect of the number of stories lost its significance. This demonstrates the high collinearity between the area

of the interior space and the number of stories. Gamble and Downing (1992), Dubin (1992), and Johnson and Lea (1982) included the presence of a basement as a variable, and this was found to have a positive effect on housing prices. However, availability of basements is highly correlated with house age, as most houses with basements are old ones. So it is most likely to see the availability of a basement as having a negative effect on housing prices.

d. Neighborhood Factors

Accessibility, the availability of public services, and structure and site factors are not the only attributes to affect housing prices. To some consumers, neighborhood quality is a major, if not the most important, attribute; therefore, it is essential that this research looks for those factors or variables that affect neighborhood quality. Neighborhood factors include household income, education level, densities, racial composition, air and water quality, and crime rates.

Many home buyers pay higher prices for housing located in communities with lower crime rates. The empirical studies by Dubin and Sung (1990) and Kain and Quigley (1970) included crime rate variables to test for neighborhood quality. Kain and Quigley's 1970 study did not give any details regarding crime rate measurement while Dubin and Sung's 1990 study mentioned that the crime rate was obtained by summing the rate of murder, rape, robbery, burglary, and aggravated assault for each crime-reporting area. The crime-reporting area is the smallest geographical unit for which crime statistics are available. The crime rate represents output measures of a very important public <u>service</u>, police protection. This variable is a better measure of neighborhood quality than per capita expenditures because neighborhood safety is of higher interest to the household. Another neighborhood factor that could affect housing prices is the level of income of the neighbors. In fact, the level of income could be associated with crime rate. Dubin and Sung (1990) argue that people with poor and low incomes might be inferior neighbors and be considered unsafe and hence undesirable. The empirical work of Knaap (1982, 1985) demonstrates that level of income is positively correlated with land values in Washington County, Oregon.

The educational level of a neighborhood's residents could play a role in affecting its housing prices. More highly educated individuals are likely to make better neighbors in that they tend to invest more in exterior maintenance, have a greater sense of social responsibility, and are more politically active (Dubin and Sung 1990). This is consistent with the empirical work of Kain and Quigley (1970) who found that a house with otherwise identical characteristics located in a census tract in which the highest median grade completed is the eighth grade will have a market value \$1,900 less than one located in a census tract where the highest median grade completed is the tenth grade.

Even though many people call for more racial integration, in reality many or all of those people live in a more homogenized neighborhood. However, the racial composition of a neighborhood is very important to many people and this factor has been found to affect the housing prices of a neighborhood. Kain and Quigley (1970) and Brookshire et al. (1982) studied the effect of the racial composition of a neighborhood on housing prices and found it to have a negative effect, while the study of Baltimore housing prices and neighborhood quality by Dubin and Sung (1990) found that race is an important characteristic affecting housing prices and is associated with socioeconomic status. This is consistent with Emerson (1972) and Muth (1969), who argue that if income were accounted for, the effect of race would be insignificance. They conclude that one cannot research the effects of race without controlling for the influences of income, education, and other socioeconomic characteristics which might equally affect market behavior.

This section has presented a discussion of the housing market by analyzing the supply-demand framework and land use and housing prices. The next section reviews and analyzes the empirical studies which were conducted on the effect of land use controls on land and housing prices. This will lay the foundation for developing a model for examining the relationship between UGBs and housing prices.

EMPIRICAL STUDIES OF LAND USE CONTROLS AND HOUSING PRICES

For several decades, land use controls and housing prices have been an important area of research. However, even though UGBs have been known for decades and used in growth management policies, there are no known studies that analyze the effect of UGBs on housing prices except one unpublished study by Alkadi and Strathman (1994). Nevertheless, in addition to analyzing the available research on UGBs and their price effect, this study uses and analyzes research that tests the effect of other growth-management programs that share similar purposes as UGBs.

As has been previously noted, housing prices are affected by the supply mechanisms of the market. The major argument against UGBs is that they constrain urban land supply, which forces land values to increase and in turn this increase might be capitalized in the price of housing. Whitelaw's theory tends to support this argument by stating that effective UGBs, by restricting bids only to land within their boundaries, operate much like ordinary zoning constraints, causing these urban lands to rise in value, while rural land outside the UGB drops in value (Knaap and Nelson 1992; Nelson 1994).

These effects are illustrated in Figure 5. Where Rm represents the land value gradient for urban land in the absence of a UGB and Rg represents the land value gradient for urban land after the imposition of a UGB at u2. Following the imposition of the UGB, land values beyond the boundary fall because urban development is no longer allowed. At the same time, land values inside the boundary at u2 rise, those who would have bid for land outside the UGB are constrained to bid for land inside the boundary. The gap in the gradient Rg offers a measure of the effects of the UGB. The greater the gap, the greater the impact.

Empirical research has quantified this effect, with one of the pioneer attempts being Gleenson's 1979 study which tries to analyze the effect of Brooklyn Park's growth management program on land values. Brooklyn Park, Minnesota, is a suburb about 20 miles north of Minneapolis. The program was intended to surround urban development and prevent it from expanding into agricultural land. Fulfilling this purpose, the program restricted the extension of public services into the agriculture area. Knaap (1982) believes this program looks similar in concept to UGBs in Oregon but does not encompass the urban area which makes the boundary incapable of constraining urban land supplies.

In fact, this program does constrain urban land supplies, through limiting development to the point/where public services are restricted; otherwise Gleenson (1979) would not have found any effect

on urban land. He found significant differences between the prices of farmland that was not currently developable under Brooklyn Park's program and urban land that was developable. Nevertheless, Kelly (1992) cited Knaap criticizing Gleenson's study. Knaap's argument is that Brooklyn Park appears to be too small to have a significant impact on the housing market of the Twin Cities region. Therefore, without comparing Gleenson's finding to land values for the entire region, it is impossible to know why the program in Brooklyn Park appears to have had that effect.



<u>Figure 5.</u> UGB and Supply Restriction Effects. Source: Knaap and Nelson 1992.

Similar to Brooklyn Park's program is San Jose's growth management program. In 1976 the San Jose City Council established

the San Jose Urban Services Boundary, a line beyond which essential public infrastructure would not be extended. New home development outside the boundary, even within city limits, was effectively prohibited. In fact, the San Jose Urban Services Boundary was never intended to restrict the number of new housing dwellings constructed; it was intended to slow the general rate of rural land conversion by promoting higher residential densities and to redirect new home construction from outlying developing area of San Jose to more developed infill areas (Landis 1986).

Some planners think that redirecting development from outlying developing areas of a city to more developed infill areas and promoting higher densities of development will solve urban sprawl problems without any negative consequences on the housing market. Landis' 1986 study demonstrates that this kind of development absolutely affects the housing market, with the average new singlefamily home sales price more than doubling within five years. What used to sell for \$53,700 in San Jose in 1975 sold for \$129,700 in 1980. Landis (1986) attributes this to the scarcity of raw land, arguing that some builders found themselves bidding on five- and ten-acre parcels that only four years previously they had judged too small to support home-building.

This demonstrates that supplying enough developable land within growth boundaries through infill is not good enough as home builders look for large parcels to benefit from economies of scale. In addition, construction prices within developed areas could increase because of more restrictions on the builder due to difficulties of moving trucks and <u>materials in and out of areas where</u> more of their vacant lots are built. All these extra costs would be capitalized in housing prices. In fast-growing metropolitan areas, turning future growth inward might push housing costs inside the UGBs notably higher (Downs 1994).

In fact, constraining land supply could empower the homebuilding industry. Lillydahl and Singell (1987) argue that communities that restrict the amount of developable land are likely to be dominated by a relatively small number of home builders. According to Solow (1974) and Kelly (1992), these builders can exercise a monopoly power over the prices and the types of homes built. Solow (1974) argues that if the net price of land were to rise too fast, resource deposits would be an excellent way to hold wealth, and owners would delay production (e.g., of homes) while they enjoyed supernormal capital gains.

The 1986 study by Landis analyzed the effect of the urban growth management system in Fresno, California. Like San Jose, Fresno's program intended to shift development away from the urban fringe back inward to fill vacant parcels in previously developed areas. In order to fulfill this purpose, the city of Fresno required developers proposing to build single-family detached homes at the urban fringe to pay fees of as much as \$5,000 per unit, while builders proposing projects in built-up areas typically paid less than \$2,000 per unit.

As a result of this policy, Landis's study found that developable parcels inside city limits sold for upwards of \$60,000 per acre in 1980, while comparable land just outside Fresno city limits sold for less than \$20,000 per raw acre. This shows that the building lower fees are capitalized in the land values. It is similar, as discussed earlier, to areas with lower tax rates, which tend to witness higher land and housing prices. However, Landis (1986) argues that even after paying the required fees, developers who owned land on the fringes of Fresno could build and market new homes at a considerably lower price than could the developers of new homes located within city limits. Unfortunately, he did not give any justification for this significant difference between the two markets. Nevertheless, without including other factors that would affect Fresno's housing market, it would be difficult from Landis's 1986 study to explain the difference between the two markets. For example, many empirical studies, as illustrated earlier, demonstrated that proximity to CBDs and employment centers do affect housing prices positively. So what Landis's 1986 study could not tell us was whether the higher prices within Fresno's city limit was attributable to proximity to the CBD and/or employment center.

Like Fresno and San Jose, Sacramento adopted an urban services boundary policy, but Sacramento's policy favored constantly making new land available as the development needed it. This was intended to open up land preserved for agriculture to residential developers rather than having infill development (Burrows 1978; Johnson et al. 1984). For example, in 1978 10,000 acres of undeveloped land were included within the boundary to accommodate 100,000 residents. Mainly as a result of this policy, Sacramento's housing market did not witness a significant increase in its housing prices as Fresno's and San Jose's housing markets did. In 1980, the mean sales prices of single family units were \$83,000, \$99,300, \$129,000 for Sacramento, Fresno, and San Jose, respectively (Landis 1986). However, there could be other factors which contributed to Sacramento's lack of a significant increase, such as Proposition 13, which rolled back property tax assessments to 1975 levels, permitted an annual increase in assessment of only 2 percent except in the event of a sale and, for all practical purposes, capped property tax rates at 1 percent per year (Fluton 1993).

Another growth management program that affected land and housing prices was the Pineland program in New Jersey. The New Jersey Pineland is an area of approximately one million acres in southern New Jersey. In 1978, President Carter signed the National Parks and Recreation Act that created the Pineland National Reserve. The program divided the Pineland area into six districts in which some districts were more restrictive to development than others.

An empirical study by Beaton (1991) examined the effect of this program on land and housing prices; this study used a cross-sectional data base consisting of sales that occurred during the period between 1966 and 1986. The study found that the greater the intensity of restrictions, the greater the rise in value. In particular residential properties in both the preservation and development areas, the most restrictive districts, appear to have capitalized the effect of the Pineland policies by more than 10 percent of their market values. By contrast, vacant land values in these most restrictive zones fell following the program adoption, while vacant land values in the least restrictive zones rose. The decrease in vacant land values in the most restrictive zones was because the right of development was taken away from landowners.

There are three studies that are directly related to UGBs. The works of Beaton et al. (1977), Knaap (1981, 1982, and 1985), and Nelson (1984 and 1986) deal with UGBs and pricing effects. The Beaton et al. (1977) work, which pioneered these studies, analyzed the effect of Salem, Oregon's UGB on land values; this study was conducted immediately after the UGB adoption in 1975, using 1976 sales price data. The study an<u>alyzed 105 undeveloped parcels of</u> land located both inside and outside the Salem UGB but could not find any effect on land prices attributable to the UGB.

Knaap tried to give two explanations for these results, the first being that the UGB may have been imposed well beyond the reaches of viable urban development at the time, especially since the UGB encompassed 25 percent more land than necessary to achieve 100 percent buildout by the year 2000, based on urban growth projections (Knaap 1982; Knaap and Nelson 1992). The second explanation was that the UGB did not have enough time to show an effect because the Beaton et al. (1977) study was conducted immediately one year after the UGB was officially recognized.

