# GROWTH MANAGEMENT AND HOUSING PRICES: THE CASE OF PORTLAND, OREGON

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*Portland, Oregon, is well known for its relatively unique urban growth boundary (UGB), a very tight form of zoning designed to control sprawl. The UGB has recently been criticized for raising housing prices. From a theoretical perspective, the UGB will put upward pressure on land and thus housing prices, but the magnitude of this effect is uncertain. Increasing density should substitute for higher land prices, partially offsetting any reduction in the supply of housing. In addition, at any given moment, speculative factors influence housing price levels in bull markets such as the one Portland has been experiencing. This article presents an econometric analysis assessing these conflicting effects. We find the UGB has created upward pressure on housing prices, but the effect is relatively small in magnitude.* (*JEL* R21, R52)

## I. INTRODUCTION

In 1995, the *Wall Street Journal* ran a front-page story with the lead: "Portland, Oregon, Shows Nation's City Planners How to Guide Growth." This article is illustrative of the universal praise Portland has, until recently, received as a model of intelligent urban planning. Much of Portland's success has been attributed to the urban growth boundary (UGB). Instituted in 1979, the UGB draws a very tight zoning band around the city, reducing sprawl and promoting high density and infill development.

However, by 1998, a different spin on the UGB was appearing in the national and international media ranging from the *Economist* to the *Washington Post*. The UGB, it was alleged, was precipitating an affordable housing crisis in Portland. Articles in the local daily paper, the *Oregonian*, also appear to accept as a fact of life that the UGB is partially if not largely responsible for the runup in housing prices (*Economist*, 1997; Claiborne, 1997; Nokes, 1997a). And yet, other cities in the western United States without UGBs have experienced comparable increases in housing prices. Despite the recent increase in the Portland area, median housing prices are now only about average for western cities. Do the housing price increases in Portland reflect the real supply constraint imposed by the UGB, or has Portland fallen prey to a more conventional housing market dynamic, powered by a combination of increased demand and speculation?

Despite the international interest these questions have generated, there has been no serious attempt to assess the impact of the UGB on Portland housing prices. This article seeks to fill that gap. Section II presents some background on the UGB; section III considers the theoretical impact the UGB should be expected to have on land and density, and on housing prices. Section IV estimates a cross-sectional model of intercity housing prices to assess the degree to which Portland's housing prices are out of line with underlying fundamentals. We conclude that the UGB has had a small, and statistically weak, upward influence on housing prices.

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**ABBREVIATIONS**

CMSA: Consolidated Metropolitan Statistical Area
HOI: Housing Opportunity Index
MSA: Metropolitan Statistical Area
NAHB: National Association of Home Builders
PMSA: Primary Metropolitan Statistical Area
UGB: Urban Growth Boundary



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## II. THE URBAN GROWTH BOUNDARY

In 1979, the Portland metropolitan region adopted an urban growth boundary, complying with an Oregon law mandating the creation of such boundaries across the state. During that same year, the metropolitan area took the additional step of creating a powerful regional government, Metro, to oversee the UGB and plan for urban growth. The combination of these actions made the Portland region the nation's largest area within a long-range urban containment boundary and the only area in the United States with an elected regional government.

Over the past 18 years, Metro has maintained the political strength necessary to hold the size of the urban growth boundary steady. Despite a sharp rise in population, the total area of the boundary has expanded by only 5 square miles in the years since its inception. This is quite a feat when one considers that the land size of the city of Denver (which has had a population growth rate similar to that of Portland) has increased by 180 square miles in the past 37 years (Katz, 1997, p. A1).

Furthermore, over the same period, downtown Portland has been revitalized. The number of jobs in the central city has doubled since the 1970s, breathing new life and activity into areas that were being deserted before the existence of the UGB (Katz, 1997). Also, the conversion of high-quality farmland into urban uses, a major policy concern during the 1970s, has slowed. Between 1982 and 1987, approximately 22,000 acres of farmland were consumed (significantly fewer than the 30,000 lost in 1973 alone; Nelson, 1992, pp. 477–478).

