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Growth Management, Land Use Regulations, and Housing Prices: Implications for Major Cities in Washington State[♣♦]

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Income and population growth affect housing demand, while land use regulations are designed to affect housing supply. Since 1989, major cities in Washington State have experienced significant changes in the supply and demand of housing, which caused a substantial increase in housing prices. This article details the sources of housing price increases in Everett, Kent, Seattle, Tacoma and Vancouver. Aside from demand factors, housing prices are found to be associated with cost-increasing land use regulations (approval delays) and statewide growth management. For example, after accounting for inflation, regulations are associated with a $200,000 (80 percent) increase in Seattle's housing prices since 1989, while housing demand raised prices by $50,000. This constitutes about 44 percent of the cost of a home in 2006. Cities with less stringent land use regulations had significantly lower price increases due to regulations.

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1. Introduction

Housing prices follow the fundamental law of supply and demand. The challenge for economists is to identify the specific factors that affect housing supply and demand. Economic theory is clear: changes in housing prices are associated with income and demographic factors on the demand side, and land use regulations on the supply side.[1] While price, income, and demographic data are readily available from government sources, regulation data has been the problem to date. It is extraordinarily costly and time consuming to obtain objective and comparative land use regulation data for informative, representative samples.

In surveying the housing literature, one is struck by the abundance of studies that focus on the effects of *specific regulations* in *particular cities*. Authors surveying the literature at times succumb to the temptation to generalize results from the numerous city/region specific studies, in hopes of establishing general patterns of how regulations affect housing prices (see, for example Nelson et al. 2004).[2] Although studies of individual jurisdictions are informative, it is unclear whether it is possible to generalize their findings. For example, the economic impact of zoning restrictions that affect lot sizes in California are distinctly different from building height restrictions in New York. Individual city studies may also be susceptible to so called "selection bias." The danger is that data selection (and creation) on the part of the researchers may influence results in a systematic manner, validating researchers' prior expectations with unusual frequency.[3]

This paper documents the effects of land use regulations on housing prices in 5 major cities in Washington State. The project was made possible by a land use study at the Wharton Business School for the University of Pennsylvania. Researchers at Wharton's Zell/Lurie Real Estate Center executed a nationwide survey of residential land use regulations in over 2,800 US communities (Gyourko et al., 2007). Their dataset provides a first opportunity to examine which specific regulations can be associated with changes in housing prices across a large number of US cities. The broad cross section approach eliminates nagging doubts about whether a particular result for a particular city is relevant to other regions.

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[1] At times public opinion and policy makers seem to be taken aback that housing prices depend on regulations. It is the expressed *purpose and design* of regulations to influence the housing supply. The conceptual framework in Section 3 clarifies that housing prices rise or fall due to regulations.

[2] This renders the Nelson et. al. (2004) paper one of the most misquoted and miscited papers in the literature, where it is often represented as an article that shows that regulations do not affect housing prices. Indeed even a cursory reading of the three bullet points in their executive summary immediately reveals that such a statement does not reflect the studies surveyed in the paper.

[3] Local studies are especially valuable when their results are confirmed by alternate researchers with different data.

Often-cited reasons for the spectacular run up of US housing prices in the past 10-20 years include lower mortgage rates, creative mortgages, and income/employment growth. These factors, which may well contribute to increasing housing prices, all relate exclusively to *housing demand*. *Housing supply* factors, however, are harder to quantify and are typified by opposing view points: environment vs. sprawl, builders vs. planners, parks vs. high-rises, and (most divisively) state vs. local growth management.

Growth management often refers to: 1) *urban growth boundaries*, 2) *regulation of development densities* (e.g., minimum lot-size rules), and 3) *cost-increasing regulations* (facility development and/or regulatory delays in the approval process). Brueckner (2007) reminds us that growth management policy interventions "are often well-meaning, being designed to achieve ends that are thought to be socially desirable." The problem is that the complexity of the urban real estate markets may create subsidiary effects that are either unanticipated or unforeseen by policy makers and planners alike.

For the first time, the Wharton database provides information on 70 land use regulations that cover growth boundaries, density and cost-increasing regulations for a large sample of major US cities. In this paper, I report how this data can be used in regression analysis[4] to identify the effects of land use regulations on housing prices in 5 major cities in Washington State. The results are highly statistically significant[5] and indicate a substantial association between regulations and changes in housing prices. While the magnitudes reported may seem surprisingly large, I will also outline that the findings are consistent with results from previous studies based on smaller cross sections of cities, different data, and different methods.

In the sample of 250 major US cities, Seattle features prominently in the results. It ranks in the 97th percentile in terms of cost increasing land use restrictions, and in the 98th percentile in terms of the effects of statewide land use regulations. This warrants a discussion of Seattle in specific, and Washington State in general. About 50 other Washington cities were included in the sample and I report their regulatory status and compare it to Seattle's. This comparison highlights that the city-specific costs of growth management programs can vary substantially across cities, depending on the restrictiveness of their respective regulatory environments.

Since I anticipate this paper to be read by non-economists, I include footnotes to provide background on statistical methods. In this context, it is also important to highlight that my

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[4] Regression analysis is a statistical method used to examine relationships between a variable of interest (housing prices in this case) and explanatory variables. Regressions allow the researcher to estimate the quantitative effect of explanatory variables upon the variable of interest. The reported "statistical significance" of regressors then indicates a degree of confidence that the true relationship is close to the estimated effect.

[5] Statistical significance in statistics expresses how likely it is that an event occurred by pure chance. So a 99 percent significance level indicates that there is a 1 percent chance that the finding could be the result of a random accident.

economic analysis provides cost estimates of regulations, but it cannot identify whether such regulations are socially optimal. Think about it this way: citizens may well value regulations *even more* than the price they have to pay for them. Nelson et al. (2004) make this point forcefully when they point out that growth restrictions in Boulder, Colorado, drove up the price of housing near green belts and that this price increase reflected nothing other than the willingness to pay. Of course in such examples, regulations and affordable housing are mutually exclusive. It therefore falls to the electorate to decide whether the benefits derived exceed the associated costs in terms of housing price increases.

2. Previous Comparative Studies of Housing Prices and Regulations

A large number of studies exist that examine the effects of specific demand and supply factors on housing prices particular cities. As discussed in the introduction, I find it scientifically difficult to derive general implications from these studies. Instead, the results below are based on a large cross section. Before these results are presented, however, it is important to review the methods and results from previous cross sectional studies of housing prices and regulations. Black and Hoben (1985) first developed a measure of "restrictive", "normal", or "permissive" regulations for 30 US metropolitan areas. They report a correlation of –0.7 between their regulation index and 1980 prices for developable lots.[6]

Segal and Srinivasan (1985) surveyed planning officials in 51 metropolitan areas to find the percentage of undeveloped land taken out of production due to land use regulations. They estimated that regulated cities have 1.7 percent faster annual housing price increases than unregulated cities. As an alternative, Shilling, Sirmans, and Guidry (1991) employed land use and environmental data from the American Institute of Planners (AIP, 1976) to find that land prices in cities with more stringent land use controls increased 16 percent for every 10 percent increase in regulations. Shilling, Sirmans and Guidry (1991) also examined regulation data from the Urban Land Institute[7] to find that average 1990 lot prices in the most restrictive cities were about $26,000 higher, compared to the least restrictive cities.

Glaeser and Gyourko (2002) examine lot prices in 40 US cities, controlling for the change in the cost of construction. They label the gap between the actual housing prices and the

[6] The correlation is one of the most commonly used statistics to express the strength and direction of an association between two variables. An association between variables means that the value of one variable can be predicted, to some extent, by the value of the other variable. The measure ranges from -1 to +1, indicating perfect negative correlation at -1, absence of correlation at zero, and perfect positive correlation at +1. The closer the correlation is to plus (minus) 1, the stronger is the positive (negative) correlation of the variables.