However, seven years after the Beaton et al. (1977) study was conducted, Nelson (1984, 1986) tried to reevaluate the effect of the Salem UGB on land values. He analyzed 209 unimproved land sales between 1977 and 1979 both inside and outside the Salem UGB. Although Nelson's 1984 and 1986 studies used sales data for years only two years after those used by Beaton et al. (1977), his study found that Salem's UGB significantly affected land values. This demonstrates Knaap's (1982) argument that the Beaton et al. (1977) study did not allow enough time for the Salem UGB to show its effect on land values.

Nevertheless, Nelson's 1984 and 1986 studies demonstrate that land values varied significantly according to their distance from the boundary. The study found that land values inside the UGB decreased with distance from the urban core at locations greater than 5,000 feet from the CBD. This finding was in line with other empirical studies, which showed that proximity to the urban core increases land and housing prices. On the other hand, the study found that within 5,000 feet from the boundary, land values rise with distance from the urban core, as the amenity value of proximity to rural land beyond the UGB began to exceed the value of proximity to the urban core. A similar study was conducted by Knaap (1982, 1985) in the Portland metropolitan area. This study, which was conducted four years after the UGB was drafted, analyzed 900 unimproved land sales recorded in fiscal year 1979-1980. The analysis demonstrates that the value of a raw acre of land 50 minutes from downtown Portland equals \$35,697 if located inside the UGB, while the value of the same acre outside the UGB falls to \$19,688 (Knaap and Nelson 1992). This result surprised policy makers with the Metropolitan Service District, the regional government of the Portland metropolitan area. They argued that a 15.3-percent market factor of excess vacant land within the UGB should prevent any price inflation. Knaap rejected their argument, and noted that the UGB had been in place long enough to influence the expectations of participants in the land market and thus had affected land value even without affecting land supply (Knaap and Nelson 1992).

Although Knaap's 1982 and 1985 studies found the UGB to be significant in affecting the Portland area's land values, it should be noted that Portland's UGB was not adopted until October 1980. This means that Knaap's studies included only two months of post-UGB data. However, the expectations of participants in the land market could have been affected by the fear of a stringent UGB and hence they could have immediately acted in the land market by acquiring more land from within the drafted UGB market. This is supported by Lillydahl and Singell (1987), when they argue that even if growth controls are not actually in effect, if the city leaders favor such controls or if residents anticipate the enactment of such controls, prices may increase in anticipation of controls. If Knaap's study had been conducted within a reasonable time after the adoption of the UGB and everybody had been certain about the final lines of the UGB, then the land values would not have shown any effect. This is exactly what happened with the Beaton et al. 1977 study, when they did not find any price effects due to Salem's UGB because they did their study one year after Salem's UGB was adopted in 1975, although it was drafted in 1973. So if their study had been conducted after 1973 but before 1975 the adoption year— they might have seen an effect due to uncertainty about Salem's UGB final lines.

Besides general housing price increases, UGBs can affect housing opportunities and choices, which may lead to further increases in the prices of the more desirable types of housing and to higher level of frustration in the market among those who do not obtain their preferred form of housing. This section presents a bidrent function to illustrate this situation.

The simple model of the bid-rent function assumes that every household has the same demand for housing. However, the present discussion assumes that we have two types of households in a city, large and small. Several factors influence a household's demand for housing, for example the number of children. Households with few children live in small dwellings, and households with more children live in large dwellings (Sullivan 1990).

It has been shown that land and housing values increase as the distance from the CBD decreases. Holding transportation costs and other factors constant, smaller households would have a steeper housing price function because they consume less housing (Sullivan 1990), while larger households would have a flatter housing price function because they consume more housing. This is represented in Figure 6, where the two functions intersect at a distance of A* from the CBD. So, any space before point A* would be occupied by small

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households, while any space after point A* would be occupied by large households. The price at the intersect point would be at P*.



Figure 6. Bid-Rent Function and Household Size. Source: Sullivan 1990.

Now, let us assume the imposition of a UGB after point A*, where the two functions intersect. The UGB imposition would cause the large household function to shift up due to constraint on land and in turn on housing supply. Figure 7 shows the new intersection between the small and the large household functions at point A and the price at point P. The consequences of this is higher prices for less space. As discussed below, higher prices then reflect a pure social cost because the efficiency of society's resource allocations has decreased (Downs 1994). This is represented in the shaded triangle in Figure 7.



Figure 7. Bid-Rent Function and Household Size after the UGB is Imposed.

This demonstrates that a cost to society results unless localities encompass in their boundaries enough land supply for each type of housing, this is because each housing type has its own demand. In addition, since not all land supplied has the same locational qualities or prestige a shortage of parcels with unusual qualities can still occur while the total supply of developable land remains adequate. For example, the price of single-family lots in Lake Oswego has risen much more than average land prices in the entire Portland metropolitan area. If this increase is due to the exclusivity of the community rather than to the creation of more parks, better schools, and other amenities, then it is likely to have a net harmful effect on social welfare even though the increase provides net benefits to homeowners (Fischel 1991; Downs 1994). The situation represented previously by Figure 4 may possibly occur without the imposition of a UGB, but will almost certainly occur with the imposition of a UGB.

It could happen in some cases, at the time of drawing up UGBs, that residential development outside the UGBs could take place either prior to or after the adoption of the UGBs. The latter case could be due to failure of the UGBs or it could simply be the product of normal slippage. For example, compared to the total development inside and outside the UGBs, development outside the UGBs was below 5 percent in Portland, 24 percent in Medford, and 37 percent in Brooking. In any case, this development outside the UGBs could cause housing prices inside the UGBs to escalate. Toulan (1994) demonstrates that emerging belts of very low density residential areas outside UGBs are certain to pose strong challenges to the future urban form of the growing regions as they become a more formidable barrier than the UGBs themselves.

Consequently, as housing prices rise and the demand on land and housing grow, developers are encouraged to leapfrog over the closer, more expensive land and go well out into the country to find land cheap enough to build on (Toulan 1965). If developers cannot, for any reason, escape the inflated market by leapfrogging to cheaper markets, then inflation will get worse.

Regardless of the total supply of land, reductions in one area may be offset by increases in others. This increase in supply may be reflected in housing price increases in nearby communities (Montgomery and Mandelker 1989) or could be represented by an increase in housing construction activities. Hence, the effect of UGBs on housing prices may not be seen within the actual communities that adopted them, but may shift to nearby communities. In fact, the extent to which local growth management policies increase housing prices varies in accordance with the principle of housing supply substitutability. This principle states that the effect of any locality's growth management policies on its housing prices will depend on how easily people priced out of living there can find similar housing available in nearby localities (Lillydahl and Singell 1987; Chinitz 1990; Landis 1992; Downs 1994; Schwartz et al. 1986).

The empirical work of Schwartz et al. (1981) demonstrated this principle when they found that there was no significant difference in increases in housing prices in Petaluma as compared with Rohnert Park, where growth control was not applied, although their study did find that building permits increased sharply in Rohnert Park after growth control in Petaluma took place. They concluded that where perfect substitution exists, growth controls will not increase housing prices in the city but they will increase the quantity of houses constructed in surrounding communities.

Further, Landis (1992) compared two communities from California— Thousand Oaks, where growth control was adopted, and Simi Valley, where growth control was not adopted. He did not find significant difference in increases in housing prices in Thousand Oaks as compared with Simi Valley, but he did find that after Simi Valley adopted its own growth controls in 1986, the housing prices increased in Thousand Oaks faster than in surrounding communities. "In other words, only when the breathing room provided by Simi Valley disappeared, did housing prices in Thousand Oaks begin to rise rapidly" (Landis 1992, p. 496).

However, if <u>localities do not allow enough land</u> supply within UGBs to be absorbed in a given period, the final price of developed property will increase. If the limitation is stringent enough, it will confer monopolistic powers on the owners of those sites, permitting them to raise land prices substantially. For example, if a community designates 1000 acres for housing for five years of development where only 200 acres per year is absorbed, the owners of these 1000 acres could charge developers very high prices for sites, which would compel the developers to charge higher prices for the housing there (Downs 1994). Consequently, leapfrog development into other communities may take place (Toulan 1965; Kelly 1992). Nevertheless, Downs (1994) argues that no one has empirically determined exactly how much the available supply of land must be in relation to average annual absorption rates, in order to avoid an increase in housing prices. He does, however, state that the land supplied should be at least two or three times as large as annual absorption rates.

Although the previous discussion demonstrates that many empirical studies have attributed increases in housing prices to urban growth management programs, proponents of these programs argue that many researchers have failed to account for price increases due to demand shifts. Deakin (1992), for example, argues that public regulatory, infrastructure, and tax policies can increase land and lot prices, but so can population, job, and income growth. One of the reasons for widely disparate findings on the magnitude of price effects is that researchers have sometimes failed to account for price increases due to demand shifts and erroneously attribute all price effects to growth control.

Toulan (1994) argues that some researchers have failed to find or isolate the real variables that affect housing prices and he states that "the Portland UGB does not seem to have created any imbalances in the land market" (p. 114). This conclusion was based on comparing Portland to a group of similar western cities. Although Portland was

compared to cities that did not have growth management programs, the comparison showed that the Portland area did not have abnormal increases in land prices, though Toulan (1994) emphasized the importance of national trends to control for external changes.

In addition, some scholars, including Kelly (1992) and Downs (1994), argue that if a community adopts a UGB that extends out too far from the city then it would have little if any impact on the land market. That is why officials in the Portland metropolitan area were surprised when Knaap (1981, 1982) found that Portland's UGB increased land values, although more than a 15-percent surplus of land was included in the UGB forecast for the year 2000. Kelly (1992) argues that if we do see an effect on the land market from UGBs, even though they are extended out far from the city, this effect could be a psychological rather than practical shortage of land supply.

Kelly (1992) also argues that most communities that adopt growth management programs, including Ramapo, Livermore, and Petaluma, are part of larger metropolitan areas and therefore do not control enough of the market for their actions to affect land prices significantly. On the other hand, these communities were highgrowth when they adopted their programs because location, amenities, or other factors caused them to attract growth. Those factors may bring a premium to land in such communities, even if there is a significant supply of competing land in the area.

For example, Kelly disagrees with Schwartz et al. (1984) when they found a significant increase in Petaluma's housing prices after the adoption of its growth program and in comparison to Santa Rosa, California, which had no growth restriction. Kelly (1992) believes that Petaluma was a more expensive community even before it adopted its growth management program and he goes further and questions whether growth management might thus be a symptom of other factors tending to make development and housing both more expensive in the community or whether it is the cause of some of the later price increases.

Miller (1986) also criticized Schwartz et al. (1984) for their focusing only on new houses, which gave them the opportunity to discuss the production of moderately priced housing rather than the provision of moderately priced housing. He argues that there is a distinction between the supply of houses built for new residents every year and the supply of houses available for purchase by new residents every year. In addition, Miller (1986) criticized Schwartz et al. (1984) for their exclusion of Rohnert Park from their 1984 study about Petaluma and Santa Rosa while using as data for this study the 1981 study's findings which did include Rohnert Park.

Although Schwartz and his colleagues are the ones who have been criticized for the pitfalls in their 1984 study, they are among those who believe that many researchers have failed to use the proper methods for deducing the effect of growth controls on housing prices. Like Toulan (1994) and Deakin (1992), they argue that many researchers have failed to measure and control for the real factors that affect housing prices, such as differences in housing characteristics, amenities, and public service quality. However, they argue that the careful researcher ought to use multiple methods to test the effect of a particular growth management.

Further, Landis (1991) selected seven pairs of communities from California, where each pair included one community that managed growth and one that did not. He analyzed the rate of increase in median single family home prices and found that the median prices did not rise any faster or to higher levels in the seven case-study communities than in their counterpart pro-growth cities. He gave some explanations of his results insofar as they contradict the law of supply and demand. First, the controls as implemented may not really be all that effective and second, there may be adequate spillover opportunities in other nearby communities, so that growth displaced from one city can easily and costlessly be accommodated in nearby or adjacent communities. Landis (1992) used median housing sale prices, but did not acknowledge the problems inherent in using them (Toulan 1994; Kelly 1992).

A further argument that could support proponents of UGBs is that they lead to increase in densities (Peiser 1989) which would in turn lead to lower housing prices.