However, in more recent years, much of the positive recognition has turned into criticism. Complaints about land shortages, congested roads, and overcrowding have become more common. According to data from the National Association of Home Builders (NAHB), the median price of a house in the Portland area rose from $85,000 in 1991 to $144,000 in 1996, an increase of 69%.[1] During that same period, the NAHB Housing Opportunity Index shows that Portland fell from being the 79th most affordable housing market in the nation to the 170th.[2] Affordable housing advocates now claim that the metropolitan area is in need of approximately 47,000 units of affordable housing (Nokes, 1997c). Furthermore, Metro figures indicate that 25% of mortgage holders are living in housing which is considered unaffordable by federal government standards.[3]

As it currently stands, the Portland UGB consists of a 364-square-mile area that includes 24 cities and the urban portions of Clackamas, Multnomah, and Washington counties. (Metro Home Page, 1997). The UGB is designed to serve as a growth management tool. The boundary does not intend to stop or limit growth, but rather aims to prevent it from encroaching into the countryside. Stated simply, the UGB manages growth by drawing a distinct line around the metropolitan area, separating urbanizable areas from rural areas. This limits development to land that falls within the boundary, thereby encouraging a more compact use of land, maximizing the usage of existing facilities and services, and allowing for the preservation of open spaces and farms.

However, Metro does not limit itself to only directing the location of development. It engages in a considerable amount of long-term planning that includes the creation of population density targets, promoting transportation systems that encourage and provide for the use of mass transit, and preparing for future development. Metro is required by law to keep enough land within the UGB to accommodate expected development during a 20-year period of time. This means that the boundary is not static. Yet, Metro still controls both the timing and location of new land made available for development. This process is accomplished through a system of urban reserves. Metro identifies rural lands adjacent

1. The data for the median home price in Portland for 1991 and 1996 were taken from the third quarter of their respective years.

2. The Housing Opportunity Index measures the proportion of homes sold in a specific market that a family earning the median income can afford to buy. The HOI monitors home prices in 191 metropolitan areas.

3. Housing is defined as being affordable by the U.S. Department of Housing and Urban Development when "[a]ll housing costs (rent or mortgage, utilities, property taxes, and insurance) do not exceed 30% of total household income" (Metro, 1997a, p. 5). Also, it should be noted that in a number of other comparably sized western cities, including Denver, Seattle, and Phoenix, an even larger percentage of homeowners are paying more than the federal affordability standard (Metro, 1997a, pp. 7–8).

to the boundary for potential inclusion, and if there is a need for additional urban land because of higher than expected population or employment growth, the Metro Council can vote to expand the UGB to include some of these lands (Metro Home Page, 1997).

Metro's most recent analysis indicated that there would be a shortage of 29,350 homes over the next 20 years, given no expansion. As a result, in late 1997 the body's governing council voted to expand the UGB by 4,500 acres. However, because of the relatively small size of the expansion, homebuilders are predicting a further upward spiral in housing prices (Nokes 1997b, p. A1). With this background, we can now begin to evaluate the connection between the UGB and housing prices.

## III. THE UGB AND HOUSING MARKETS

Theoretical impacts of the UGB on housing prices reflect a balance between rising land prices and increased density. The UGB will clearly lead to an increase in land prices. Knapp (1985) found evidence for this effect soon after the boundary was established, in data from the early 1980s. More recently, a Metro study reports that the price per acre for single-family residential areas declined from $150,000 per acre near the center of the UGB to $120,000 per acre at the edge. Just beyond the UGB the price dropped dramatically to $18,000 per acre (Metro, 1997b, p. 25).

At the same time as land prices rise, a trend toward increasing density will emerge. This results from two different forces. First, higher densities are encouraged and often required as an integral component of growth management. Second, as the cost of land rises, houses tend to be built on smaller lots. This occurs because builders will use less land in order to keep the cost of their houses from rising too high, and homeowners will be unable to buy as much land as they would normally like. Thus, from both the production and consumption sides, higher land prices lead to greater density (Mildner et al., 1996, pp. 1–12).

And indeed, the average lot size of new residential development has declined in both Clackamas and Multnomah counties. From 1991 to 1995, the size of the average residential lot fell by 13.5% in Clackamas County and by 20% in Multnomah County.[4] In addition, Portland has seen high rates of both infill development and redevelopment along with the percentage of new households locating within the boundary. In the recent past, 29% of residential development came from infill and redevelopment. This trend is not isolated to the housing market. For example, 37% of the recent employment development has come from both infill and redevelopment. Likewise, Metro data indicates that most new housing growth is occurring within the boundary (65%). This percentage is much higher than it was during the 1980s and seems to indicate that the region is not seeing leapfrog residential development on a large scale[5] (Metro, 1997b, p. I-3).