[7] The data is based on a survey of 11 real estate experts who ranked land use restrictiveness of 30 metropolitan areas on a 10-point scale. Instead of a single regulation criterion, the survey covered 6 broad areas of land use regulations. The Urban Land Institute data covers: 1) wet land management, 2) power plant regulation, 3) critical areas and wilderness, 4) strip mining, 5) flood plains, and 6) tax incentives. The variable is unfortunately binary, indicating only whether regulations exist or not.

cost of construction (minus the lot price) provocatively the "zoning tax." Table 1 is a reproduction of their results showing the change in housing prices relative to construction costs in major cities and suburbs. They then associate their zoning taxes with cost-increasing regulations (time to permit issuance for zoning requests) and find a statistically significant relationship.

Other large scale studies are regional, such as Katz and Rosen's (1987), who analyzed 85 cities in the San Francisco Bay area, and found that the selling price of houses increased between 17-38 percent in communities with growth control measures. Levine (1999) expanded Katz and Rosen's approach to 490 Californian cities and 18 different land use measures. He finds that land use restrictions "displaced new construction, particularly rental housing, possibly exacerbating the expansion of the metropolitan areas into the interiors of the state." Pollakowski and Wachter (1990) examined 17 zoning jurisdictions in Montgomery County, Maryland, over a period of eight years and found that a 10 percent increase in these zoning restrictions increased housing prices by 27 percent. Interestingly, they also provided evidence on the special externalities[8] of regulations: housing prices are shown to rise when the restrictiveness of zoning measures in adjacent jurisdictions increased. Finally, Gyourko and Summers (2006) analyze 218 jurisdictions in the Philadelphia area and find that jurisdictions with average land use regulations saw slightly negative increases in the real cost of single family lots over 10 years. The most restrictive municipalities in terms of land use restrictions, in contrast, saw lot cost increases of up to 70 percent.

The most prominent comparative study is Malpezzi (1996) who examines 56 US cities. He built his analysis on regulatory data collected by the *Wharton Urban Decentralization Project* carried out by Linneman et al. (1990).[9] Despite its comparatively large coverage, Malpezzi's data still lacks information on key cities (such as Seattle). He focuses squarely on cost-increasing regulations (zoning and permit time costs) and he adds a variable to identify when states regulate environmental impact (coastal, wetland or floodplain management). His findings imply that moving from lightly regulated to highly regulated cities reduces housing permits by 42 percent and increases housing prices by 51 percent.

3. Supply and Demand for Housing

Before I move to the formal statistical analysis, it is important to review the basic mechanics of housing supply and demand. The following section closely follows the lucid framework laid out

[8] An externality is an economics term that describes that a decision imposes costs or benefits to third party. This implies that agents in private economic transactions do not all bear costs or reap all benefits of the transaction.
[9] Unfortunately, communication with the authors of the study indicates that this data has been lost.

in Malpezzi (1996); it can also be found in any introductory urban/real estate economics textbook (e.g., O'Sullivan, 2003). Figure 1 represents a simple housing market for identical units. In a free market, supply and demand curves (S_1 and D_1, respectively) intersect at the equilibrium point, *A*. Point *A* maximizes private welfare as it equates the private costs to the private benefits for housing units. In the presence of an externality, however, society faces a potential market failure. In the context of real estate economics, an example of such an externality would be the public's desire for parks and green spaces.[10] Such externalities raise the social cost of supplying housing above the private cost, which shifts the supply curve up to S_2. From society's perspective, the equilibrium at point *A* now represents "too much" housing at "too low" a price. A policy to regulate housing to coincide with point *B* would be the socially preferred outcome. The difference between the housing quantities and prices at *A* and *B* is the social cost of attaining the public benefit of reduced housing. This cost consists of the welfare lost due to a reduced number of housing units on the market, plus the welfare lost due to an increased price *per unit*.

Note that there also exist housing externalities that *increase* social benefits *beyond* private benefits. This would lower the social cost of housing supply.[11] In this case, welfare maximizing policy interventions are regulations that expand housing and *lower* its price (take the provision of low income housing). The housing framework therefore highlights two important insights: 1) there is no reason to expect housing prices to rise, due to regulations that are intended to attain the social optimum, 2) if housing prices rise due to regulations, it reflects that policy makers associated a negative externality with the supply of housing. Finally, note also that the

[10] Malpezzi (1996) mentions the following externalities that raise the social cost of housing: 1. *Congestion*. Building additional housing units in a community generally increases traffic locally (although it may reduce total commuting distance). 2. *Environmental costs*. Building additional housing units may reduce the local supply of green space; reduce air quality; and increase pressure on local water, sanitation, and solid waste collection systems (although again the global impact is less clear). 3. *Infrastructure costs*. Costs may rise as communities invest to grapple with environmental problems and congestion. Effects will depend on whether the particular community has yet exhausted economies of scale in the provision of each type of infrastructure. 4. *Fiscal effects*. In addition to the obvious effects from the above, demand may increase for local public services (education, fire and police protection, new residents believing libraries should be open on Sundays in contradiction to local custom). New residents may or may not pay sufficient additional taxes to cover the marginal costs. 5. *Neighborhood composition effects*. New households may be different from existing households. If existing households prefer living with people of similar incomes, or the same race, they will perceive costs if people different from them move in.

[11] Malpezzi (1996) points to 1. *Productivity and employment*. A well-functioning housing market is generally required for a well-functioning labor market. In particular, labor mobility may be adversely affected and wages may rise to uncompetitive levels if housing markets are not elastic. 2. *Health benefits*. At least at some level, less crowding and improved sanitation may be associated with lower rates of mortality and morbidity. 3. *Racial and economic integration*. One person's external cost may be another person's external benefit if some households value heterogeneity, for themselves or for others. For those particularly concerned about employment of low-income households or minorities, concerns about the productivity and employment effects mentioned earlier are reinforced. 4. *Externalities associated with homeownership*. More housing units or lower housing prices may be associated with greater opportunity for homeownership. Homeownership has been argued to be associated with many desirable social outcomes, ranging from improved maintenance of the housing stock to greater political stability.

cost increases associated with regulations must match the associated social valuation. It is easier to vote for the visual benefits of regulations (parks and green spaces) when the associated costs are not clearly identified.

4. A Summary of the Empirical Approach

4.1 The Empirical Model

This section reports on the methodology employed in Eicher (2008), who builds on Malpezzi (1996)'s framework as the theoretical backbone for regression analysis that is designed to estimate the impact of supply and demand factors on housing prices. Section 4.1 provides the modeling details and readers who are less interested in the statistical background can skip straight to Section 4.2. The standard model of the owner-occupied housing market depends on the demand and supply of owner occupied housing, where demand, $Q_{ho}^{D} = F^{D}\left[P_{ho}, I_{ho}, D_{ho}\right]$ is a function of the relative price of housing, P_{ho}, income, I_{ho}, and demographic variables, D_{ho}, that relate to density and population size.

The supply of owner occupied housing, $Q_{ho}^{S} = F^{S}\left[P_{ho}, R_{ho}, P_{i}^{S}\right]$is then dependent on the relative price of housing, P_{ho}, land use regulations, R_{ho}, and the prices of all *i* inputs, P_{i}^{S}. The latter reflects, for example, construction and land cost indices. Malpezzi (1996) argues that good data for input price indices, especially land, are not available. When prices of inputs are associated with regulations, Malpezzi suggests to substitute for P_{i}^{S}, which renders the reduced from $Q_{ho}^{S} = F^{S}\left[P_{ho}, R_{ho}\right]$. In equilibrium, supply and demand are equalized, which allows for a derivation of a reduced form housing price equation, $P_{ho} = F\left[R_{ho}, I_{ho}, D_{ho}\right]$, which enders housing prices as a function of land use regulations, income, and demographic variables.