CONCLUDING REMARKS

Previous analyses have shown that housing prices are influenced by several factors which are either part of the supplydemand function or related to land use characteristics. The latter include accessibility factors, public services factors, structure and site factors, and neighborhood factors. The supply-demand function include land, labor, capital, and materials on the supply side, and growth, increasing population incomes, decentralization of population, and interest rates on the demand side. The discussion demonstrates that UGBs and other land use controls influence the housing market by constraining the amount of land supplied for housing. Several empirical case studies have been reviewed but unfortunately, none of them analyzed the effect of UGBs on housing prices.

However, most studies demonstrate increases in land values due to UGBs or increases in both land values and housing prices due to other growth controls. On the other hand, some scholars argue that UGBs and other growth controls do not increase housing prices. Some researchers fail to include and isolate the variables that cause housing prices to increase. As a result of this confusion, many policy makers are unclear about whether UGBs do cause housing prices to increase.

This research is an attempt to dispel some of the mystery about the relationship between UGBs and housing prices by extending the analysis to include additional factors contributing to housing prices. The study uses a least-squares statistical model to analyze data from Washington County, Oregon. The next chapter addresses these issues as it reviews the research methodology.

CHAPTER III RESEARCH METHODOLOGY

The purpose of this chapter is to present the methodology for this study. The discussion is in six sections. The first presents the problem statement. The second section discusses the quantifiable factors that are related to housing prices. The third section presents the research hypotheses. The fourth section presents the research models used in the analysis. The fifth section discusses the conceptual and operational model for this study. The sixth section discusses the variable measurements and data sources.

STATEMENT OF THE PROBLEM

As mentioned earlier, over the last several decades urban sprawl and increasing levels of rural and farm land consumption have become two of the major problems facing many urban areas. Many localities have adopted growth management methods, including UGBs, to overcome these problems. A number of scholars and policy makers argue that UGBs cause housing prices to increase and because of this many less affluent people are driven away from the housing market as this increase in housing prices affects housing affordability. On the other hand, some scholars maintain that UGBs do not increase housing prices, arguing that researchers have failed to include and isolate the variables that are the real cause of housing price increases. ł

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This research attempts to examine the relationship between UGBs and housing prices. The problem is complex, and the factors contributing to housing prices are numerous. Some of these factors are measurable and tangible, while others are subjective and intangible. The following section presents the quantifiable factors that contribute to housing prices.

FACTORS CONTRIBUTING TO HOUSING PRICES

Previously reviewed studies have shown that the classic models of urban rent determination have focused mainly on the transportation savings associated with alternative locations. In the last few years, however, urban experts have begun to focus on the ways in which amenities, disamenities, supply and demand factors, and local growth controls affect housing prices.

As for the demand factors, many researchers found that interest rates (Snyder and Stegman 1986; Manchester 1986; Singell and Lillydahl 1990; Segal and Srinivasan 1985; Pollakowski and Wachter 1990), population (Beaton 1982; Segal and Srinivasan 1985; Black and Hoben 1985), and income (Fischel 1991; Segal and Srinivasan 1985; Black and Hoben 1985; Dubin 1990; Smith 1989; Lee 1968; Muth 1960), affected housing prices.

Accessibility factors are among the influential contributors to housing prices. Many researchers found that proximity to CBD (Lloyd and Dicken 1977; Alonso 1964; Meyer et al. 1965), employment and shopping centers (Miller 1982; Waldo 1974; Harrison and Rubinfeld 1978; Brookshire <u>et al. 1982; Gamble and Downing</u> 1982), major freeways (Peiser 1989; Kelly 1992; Johnson and Ragas 1987), elementary schools (Miller 1982; Li and Brown 1980; Johnson and Lea 1982), and

recreation areas such as parks, lakes and waterfront (Gamble and Downing 1982; Miller 1982; Correll et al. 1978; Nelson 1984; Palmquist 1980), will affect housing prices.

There are public services factors among those contributors to the housing prices. Most of the empirical studies focused on school quality and found it to affect housing prices (Dubin and Sung 1990; Li and Brown 1980; Oates 1969; Kain and Quigley 1970). Besides this factor, property taxes were also found to affect housing prices (Oates 1969; Knaap 1981) if there are widely varying tax rates across many jurisdictions (Hushak 1975).

Structure and site factors were also found to be major contributors to housing prices and the empirical work of Harrison and Rubinfeld (1978), Palmquist (1980), Singell and Lillydahl (1990) , Lafferty (1984), Brookshire et al. (1982), Hughes and Sirmans (1992), Brown and Pollakowski (1977), Kain and Quigley (1970), Gamble and Downing (1982), Nelson, Genereux and Genereux (1992), Johnson and Lea (1982), and Dubin (1992) found that lot size, age of the house, number of bedrooms, area of the interior living area, number of bathrooms, number of stories, number of garages, number of fireplaces, and the availability of a basement (Dubin 1992; Johnson and Lea 1982; Gamble and Downing 1992) had a positive effect on housing prices, but a basement could have a negative effect if the house in the sample is old (Alkadi and Strathman 1994).

Many researchers emphasized the importance of neighborhood quality factors and tried to test for their effect on housing prices. The empirical studies found that crime rates (Dubin and Sung 1990; Kain and Quigley 1970), <u>level of income of the neighbors</u> (Dubin and Sung 1990; Knaap 1982, 1985), the education level of the neighbors (Kain and Quigley 1970; Dubin and Sung 1990), and the racial composition of a neighborhood (Brookshire et al. 1982; Kain and Quigley 1970; Dubin and Sung 1990) also had an effect on housing prices.

The next section lists the research hypotheses this study examines to shed light on the relationship between housing prices and various factors related to the imposition of the UGB.

RESEARCH HYPOTHESES

This analysis examines the following hypotheses:

- 1. The rate of increase in the price of housing after the imposition of the UGB is significantly greater than the rate of increase in the price of housing before the imposition of the UGB.
- 2. In the period after the imposition of the UGB, the rate of increase in housing prices in each of four successive periods is significantly greater in each period than in the preceding period.
- 3. The difference in the rate of increase in housing price between single-family houses on large lots and on small lots is greater in the period after the UGB than in the period before.
- 4. In the period after the imposition of the UGB, the difference in the rate of increase in housing prices in each of four successive periods between single-family houses on large lots and on small lots is significantly greater in each period than in preceding period.
- 5. Housing prices increase as distance to the UGB decreases.

MODELS FOR EXAMINING THE RELATIONSHIP BETWEEN UGBs AND HOUSING PRICES

To test the foregoing hypotheses, different models were analyzed in an effort to identity the best model for capturing the relationships between various factors and housing price. As noted earlier there is not a single study that analyzes the effect of UGBs on housing prices, except the unpublished one by Alkadi and Strathman (1994). The studies reviewed in this work either dealt with UGBs and their effect on land values or analyzed other growth management programs and their effect on land values and/or housing prices. The studies that dealt with the UGBs and their effect on land values (Beaton et al. 1977; Knaap 1982; 1985; Nelson 1984; 1986) employed posttest-only models in which urban and non-urban variables in the post-UGB period were compared using the method of least-squares regression. Similarly, the studies that dealt with other growth management programs and their effect on land values and/or housing prices employed posttest-only models in which postcontrol urban and non-urban variables (Gleeson 1979) and postcontrol restrictive and less restrictive zones (Beaton 1991) were compared using the method of least-squares regression. All of the above studies did their comparisons within the same communities. Landis (1986), however, compared pairs of postcontrol cities with and without growth controls, although he analyzed his data without regression models.

These postt<u>est models have their own</u> shortcomings. According to Schwartz et al. (1986), these posttest-only models cannot control for any differences that existed before growth controls were implemented. Such differences will therefore be incorrectly attributed to the growth-control programs. Further, these posttest-only models assume that comparable communities without growth control programs are independent of those with growth control. If, however, this is not the case and housing markets are in fact interdependent, the community with the growth-control program will affect the market for housing attributes in the nearby (nongrowth-control) communities and cause their implicit prices to change. Thus, the results will be biased, and will understate the true growth-control Further, Fischel (1991) argues that studying an entire effect. metropolitan statistical area (MSA) in which some communities with growth controls have higher housing prices than other MSAs is an imperfect measure. He explains that this is because some of the increase in housing prices could be due to communities making themselves more attractive relative to others and that growing areas are more likely to adopt growth controls than others, so that land values would have risen even without the growth controls.

Few studies focused on variables of a particular growth-control program and the characteristics of surrounding areas using time-series data and least-squares regression. In fact none of the studies reviewed in this research have used such models. These models require the researcher to do before-and-after comparisons of the growthcontrolled community without the need for a comparison to a control group. The advantage of these types of models is that the interdependence of housing markets is not an issue.

However, Schwartz et al. (1986) argued that these models have shortcomings in that they cannot control for changes in price over time that are not due to growth controls, such as changes due to fluctuations in interest rates or inflationary expectations that alter demand. In fact, this shortcoming can be overcome and many studies have overcome it by including the interest rate as an independent variable to control for changes due to fluctuations in interest rates (Manchester 1986; Singell and Lillydahl 1990; Segal and Srivinasan 1985; Pollakowski and Wachter 1990).

The inflationary problem was solved by several different techniques. Miller (1986) noted that some studies used techniques to control for inflation. For example, Palmquist (1980) used adjustments for nominal value changes over time, including a time dummy variable in a time-series analysis, where the dummy is used to calculate the real estate price index. The usual alternative technique is to develop a separate regression model for each year and calculate an index based on the change in the estimated regression coefficients for each attribute for each period. By introducing a time index, the researcher is essentially performing a pretest-posttest analysis, comparing the precontrol period with the postcontrol period.

The time index approach has been used by several studies, such as that by Nelson (1984), who argued that rather than deflating sales prices by regional or national consumer price deflators, the time index has the advantage of indicating local inflationary tendencies and changing market conditions over time. Unlike Nelson, Uba (1994) used the deflation technique. The deflation technique is generally preferred over the time index technique with regard to accuracy, as the time index technique assumes that the inflation rate is constant over time— an incorrect assumption.

Sometimes an individual city needs closer examination in order to choose the proper technique based on the characteristics of that city. Deflating by national indices is crude, especially in the case of the Portland area because the early 1980s saw negative inflation while

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the nation as a whole was still experiencing some inflation. It follows, then, that in the case of the Portland area, the time index would be the better technique to use.

Although related to housing prices, pretest-posttest comparison models have not been used in many studies. They were used in the studies of Singell and Lillydahl (1990) and Urban Land Institute and Gruen, Gruen and Associates (1977), but the growth controls involved were different from UGBs.

To overcome the shortcoming of both the posttest comparison and pretest-posttest comparison models, some scholars have recommended combining them to form a pretest-posttest comparison with a control group, although this model still does not overcome the problem of an interdependent housing market (Schwartz 1986).

Based on the previous discussion about the three model approaches (posttest-only, pretest-posttest, and pretest-posttest with control group), the pretest-posttest comparison would be more suitable to this study for several reasons. First, since this study intends to use Washington County, Oregon, as the study area, it is difficult to find a nearby comparable community both without a UGB and independent in its housing market. For example, Vancouver, Washington, which has no UGB, could act as the control group, since it is comparable to the Portland area. Unfortunately, Vancouver's housing market is interdependent with Portland's and this fact is enough to eliminate the posttest-only comparison model.

Secondly, the pretest-posttest with comparison to control group is time consuming and would not solve the issue of the interdependence in housing market. Therefore, this approach is eliminated too. The weakness of the pretest-posttest approach is controlling for the interest rates and inflation, but as discussed earlier these issues can be overcome by different iechniques. As a result, the pretest-posttest is the most suitable approach for this study.

CONCEPTUAL AND OPERATIONAL MODEL

Developing a model that is suitable for examining the effect of UGBs on housing prices is a crucial issue. The design of the model will not be influenced only by the factors contributing to housing prices but also by the characteristics of the analyzed area. As discussed above, there are three approaches which can be utilized to model the effect of UGBs on housing prices: a one-time comparison of housing prices between UGB and non-UGB communities after the UGB is instituted, a before-and-after comparison in the UGB community only, and before-after comparison between the UGB community and a non-UGB community. As noted, a before-and-after comparison within the UGB community model is the most suitable for this research.