The trends toward higher land prices and increased densities theoretically pull housing prices in opposite directions. On the one hand, since land is one of the most significant inputs for housing, one would expect housing prices to be positively correlated with land prices. However, the factor substitution inherent in increased densities (the substitution of capital for land) may succeed in mitigating any increase in land prices. This occurs because consumers are generally willing to pay less for housing as density increases due to the fact that higher densities usually mean smaller yards, fewer open spaces, and less privacy. Thus, it is theoretically possible for increased land costs to be passed on to the consumer in the form of increasingly smaller lot sizes. Because rising land prices and increasing densities have opposite effects on housing prices, the impact of Portland's

4. Lot sizes in Clackamas County fell from 11,102 square feet to 9,602 square feet. During this same period of time, average lot sizes in Multnomah County fell from 8,823 square feet to 7,030 square feet. The average lot size in Washington County remained constant at about 9,000 square feet per acre, but the data for this county are dominated by the unincorporated areas. Additionally, the impact on densities has been felt outside the UGB. Lot sizes in Clark County, which is not part of the UGB but is considered part of the Portland metropolitan area, fell by 18% from 1992 to 1994 (Mildner et al., 1996, pp. 4.3–5.7). As land and housing prices rise within the UGB, people have begun to develop outside the boundary through a process referred to as leapfrog development. This has raised the prices of land and housing in these outlying areas, resulting in higher densities, as is indicated by the Clark County data.

5. Metro asserts that most of the residential development not occurring within the UGB is taking place in Clark County (as was indicated by the data on lot size for Clark County in the preceding paragraph).

urban growth boundary on the housing market really depends on which of these two forces is stronger.

Figure 1 shows that housing prices in Portland were well beneath the national median price in 1991. However, it also illustrates that Portland had already surpassed the national average by 1994 and that the disparity between the mean housing price in Portland and that of the rest of the country has continued to grow. Housing prices in the Portland metropolitan area have risen substantially over the past 6 years. Prices increased by 69% from 1991 to 1996, a rate much faster than the national average. According to the graph, the mean home price in Portland was approximately $25,000 higher than the national mean in 1996.

Table 1 below shows similar data for eight other western cities with populations of over one million. Specifically, Table 1 shows the median price of a home in 1991, 1993, and 1996 for each of these cities. It also illustrates the percentage change in prices that each of these experienced.

**TABLE 1**
Median Housing Prices (Western Metropolitan Areas)

| Metropolitan Area | 1991 | 1993 | 1996 | % Change |
|---|---|---|---|---|
| San Francisco | $275,000 | 280,000 | 289,000 | 5.09% |
| San Diego | 171,000 | 163,000 | 165,000 | –3.90% |
| Seattle | 135,000 | 140,000 | 153,000 | 14.33% |
| Salt Lake City | 85,000 | 102,000 | 146,000 | 71.76% |
| **Portland** | **85,000** | **108,000** | **144,000** | **69.41%** |
| Sacramento | 145,000 | 140,000 | 135,000 | –6.90% |
| Denver | 90,000 | 101,000 | 130,000 | 44.44% |
| Las Vegas | 97,000 | 117,000 | 123,000 | 26.80% |
| Phoenix | 85,000 | 109,000 | 120,000 | 41.18% |

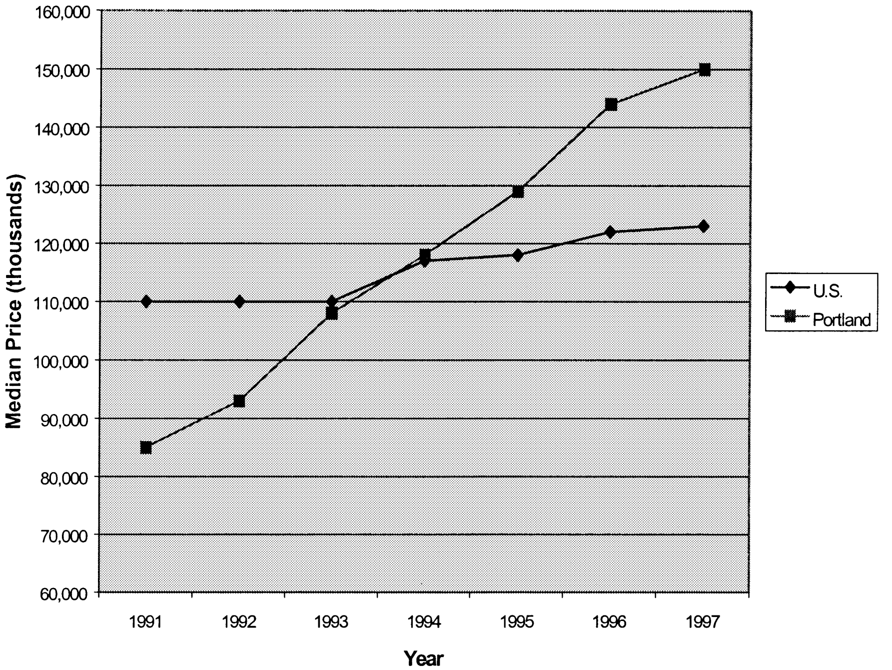
*Source:* NAHB Housing Opportunity Index database.