In the statistical model, the reduced housing price equation is then estimated as

$$\hat{P}_{ho} = \alpha_1 + a_2 \ \hat{I}_{ho} + a_3 \ \hat{Pop}_{ho} + a_4 \ Density + \sum_i b_i R_{i\,ho} + \varepsilon$$

Every statistical model also includes a "constant" term, a_o, that picks up the average increase in housing prices common among all cities when demand and supply factors are zero. Such common effects could represent changes in the national level of unemployment, mortgage rates, or lending procedures. Variable with a "^" superscript represent the compounded growth rate over 17 years, so that $\hat{P}_{ho}$ is the average annual compound growth in median housing prices for owner occupied homes as reported by the Census from 1989 to 2006. This change in housing prices is to be explained by changes in demand factors (income and population growth, as well as density) over the period. Data for these demand factors have been obtained from the Census.[12]

The regression model allows for *i* different regulations. Since the 70 possible candidate regressors for regulations are at times highly correlated, Wharton proposed one overall index based on 11 subindices. I find it more informative, however, to attempt to identify different dimensions in the regulation data. I therefore employ stepwise regression to identify candidate regressors in each subindex are independently significant.

4.2 Regulations

Information on land use regulations is provided by the Wharton database detailed in Gyourko et al (2007). The database features 70 land use indicators for 2730 jurisdictions. The indicators speak to all three major components of land use regulations: urban growth boundaries, regulation of development densities, and cost-increasing regulations. A list of the data collected in the Wharton database is provided in Table 2. Many of these variables are highly correlated, which is why Gyourko et al. (2007) suggest the construction of an overall "Wharton Index" (formally the *Wharton Residential Land Use Regulation Index)* that is composed of 79 individual land use regulations. The Wharton Index itself is composed of 11 sub-indices that reflect *i) Local Political Pressure, ii) State Political Involvement Index, iii) State Court Involvement Index, iv) Local Zoning Approval Index, v) Local Project Approval Index, vi) Local Assembly Index, vii) Density Restrictions Index, viii) Open Space Index, ix) Exactions Index, x) Supply Restrictions Index, and xi) the Approval Delay Index.* The exact definitions of these indices are documented in Gyourko et al. (2007).[13]

Gyourko et al. (2007) report average regulatory statistics by state and by metropolitan area (which I reproduce in Table 3 and Table 4, respectively). These summary statistics already indicate that Washington State ranks seventh among all states in terms of land use regulations as indicated by the Wharton Land Use Index. It also indicates that the Seattle metropolitan area ranks sixth among all metropolitan areas in the US in terms of restrictiveness of land use regulations. Eicher (2008) studies cities, not metropolitan areas, because both housing prices and regulation data are reported at the city level. Also, important metropolitan areas are missing data on key cities (for example, Seattle-Bellevue-Everett is missing data on Bellevue).

[12] A detailed discussion of the data can be found in Eicher (2008).
[13] One key sub-index is the *Approval Delay Index*, which will be of consequence below. It is defined as the average time lag (in months) for three types of projects: i) relatively small, single-family project involving less than 50 units; ii) a larger single-family development with more than 50 units, and iii) multifamily projects of indeterminate size.

Eicher (2008) conducts regression analysis to show that demand factors explain only a fraction of the variation (20 percent) in housing prices across the 250 major US cities. He also shows that the addition of land use indicators does not diminish the explanatory power of demand factors, but improves the statistical model overall. The demand factors are, as expected, highly significant. Both the increase in income as well as the increase in population growth had an important impact in all 5 cities. In terms of regulations, four major categories of regulations are strongly associated with changes in housing prices. The regulatory variables consist of statewide indicators that speak to the executive, legislative and judicial branches of government. In addition, local regulations associated with changes in housing prices are cost increasing regulations that refer to permit and zoning permit delays. Below I summarize the key factors that are associated with changes in housing prices in the sample from 1989 to 2006:

I) **Autonomous Change in Housing Prices** is the constant term that picks up autonomous changes that are common to all cities; for example changes in the national unemployment rate, changes in mortgage interest rates or changes in the availability of credit over the period.

II) **Income and Population Growth**

III) **Density** (Population per Square Mile)

IV) **Land Use Regulations** imposed by

- **IVa)** **Statewide Land Use Restrictions Imposed by Executive and Legislative Branches**, defined as the effects on major cities due to the level of activity in the executive and legislative branches over the past ten years, which were directed toward enacting greater statewide land use regulations.
- **IVb)** **Municipal Land Use Restrictions Upheld by Courts**, defined as the effects on major cities due to the tendency of appellate courts to uphold or restrain land use regulation.
- **IVc)** **Involvement of Growth Management and Residential Building Restrictions,** defined as the effects on cities dues to the involvement of the state legislature in affecting residential building activities and/or growth management procedures.
- **IVd)** **Approval Delays,** given by 8 indicators that measure the average duration of the review process, the time between application for rezoning and issuance of a building permit, the time between application for subdivision approval and the issuance of a building permit conditional on proper zoning being in place. Each indicator considers three types of projects:
  - **IVd.i)** Small single-family projects involving fewer than 50 units
  - **IVd.ii)** Larger single-family developments with more than 50 units
  - **IVd.iii)** Multifamily projects of indeterminate size

The statistical association between each of these indicators and the growth rate in housing prices is strong (see Eicher 2008, who also examines the validity of the statistical model to test whether important determinants that may explain systematic variation in housing prices have been omitted).

5. The Dollar Cost of Regulations

The association between regulations on housing prices can be expressed in terms of actual dollar costs. One approach is to compare housing prices associated with the highest/ lowest levels of land use restrictions. This is easily done when only one regulation is considered. The above model consists, however, of four *different* types of regulations. In this case, it is most informative to report the actual estimated dollar value that each regulation adds to housing prices. In general, the more restrictive the land use regulations, the greater the impact on housing prices. This information is provided in Table 5 for five major cities that reported sufficient regulatory data to be included in the Wharton survey, and for which the Census provides income and housing price data in its 2006 statistics.[14]

For Seattle, the Census reports that the price of an owner occupied home in Seattle increased by $225,000 from 1989 to 2006 (after accounting for inflation), while it increased about $110,000 in Everett and Kent. Tacoma and Vancouver saw price increases of $80,000 and $70,000, respectively. Note that these figures are expressed in "real" terms, so that I have already accounted for the increase in the general price level due to inflation. Demand factors (income and population growth) contributed $35,611 to the increase in housing prices in Seattle. While the demand effect is significantly higher than the average for all cities ($3,840), the result is not surprising. Seattle experienced above average income and population growth over the past two decades. In Tacoma and Everett, income and population growth were lower than in Seattle. Therefore, their demand factors account for a much smaller share of the increase in housing prices than in Seattle. Kent and Vancouver, on the other hand, saw substantial increases in housing demand, perhaps due to their proximity to Seattle and Portland, respectively. Specifically, Vancouver's change in housing demand drove over 40 percent of the increase in its housing prices ($55,605 out of the total $134,822 increase).

The largest share of housing prices was due to regulations in all five Washington cities that were available for study. They added about $200,000 to housing prices in Seattle and tight regulatory environments in Kent and Everett drove up housing prices over $100,000. Here statewide regulatory measures seem to have been particularly important in affecting Seattle's housing prices, although the local approval delays still contributed about $30,000. All other cities did not rank as high in terms of approval delays as Seattle. Hence, their regulatory impact is generated largely by statewide measures. By far the greatest impact is generated by statewide restrictions imposed by the level of activity in the Executive and Legislative branches over the past ten years in Washington State.