In order to apply the before-and-after comparison within the UGB community, a pre-post dummy variable is utilized to distinguish the periods before and after the implementation of the UGB. In addition to using a dummy variable to distinguish these periods, interaction variables such as time by lot size are used to test for the effect of the UGB.

Land supply before the imposition of the UGB was not constrained and was elastic. With the imposition of the UGB land supply became finite at least for the designated period (until the year 2000 for the Portland metropolitan area). Therefore, as time passes the raw land supply within the UGB decreases. Two consequences result from these factors. The first is that choices from the available land supply become limited. Second, owners of land that is available for development enjoy a monopoly and prices on this property becomes inflated. The sum result of these two factors is that the price of a single foot become more expensive.

Figure 8 illustrates this effect. The supply curve SU represents the unconstrained land supply before the UGB. After the imposition of the UGB, land supply became constrained, and this is shown by the supply curve SC. As time passes, demand for land increases. Figure 8 shows the quantity demanded at different periods of time, Dt1, Dt2, Dt3, and Dt4. With land supply fixed at SC land prices increase more than at SU, when land supply was unconstrained.



<u>Figure 8.</u> Changes in Demand for Land as Time Passes while Land Supply is Constrained by the Imposition of the UGB.
To test this effect, this research interacted the time variable with the lot size variable. This interaction allowed this study to measure the effect of the UGB. If there is an effect, the coefficient of the interaction variable must be greater than zero. At the same time, if the coefficient of the interaction variable at Dt2 is greater than at Dt1, this means that lot size price is getting higher as time passes and this is due to the constraint on land supply created by the UGB. That is, the higher the coefficient, the higher the effect of the UGB.

Further, since the UGB encompassed the developable land and made it finite until the year 2000, housing choice becomes constrained as time progresses. As mentioned in the third hypothesis, houses located on large lots become more appreciated and hence more expensive as they become more scarce. Again, as time passes, more of this housing type is consumed. In order to analyze the relationship between UGB on lot size, this research interacted the time variable and a dummy variable which distinguished between houses located on large and small lots.

The UGB should have no effect on house improvements, and therefore as time passes, house improvements should remain constant. However, in order to control for appreciation in housing improvements that is occurring from other factors, such as construction materials, labor force, and higher building standards, the time variable was interacted with the house improvements variable (interior square footage). In sum, the two types of interactions— time with lot size and time with lot quantity— shed light on the relationship between the UGB and housing prices.

Based on the above discussion, hedonic price estimation is utilized to test the model (which will utilize an ordinary least-squares estimate to obtain the regression coefficients and their level of significance) and show the implicit price of property characteristics, including the imposition of UGBs. The implicit price estimates the dollar value of each attribute including those related to the UGBs. The equation is derived from a model specified for the study and states:

P=a+b1(UGB)-b2(INTRATE)+b3(BATH)-b4(AGE)+b5(SQFT)+b6(BED)+b7(LOTSIZE)+b8(FIREPLAC)+b9(GARAGE)-b10(CRIME) +b11(EDUCAT)+b12(LOTAMT)-b13(DCBD)-b14(DEMP)-b15(DSCH) -b16(DHWYS)-b17(DUGB)-b18(DREC)+b19(TIME) | +b20(TIME*LOTSIZE)+b21(TIME*SQFT)+b22(TIME*LOTAMT) +b23(WAPOP)+b24(REGPOP)+b25(ORPOP)+ b26(WAINC) +b27(REGINC)+b28(ORINC)+b29(INCOME)

where:

| Р | is the selling price of the house |
|----------|--|
| UGB | is a dummy variable =1 if house was sold after in |
| | October 1980, when the UGB was adopted |
| INTRATE | is mortgage interest rate |
| BATH | is number of bathrooms in the house |
| AGE | is the age of the house in years at the time of the sale |
| SQFT | is interior square footage of the house |
| LOTSIZE | is lot size of the house in square feet |
| BED | is number of bedrooms in the house |
| FIREPLAC | is number of fireplaces in the house |
| GARAGE | is number of garage spaces in the house |
| LOTAMT | is a dummy variable =1 if house is located on 12,800 |
| | sq.ft. or more |

| CRIME | is the aggregated number of burglaries, motor vehicle | | | | | |
|--------------|--|--|--|--|--|--|
| | theft, and vandalism (in Washington County) | | | | | |
| EDUCAT | is level of education of neighborhood residents | | | | | |
| DCBD | is distance of a house from the CBD in feet | | | | | |
| DEMP | is distance of a house from nearest employment center | | | | | |
| | in feet | | | | | |
| DSCH | is distance of a house from nearest elementary school | | | | | |
| | in feet | | | | | |
| DHWYS | is distance of a house from nearest major freeway in | | | | | |
| | feet | | | | | |
| DUGB | is distance of a house from UGB in feet | | | | | |
| DREC | is distance of a house from nearest park in feet | | | | | |
| TIME | is the time in months from January 1978 (1) to | | | | | |
| | December 1990 (156) | | | | | |
| TIME*LOTSIZI | E is the interaction between time index and lot size | | | | | |
| TIME*SQFT | is the interaction between time index and square | | | | | |
| | footage of the house | | | | | |
| TIME*LOTAM | is the interaction between the time index and the | | | | | |
| | dummy variable of the size of the parcel whether large | | | | | |
| | or small | | | | | |
| WAPOP | is Washington County's population for the year the | | | | | |
| | house sold | | | | | |
| REGPOP | is the Portland metropolitan area's population for the | | | | | |
| | year the house sold | | | | | |
| ORPOP | is Oregon's population for the year the house sold | | | | | |
| WAINC | is Washington County's per capita income for the year | | | | | |
| | the <u>house sold</u> | | | | | |
| REGINC | is the Portland metropolitan area's per capita income | | | | | |
| | for the year the house sold | | | | | |

ORINC is Oregon's per capita income for the year the house sold

INCOME is the median level of income of neighborhood residents

This model has been used to test all of the hypotheses. However, in order to test for the second hypothesis, the sales prices for the houses that were sold after the adoption of the UGB were classified into four periods, from October 1980 to December 1982, from January 1983 to December 1985, from January 1986 to December 1987, and from January 1988 to December 1990, and each period was regressed separately. The notion behind the above classification, is to separate the effect of the depression that occurred in the Portland housing market during the period between 1982 and 1985, and the periods preceding and following it. The period from 1986 to 1987, although not in depression was still lower and did not reach the 1982 levels again until 1988.

In more detail, median home prices for the period 1982-1985 decreased at a rate faster than that of personal income while median home prices for the period 1985-1990 increased at a rate faster than that of personal income (Toulan 1994). Impact fees in Washington County were adopted in October 1990 and in order to isolate the effect of these fees on housing prices it would be wise to stop the post testing period in this month rather than adding a dummy variable for houses sold after this period. The ten years after the adoption of the UGB, which includes the depression and prosperity markets, are enough for the purpose of this study. Another reason for stopping the testing in 1990 is the introduction shortly after of Measure 5— the property tax limitation measure— which most probably had a major effect on the housing market.

The model analyzes several relationships. First, the relationship between the UGB and housing prices was found by estimating UGB. Time-series estimation indicated the change in housing prices during each of the four periods. Second, the effect of proximity to UGBs was figured by estimating DUGB. Third, the relationship between UGBs and the price of housing located on large parcels was tested by estimating TIME*LOTAMT. Fourth, the coefficient of the TIME*LOTSIZE interaction was used to calculate and test the relationship of the UGB. Finally, the coefficients of TIME*LOTSIZE and TIME*SQFT were utilized to calculate for the real implicit price trends per month due to lot size and house improvements.

VARIABLE MEASUREMENT AND DATA SOURCES

The type of data collected for operationalizing the association of dependent and independent variables are indicated below.

<u>The Dependent Variable</u>

The dependent variable in this study measures the sales price of individual homes in Washington County before and after the adoption of the Portland metropolitan area's UGB. This UGB was adopted in October 1980; thus the sample consists of time-series data as a sample of all single-family homes sold in Washington County between January 1978 and December 1990.

The Independent Variables

The study measures the following independent variables which were associated with the sale prices of homes in the Washington County:

Supply-Demand Variables

| INTRATE | Mortgage interest rate is measured in percentage |
|---------|--|
| UGB | If a house sold after the UGB was adopted in October |
| | 1980 it will get the number 1, and 0 if before |
| WAPOP | Washington County's population during the year the |
| | house was sold |
| REGPOP | The Portland metropolitan area's population during |
| | the year the house was sold |
| ORPOP | Oregon's population during the year the house was |
| | sold |
| WAINC | Washington County's per capita income during the |
| | year the house was sold |
| REGINC | The Portland metropolitan area's per capita income |
| | during the year the house was sold |
| ORINC | Oregon's per capita income during the year the house |
| | was sold |
| | |

Accessibility Variables

- DCBD Straight line distance (in feet) between the CBD and site of the house sold.
- DEMP Straight line distance (in feet) between the nearest employment center and site of the house sale. Based on the analysis of economic and service activities and employment intensity, five locations were selected as

employment centers in Washington County (see Figure 9)

| DSCH | Straight line distance (in feet) between the nearest local |
|------|--|
| | elementary school and site of the house sold |
| DHWY | Straight line distance (in feet) between nearest highway |
| | and site of the house sold. This research used the three |
| | major highways, I-5, SR-26, and I-217 |
| DUGB | Straight line distance (in feet) between the UGB and |
| | site of the house sold. |

DREC Straight line distance (in feet) between the nearest public park and site of the house sold

All distance measurements were calculated utilizing GIS software.

Structure and Site Variables

| BATH | Number of bathrooms in the house at time of sale |
|----------|---|
| AGE | Age of the house in years at time of sale |
| SQFT | Interior square footage of the house at time of sale |
| LOTSIZE | Lot size of the house in square feet at time of sale |
| BED | Number of bedrooms in the house at time of sale |
| FIREPLAC | Number of fireplaces in the house at time of sale |
| GARAGE | Number of garage spaces in the house at time of sale |
| LOTAMT | Distinguishes between houses located on large parcels. |
| | If a house is located on a parcel less than 12,800 square |
| | feet, it is considered to be small and 0 was assigned. |
| | The 12,800 square feet was chosen because this was the |
| | average size of the zoned single-family residential |
| | before the adoption of the UGB and after until 1982 |



Figure 9. Washington County map with Urban Growth Boundary.

- TIME*This interaction between the time index variable andLOTSIZEthe lot size variable of the size of the parcel allowed for
the distinction of the effect of UGB on lot size
- TIME* This interaction between the time index variable and SQFT the square footage variable allowed for the control of appreciation that would occur due to factors such as construction material market, labor force, and higher building standards
- TIME* This interaction between the time index variable and LOTAMT the lot amount dummy variable of the size of the parcel whether large or small allowed for the distinction of the effect of UGB on large and small parcels

Neighborhood Variables

- CRIME Number of crimes in Washington County during the year the house was sold. This is the aggregated number of burglaries, motor vehicle theft, and vandalism. According to Arlene Wittmayer and Mary Nunnenkamp at the Washington County Sheriff's Department, these three crime types are the ones that concern homebuyers the most. They tend to affect neighborhood security because they are perpetuated by strangers while other crimes such as murder are perpetuated by relatives or known people.
- EDUCAT Level of education, years of education, of neighborhood residents where the sold house is located. In particular, the level of education in each census tract of a particular house was reported. All

houses which were sold between January 1978 and June 1985 used the 1980 Census, and all houses sold between July 1985 and December 1990 used the 1990 Census

INCOME Level of income of neighborhood residents, mean average, where the sold house is located. In particular, the level of education in each census tract of a particular house was reported. All houses which were sold between January 1978 and June 1985 used the 1980 Census, and all houses sold between July 1985 and December 1990 used the 1990 Census

Inflation Control Variable

TIME Since this research is using time-series data, inflation in housing prices is a concern. The time variable controls for inflation. It is measured in months with 1 being the first month, January 1978, through 156, being the last month, December 1990

Data Sources

Data for the dependent variable (sale prices) for 46,400 homes sold in Washington County, Oregon, between January 1978 and December 1990 was obtained from the Department of Assessment and Taxation in Hillsboro, Oregon. For the independent variables, data for interest rates was obtained from the Federal Reserve Bulletins. Population and per capita income variables were obtained from the Center for Population Research and Census at Portland State University. The structural and site independent variables were obtained from the Department of Assessment and Taxation in

Hillsboro. The three neighborhood independent variables were obtained from two different sources. The education and income levels of the neighborhood residents were obtained from the Center for Population Research and Census at Portland State University while the crime rate was obtained from the Analysis of Crime in Oregon Reports. Finally, the distance variables were computed utilizing GIS software.