Table 1 shows that, while the price of the median home in Portland has risen considerably over the past 6 years, Portland's housing prices have only more closely aligned themselves with those in similarly sized metropolitan areas in the western region of the United States. In 1991, Portland was tied with Phoenix, Arizona, and Salt Lake City, Utah, for the lowest price housing of the cities listed in the table. However, by 1996 Portland had jumped to the middle of the pack, but was still below the median price. During that period of time, Portland had the second highest percentage increase in housing prices (more than double the average of the other cities). Only Salt Lake City had a larger percentage increase; however, some of this may be due to the construction boom associated with the upcoming winter Olympics.

It is this evidence that has led the media to conclude that the UGB is responsible for the dramatic runup in Portland's housing prices. However, Salt Lake experienced similar changes in housing prices, income, and population as Portland. Yet, Salt Lake City does not have an UGB. Moreover, while economic theory indicates very clearly that both land prices and density levels should increase as a direct result of the UGB, the theoretical relationship between the UGB and housing prices is more ambiguous. It could be that more conventional demand side housing market dynamics explain housing prices increases in Portland. Since the early 1990s, the region has enjoyed above average employment growth, spearheaded by its emergence as a center for high-tech development as well as its status as an excellent base for conducting international trade with the Far East (Metro, 1997b, p. RF-5).

Moreover, it is important to note that an initial increase in housing prices may create a "bull market" in which prices rise rapidly over a prolonged period of time. Case (1986, 1991) and Case and Shiller (1988, 1989, 1990) studied such housing markets, including those in Anaheim, San Francisco and Boston, in which the initial increase may very well result from the demand-side factors mentioned above; however, the subsequent upward movement in prices is primarily motivated by psychological forces, operating on top of economic fundamentals. If it is assumed that housing consumers (who are also investors) look to observed price movements to form their future expectations of prices, one can certainly imagine a situation in which consumers scramble to purchase a home either because they think that it is a good time to buy or because they are afraid of being priced out of the market. This process stimulates demand and only serves to further increase housing prices, creating a boom in the local housing market.

**FIGURE 1**
Housing Prices




Case and Shiller (1988) conclude that housing booms should be recognized as being the response of housing consumers to one another, former changes in prices, or outside proof of boom markets, in addition to underlying economic conditions. They also argue that there is no single cause for all booms, but that the trigger is apparently an event or sequence of events not observed by most homebuyers, such as a demographic change or income growth, to which consumers then respond. All of this suggests an "inefficient" market for residential real estate in which consumer speculation—as opposed to real supply and demand conditions—appears to play a significant role. It bears mentioning that in the case of Portland, some of the consumer speculation may be fueled by the existence of the UGB in addition to initial housing price increases.

To summarize, the UGB has clearly increased land prices and housing density; however, due to the increased density, it is not clear that there has been a reduction in the stock of housing units, and thus upward pressure on prices from a long run supply constraint.[6] Additional, explanations for the runup in Portland housing prices include, first, rapid demand growth reflecting healthy fundamentals, and second, the development a speculative bull market on the back of that initial demand surge. We now attempt to weigh these explanations.

## IV. MODELING INTERCITY HOUSING PRICES

The strategy used in this study to test for the price effects of the UGB is straightforward. The approach is to compare Portland's housing prices to prices in other major cities around the country, using regression analysis to control for other demand and supply side effects, as well as speculative influences on price. This allows us to do two things: first, to evaluate Metro's claim that the Portland housing market has merely been catching up with respect to economic fundamentals; second, using a proxy variable in our regressions, to develop a direct estimate of the price effect of the UGB.

6. Moreover, since the boundary is expandable, there is no reason to believe, a priori, that a supply shortage will develop.