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[14] The exact calculation of the dollar amounts is discussed in Eicher (2008).

These dollar values may seem extraordinarily large, but they are surprisingly close to previous estimates in studies that use smaller samples. Glaeser and Gyourko (2002) examine the effects of zoning on land values and find that the price of a home on a quarter acre lot increased by $200,703 in Seattle due to regulatory delays.[15] Not all of the price increases in the 26 cities studied by Glaeser and Gyourko (2002) coincide identically with the results in Eicher (2008), but the overall correlation coefficient between the increase in land prices in Glaeser and Gyourko (2002) and the increase in housing prices in the relevant cities studied by Eicher (2008) is an astonishing 0.91.[16]

Another reality check is to ask whether regulations in Washington State were truly as different from the average city as their dollar values suggest. Table 4 had already indicated that Seattle is actually one of the most restrictive cities in terms of land use regulations in the entire sample. Table 3 had shown that Washington State ranked 7th in the nation in terms of overall regulatory stringency. Table 6 splits the rankings in Table 4 and Table 3 to report the ranking for each city in terms of *each* key land use regulatory measures in the Wharton sample. For example, the city of Seattle (not the Seattle metropolitan area reported in Table 4), ranks in the 98th percentile for the overall Wharton Index. That is, only 2 percent of the cities in the sample have more restrictive regulations overall.

This overall ranking evaluates the stringency of a large number of individual land use regulations. Seattle ranks in the 90 percentile or higher in more than 16 key indicators. Several of the indicators (shaded) are related to approval delays. Other variables in the table are key regressors in the statistical model (the state court effect, the growth management effect and the legislative involvement index). Note that especially Kent is ranked almost as restrictive as Seattle, while Everett's regulatory stringency place it in the 71st percentile. Vancouver is the counter example; its regulatory structure is about average (the 51st percentile), which explains why so much of its increase in housing prices was driven by demand.

5.1 What is the Effect of Statewide Regulations?

Why are the effects of *statewide* regulations associated with such strong increases in housing prices in these 5 major cities in Washington State? The answer lies in examining the land use restrictions of all Washington cities in the Wharton sample. Table 6 clearly reports that each city is affected differently by statewide land use measures. In general, the larger the city,

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[15] Glaeser and Gyourko (2002) report only the cost increase per square foot. O'Tool (2002) then calculates quarter acre lot prices based on the difference between Glaeser and Gyourko's imputed land cost and their estimated price of land specification. Kent, Vancouver, Everett and Tacoma were not in their sample.

[16] Recall from footnote 6 that a perfect correlation of the result in the two studies would imply a correlation coefficient of 1.

the greater the effect. Most likely this is related to the design of Washington State's Growth Management Act (GMA), enacted by the Washington Legislature in 1990. The "*GMA requires state and local governments to manage Washington's growth by identifying and protecting critical areas and natural resource lands, designating urban growth areas, preparing comprehensive plans and implementing them through capital investments and development regulations*" (see http://www.gmhb.wa.gov/gma/index.html). In 1995, the State Legislature added a requirement to review and update policies and regulations by 2004. This update was to be based on "Best Available Science" (BAS).

Clearly, statewide growth management plans affect all jurisdictions identically in terms of the letter of the law.[17] However, to adhere to the letter of the law, individual jurisdictions have to pass their own land use regulations to accommodate the growth targets. If statewide land use restrictions limit sprawl to create distinct high and low population density areas, each city is affected differently, depending on its individual supply and demand for housing. This is shown in the large variation of the *Stateleg* variable in Table 6. The effects of limits on growth are greater in metropolitan areas whose agglomeration pressures are stronger (see Duranton and Puga, 2004 for a review), as statewide growth limits in suburbs redirect demand (and price pressures) to the metropolitan core. In the absence of such land use restrictions, cities such as New York or Las Vegas have been documented to easily accommodate great population growth (housing demand) without price pressures (see Glaeser, Gyourko and Sachs, 2005) presumably through increases in building heights and sprawl.

Statewide regulations as catalysts of agglomeration, but they cannot explain why courts are associated with housing price increases. Here the answer may be that courts play a crucial role in complementing statewide growth management plans. Statewide plans force municipal regulations, as discussed above. For example, some argue that under Washington's growth management plan, King County had few options but to require landowners in Seattle's rural periphery to keep 50 to 65 percent of their property in its "natural state" (see Langston, 2004). This clearly forced greater density in Seattle and it is difficult to see that such a supply restriction would not be accompanied by a housing price response.

It was important, however, that a challenge to the constitutionality of the local land use regulations was rejected by the Washington State Supreme court. The court clearly stated that *state law required* the local government to provide land use restrictions of the type imposed in

[17] All cities that are covered by a GMA, that is. In Washington, for example, the GMA was a state mandate that local governments had to follow - where it applied. Originally only 18 counties were required to plan and 11 more opted in. The remaining counties were exempted from portions of the process. (I thank R. A. Nelson for this comment).

King County in order to adhere to the statewide growth management plan. The state's Supreme Court therefore rejected the validity of a King County referendum to repeal local regulations that were put into place explicitly to adhere to the statewide growth management plan (Ervin 2006). Charles Johnson, the Associate Chief Justice of the Supreme Court of the State of Washington, summarized the majority opinion succinctly: "where the state law requires local government to perform specific acts, those local actions are not subject to local referendum." If the dissenting justices had been in the majority, the teeth may well have been taken out of the implementation of the growth management plan in King County. This would have stopped the imposition of local regulations, and therefore mitigated the upward pressure on housing prices. Note the importance of the interaction between state legislature and courts: state law forced local land use regulations, and the state court upheld local land use regulations because they were mandated by state law.

The Seattle metropolitan area responded to the GMA mandate by instituting a Growth Management Planning Council (GMPC). A search of the Council's Agendas as well as communications with the Managers of the Comprehensive Plan Update and King County's Housing and Community Development Program indicates that their review of the GMA effects includes only one study that examines the historic change in housing prices.[18] This study graphs *annual* changes in housing prices against employment (a proxy for population growth) and housing supply. The factors associated with changes in housing supply have not been studied. By correlating employment and housing supply with *annual* changes in housing prices, the GMPC study mixes short and long term effects. In the short run (year to year), the supply of housing is fixed; therefore, annual changes in housing prices can hardly exhibit a significant correlation with housing supply.

It seems, then, that policy makers and planners in the Seattle area have traditionally looked at demand effects on housing prices (population growth). This new data that I present above indicates that housing supply (regulations) also has a significant and costly impact on the cost of housing, not only in Washington State but especially Seattle. It is, therefore, imperative for any regulation policy intervention at the municipal, county or statewide level to be accompanied by strong follow up analyses regarding their impacts on housing prices. In addition, studies should be *comparative* so that the impact of regulations on Seattle can be evaluated by comparing results across cities with similar housing demand pressures in order to have a clear metric of evaluation.

6. Summary and Policy Implications

[18] See Figures 14 and 15 in the staff report presented to the GMPC on March 28th, 2001. http://www.metrokc.gov/ddes/gmpc/ag_rpts2001.shtm

Using new and consistently collected land use data reveals that statewide land use regulations are directly and strongly correlated with housing price increases in Seattle, Vancouver, Kent, Everett and Tacoma. The data also indicates that when courts reject challenges to municipal land use restrictions (which may have been created to adhere to statewide laws), the effects of regulations on housing prices are amplified. Finally, local cost increasing regulations are also found to impact housing prices.

The restrictiveness and the effects of land use regulations vary widely in the five cities. Therefore the impact of land use regulations on housing prices differs substantially, ranging from an estimated $199,726 in Seattle to $71,231 in Vancouver, WA. The largest share of this increase is not due to municipal regulations, but due to the effects of statewide regulations. When statewide regulations negate sprawl, they exacerbate density in city centers. Ultimately these dynamics are reflected in the increase in housing prices.