For the purpose of testing the hypotheses raised in this research, the homes sold in Washington County were stratified according to two criteria, first, according to their selling date, and second, according to their prices. The notion behind stratification according to price values was to maintain representation of each stratum. Based on the two classification criterion, a total sample of 2269 homes was selected for the period between 1978-1990. Out of this sample, 335 homes were for the period before the implementation of the UGB (January 1978 and October 1980). The samples for the periods after the implementation of the UGB consisted of 178 homes for the period between November 1980 and December 1982, 400 homes for the period between January 1983 and December 1985, 459 homes for the period between January 1986 and December 1987, and 897 homes for the period between January 1988 and December 1990. Each of the above samples contained at least 5 percent of the homes in each sample sold for at the following price levels: \$50,000 or less, \$50,001-\$100,000, \$100,001-\$150,000, \$150,001-\$200,000, and \$200,001 or more.

CHAPTER IV DATA ANALYSIS AND RESEARCH FINDINGS

The scope of this chapter is to present a descriptive analysis of the research data and the research findings. The exploration is in four sections. The first section explains the housing market in the study area during the period between 1978 and 1990. The data described below concerns the sold houses and does not differentiate between old and newly constructed houses. The second section presents the model refinement. The third section describes and interprets the findings of the research regarding the hypotheses. The fourth section presents a summary of the major findings of this research.

DATA ANALYSIS

During the period studied, the analysis showed different behaviors in the housing market. The average price of a house during the period between 1978 and 1990 was found to be \$80,398. This number was almost one eighth less prior to the imposition of the UGB, while after the implementation this number fluctuated between 1980 and 1990. As shown in Figure 10, the average price for a house was \$79,515, \$73,168, \$74,886, and \$90,237 in 1980-1982, 1983-1985, 1986-1987, and 1988-1990 respectively.

The average lot size almost took a pattern of a zigzag form. The average size before <u>implementation of the UGB was 11,214</u> square feet. During the period 1980 and 1982, which is immediately after the UGB was implemented, the average lot size for a house was 9,255 square

foot. However, following this period, the sample for the period between 1983 and 1985 showed an average lot size of a house was 11,697 square feet. As shown in Figure 11, the average lot size kept going up and down during the different periods.



AVERAGE PRICE FOR SAMPLED HOUSES

<u>Figure 10.</u> Average Price for Single-Family Dwellings Sold, 1978-1990.

The behavior of the average interior square footage of a house was different from the average prices and average lot sizes during the studied period. Except for the period before the implementation of the UGB, the average interior square footage of a house kept increasing but at different rates. As shown in Figure 12, the average interior square footage of a house was 1,702, 1,756, 1,777, and 1,816 square feet between 1980-1982, 1983-1985, 1986-1987, and 1988-1990 respectively.



AVERAGE LOT SIZE FOR SAMPLED HOUSES

<u>Figure 11.</u> Average Lot Size for Single-Family Dwellings Sold, 1978-1990.

MODEL REFINEMENT

Prior to discussing the results of each hypothesis, it is important to mention that due to the high multicollinearity between the variables LOTSIZE and the interaction between TIME*LOTSIZE (R=0.987), SQFT and the interaction between TIME*SQFT (R=0.662), and TIME and the interaction between TIME*SQFT (R=0.727), the variables of LOTSIZE and SQFT were eliminated from the regression equations. Further, LOTAMT and TIME*LOTAMT were highly correlated (0.902), and so LOTAMT was eliminated from the regression equations, too.



Figure 12. Average Interior Square Footage for Single-Family Dwellings Sold, 1978-1990.

This research tried to include other variables that are important to housing market behavior, but due to the high multicollinearity and autocorrelation they also had to be excluded. The variable of regional population plays a very significant role in housing prices changes. This study uses time-series data and the time index was an important variable to be included in the model specification. Unfortunately, time and population here found to be highly correlated (R=0.970); therefore the population variable was excluded from the regression equation. The study went further and tried to include population variables at the state and county levels. The high autocorrelation between time and state population (R=0.922) and time and county population (R=0.978) led to the exclusion of the population variable at state and county levels.

Regional income is another important variable that can influence housing market behavior. This study did obtain a regional per capita income variable and tested for this variable, but the high autocorrelation between this variable and the time index variable (R=0.942) forced the study to exclude the regional per capita income variable. The study went further and tried to include per capita income variable at state and county levels. Unfortunately, there was also high autocorrelation between time and state per capita income (R=0.949)) and time and county per capita income (R=0.950), and so per capita income at the state and county levels were also excluded from the regression model. The final model, therefore, included only the variables listed in Table I.

RESEARCH FINDINGS

The findings of the research hypotheses are presented here in three sections. The first section discusses the analysis of the relationship between UGBs and rate of increase in housing prices. The second section discusses the relationship between UGBs and rate of increase in housing prices as the designated periods for UGBs get closer. The third section analyses the relationship between UGBs and housing prices, differentiating between large and small lots.

UGBs AND RATE OF INCREASE IN HOUSING PRICES

The empirical analysis of the first hypothesis reveals several results as shown in Table I. The regression shows that all the

independent variables jointly explain 53 percent of all the variation in sale prices of homes sold before and after the implementation of the UGB. Contrary to the expected sign being positive, the UGB coefficient appears to be negative and significant at least at the .01 level. This coefficient suggests that after the implementation of the UGB, housing prices decreased by about \$20,583. Although this finding is contrary to what was expected, there are reasons for why UGBs would be associated with lower housing prices. Some scholars (Peiser 1989) argue that UGBs lead to an increase in densities, which would in turn lead to lower housing prices. It is also argued that UGBs make services and utilities more efficient and the savings from this increased efficiency would be reflected in lower housing prices. Further, those scholars argue that UGBs clarify goals and vision and guarantee future development, which in turn shortens administrative procedures and time (Lowry 1992).

It is very important to recognize also that the implementation of the Metropolitan Housing Rule (MHR) in 1981 could have caused housing prices to go down. It is difficult to isolate the effect of UGB as opposed to the MHR, since both policies took place almost at the same time. Moreover, the instability in the economy during the early 1980s could also have caused housing prices to decline.

Consequently, this research goes further and divides housing data for the full period 1978-1990 into two groups, one before the implementation of the UGB, between the period of January 1978 and October 1980, and the other after the implementation of the UGB, between the period of November 1980 and December 1990. These two groups were analyzed using regression models. The results were compared to the results of the full period (before and after the

implementation of the UGB), and the UGB variable was eliminated to allow for perfect comparison. Table II shows the regression results.

| Variable | Coefficient | T-Score |
|--------------|-------------|---------|
| UGB | -20583 | -8.4*** |
| AGE | -290 | -7.2*** |
| BEDROOM | 1781 | 2.1** |
| BATHROOM | 7836 | 7.8*** |
| GARAGE | 3312 | 1.9* |
| FIREPLACE | 551 | 0.6 |
| INTRATE | 3653 | 8.1*** |
| DCBD | -0.23 | -4.5*** |
| DSCH | 1.39 | 3.7*** |
| DUGB | -0.68 | -4.8*** |
| DREC | 0.57 | 1.6* |
| DHWYS | -0.28 | -2.9*** |
| DEMP | -0.11 | -1.2* |
| CRIME | -8370 | -4.9*** |
| EDUCATION | 1.5 | 1.4* |
| TIME | -18.1 | -0.6 |
| TIME*LOTSIZE | 0.0015 | 3.5*** |
| TIME*SQFT | 0.207 | 22.7*** |
| | | |
| | | |
| Constant | 34866 | 3.9*** |
| Multiple R2 | 0.53 | |
| Sample Size | 2269 | |

| TABLE I |
|---|
| MULTIPLE REGRESSION FOR PRICE AS A DEPENDENT VARIABLE (SAMPLE |
| PERIOD BEFORE AND AFTER THE UGB) |

* Significant at 0.05 level (one-tailed)

** Significant at 0.05 level (two-tailed)

*** Significant at 0.01 level (two-tailed)

The regression results show that all the independent variables jointly explained 52, 62, and 53 percent of the variation in sale prices of homes sold before and after, only before, and only after the implementation of the UGB, respectively.

| TABLE II |
|---|
| MULTIPLE REGRESSION FOR PRICE AS A DEPENDENT VARIABLE (SAMPLE |
| PERIOD BEFORE AND AFTER THE UGB) |

| Variable | Before- | After UGB | Before UGB | | After UGB | |
|--------------|----------------|-----------|------------|---------|-----------|---------|
| | Coeff. T-Score | | Coeff. | T-Score | Coeff. | T-Score |
| AGE | -287 | -7.0*** | -140 | -1.9* | -341 | -7.6*** |
| BEDROOM | 1754 | 2.0** | 149 | 0.1 | 1222 | 1.2* |
| BATHROOM | 7695 | 7.6*** | 11589 | 6.9*** | 6277 | 5.5*** |
| GARAGE | 3001 | 1.7* | 1741 | 0.6 | 3820 | 1.9* |
| FIREPLACE | 502 | 0.5 | -1628 | -0.9 | 726 | 0.7 |
| INTRATE | 1884 | 4.6*** | -430 | -0.3 | 4454 | 5.7*** |
| DCBD | -0.23 | -4.4*** | -0.11 | -1.4* | -0.23 | -4.0*** |
| DSCH | 1.3 | 3.5*** | 0.6 | 0.3 | 1.3 | 3.3*** |
| DUGB | -0.67 | -4.7*** | -0.50 | -2.1** | -0.65 | -4.1*** |
| DREC | 0.61 | 1.7* | 0.39 | 0.6 | 0.64 | 1.6* |
| DHWYS | -0.26 | -2.7*** | -0.43 | -2.9*** | -0.27 | -2.5*** |
| DEMP | -0.09 | -1.0* | 0.25 | 1.6 | -0.15 | -1.5* |
| CRIME | -6560 | -3.8*** | -1240 | -0.5 | -10326 | -3.4*** |
| EDUCATION | 1.5 | 1.4* | 1.8 | 1.1* | 0.87 | 0.6 |
| TIME | -188 | -8.7*** | -461 | -1.4 | 11 | 0.3 |
| TIME*LOTSIZE | 0.0015 | 3.6*** | 0.013 | 6.0*** | 0.0013 | 2.9*** |
| TIME*SQFT | 0.207 | 22.4*** | 0.547 | 6.6*** | 0.217 | 21.9*** |
| | | | | | | |
| | | | | | | |
| Constant | 48478 | 5.5*** | 51125 | 3.3*** | 11892 | 0.7 |
| Multiple R2 | 0.52 | | 0.62 | | 0.53 | |
| Sample Size | 2269 | | 335 | | 1934 | |

Significant at 0.05 level (one-tailed)

** Significant at 0.05 level (two-tailed)

*** Significant at 0.01 level (two-tailed)

Comparing the three regressions, it is obvious that some variables became significant after the implementation of the UGB while others did not. Although the coefficients of DUGB are significant before and after the implementation of the UGB at a level of .05 and .01, respectively, the coefficient after the implementation of the UGB is higher than before the UGB was implemented, a finding which is consistent with the theoretical literature (Correll et al. 1978; Nelson 1984). In particular, the coefficients of DUGB suggest that a house close to the UGB after it was implemented will lose \$0.65 for every foot of distance from the UGB while the value before the implementation was \$0.50 for every foot of distance. It must be kept in mind, however, that the period after the UGB was implemented experienced a severe depression. Thus, the \$0.65 could be underestimated. When looking to the rate of increase it is clear that a house sold after the UGB was implemented captured a higher rate of increase, but it is not that high compared to the rate of increase before the UGB was implemented. In particular, due to DUGB, a house after the UGB was implemented captured 0.00080 percent of the house value for every single foot it gets closer to the UGB versus 0.00071 before the UGB was implemented.