**TABLE 2**
Variables in the Model

| Variable | | Expected Sign |
|---|---|---|
| PRI | Median housing price (1996) | |
| POP | Population (1995) | + |
| INC | Median income (1996) | + |
| UNR | Unemployment rate (1996) | − |
| WTH | Climate mildness index | + |
| CCI | Construction cost index | + |
| LAN | Land availability | − |
| MUN | Number of municipalities | − |
| REG | Wharton regulatory index | + |
| SPC | Percentage change in PRI, 1990–1995 | + |

There is an extensive literature that estimates cross-sectional models of housing prices or housing price changes (Ozanne and Thibodeau, 1983; Segal and Srinivasan, 1985; Abraham and Hendershott, 1992; Malpezzi, 1996; Potepan, 1996).[7] This literature was surveyed to develop a reduced form price equation of the form

$$(1)\ \text{PRI} = f(\text{POP, INC, UNR, CLI, CCI, LAN, MUN, REG}, \Delta\text{P}),$$

where the variables are defined in Table 2. The dependent variable is simply the mean housing price; thus, there is no adjustment for quality. Hedonic measures are not readily available, and for the purposes of this study, not really suitable.[8]

The first four independent variables reflect the demand side of the market; their expected relationship with equilibrium housing prices requires no further explanation. The next four variables capture supply-side constraints. Our construction cost data are from Boeckh (1996, pp. 4–13) and incorporate index figures for the cost of constructing frame residences.

The land availability variable measures the effect that surrounding bodies of water have on the supply of developable land available within or near a metropolitan area. The index used here was created by Rose (1989). The values assigned to different metropolitan areas fluctuate between 1 (for Atlanta, Ga.), which means that the supply of developable land is in no way limited by bodies of water, to .470 for Honolulu, indicating that its urban land supply is 47% of what would be available in the absence of water restrictions (Rose, 1989, p. 343).[9]

The third supply-side variable used in the model is the number of municipalities within the metropolitan area. This has been a traditional proxy for regulatory constraints in cross-sectional models of housing prices since it was introduced by Ozanne and Thibodeau (1985) (see also Potepan, 1996). The assumption here is that a metropolitan area faces a downward-sloping demand for its land. Therefore, if the owners of land could somehow restrict its supply, they would earn larger profits. Ozanne and Thibodeau further assumed that in areas with few governments controlling most of the land, municipalities would perceive the downward-sloping demand and restrict land development. On the other hand, in areas with land divided among many governments, each government would discern a horizontal demand for land and therefore would have no incentive to restrict development. Thus, the fewer the municipalities, the more restrictions on development one might expect.

The final supply-side variable is a city-specific regulatory variable developed by Malpezzi (1996), from the Wharton Urban Decentralization Project. This measure is based on information regarding development processes collected in 60 metropolitan areas via a survey of local planning officials. The specific components of the Wharton data that Malpezzi considered when creating his regulatory index were the change in approval time for single-family housing projects between

7. Peng and Wheaton (1994) look at the impact of restrictive land policies in Hong Kong; their results indicate that such policies do raise the price of housing. However, the model also shows that the adjustment in prices to changes in the supply of land is gradual, unlike housing price increases observed in Portland.

8. Because land prices have risen as a result of the UGB, the median Portland house will have a smaller yard than comparably sized housing in, say, Denver. The study does not seek to answer questions about a quality-adjusted housing stock. Instead, the intent is to determine whether or not the UGB reduces the stock of Portland-style housing in Portland.

9. This index takes into consideration only large bodies of water and not mountains as well. Ideally, a variable that incorporated both of these would be the best suited for this study.

1983 and 1988, the estimated time between application for rezoning and issuance of permit for a residential subdivision, the acreage of land zoned for single-family and multifamily housing as compared with demand, the percentage of zoning changes approved, and the Wharton scale for adequate infrastructure. To arrive at the final values for his index, Malpezzi added the unweighted values of each of these five components.

While this variable is the best measurement of metropolitan area growth regulation that we have been able to find, it is not without its problems. First of all, this index was created in 1990, six years before the time period this study is focusing on. It is certainly possible that growth regulations have change since the creation of the index. However, in relative terms growth restrictions have likely remained the same for most cities, with one important exception. The hypothesis that the UGB has raised Portland's housing prices dramatically in the last 5 years implies, of course, that Portland's regulatory barriers to development have intensified significantly over the period. We will exploit this conjecture in our estimation below.