The dollar cost estimates are derived by examining the change in housing prices from 1989 to 2006. This long term view is different from short term fluctuations that are often the focus of public debates. In the short run (a year or so), the supply of housing is fixed, so *by design* it is unlikely to find a meaningful correlation between housing prices and supply over this time frame. The above results highlight that only a fraction of the change in housing prices is explained when supply side is ignored, especially in Seattle, Vancouver, Kent, Everett and Tacoma.

This analysis does not address whether more regulations are better or worse for the 5 cities in Washington State. This would be a value judgment that requires the documentation of both costs *and benefits* of regulations. Ultimately, the increase in housing prices may be below or above the valuation that citizens place on parks, the environment and/or the absence of sprawl. To elicit a benefit valuation of regulations is beyond the scope of this research project. Economic methods to study the contingent valuation[19] are widespread in environmental economics, but they are time intensive (and costly) and infrequently used in the housing regulation literature to establish the benefits of regulations.[20] The alternative is to rely on the electorate. After being informed about the costs of regulations, voters can decide whether to support further regulations, or whether to abolish existing ones. For constitutional reasons, this decision must take place at the state level in Washington State.

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[19] Contingent valuation is a survey-based method to assign monetary valuations to goods and services (in this case land use regulations) that cannot be bought and sold in the marketplace.
[20] See, for example, Beasley et al. (1986), Breffle et al. (1998) , Ready et al. (1997) and Geoghegan (2002)

While this study details the private costs of regulations (the increased cost of housing), it does not include the social cost of regulations, since costs for changed commuting, parking and pollution pattern are not available. Also, while higher housing prices represent a windfall for sellers, they constitute a redistribution from buyers to sellers and reduce housing affordability.[21] Land use regulations that increase housing prices also have a time dimension: current owners are the beneficiaries of such regulations, but their children and future migrants to the area bear the costs. This represents redistribution over time and generations, which may affect the location decisions of individuals and companies to limit productivity growth in highly regulated cities.[22]

[21] Housing is generally classified as affordable when renters or owners pay less than 30% of their income in rent or mortgage. According to the National Low Income Housing Coalition, which provides the comprehensive US data on affordable housing annually, 30 percent of the monthly median income in Washington State (Seattle) in 2006 was \$481 (\$557), while the fair market rent for a zero bedroom house was \$552 (\$623) (NLIHC, 2007). While this paper does not address housing affordability, research on the topic is comprehensively summarized in Quigley and Raphael (2005). They cite only one paper that examines the effects of land use regulations on affordable housing: *"Malpezzi and Green (1996) quantified the impact of metropolitan-wide measures of regulatory restrictiveness on rents for the bottom, middle and third quartiles of the metropolitan rental markets. Their regression results indicate that moving from a relatively unregulated to a highly regulated metropolitan area increases bottom quartile rents by more than a fifth and bottom-quartile house values by more than three-fifths. The largest price effects of such regulations occur in the market for low-quality housing."*

[22] See van Nieuwerburgh and Weill (2007)

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Figure 1. **Case 1: Cost Externalities Exist; Optimal Regulation Is Imposed**

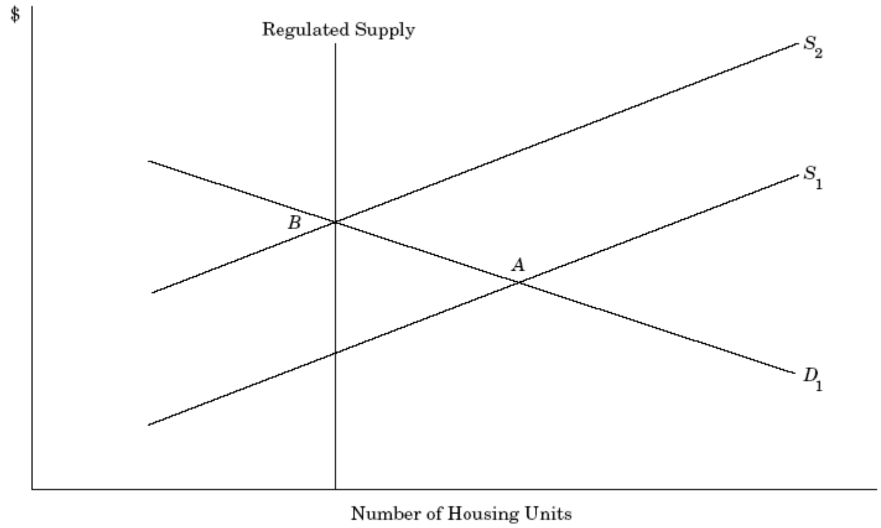

Table 1
Prices of Housing Units Relative to Their New Construction Costs

	1989 Housing valued 90% ≤ construction cost	1999 Housing valued 90% ≤ construction cost	1989 Housing valued ≥ 140% construction cost	1999 Housing valued ≥ 140% construction cost
San Francisco Suburbs, Calif.	1%	2%	98%	97%
San Francisco, Calif.	0%	4%	97%	96%
Anaheim Suburbs, Calif.	25%	3%	96%	96%
Anaheim, Calif.	0%	0%	100%	93%
San Diego, Calif.	7%	3%	88%	93%
Oxnard Suburbs, Calif.	0%	4%	100%	93%
Seattle Suburbs, Wash.	**2%**	**1%**	**72%**	**90%**
Los Angeles, Calif.	2%	4%	93%	89%
Los Angeles Suburbs, Calif.	4%	4%	91%	89%
San Diego Suburbs, Calif.	4%	5%	92%	88%
Denver, Colo.	4%	8%	60%	86%
Seattle, Wash.	**6%**	**2%**	**49%**	**86%**
Boston Suburbs, Mass.	1%	2%	87%	86%
Salt Lake City Suburbs, Utah	10%	2%	22%	86%
Fort Lauderdale Suburbs, Fla.	0%	0%	76%	85%
Albuquerque, N.M.	2%	3%	82%	83%
Raleigh, N.C.	6%	2%	81%	81%
New York Suburbs, N.Y.	3%	9%	85%	78%
Phoenix Suburbs, Ariz.	2%	0%	65%	76%
Riverside Suburbs, Calif.	5%	2%	87%	76%
Chicago Suburbs, Ill.	6%	5%	67%	74%
Miami Suburbs, Fla.	5%	0%	72%	73%
Sacramento, Calif.	0%	3%	55%	72%
Newark Suburbs, N.J.	1%	1%	96%	72%
Sacramento Suburbs, Calif.	3%	5%	83%	72%
Austin, Tex.	0%	6%	46%	71%
Greensboro, N.C.	13%	0%	59%	69%
Norfolk, Va.	1%	2%	87%	66%
Tampa Suburbs, Fla.	3%	5%	57%	66%
Phoenix, Ariz.	2%	5%	69%	65%
Tucson, Ariz.	6%	4%	43%	61%
Baltimore Suburbs, Md.	5%	1%	66%	61%
Columbus Suburbs, Ohio	12%	3%	47%	61%
New Orleans Suburbs, La.	10%	6%	53%	61%
Orlando Suburbs, Fla.	3%	4%	70%	61%
Atlanta Suburbs, Ga.	3%	6%	67%	58%
Cleveland Suburbs, Ohio	15%	5%	23%	58%
Detroit Suburbs, Mich.	24%	8%	26%	58%
New Orleans, La.	2%	3%	49%	57%
Nashville-Davidson, Tenn.	2%	5%	69%	56%
New York, N.Y.	4%	11%	81%	56%
Birmingham Suburbs, Ala.	10%	12%	56%	53%
Milwaukee Suburbs, Wis.	5%	8%	39%	53%
Dallas Suburbs, Tex.	3%	6%	58%	52%
Tampa, Fla.	9%	13%	43%	49%
Fort Worth Suburbs, Tex.	9%	9%	59%	49%
Wichita, Kans.	18%	13%	21%	48%
Dallas, Tex.	6%	13%	56%	47%
Cincinnati Suburbs, Ohio	10%	10%	29%	47%
Philadelphia Suburbs, Pa.	3%	11%	78%	47%
Las Vegas, Nev.	0%	3%	29%	45%
Chicago, Ill.	20%	16%	28%	44%
Jacksonville, Fla.	8%	11%	55%	43%
Minneapolis Suburbs, Minn.	8%	5%	29%	43%
Oklahoma City, Okla.	13%	16%	30%	41%
Little Rock, Ark.	9%	8%	36%	40%
Albany Suburbs, N.Y.	6%	0%	63%	40%
Tulsa, Okla.	7%	8%	36%	38%
St. Louis Suburbs, Mo.	11%	21%	34%	34%
Kansas City Suburbs, Mo.	15%	5%	22%	33%
Houston Suburbs, Tex.	23%	8%	24%	31%
Minneapolis, Minn.	22%	20%	21%	30%
Columbus, Ohio	33%	12%	18%	29%
Fort Worth, Tex.	12%	26%	40%	29%
El Paso, Tex.	5%	2%	34%	28%
Rochester Suburbs, N.Y.	1%	9%	63%	28%
Baltimore, Md.	18%	30%	41%	27%
Houston, Tex.	25%	25%	40%	27%
San Antonio, Tex.	12%	30%	48%	26%
Toledo, Ohio	27%	40%	16%	23%