Nevertheless, it could also be argued that the DUGB before the implementation of the UGB was significantly sizable, due to the fact that participants in the land market feared a stringent UGB and its consequences and were unsure of the final lines of the UGB, drafted before October 1980. In fact, the date of line demarcation goes back to 1977 and that is how Knaap (1982) found some effects of the UGB on land values when he studied the Portland metropolitan area.

coefficients on Based the of the two interactions, TIME*LOTSIZE and TIME*SQFT, as shown in Table II, the real implicit price trends in house value can be calculated for each period. The coefficients of the interactions show the price increment of one square foot in LOTSIZE and SQFT. Multiplying these coefficients with the average size of LOTSIZE and SQFT in a certain period would reveal the real implicit price of an average LOTSIZE per month, as the TIME variable was measured in a one-month increment. In particular, the average LOTSIZE during the period after UGB was 11,827 square feet. Multiplying the coefficient outcome for the same variable during the same period reveals \$15. This is the increment in LOTSIZE per month. In order to measure the rate of the increase in LOTSIZE price, the real implicit price of an average LOTSIZE per month was divided by the average house price (Table III).

Table III and Figure 13 show that the value of a house was lower in its LOTSIZE value after the implementation of the UGB than before. In particular, LOTSIZE appreciated by only 0.02 percent of the house value after the UGB was implemented while the appreciation before the UGB was implemented was 0.20 percent. In fact, this should be the opposite, as the argument is that the increased rate in housing prices is higher after the UGB was implemented. However, the outcomes of the SQFT suggests that there must be other factors that are affecting the housing market which are not accounted for.

The results reveal that the value of a house is lower in its SQFT value after implementation of the UGB than before, 0.47 percent after implementation as opposed to 1.32 percent before implementation. Since the UGB is mainly concerned with land supply, the SQFT value should not be affected, as the model controlled for other factors. However, the reduction in the values of LOTSIZE and SQFT after implementation of the UGB stresses the necessity for further analysis about the period following the implementation. The next section deals with this issue.

TABLE III

REAL IMPLICIT PRICE TRENDS (IN \$) PER MONTH DUE TO LOT SIZE AND HOUSE IMPROVEMENTS FOR THE PERIODS BEFORE AND AFTER THE UGB

| | Before-After UGB Value percent | | Befor | e UGB | After UGB | |
|---------|-----------------------------------|------|----------------------------|-------|-----------|---------|
| 1 | | | alue percent Value percent | | Value | percent |
| TOTAL | 386 | 0.47 | 1082 | 0.52 | 402 | 0.49 |
| LOTSIZE | 18 | 0.02 | 146 | 0.20 | 15 | 0.02 |
| SQFT | 367 | 0.45 | 936 | 1.32 | 387 | 0.47 |



<u>Figure 13.</u> Real Implicit Price Trends per Month Due to Lot Size and House Improvements for the Periods Before and After the UGB.

In short, the reduction in the LOTSIZE coefficient value after implementation could be attributed to three factors: first, the association of the UGB with the MHR, which could have caused land values to go down; second, the recession which hit the Portland economy in the early 1980s; third, the fear of a stringent UGB, with resultant immediate land acquisition from within the drafted UGB market.

This is supported by Lillydahl and Singell (1987) when they argue that even if growth controls are not actually in effect, if the city leaders favor such controls or if residents anticipate the enactment of such controls, prices may increase in anticipation of these controls. Thus, after the UGB was implemented, the ambiguity went away and prices came down. Even with this explanation for a reduction in the LOTSIZE coefficient value after the implementation of the UGB, a house would increase by \$180 a year.

However, the analysis shows that AGE, BATHROOM, DCBD, and DHWYS remain significant in the two regressions, before and after the UGB, while the coefficients of GARAGE, BEDROOM, INTRAT, DSCH, DREC, DEMP, and CRIME become significant only after the period of UGB implementation as opposed to before. The level of significance varies between slight significance at the level of 0.05 (one-tailed) to highly significant at the level of 0.01 (two-tailed). In particular, the DCBD coefficient suggests that a house would lose \$0.11 during the period before UGB implementation, and \$0.23 during the period after implementation, for every foot of distance from the CBD. This reveals a downward sloping gradient of 0.82 and 1.5 percent per mile, before and after the UGB, respectively. In fact, the latter is close to what was reported by Mills and Hamilton (1989). In addition, the coefficients of the DHWYS were found to be significant at the level of 0.01 (two-tailed) but the value dropped in the period after the UGB was implemented.

Although the coefficient of DSCH, after UGB implementation, is significant at least at the .01 level, it carries a different sign than expected. The coefficient suggests that the price of a house will increase by \$1.3 for every foot of distance from elementary schools as some people see proximity to elementary schools as a negative. However, the direction of the sign could change from time to time and from location to location depending on the behavioral changes of the people involved. It is interesting, when looking at both regressions analyzing the housing market before and after UGB

implementation, to note that only FIREPLACE and TIME coefficients are not significant.

Nevertheless, the opposite sign stimulated further research in an effort to explain this outcome. One possible reason could be that most of the houses in the studied sample are occupied by people with few or no children and those homes would have a small number of bedrooms. One way to test this is by interacting the DSCH variable with BEDROOM. This research did created an interaction between these two variables but did not find it to be significant. The other possible reason is that people like to stay away from schools with low quality. Interacting school quality with DSCH allow for an analysis of the relationship between school quality and school distance. However, this study was not able to find data about school quality; therefore, it was difficult to test this relationship.

Support for the suspicion that the price functions of the two periods, before and after, are not similar is indicated by a Chow-test Fratio, which is significant at 0.01 level and results in rejection of the null hypothesis.

RATE OF INCREASE IN HOUSING PRICES IN THE LATTER PERIODS

As discussed in Chapter III, in order to test for higher land values and housing prices as UGBs get closer to the end of their designated periods, the period after UGB implementation has been divided into four sub-periods and in turn four regressions have been utilized. As shown in Table IV, the coefficients of all the variables fluctuated up and down. It is obvious from the results that the period between 1983-1985 witnessed a drop in most of the coefficients compared to the preceding and following periods. In fact, this is not unexpected, as the results are consistent with the depression that occurred in the Portland housing market during the period between 1983-1985.

| Variable | 1980-1982 | 1983-1985 | 1986-1987 | 1988-1990 | |
|--------------|---------------|----------------|---------------|----------------|--|
| | Coef. T-Score | Coef. T-Score | Coef. T-Score | Coef. T-Score | |
| AGE | -442 -2.1** | -160 -1.6* | -298 -2.9*** | -488 -8.5*** | |
| BEDROOM | -3308 -0.8 | 7194 3.1*** | 6890 3.2*** | -5261 -3.8*** | |
| BATHROOM | 15800 3.1*** | 4280 1.7* | 6465 2.7*** E | 4855 3.1*** | |
| GARAGE | -10106 -1.2 | 3077 0.7 | 3535 0.7 | 5586 2.1** | |
| FIREPLACE | 3107 0.7 | 2058 0.8 | -2194 -1.0 | 988 0.7 | |
| INTRATE | -2155 -0.6 | 2459 0.6 | 6537 0.9 | -10566 -4.0*** | |
| DCBD | 0.09 0.3 | -0.17 -1.4* | -0.3 -2.4*** | -0.26 -3.2*** | |
| DSCH | 2.4 1.4* | 0.6 0.7 | 0.6 0.7 | 1.2 2.1** | |
| DUGB | 0.1 0.2 | -0.35 -0.9 | -0.82 -2.8*** | -0.68 -2.0*** | |
| DREC | -0.9 -0.6 | 0.01 0.01 | 0.54 0.6 | 1.3 2.4*** | |
| DHWYS | -0.09 -0.2 | -0.07 -0.2 | -0.28 -1.3* | -0.37 -2.5*** | |
| DEMP | 0.003 0.00 | 0.004 0.01 | -0.1 -0.6 | 0.2 1.4 | |
| CRIME | -25861 -0.8 | -103321 -2.0** | -1947 -0.04 | -1920 -0.2 | |
| EDUCATION | -0.1 -0.03 | -0.9 -0.3 | 5.3 1.8* | 0.5 0.2 | |
| TIME | -945 -1.2 | 67.4 0.2 | 371 0.8 | 768 3.6*** | |
| TIME*LOTSIZE | 0.009 0.8 | -0.002 -2.4*** | 0.003 2.4*** | 0.002 4.2*** | |
| TIME*SQFT | 0.465 4.7*** | 0.224 7.1*** | 0.162 7.6*** | 0.252 21.5*** | |
| | | | | | |
| | | | | | |
| Constant | 146284 1.4* | 189726 2.3** | -73464 -0.5 | 45390 1.1* | |
| Multiple R2 | 0.50 | 0.41 | 0.47 | 0.67 | |
| Sample Size | 178 | 400 | 459 | 897 | |

TABLE IV MULTIPLE REGRESSION FOR PRICE AS A DEPENDENT VARIABLE (SAMPLE PERIOD AFTER THE UGB)

Significant at 0.05 level (one-tailed)

** Significant at 0.05 level (two-tailed)

*** Significant at 0.01 level (two-tailed)

.....

However, th<u>e four regressions show that all</u> the independent variables jointly explained 50, 41, 47, and 67 percent of all the variations in sale prices of homes sold after UGB implementation and

between the periods 1980-1982, 1983-1985, 1986-1987, and 1988-1990, respectively.

The interactive effects of LOTSIZE*TIME and SQFT*TIME are consistent with previous theoretical predictions. All of their coefficients are significant at least at the .01 level except for TIME*LOTSIZE for the period between 1980-1982, which is not significant.

Based on earlier discussion of the coefficients of the two interactions TIME*LOTSIZE and TIME*SQFT, the real implicit price trends of the price of a house when looking at the components of LOTSIZE and SQFT are summarized in Table V and Figure 14. LOTSIZE and SQFT fluctuated and SQFT decreased during the two periods followed the first one and then picked up. LOTSIZE followed a zigzag pattern decreasing and increasing and then decreasing again.

| | 1980-1982 | | 198 | 1983-1985 | | 1986-1987 | | 38-1990 | |
|---------|-----------|------|-------|-----------|-----|-----------|-----|---------|--|
| | Value % | | Value | Value % | | Value % | | Value % | |
| TOTAL | 865 | 1.09 | 361 | 0.49 | 321 | 0.42 | 482 | 0.53 | |
| LOTSIZE | 74 | 0.09 | -32 | -0.04 | 33 | 0.04 | 26 | 0.03 | |
| SQFT | 791 | 1.0 | 393 | 0.53 | 288 | 0.38 | 456 | 0.50 | |

TABLE V REAL IMPLICIT PRICE TRENDS (IN \$) PER MONTH DUE TO LOT SIZE AND HOUSE IMPROVEMENTS FOR THE PERIODS AFTER THE UGB

In particular, during the period between 1983-1985, both interactions TIME*LOTSIZE and TIME*SQFT obtained lower coefficients compared to the preceding period. Again, this was expected due to the depression that occurred during this period. What is interesting is that during the period of 1986 and 1987 TIME*LOTSIZE picked up in its coefficient while TIME*SQFT became

worse than the period of the depression. This leads to the necessity for further research about the labor and construction material markets during that period.



REAL IMPLICIT PRICE TRENDS

<u>Figure 14.</u> Real Implicit Price Trends per Month Due to Lot Size and House Improvements for the Four sub-Periods After the UGB.

The results of the last period, between 1988-1990, show that the coefficients of the two interactions TIME*LOTSIZE and TIME*SQFT were opposite their values in the previous period. The coefficient of TIME*LOTSIZE became lower where the coefficient of TIME*SQFT became higher. This implies that the UGB had no marked relationship with housing prices.