The final explanatory variable attempts to capture speculative effects—controlling for economic fundamentals on the demand and supply side, one would expect markets where there has been a significant runup in price over the last five years to have higher housing price levels.[10]

This variable unfortunately suffers from a possible omitted variable bias: rapid increases in price will be due only in part to speculation; they will also reflect in part tight supply and demand conditions. To the extent that this model fails to capture some of the important supply and demand elements determining price, the estimated coefficient on the speculative variable will be biased upward. For example, suppose that in addition to the factors listed in Table 2, housing prices were also significantly determined by crime rates; suppose also that between 1990 and 1995 crime rates dropped in half the cities—where housing prices rose—and increased in the other half—where housing price dropped. In that case, the model would attribute higher housing prices in the first set of markets to speculation, when in fact they were due to lower crime rates. (For median housing data, it turns out, changes in citywide crime rates are not good predictors of changes in housing prices.)

While this is a significant possibility, this bias is likely to be small and will not in any case affect our major conclusions. The bias is likely to be small because the model includes most of the major supply and demand factors identified in the cross-sectional literature in their price equation, and because both Case and Shiller (1989) and Abraham and Hendershott (1992) find that a substantial portion of the year to year to change in housing prices can be explained by speculative motives.

## V. ESTIMATION AND RESULTS

Equation 1 is estimated in a linear form using data from 37 cities. One adjustment was made to the data, to reflect the purported tightening of the UGB constraint. In Malpezzi's (1996) 1990 Wharton data set, Portland carries a value of 19, close to the median. We chose to stack the deck in favor of a UGB effect by assuming that by 1996 the UGB had become such a strong check on development that Portland now ranked as the most regulated city in the country—ahead of Honolulu and San Francisco—with a Wharton index ranking of 30.[11] The results of the ordinary least squares estimation are reported in Table 3.

Given concerns about the possible endogeneity of the speculation variable, the regression was run both excluding and including it. In both cases all the variables have the expected signs, and in both cases median income levels, the climate mildness index,

10. The model was also run with a dummy for western cities and, in one specification, a dummy for non-California western cities. The logic in the latter case was this: during the early 1990s, the folk lore was that out-migration from recession-wracked California, where housing prices nevertheless remained well above regional averages, was driving up prices throughout the West. Both variables were generally significant, and both specifications led to small improvements in the overall fit for the model, but had little impact on the Wharton regulatory variable. In both cases, the inclusion of the western dummies not surprisingly reduced the explanatory power of the speculative change in price variable.

11. Note that under the maintained hypothesis—tight regulation in Portland in 1996—it would be incorrect to estimate the 1996 housing equation using Portland's 1990 value for the Wharton index. In fact, doing so would bias the estimate on the Wharton coefficient.

**TABLE 3**
Regression Results

| Variable | Coefficient Estimate (Standard Error) | Coefficient Estimate (Standard Error) |
|---|---|---|
| POP | .00087 | .00061 |
| | (.00234) | (.00212) |
| INC | 2.9* | 3.0* |
| | (0.7) | (0.7) |
| UNR | −5836.4** | −3153.4 |
| | (3425.0) | (3279.0) |
| CLI | 690.2* | 740.4* |
| | (175) | (160.3) |
| CCI | 34.8* | 41.1* |
| | (15.24) | (14.1) |
| LAN | −26137 | −22612 |
| | (26250) | (23910) |
| MUN | 37.4 | 31.6 |
| | (60.1) | (54.7) |
| REG | 1955.0** | 1386.2 |
| | (1119) | (1040) |
| $\Delta P$ | — | 417.0* |
| | | (159.2) |
| Constant | −106930 | −135290 |
| Adj $R^2$ | .82 | .85 |
| $N$ | 37 | 37 |

*Significant at the 1% level.
**Significant at the 10% level.

and the construction cost index are highly significant.[12]

With the change in price variable omitted, the unemployment rate and the Wharton index also register significant at the 10% level. The addition of the speculative price change variable both reduces the magnitude of the affects of these latter two variables somewhat, and increases their standard errors—indicating a not surprising multicollinearity. However, the model remains fairly stable, and thus the independent effects of the unemployment rate and the Wharton index, while no longer quite statistically significant, still manage to peek through. Finally, the adjusted $R^2$ values indicate a good fit.

Based on these coefficient estimates, the predicted prices for a house in Portland in 1996 were, respectively, $145,927 and $163,179. The actual price in Portland was $144,000. Thus, if one ignores the impact of speculation in Portland's housing market over the last five years, the economic fundamentals (with the assumption of a strongly binding UGB) imply a price close to the current market value. However, if one adds to the basic demand and supply picture—as independent data—the history of rapid price increases, Portland's current price is $20,000 under the price comparable cities around the country are supporting. This $20,000 price difference is not statistically significant, however. Our conclusion from this analysis is that the Portland housing market has indeed been realigning itself with housing prices of similarly sized western cities, but is now close to achieving an equilibrium.