Source: Glaeser and Gyourko (2002)

Table 2
Land Use Variables Collected in the Wharton Land Use Database

	Variable Name	Value Explanation
1	Local	local council involvement in regulation (1-not at all, 5-very)
2	pressure	community pressure involvement in regulation (1-not at all, 5-very)
3	countyleg	county legislature involvement in regulation (1-not at all, 5-very)
4	Stateleg	state legislature involvement in regulation (1-not at all, 5-very)
5	localcourts	local courts involvement in regulation (1-not at all, 5-very)
6	statecourts	state courts involvement in regulation (1-not at all, 5-very)
7	commission	planning commission approval required for rezoning, 0=no, 1=yes, 2=yes by superm
8	loczoning	local zoning board approval required for rezoning, 0=no, 1=yes, 2=yes by superma
9	Council	local council approval required for rezoning, 0=no, 1=yes, 2=yes by supermajorit
10	cntyboard	county board approval required for rezoning, 0=no, 1=yes, 2=yes by supermajority
11	cntyzoning	county zoning board approval required for rezoning, 0=no, 1=yes, 2=yes by superm
12	envboard	environmental review board approval required for rezoning, 0=no, 1=yes, 2=yes by
13	commission_no~z	planning commission approval required (norezoning), 0=no, 1=yes, 2=yes by superm
14	Council_norez	local council approval required (norezoning), 0=no, 1=yes, 2=yes by supermajorit
15	cntyboard_norez	county board approval required (norezoning), 0=no, 1=yes, 2=yes by supermajority
16	envboard_norez	environ review board approval required (norezoning), 0=no, 1=yes, 2=yes by super
17	publhlth_norez	public health off approval required (norezoning), 0=no, 1=yes, 2=yes by supermaj
18	dsgnrev_norez	design review board approval required (norezoning), 0=no, 1=yes, 2=yes by superm
19	sfulandsupply	supply of land importance (single family) 1-not at all, 5-very
20	mfulandsupply	supply of land importance (multi family) 1-not at all, 5-very
21	sfudensrestr	density restrictions importance (single family) 1-not at all, 5-very
22	mfudensrestr	density restrictions importance (multi family) 1-not at all, 5-very
23	sfuimpact	impact fees/exactions importance (single family) 1-not at all, 5-very
24	mfuimpact	impact fees/exactions importance (multi family) 1-not at all, 5-very
25	sfucouncil	council opposition importance (single family) 1-not at all, 5-very
26	mfucouncil	council opposition importance (multi family) 1-not at all, 5-very
27	sfucitizen	citizen opposition importance (single family) 1-not at all, 5-very
28	mfucitizen	question4 citizen opposition importance (multi family) 1-not at all, 5-very
29	sfulengthzoning	length zoning process importance (single family) 1-not at all, 5-very
30	mfulengthzoning	length zoning process importance (multi family) 1-not at all, 5-very
31	sfulengthpermit	length permit process importance (single family) 1-not at all, 5-very
32	mfulengthpermit	length permit process importance (multi family) 1-not at all, 5-very
33	sfulengthdvlp	length development process importance (single family) 1-not at all, 5-very
34	mfulengthdvlp	length development process importance (multi family) 1-not at all, 5-very
35	sfupermitlimit	sf annual permit limit, 0=no, 1=yes
36	mfupermitlimit	mf annual permit limit, 0=no, 1=yes
37	Sfuconstrlimit	sf annual construction units limit, 0=no, 1=yes
38	mfuconstrlimit	mf annual construction units limit, 0=no, 1=yes
39	mfudwelllimit	mf dwelling limit, 0=no, 1=yes
40	mfudwellunitl~t	num. of units in mf dwelling limit, 0=no, 1=yes
41	minlotsize	min lot size requirement, 0=no, 1=yes
42	minlotsize_lh~e	<=0.5 acre minlotsize requirement, 0=no, 1=yes
43	minlotsize_mh~e	question6 >0.5 acre minlotsize requirement, 0=no, 1=yes
44	minlotsize_on~e	question6 >1 acre minlotsize requirement, 0=no, 1=yes
45	minlotsize_tw~s	question6 >2 acres minlotsize requirement, 0=no, 1=yes
46	affordable	question6 affordable housing requirement, 0=no, 1=yes
47	sfusupply	question7 sf zoned land supply compared to demand, 1=far more, 5=far less
48	mfusupply	question7 mf zoned land supply compared to demand, 1=far more, 5=far less
49	commsupply	question7 commercially zoned land supply compared to demand, 1=far more, 5=far less
50	indsupply	question7 industrially zoned land supply compared to demand, 1=far more, 5=far less
51	lotdevcostinc~e	questions8_9 lot development cost increase (last 10 years)
52	sflotdevcosti~e	questions8_9 single family lot development cost increase (last 10 years)
53	time_sfu	review time for single family units (months)
54	time_mfu	review time for multi family units (months)
55	timechg_sfu	change in review/appr time for sf projects over decade, 0=none, 1=longer, 2=much
56	timechg_mfu	change in review/appr time for mf projects over decade, 0=none, 1=longer, 2=much
57	time1_l50sfu	permit lag for rezoning, <50 sf units, mths-midpoint
58	time1_m50sfu	permit lag for rezoning, >50 sf units, mths-midpoint
59	time1_mfu	permit lag for rezoning, mf project, mths-midpoint
60	time2_l50sfu	permit lag for subdivision appr (norezoning), <50 sf units, mths-midpoint
61	time2_m50sfu	permit lag for subdivision appr (norezoning), >50 sf units, mths-midpoint
62	time2_mfu	permit lag for subdivision appr (norezoning), mf project, mths-midpoint
63	submitted	# applications for zoning changes submitted (last 12 months)
64	approved	# applications for zoning changes approved (last 12 months)
65	execrating	State Legislative Profile (Foster and Summers)
66	judicialrating	State Judicial Profile (Foster and Summers)
67	town_meet	Town Meeting for of Government
68	zonvote	Town Meeting Aproves Zoning Changes
69	zonvote_super	Town Meeting Aproves Zoning Changes by a Super-Majority
70	totinitiatives	Total number of initiatives from 1996-2005
71	LPPI	Local Political Pressure Index
72	SPII	State Political Involvement Index
73	SCII	State Court Involvement Index
74	LZAI	Local Zoning Approval Index
75	LPAI	Local Project Approval Index
76	LAI	Local Assembly Index
77	DRI	Density Restrictions Index
78	OSI	Open Space Index
79	EI	Exactions Index
80	SRI	Supply Restrictions Index
81	ADI	Approval Delay Index
82	WRLURI	Wharton Residential Land Use Regulation Index