The decrease in the LOTSIZE value could be due to less demand for land as growth escaped to the neighboring area, Clark County, Washington where UGBs were not in existence. To explore this possibility, building permits of the six counties--- Clackamas; Columbia; Multnomah; Washington; Yamhill; Clark County, Washington— which comprise the Portland metropolitan area, were analyzed between 1980 and 1990 and the population for the year 1980 was considered the base year. Figure 15 shows that during the last three years, 1988, 1989, and 1990, issuance of building permits in Clark County increased so rapidly that by the end of 1990 they surpassed Washington County, which had been the county issuing the greatest number of building permits between 1980 and 1989.

In short, growth could have escaped to Clark County during the period of 1988 and 1990 and that is why the results show a lower coefficient for TIME*LOTSIZE during this period. In fact, seeing the growth escaping to Clark County is not surprising and is consistent with most of the empirical research (Lillydahl and Singell 1987; Chinitz 1990; Landis 1992; Downs 1994; Schwartz et al. 1986). In particular, the empirical work of Schwartz et al. (1981) found that there was no significant difference in the increase in housing prices in Petaluma as compared with Rohnet Park, where growth control was not applied, but their study did find that the number of building permits increased sharply in Rohnert Park after growth control in Petaluma took place. They concluded that where perfect substitution exists, growth controls will not increase housing prices in the community where the controls are imposed, but they will increase the quantity of houses constructed in surrounding communities. However, during the last two periods following the depression, the UGB caused housing prices to increase by up to \$1,738. This significant

increase is enough to hinder the ability of many people to own a house.

CHANGE IN BUILDING PERMITS



<u>Figure 15.</u> Changes in Building Permits Issued Between 1980 and 1990 (population for 1980 was Taken as the Base Year)

Nevertheless, it should be noted that the increase in issuance of building permits in Clark County by the end of 1990 could be also due to the high property taxes in Oregon as Measure 5, which intended to limit property taxes, did not take place not until the 1991-92 fiscal year. However, no matter how much the rate of the increase in housing prices, the rate of increase after the UGB was implemented was lower than before the UGB was implemented. Support for the suspicion that the price functions of the four sub-periods, after the UGB, are not similar is indicated by a Chow-test F-ratio, which is significant at 0.05 for the first two sub-periods and at 0.01 for the last two sub-periods level. This results in rejection of the null hypothesis.

The coefficients of the DCBD and the DUGB kept increasing during the first three periods, including the recession period, but the coefficients of both variables dropped during the last period. However, the coefficients of the DCBD was significant during the last three periods while the coefficients of the DUGB were significant only during the last two periods. Comparing the downward sloping gradient of both DCBD and DUGB related to housing prices, the results show that DUGB has a higher downward sloping gradient than DCBD, 0.7, 2.5, 5.8, and 4.0 percent per mile for DUGB for the first, second, third, fourth periods, respectively, 0.6, 1.2, 2.1, and 1.5 percent per mile for DCBD for the first, second, third, and fourth periods, respectively. Since the emergence of suburban subcenters and multi-centers of activities, the importance of proximity to the CBD has decreased and this has contributed to the higher gradient percentage of the DUGB versus DCBD. Proximity to UGBs is also limited. The other possible reason is that most of the houses in Washington County are closer to the UGB than to the CBD.

When looking at the rate of increase due to DUGB, the rate during the last period after the UGB was implemented dropped significantly compared to the prior period, 0.001094 for the period between 1986-1987 and 0.00075 for the period between 1988-1990. In fact, the rate of the last period was almost similar to the rate of increase during the period before the UGB was implemented which was 0.00071.

RATE OF PRICE INCREASES OF SINGLE-FAMILY HOUSES ON LARGER LOTS

One of the hypotheses that has been raised in this research states that houses located on large lots, 12800 feet and above, would capture higher rates in prices compared to houses located on lots smaller than this. This could be due to the limited supply of raw land because of UGB imposition.

The regression models reveal several results. As shown in Table VI, all the independent variables jointly explained 52 percent, 60 percent, and 53 percent for the periods before-after, before, and after the UGB was implemented, respectively.

Table VI shows that the coefficients of TIME*LOTAMT dropped after the imposition of the UGB. In particular, the rate was 0.71 percent before the UGB was implemented while it was 0.10 percent after. Again, this is due to the fluctuation of the economy during the period after the UGB was implemented. This is clear, as the results reveal the same drop in the coefficient of the TIME*SQFT variable; it is unusual for the value of the area of interior footage of a house to drop as a result of the UGB when most of the related variables are accounted for.

However, the results of the period after UGB implementation and after the division into the four periods as discussed give a clear picture about the rate of increase after the UGB was implemented. Table VII shows the four regression results which tested for the four periods after the <u>UGB was implemented</u>. All the independent variables jointly explained 49, 41, 47, and 67 percent for the periods 1980-1982, 1983-1985, 1986-1987, and 1988-1990, respectively.

| Variable | Before-After UGB | Before UGB | After UGB | |
|-------------|------------------|----------------|----------------|--|
| | Coeff. T-Score | Coeff. T-Score | Coeff. T-Score | |
| AGE | -323 -7.7*** | -173 -2.2** | -390 -8.5*** | |
| BEDROOM | 1849 2.1** | 620 0.4 | 1335 1.3* | |
| BATHROOM | 7587 7.5*** | 10512 6.1*** | 6229 5.5*** | |
| GARAGE | 2630 1.4* | 2280 0.8 | 3320 1.6* | |
| FIREPLACE | 513 0.5 | -296 -0.1 | 686 0.7 | |
| INTRATE | 1915 4.7*** | -1345 -0.9 | 4644 6.0*** | |
| DCBD | -0.22 -4.2*** | -0.13 -1.5* | -0.22 -3.8*** | |
| DSCH | 1.2 3.3*** | 1.3 1.9* | 1.2 3.0*** | |
| DUGB | -0.67 -4.7*** | -0.62 -2.5** | -0.63 -4.0*** | |
| DREC | 0.48 1.3* | 0.33 0.5 | 0.48 1.2* | |
| DHWYS | -0.26 -2.7*** | -0.43 -2.8*** | -0.27 -2.5*** | |
| DEMP | -0.1 -1.1* | 0.17 1.2* | -0.16 -1.5* | |
| CRIME | -6464 -3.7*** | -2841 -1.2* | -9765 -3.2*** | |
| EDUCATION | 1.7 1.5* | 1.5 0.9 | 1.1 0.8 | |
| TIME | -173 -8.0*** | -203 -0.6 | 34 0.9 | |
| TIME*LOTAMT | 75 5.3*** | 506 4.3*** | 77 5.3*** | |
| TIME*SQFT | 0.204 22.1*** | 0.587 6.9*** | 0.211 21.5*** | |
| | | | | |
| | | | | |
| Constant . | 48302 5.5*** | 61092 3.8*** | 8014 0.4 | |
| Multiple R2 | 0.52 | 0.60 | 0.53 | |
| Sample Size | 2269 | 335 | 1934 | |

TABLE VI MULTIPLE REGRESSION FOR PRICE AS A DEPENDENT VARIABLE (SAMPLE PERIOD BEFORE AND AFTER THE UGB)

* Significant at 0.05 level (one-tailed)

* Significant at 0.05 level (two-tailed)

*** Significant at 0.01 level (two-tailed)

The coefficients for TIME*LOTAMT, the interaction variable, are significant during the three periods following 1982, and, in fact, for these three periods, the level of significance went up as time proceeded, to the .05 level (one-tail), .05 level (two-tail), and 0.01 level (two-tail), respectively. The magnitudes of the coefficients also increased as time passed. A house on a large lot-during 1983-1985 captured \$58 per month, \$66 per month during 1986-1987, and \$75 per month during 1988-1990; This implies that larger lots got more scarce

as time passed especially since the UGB prevented any inclusion of raw land since October 1980. Further details show that a house located on a large lot captured an increase of \$6,372 between 1983 and 1990. However, when looking at the rate of the increase in LOTAMT price, the analysis shows that the rate was increasing until the last period, where the rate dropped. In particular, the rate was 0.025, 0.079, 0.088, and 0.083 percent, respectively.

| TABLE VII |
|---|
| MULTIPLE REGRESSION FOR PRICE AS A DEPENDENT VARIABLE (SAMPLE |
| PERIOD AFTER THE UGB WAS IMPLEMENTED) |

| Variable | 1980-1982 | 1983-1985 | 1986-1987 | 1988-1990 |
|-------------|---------------|----------------|---------------|----------------|
| | Coef. T-Score | Coef. T-Score | Coef. T-Score | Coef. T-Score |
| AGE | -390 -1.8* | -216 -2.1* | -293 -2.8*** | -529 -8.9*** |
| BEDROOM | -3127 -0.8 | 8005 3.5*** | 7115 3.3*** | -4814 -3.5*** |
| BATHROOM | 15922 3.1*** | 4514 1.8* | 6743 2.8*** | 4276 2.8*** |
| GARAGE | -9105 -1.1 | 2150 0.5 | 5137 1.1* | 4801 1.8* |
| FIREPLACE | 3358 0.8 | 1226 0.5 | -2054 -0.9 | 835 0.6 |
| INTRATE | -2334 -0.7 | 1925 0.4 | 6816 0.9 | -10200 -3.9*** |
| DCBD | 0.08 0.3 | -0.21 -1.6* | -0.3 -2.3** | -0.24 -3.1*** |
| DSCH | 2.7 1.6* | 0.03 0.03 | 0.6 0.7 | 1.1 2.0** |
| DUGB | 0.1 0.1 | -0.35 -0.9 | -0.8 -2.7*** | -0.72 -3.2*** |
| DREC | -0.9 -0.6 | 0.14 0.16 | 0.59 0.7 | 1.1 2.0** |
| DHWYS | -0.1 -0.2 | -0.07 -0.3 | -0.27 -1.2* | -0.39 -2.7*** |
| DEMP | -0.001 -0.00 | 0.05 0.2 | -0.1 -0.6 | 0.2 1.5 |
| CRIME | -23783 -0.7 | -104495 -2.0** | -1269 -0.02 | -130 -0.01 |
| EDUCATION | -0.4 -0.09 | -0.9 -0.3 | 5.1 1.7* | 0.5 0.3 |
| TIME | -822 -1.1 | 81 0.2 | 417 0.9 | 811 3.8*** |
| TIME*LOTAMT | 20 0.1 | 58 1.3* | 66 2.2** | 75 4.5*** |
| TIME*SQFT | 0.481 4.8*** | 0.179 6.0*** | 0.159 7.4*** | 0.250 21.4*** |
| | | | | |
| | | | | |
| Constant | 139224 1.4* | 203406 2.4*** | -83479 -0.5 | 35436 0.9 |
| Multiple R2 | 0.49 | 0.41 | 0.47 | 0.67 |
| Sample Size | 178 | 400 | 459 | 897 |

* Significant at 0.05 level (one-tailed)

* Significant at 0.05 level (two-tailed)

*** Significant at 0.01 level (two-tailed)

SUMMARY

By exploring the relationship between housing prices and the UGB, it was found that the UGB did not affect housing prices. In particular, the increased rate in the value of the LOTSIZE was much lower during the period after the UGB was implemented compared to the period before the UGB.

In addition, during the period after the UGB was implemented, the rate of increase in lot size is almost flat. This low rate could be attributed to the ample amount of land supplied within the UGB as this analysis studied only up to the midpoint of the designated period.

The analysis showed an overall increase in the rates of the value of LOTAMT during the three periods following the UGB implementation, while the rate decreased at the fourth period. Large lots did capture higher values as time passed compared to small lots, but the rate of increase during the period after the UGB was implemented was much lower compared to the period before the UGB was implemented.

Finally, it has been demonstrated that proximity to the UGB was seen as an amenity and that housing prices do decline as they get away farther from the UGB.

CHAPTER V CONCLUSIONS AND POLICY IMPLICATIONS

In light of the empirical analysis described in the previous chapter on the relationship between UGBs and housing prices, this chapter will attempt first to summarize the major findings of the research, then to discuss research limitations, and the generalizability of the study, and finally, it will end with policy implications and recommendations for further research.

MAJOR FINDINGS

This study examined and analyzed the hypotheses raised in this research and showed the different results obtained as each hypothesis was analyzed. The following discussion summarizes the results of each hypothesis separately.