How much of a premium has the UGB added to the median housing price in Portland? Recall that we arbitrarily set the Portland Wharton index value at the maximum possible value of 30. If we roll that back to Portland's actual 1990 Wharton value of 19,[13] the point estimates from the two regression equations suggest that housing prices would fall by, respectively, $21,503, or $15,246 with the speculative impacts figured in (see Table 4). Again, however, these differences in predicted price are not statistically significant.[14]

In addition, it is critical to recognize that these are worst-case scenarios. It is difficult to imagine that the UGB has made Portland a more regulated city than San Francisco or Honolulu, both of which have historically been considered to have very strict growth policies. Ultimately, we interpret the results as providing weak evidence that the UGB has probably increased median housing prices; the most likely interpretation is that the price increase is less than $10,000.

## VI. CONCLUSION

Portland, Oregon, is viewed as an international leader in growth management policy. This article has provided a first rigorous look at a topic that has been debated internationally: is Portland's UGB responsible

12. The failure of the topographical constraints variable to register significant may be explained by a lack of variation in our data; with the exceptions of Honolulu, Chicago, and San Francisco, the metropolitan areas in the study experienced few water limitations to expansion.

13. The policy exercise conducted here is thus to ask, what does the model estimate would happen if one were to roll back Portland's supply-side constraint to the 1990 level?

14. The increased restrictiveness of the boundary could simply be the result of pressures created by population and income growth combined with a constant land supply.

**TABLE 4**
Predicted Portland Housing Prices

| Model | Actual Price | Predicted Price (REG = 30) | Predicted Price (REG = 19) | Change in Predicted Price |
|---|---|---|---|---|
| $\Delta P$ Omitted | $144,000 | $145,927 | $124,413 | $21,504 |
| $\Delta P$ Included | $144,000 | $163,179 | $147,933 | $15,246 |

for an affordability crisis in that city? The answer is, probably not. While the UGB has likely imposed upward pressure on prices, the results indicate that the effect has been fairly modest. The large price increases Portland has experienced over the past 7 years most likely reflect the conventional housing market dynamic identified by Case and Shiller—a speculative bull market riding on the back of an initial demand surge. It is of course possible, in addition, that popular perceptions of a UGB-induced land shortage have helped fuel such a speculative wave.

## APPENDIX

The standard deviation, variance, and minimum and maximum values for each variable are listed in Table 5.

Data for 37 metropolitan areas were gathered. Each area was measured as either a metropolitan statistical area (MSA)[15] or a primary metropolitan statistical area (PMSA), depending upon how it is defined by the U.S. Census Bureau. However, the method of measurement for each metropolitan area was kept consistent across all the variables. In other words, if the Census Bureau defines New York City as a PMSA, all of the New York City data used in this study will reflect this definition.

We considered measuring some of the metropolitan areas (those the Census Bureau regarded as PMSAs) as consolidated metropolitan statistical areas (CMSAs). The difference between these two forms of measurement is that a PMSA is essentially a separate component area within a CMSA that meets certain statistical criteria established by the U.S. Census Bureau. The bureau opted against the use of CMSAs because of the belief that the component areas may often constitute separate housing markets. For example, the Portland CMSA includes Salem. However, the housing markets in these two cities are separated by miles of protected farmland, and both markets fall under very different regulatory frameworks. Additionally, data limitations made the use of PMSAs necessary.

The time period chosen for this model was 1996. The reason that this year was chosen over any number of other possibilities is because it was the most recent year for which a complete data set was available. By choosing 1996, one captures as much of Portland's recent rise in housing prices as possible.

For the dependent variable, the model uses the median home price in each metropolitan area. The data for this variable come from the National Association of Homebuilders (NAHB) Housing Opportunity Index (HOI) database. The HOI database calculates the median home price by collecting a representative sample of all home sales in the metropolitan area, including those of new homes. The home price for each MSA or PMSA was taken from the third quarter of 1996. However, the housing data for Hartford, Connecticut, Providence, Rhode Island, and Phoenix, Arizona, were not available for the third quarter due to data collection problems. As a result, the observations for Hartford and Providence were taken from first quarter of 1996 while the median housing price for Phoenix was taken from the second quarter.

Like the data for the dependent variable, the 1996 income statistics came from the NAHB's HOI database and reflect the median level across the metropolitan area.