Source Gyourko *et. al.* (2007). Note: SF and MF are single and multi family units

Table 3
Average Wharton Residential Land Use Regulation Index Values by State

State	Wharton Index	Number of Observations
1. Hawaii	2.32	1
2. Rhode Island	1.58	17
3. Massachusetts	1.56	79
4. New Hampshire	1.36	32
5. New Jersey	0.88	104
6. Maryland	0.79	18
7. Washington	0.74	49
8. Maine	0.68	44
9. California	0.59	182
10. Arizona	0.58	40
11. Colorado	0.48	48
12. Delaware	0.48	5
13. Connecticut	0.38	65
14. Pennsylvania	0.37	182
15. Florida	0.37	97
16. Vermont	0.35	24
17. Minnesota	0.08	80
18. Oregon	0.08	42
19. Wisconsin	0.07	93
20. Michigan	0.02	111
21. New York	-0.01	93
22. Utah	-0.07	41
23. New Mexico	-0.11	16
24. Illinois	-0.19	139
25. Virginia	-0.19	35
26. Georgia	-0.21	56
27. North Carolina	-0.35	64
28. Montana	-0.36	6
29. Ohio	-0.36	135
30. Texas	-0.45	165
31. Nevada	-0.45	7
32. Wyoming	-0.45	7
33. North Dakota	-0.54	8
34. Kentucky	-0.57	28
35. Idaho	-0.63	19
36. Tennessee	-0.68	41
37. Nebraska	-0.68	22
38. Oklahoma	-0.7	36
39. South Carolina	-0.76	30
40. Mississippi	-0.82	21
41. Arkansas	-0.86	23
42. West Virginia	-0.9	15
43. Alabama	-0.94	37
44. Iowa	-0.99	59
45. Indiana	-1.01	47
46. Missouri	-1.03	67
47. South Dakota	-1.04	11
48. Louisiana	-1.06	19
49. Alaska	-1.07	7
50. Kansas	-1.13	46

Source Gyourko *et. al.* (2007)

Table 4
Wharton Residential Land Use Regulation Index Averages For Major Metropolitan Areas

	Metropolitan Area	Wharton Index	Number of Observations
1	Providence-Fall River-Warwick	1.79	16
2	Boston	1.54	41
3	Monmouth-Ocean	1.21	15
4	Philadelphia	1.03	55
5	**Seattle-Bellevue-Everett**	1.01	21
6	San Francisco	0.9	13
7	Denver	0.85	13
8	Nassau-Suffolk	0.8	14
9	Bergen-Passaic	0.71	21
10	Fort Lauderdale	0.7	16
11	Phoenix-Mesa	0.7	18
12	New York	0.63	19
13	Riverside-San Bernardino	0.61	20
14	Newark	0.6	25
15	Springfield	0.58	13
16	Harrisburg-Lebanon-Carlisle	0.55	15
17	Oakland	0.52	12
18	Los Angeles-Long Beach	0.51	32
19	Hartford	0.5	28
20	San Diego	0.48	11
21	Orange County	0.39	14
22	Minneapolis-St	0.34	48
23	Washington DC	0.33	12
24	Portland-Vancouver	0.29	20
25	Milwaukee	0.25	21
26	Akron	0.15	11
27	Detroit	0.12	46
28	Allentown-Bethlehem-Easton	0.1	14
29	Chicago	0.06	95
30	Pittsburgh	0.06	44
31	Atlanta	0.04	26
32	Scranton-Wilkes-Barre-Hazelton	0.03	11
33	Salt Lake City-Ogden	-0.1	19
34	Grand Rapids-Muskegon-Holland	-0.15	16
35	Cleveland-Lorain-Elyria	-0.16	31
36	San Antonio	-0.17	12
37	Tampa-St.Petersburg-Clearwater	-0.17	12
38	Houston	-0.19	13
39	San Antonio	-0.24	12
40	Fort Worth-Arlington	-0.27	15
41	Dallas	-0.35	31
42	Oklahoma City	-0.41	12
43	Dayton-Springfield	-0.5	17
44	Cincinnati OH-KY-IN	-0.56	27
45	St. Louis MO-IL	-0.72	27
46	Indianapolis IN	-0.76	12
47	Kansas City MO-KS	-0.8	29

Source Gyourko *et. al.* (2007)

Table 5
Sources of the Increase In Real Housing Prices in Major Washington Cities

	Seattle	Tacoma	Vancouver	Everett	Kent	US Avg.
Housing Price in 2006[1]	$447,800	$228,300	$233,600	$258,000	$281,600	$258,524
Change in Housing Price since 1989	102%	113%	136%	62%	62%	54%
INCREASE IN HOUSING PRICES DUE TO:						
I) Autonomous Change in Housing Prices[6]	-$33,946	-$16,806	-$16,396	-$21,613	-$23,607	-$24,556
II) Increase in Income and Population	$35,611	$8,500	$49,900	$7,459	$24,416	$3,840
III) Density (Population per Square Mile)	$17,665	$5,203	$4,705	$5,059	$5,917	$8,624
IV) Land Use Restrictions and Regulations	$199,726	$81,515	$71,231	$110,797	$121,335	$101,977
IVa) State Wide Land Use Restrictions Imposed by Executive & Legislature[2]	$77,156	$38,198	$37,268	$49,125	$53,658	$43,024
IVb) Municipal Land Use Restrictions Upheld by Courts[3]	$42,154	$20,869	$20,361	$26,839	$29,316	$34,306
IVc) State Wide Growth Management and Residential Building Restrictions[4]	$51,026	$20,210	$9,859	$25,991	$21,292	$16,177
IVd) Approval Delay[5]	$29,389	$2,238	$3,744	$8,842	$17,070	$8,470
Cost of Regulation of Regulation as % of 2006 housing price	44%	35%	30%	43%	43%	

NOTES
1) Source: 1990 Census and 2006 PUMS Census. http://factfinder.census.gov/home/saff/main.html?_lang=en. Median Owner Occupied House adjusting price for the general level of inflation, expressing all data in 2006 dollars using the consumer price index. http://www.bls.gov/cpi/
2) The level of activity in the Executive and Legislative branches over the past ten years that is directed toward enacting greater statewide land use restrictions. Source: Foster and Summers (2005)
3) The tendency of appellate courts to uphold or restrain municipal land use regulation. Source: Foster and Summers (2005)
4) Involvement of state legislature in affecting residential building activities and/or growth management procedures Source: Gyourko *et. al.* (2007).
5) Approval delay is the average time lag (in months) for a) relatively small, single-family projects involving fewer than 50 units; b) larger single-family developments with more than 50 units, and c) multifamily projects of indeterminate size. Lag times are due to the average duration of the review process, the time between application for rezoning and issuance of a building permit and the time between application for subdivision approval and the issuance of a building permit conditional on proper zoning being in place. Source: Gyourko *et. al.* (2007).
6) Changes in housing prices when if there had been no changes in regulations or income or population. This effect is likely capturing the falling mortgage rates, relaxed lending practices and changes in the cost of construction.