UGBs and Rate of Increase in Housing Prices

The major variable in the first regression model was the UGB variable, which allowed the measurement of the effect of the UGB after it was implemented. The analysis showed a negative coefficient which meant houses sold after UGB implementation were lower in price, however, the analysis went further and utilized three different regressions. One tested the full period before and after the UGB, another tested before the UGB, and the third one tested after the UGB.

Comparing the results of the three regressions, it was demonstrated that the lot size coefficient had lower values after UGB

implementation which implied that there was no relationship between the UGB and the rate of increase in housing prices. Nevertheless, the same results showed the same relationship between the amount of the interior footage of a house and the UGB. The rate of increase of the square footage of interior space of a house dropped from 1.32 percent to 0.47 percentage when comparing periods before and after the UGB.

The rate of increase in housing prices due to LOTSIZE dropped significantly form 0.20 percent to 0.02 percent from the period before the UGB was implemented to the period after. There could be other forces behind this drop rather than the UGB itself.

It could be that the combination of the recession that hit the Portland housing market in the early 1980s, the disappearance of the fear of having a stringent UGB that preceded UGB implementation, and the association of the implementation of the in 1981, that could have contributed to the drop in housing prices, and not the UGB. Still, based on the results of the analysis, this study was not able to find any relation between the rate of increase in single-family housing prices and the UGB.

Rate of Increase in Housing Prices in the Latter Periods

The period after UGB implementation was divided into four periods and hence four regression models were utilized. The sum of the two main components for a real implicit price trend in a house value gradually increased during each period. However, lot size, which is directly related to the UGB, showed different magnitudes. Lot size captured 0.09 percent per month of housing value between 1980-1982, and this percentage became -0.04 during the period of 1983-1985, while it went up again to +0.04 during 1986-1987, but dropped
down again to positive +0.03 percent during 1988-1990. The negative value during the period 1983-1985 could be attributed to the recession which occurred during this period.

These magnitudes do not comply with the hypothesis that states that the rate of increase during the latter periods are more rapid after the UGB was implemented. In fact, the rate of increase kept going down between the first and the fourth periods. Furthermore, with the exclusion of the period of the recession, the rate of increase in housing prices during the period before the UGB was implemented was much higher than any single period after the UGB was implemented. For example, during the period between 1986-1987 when the economy was much better than the period before, the rate of increase was 0.04 percent versus 0.20 percent during the period before the UGB was implemented. In particular, the rate of increase during the period before the UGB was as much as five times the highest rate after the UGB was implemented.

Consequently, this research was not able to prove the hypothesis that states that the rate of increase in housing prices is more rapid towards the latter periods.

Rate of Price Increases of Single-Family Houses on Larger Lots

The analysis showed some interesting results with respect to lot size. When the results of the data obtained from the three regression models, before/after, before, and after the UGB were compared, the lot amount variable was significant in the three regressions. Although the period after the UGB showed some increase in housing prices due to lot amount, the rate of increase during the period after the UGB was implemented was 0.09 percent versus 0.71 percent before the UGB was implemented (almost 8 times less).

However, to understand better the relationship between the rate of increase in single family housing prices due to lot amount and the UGB, the post period was tested using four regression models. The results showed that there was not a significant increase due to lot amount during the first period, 1980-1982, while during the following three periods the coefficients of the lot amount variable showed a significant increase in their values. In fact, the increase went up as time proceeded. In particular, a house built on a large lot (12,800 feet or larger) captured \$58 per month during 1983-1985, \$66 during 1986-1987, and \$75 during 1988-1990. When the rate of increase was compared, the real implicit price of the lot amount during the last period, 1988-1990, showed a drop compared to the prior period. The rate of increase went down from 0.088 to 0.083 percent. On the other hand, when comparing the rate of increase during the four periods (after the UGB was implemented) with the rate of increase during the period before the UGB was implemented, it is obvious that the rate of increase during the period before the UGB was implemented was much higher (0.71 percent) than any of the four periods (0.025, 0.079, 0.088, 0.083 percent, respectively) after the UGB was implemented. With the model and specification used to arrive at these results, this research was not able to find a relationship between the UGB and a higher rate of increase in housing prices due to lot amount.

Proximity to UGBs as an Amenity

The overall analysis showed that a house would gain some value as it gets closer to the UGB. Although both regression results, before and after the UGB, showed a negative coefficient for the DUGB variable, the post analysis showed a higher coefficient value. This means that people do value proximity to the UGB and as time passes this proximity becomes more appreciated as development, including facilities and economic activities, gets closer to those houses that are located by the UGB.

Nevertheless, comparing and analyzing the four periods after UGB implementation showed that the coefficients of the DUGB during the last two periods are significant and that a house would gain \$0.82 per foot during 1986-1987 as it gets closer to the UGB, and \$0.68 during 1988-1990. Although the rate of increase in housing prices due to DUGB went down during the last period compared to the period before, it is still the case that the rate of increase is higher than before the UGB was implemented. These results support the hypothesis that states that distance to UGB influences housing prices.

RESEARCH LIMITATIONS

This study attempted to overcome some of the shortcomings of other research that analyzes housing prices and growth controls. To investigate the relationship between housing prices and UGBs, a timeseries analysis was used instead of the commonly used and frequently criticized cross-sectional method.

Using a time-series analysis limited the choices of variables, in particular the economic variables. Some researchers (Beaton 1982; Segal and Srinivasan 1985; Fischel 1991; and Black and Hoben 1985) argue that income and population are a very important measure of housing market in the region. However, this research excluded those variables due to the high multicollinearity and autocorrelation with other variables such as the time index.

Also, it is frequently documented in the housing market literature that school quality is an important factor in choosing a

house. This study attempted to find some data regarding school quality but there was none available. In fact, this research showed that proximity to elementary schools is positively correlated with housing prices, which means a house would lose some of its value as it gets closer to an elementary school. However, if the school quality data were available it would be possible to investigate whether proximity to an elementary school has an association with school quality or not.

Although the crime rate variable was included in all the regression equations and found to be significant in most of the results, crime rate was measured on the county level rather than the neighborhood level. It was difficult to locate the neighborhood of each house because many sales fell within the unincorporated areas of Washington County.

In the first regression, the UGB variable, the main variable in the model, showed a negative sign which is opposite of the expected one. This was attributed to the recession that took place in early 1980s. However, if the unemployment rate had been included as a variable in the regression model, the direction of the UGB's coefficient probably would have changed.

Further, the association of another developmental policy, the Metropolitan Housing Rule MHR, which was implemented in 1981, made it difficult for this research to isolate the individual effect of each policy.

Finally, the difficulty of obtaining data before 1978 made it very difficult to isolate the complete effect of the UGB before it was drafted in 1977.

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GENERALIZATION OF THE STUDY

This research used Washington County, Oregon, as a case study. However, it should be noted that Oregon is unique. On the one hand, Oregon is one of the early pioneers of UGBs in the nation, while on the other hand, its economics fluctuate and are less stable and more sensitive to national economic trends than other states due to its dependence on natural-resource industries. Oregon's economy was hit hard by the recession in the nation's economy.

Therefore, due to these varying economic conditions, it is difficult to draw any definite conclusions about the generalizability of this study's results to other regions.

POLICY IMPLICATION AND FUTURE RESEARCH

Previous research, such as that by Knaap (1982, 1985) and Nelson (1984, 1986) has focused on the relationship between UGBs and land values, but the relationship between UGBs and housing prices has never been examined using empirical analysis. However, the relationship between UGBs and housing prices and the desire of state and local governments to ascertain this relationship will continue to be an important topic for researchers and policy makers.

The findings of this research did not support the first four hypotheses regarding the relationship between the UGB and the rate of increase in housing prices. In fact, these findings are in line with Toulan's 1994 argument about the land market that "the Portland UGB does not seem to have created any imbalances in the land market" (p. 114). Based on these findings, it could be argued that

UGBs are positive in that they preserve farm land and stop sprawl without the negative consequences of raising housing prices.

However, more complex models, better specification, and more data could show different results. In addition, it should be noted that this research tests only up to 1990, which is the midpoint of the designated period for the UGB. At this point there was an ample amount of raw land within the UGB and that is why the UGB did not show any relation to the rate of increase in housing prices. Thus policy makers are encouraged to study the same relationship for the period between 1990-1996.

Nevertheless, even if it is found that there is a relationship between the UGB and rate of increase in housing prices, it is more rational for policy makers to weigh the cost and benefits of the UGB before altering the existing UGB. In particular, the UGB was implemented to serve the public interest and to accomplish several positive things, such as preserving rural land, shortening commutes, and stopping urban sprawl, which benefit the public at large. On the other hand, the UGB may be found to increase the individual cost in obtaining a house. So, the benefits to the public and the costs to the individual should be weighed. In short, policy makers should look at a larger picture than just costs.

For future research, this study recommends the following:

1. This research focused only on single-family dwellings; therefore, it is recommended that future research analyze the relationship between UGBs and prices of other types of housing dwellings.

2. This research studied only up to 1990, when there was an ample amount of land within the UGB. It is recommended that

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future research take this further and test the relationship between the UGB and housing prices between 1991 and 1996.

3. After 1990 some major policies were enacted such as Measure 5 and the Traffic Impact Fee. The implementation of these policies in conjunction with the UGB requires future research using more complex models to control for the effect of each intervening policy.

4. Market pressures due to the UGB may not be uniform in an urban area; therefore it is recommended that future research take into consideration this effect.

5. This research recommends that future research examines the real effects of the MHR because of the association with the UGB and because it is difficult, with the available data, to ascertain whether the MHR has a negative or positive effect on the single-family housing market without analyzing the price trends of a particular type of dwelling.

In 1981, in addition to Goal 10, the Portland region adopted the Metropolitan Housing Rule MHR. "Its stated purpose is to assure opportunity for the provision of adequate numbers of needed housing units and the efficient use of land within the Metropolitan Portland (Metro) urban growth boundary, to provide greater certainty in the development process and so to reduce housing costs" (Toulan 1994, p. 105).

The MHR, for example, required that at least 50 percent of new residential units be attached single-family housing or multiple-family housing. Ketcham and Siegel (1991) believe that the MHR is an effective tool and as a result, 82 percent of all vacant land within the Portland metropolitan region was zoned as single-family residential in 1978 with an average lot size of 12,800 square feet. In 1989, which is eight years after the MHR was adopted, the average lot size had

decreased to 8,800 square feet. and 54 percent of all vacant land was now zoned for multiple-family development. Although Toulan (1994) agrees with Ketchain and Siegel (1991) that the MHR has been a very effective tool, he argues that what cannot be easily verified is the extent to which housing affordability has been enhanced by the enactment of the MHR.

In fact, an analysis could show that the MHR caused singlefamily housing prices to go up because it reduced the percentage of availability of single-family houses while many people were looking to live in single-family houses even while other types were available. This is what happened, as discussed in Chapter II, in Boulder, Colorado.

On the other hand, another study could find that the MHR caused single-family housing prices to decrease because perhaps people who wanted to live in single-family houses would be perfectly content living in apartments or condominiums as they see more of their neighbors doing so, and in turn this will shift the demand from single-family to multi-family housing and consequently lower prices in the single-family housing market. However, it is not clear that forcing people to live in less than a single-family house would create a net social benefit. It is conceivable that it would have the same sort of effect as the Boulder program and that some people would actually move outside the Portland region and endure long commutes in order to live in single-family houses. Only time and a good deal of additional research will tell.

6. Many planners argue that the real constraint on land is the availability of the <u>utilities and services rather than</u> the line of the UGB. Therefore, it is recommended that future research test for the relationship between the UGB and housing prices while taking into

consideration the amount of land that is developable. The argument states that housing prices are correlated with the availability of developable land rather than with raw land.

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7. Some scholars argue that the effect of the UGB goes back to its drafting rather than its implementation (the UGB was implemented in 1980 but was drafted in 1977). However this research was not able to find data before 1978. Future research should take this issue into consideration, especially for testing the effect of the UGB on other counties. Realtor Multiple Listing Service (RMLS) is an alternative source for data although it is not as comprehensive as the data from the Department of Assessment and Taxation. RMLS accounts only for those houses sold through real estate agents and does not include those houses sold by owners.

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