The final three demand-side variables are the total population, the metropolitan area unemployment rate, and the climate. For the population variable, data came from the U.S. Census Bureau's web page. The observations we used reflect the total population of the metropolitan area as of July 1, 1996. The unemployment data are from the Bureau of Labor Statistics' web page. It is the nonseasonably adjusted unemployment rate as measured in July of 1996. Finally, the data for the climate variable are from the *Places Rated Almanac* (1997, pp. 179–181). This almanac scores the weather conditions of each metropolitan area based upon mildness, brightness, and stability and generates from this a climate mildness index. The scores ranged from a high of 98.12 (San Francisco, CA) to a low of 5.84 (Grand Forks, ND). Obviously, the higher the value of the index, the more "ideal" the climate.

The first of the supply-side variables used is the nonhousing construction cost index. The data for this variable are from Boeckh (1996, pp. 4–13). For each metropolitan area, Boeckh measures 115 different labor, material, insurance, and tax costs to compile a number of residential and commercial construction cost indices. The model used here incorporates the index figures for the cost of constructing frame residences.

The three other supply-side explanatory variables look at controls imposed upon development. The topographical constraints variable measures the effect that surrounding bodies of water have on the supply of developable land available within or near a metropolitan area. The index used here was created by Rose (1989). The values assigned

15. A metropolitan statistical area consists of one city with 50,000 or more inhabitants or a Census Bureau-defined urbanized area (of at least 50,000 inhabitants) and a total metropolitan population of at least 100,000 (75,000 in New England; Census Bureau web page).

**TABLE 5**
Summary Statistics

| Variable | Mean | Standard Deviation | Variance | Minimum | Maximum |
|---|---|---|---|---|---|
| Median housing price | $123,970 | 41,480 | 1.72E + 09 | $78,000 | $289,000 |
| Total population | 2.61E + 06 | 2.02E + 06 | 4.09E + 12 | 8.72E + 05 | 9.13E + 06 |
| Median income | $47,003 | 5,963.30 | 3.56E +07 | $35,500 | $61,300 |
| Construction cost index | 1,844 | 415.35 | 172,510 | 1,345 | 3,220 |
| Unemployment rate | 4.94% | 1.5 | 2.269 | 3 | 9.2 |
| Climate mildness index | 54.041 | 25.735 | 662.3 | 10.76 | 98.12 |
| Topographical constraints | 0.869 | 0.1528 | 0.0233 | 0.47 | 1 |
| Wharton regulatory index | 20.78 | 4.184 | 17.508 | 13 | 30 |
| Number of municipalities | 76.73 | 70.503 | 4,970.70 | 1 | 294 |
| Percentage change in housing prices | 17.22% | 20.604 | 424.54 | −16.22% | 71.21% |

to different metropolitan areas fluctuate between 1 (for Atlanta, GA), which means that the supply of developable land is in no way limited by bodies of water, to .470 for Honolulu, indicating that its urban land supply is 47% of what would be available in the absence of water restrictions (Rose, 1989, p. 343).

The second of the supply-side restraint variables is the city-specific regulatory variable developed by Malpezzi (1996), as reported above. In constructing this index, Malfpezzi used data from the Wharton Urban Decentralization Project carried out by Peter Linneman, which collected information regarding development processes in 60 metropolitan areas by surveying local planning officials. The specific components of the Wharton data that Malpezzi considered when creating his regulatory index were the change in approval time for single-family housing projects between 1983 and 1988, the estimated time between application for rezoning and issuance of permit for a residential subdivision, the acreage of land zoned for single-family and multifamily housing as compared with demand, the percentage of zoning changes approved, and the Wharton scale for adequate infrastructure. To arrive at the final values for his index, Malpezzi added the unweighted values of each of these five components. (p. 222). The last supply-side variable used in the model is the number of municipalities within the metropolitan area. The necessary data was compiled from the U.S. Census Bureau (1994, vol. 1, table 28) and totaled the number of municipalities (excluding townships) in each county of the MSAs and PMSAs used in the sample.

For our final variable, the change in housing prices, we computed the percentage growth in the median value from the third quarter of 1991 to the third quarter of 1996, using the NAHB HOI database.[16] Five years was selected as a suitable indicator of whether or not the metropolitan area was experiencing the kind of sustained "bull markets" identified by Case and Shiller (1989). It seems unlikely that a variable which looked at only 1 or 2 years would be a significant indicator of an overshooting housing market.

16. Both the observation of median housing prices for 1991 and 1996 for Hartford, Connecticut, and Providence, Rhode Island, were taken from first quarter instead of the third. The median housing price for Phoenix, Arizona, was taken from the second quarter of both years.

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