Table 6
Stringency of Land Use Regulations for WA Cities in the Wharton Sample
Percentile Ranking for the sample of 2729 major US Cities

City	rank_wrluri	rank_stateleg	rank_statecourts	rank_adi	rank_time1_m50sfu	rank_time2_m50sfu	rank_time1_l50sfu	rank_time2_l50sfu	rank_time_sfu	rank_time1_mfu	rank_time2_mfu	rank_time_mfu	rank_lppi	rank_pressure	rank_dsgnrev_norez	rank_envboard_norez
Seattle City, WA	98%	98%	99%	97%	91%	93%	94%	96%	91%	92%	94%	93%	97%	95%	90%	97%
Buckley City, WA	98%	92%	65%	89%	91%	77%	94%	83%	79%	92%	80%	71%	91%	95%	90%	47%
University Place City, WA	98%	92%	96%	89%	91%	93%	94%	83%	13%	92%	80%	27%	96%	42%	41%	47%
Sammamish City, WA	97%	92%	96%	95%	91%	93%	94%	96%	73%	92%	94%	86%	77%	75%	41%	47%
Kent City, WA	94%	76%	87%	93%	91%	93%	94%	96%	13%	92%	94%	8%	89%	95%	90%	97%
Sumner City, WA	94%	98%	96%	93%	91%	93%	94%	96%	13%	92%	94%	27%	67%	75%	90%	47%
Burlington City, WA	93%	76%	87%	49%	39%	47%	48%	55%	73%	42%	51%	64%	93%	75%	90%	47%
Issaquah City, WA	93%	92%	87%	95%	91%	99%	94%	96%	13%	92%	94%	64%	71%	75%	90%	47%
Olympia City, WA	92%	76%	87%	94%	99%	93%	100%	96%	59%	92%	51%	49%	90%	75%	41%	47%
Kirkland City, WA	91%	98%	87%	96%	91%	93%	94%	96%	59%	92%	94%	93%	86%	75%	90%	47%
Des Moines City, WA	90%	49%	25%	53%	70%	14%	79%	18%	37%	74%	16%	64%	92%	3%	41%	47%
Ponlsbo City, WA	89%	92%	99%	95%	99%	93%	100%	96%	93%	92%	51%	49%	56%	42%	41%	47%
Covington City, WA	89%	76%	87%	89%	91%	77%	94%	83%	79%	92%	80%	71%	62%	75%	41%	47%
City of Redmond, WA	87%	92%	87%	90%	91%	93%	94%	96%	13%	74%	80%	79%	41%	75%	90%	47%
Auburn City, WA	87%	76%	65%	91%	91%	93%	79%	83%	73%	92%	94%	64%	28%	42%	41%	47%
City of Mercer Island, WA	86%	92%	87%	91%	91%	93%	79%	83%	73%	92%	94%	71%	94%	95%	41%	47%
Cheney City, WA	85%	98%	87%	88%	91%	77%	94%	83%	73%	92%	80%	64%	74%	75%	41%	47%
Milton City, WA	84%	98%	96%	84%	91%	77%	94%	55%	37%	92%	51%	64%	81%	75%	41%	47%
Woodland City, WA	83%	76%	65%	80%	91%	77%	79%	55%	85%	74%	51%	79%	35%	75%	41%	47%
Kenmore City, WA	83%	49%	65%	59%	39%	47%	48%	55%	85%	42%	51%	89%	35%	75%	41%	47%
Snohomish City, WA	82%	17%	25%	84%	91%	47%	94%	55%	73%	92%	51%	71%	67%	75%	90%	47%
Seatac City, WA	81%	92%	87%	47%	70%	14%	48%	18%	13%	74%	51%	49%	45%	75%	41%	47%
Kennewick City, WA	81%	92%	87%	44%	39%	47%	48%	55%	59%	42%	51%	49%	41%	42%	41%	47%
Lake Stevens City, WA	81%	76%	87%	68%	70%	47%	79%	55%	79%	74%	51%	71%	45%	42%	90%	47%
Washougal City, WA	77%	76%	65%	84%	91%	93%	94%	96%	59%	11%	16%	8%	67%	42%	41%	47%
Fircrest City, WA	76%	92%	87%	70%	70%	77%	79%	83%	73%	42%	51%	64%	49%	42%	41%	47%
Port Townsend City, WA	74%	92%	65%	80%	91%	47%	94%	55%	13%	92%	51%	27%	38%	95%	90%	97%
Liberty Lake City, WA	73%	49%	65%	33%	39%	47%	48%	55%	13%	42%	51%	8%	56%	42%	41%	47%
Centralia City, WA	73%	98%	99%	38%	39%	47%	48%	55%	13%	42%	51%	49%	96%	95%	41%	47%
Normandy Park City, WA	72%	76%	65%	67%	70%	77%	79%	55%	13%	74%	80%	27%	59%	42%	41%	47%
Lakewood, WA	72%	76%	65%	74%	70%	77%	48%	83%	59%	74%	80%	71%	88%	42%	41%	47%
Port Orchard City, WA	71%	98%	96%	74%	70%	77%	48%	83%	85%	42%	80%	79%	41%	42%	41%	47%
City of Sequim, WA	71%	76%	96%	48%	39%	14%	14%	96%	59%	11%	16%	49%	28%	75%	41%	47%
Everett, WA	71%	92%	87%	74%	70%	77%	79%	83%	37%	74%	80%	49%	41%	42%	41%	47%
City of Raymond, WA	67%	98%	87%	3%	10%	14%	14%	18%	13%	11%	16%	8%	81%	42%	41%	47%
Arlington City, WA	67%	76%	87%	54%	70%	77%	48%	55%	13%	42%	51%	49%	28%	42%	90%	47%
East We tchee City, WA	63%	92%	99%	44%	39%	47%	48%	55%	59%	42%	51%	49%	62%	75%	41%	47%
Woodinville City, WA	60%	76%	99%	69%	39%	77%	48%	83%	59%	74%	80%	64%	1%	3%	41%	47%
Pullman City, WA	59%	17%	25%	58%	39%	77%	48%	83%	13%	42%	80%	27%	15%	16%	41%	47%
Vancouver City, WA	57%	49%	65%	44%	39%	47%	48%	55%	59%	42%	51%	49%	21%	75%	41%	47%
Bremerton City, WA	55%	76%	65%	59%	70%	77%	48%	55%	37%	74%	51%	27%	31%	42%	41%	47%
Ephrata City, WA	51%	92%	87%	57%	70%	47%	48%	55%	59%	74%	51%	49%	13%	42%	41%	47%
Chehalis City, WA	48%	98%	99%	44%	70%	14%	79%	18%	13%	74%	16%	8%	49%	95%	41%	47%
Lacey City, WA	45%	76%	87%	60%	70%	77%	48%	55%	73%	42%	51%	64%	28%	42%	41%	47%
Forks City, WA	44%	49%	96%	13%	10%	14%	14%	18%	59%	11%	16%	49%	2%	42%	41%	47%
Chelan City, WA	40%	76%	25%	33%	39%	47%	48%	55%	13%	42%	51%	8%	35%	75%	41%	47%
Tacoma City, WA	30%	92%	87%	17%	39%	14%	48%	18%	13%	42%	16%	8%	13%	16%	41%	47%
Burien City, WA	28%	49%	65%	30%	10%	47%	48%	55%	37%	11%	51%	49%	2%	16%	41%	47%
Aberdeen City, WA	23%	17%	25%	3%	10%	14%	14%	18%	13%	11%	16%	8%	7%	16%	41%	47%
City of Shoreline, WA		49%	87%	38%	39%	47%	48%	55%	73%	11%	16%	64%	41%	95%		

A 99% ranking indicates that less than 1 percent of the cities in the sample (or 27 of 2729 cities) more stringent regulations in that particular category. Source: Gyourko *et. al.* (2007). Note: All Washington Cities not included in the analysis in the previous tables had to be dropped because of insufficient Census data.