REGULATION AND THE HIGH COST OF HOUSING IN CALIFORNIA

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During the three-year period ending in July 2003, the rise in housing costs in California far exceeded the national inflation rate. Housing prices in five coastal counties increased by more than 60 percent. For the highest quintile of cities, prices increased by an average of more than thirty percent \textit{per year}. Evidently California housing markets differ along important dimensions from those in the rest of the country.

One striking difference is the degree of regulation governing land use and residential construction. California represents the most extreme example of autarky in land use regulations of any U.S. state. Cities are free to set their rules independently, with little oversight. Moreover, state tax policy creates incentives that are likely to decrease production an increase housing costs. Property taxes are constitutionally limited to one percent of acquisition costs while cities are permitted a share of local sales tax receipts. This creates a regulatory incentive to favor retail development over housing construction, to favor development of expensive housing over moderately priced housing, and to discourage the construction of housing.

In this paper, we explore the linkages between land-use regulations, growth in the housing stock, and housing prices in California cities. First, we assess whether housing is more
expensive in more regulated cities. Next, we assess whether growth in the housing stock over
the period of a decade depends on the degree of land-use regulation at the start of the decade.
Finally, we estimate the price elasticity of housing supply in regulated and relatively unregulated
cities. Our results suggest that current regulations have powerful effects on housing outcomes.

1. Data and Methodology

We develop a city-level index of regulatory stringency for California cities, and we relate
this index of regulation to local housing prices in 1990 and 2000. We explore a series of simple
hypotheses about the ways in which regulation affects the costs of housing and about the
sensitivity of the housing stock to changes in price.

A. Estimating geographic and inter-temporal variation in housing costs

Hedonic methods are commonly used to measure the extent to which prices of otherwise
identical housing units differ by location or differ over time in the same geographical location.
While the American Housing Survey is the standard data set for estimating hedonic indices,
Malpezzi et. al. (1990) demonstrate the viability of producing housing price indices with data
from the Census Public Use Microdata Samples (PUMS). In this paper, we use the 1990 and
2000 PUMS to estimate a series of constant-quality housing price indices for California cities.

For reasons of confidentiality, household data from the census identify Public Use
Microdata Area (PUMA), not the political jurisdiction within which a sampled household
resides. However, it is possible to probabilistically apportion sampled households and dwelling
units to political jurisdictions, by relying upon the proportion of the population of each PUMA
that lies within each census place.²
The hedonic models first regress the logarithm of house value or rent on indicators of all of the housing characteristics measured in the PUMS, including the number of rooms, the number of bedrooms, the age of the unit, the number of units in the structure, whether the unit is a condominium, and whether the unit has complete kitchen and plumbing facilities. These models are estimated separately for owner and renter occupied dwellings for 407 separate California cities. The regression results are then used to estimate the market price of constant quality owner-occupied dwellings and rental units for each city for 1990 and for 2000. Variations in these indexes over time and space are the principal dependent variables in the subsequent analysis.

B. Measuring housing market regulation

Explicit growth controls, such as urban service boundaries or growth moratoria, reduce the quantity of developable land and thus the ability of housing supply to adjust to changes in demand. Minimum quality standards, large lot zoning (intended to reduce density), and “fiscal zoning” (designed to minimize the fiscal impact of land use), are likely to restrict further the supply of housing.

These regulations are prevalent in California cities. We rely on a survey of city California land use officials (Glickfeld and Levine, 1992) to measure their incidence. The survey was designed to measure inter-city variation in land-use planning provisions, and it included a detailed set of questions on the growth control measures that each city had in place at the time of the survey.

For each of 407 cities, we observe fifteen growth control measures that have been widely adopted throughout California. Roughly half regulate residential development directly, a third regulates commercial development, with the remainder regulating both. Among the most
frequently adopted measures, roughly half of all cities have provisions requiring adequate pre-existing service levels for residential and commercial development. Nearly half recently reduced permissible density and the permissible height of commercial and industrial buildings. Among the more extreme growth control measures are those requiring supermajority city council votes for increasing densities (“upzoning”) or requiring voter approval. Roughly one fifth of cities had not adopted any of these measures at the time of the survey, while another forty percent had adopted one or two of these provisions.

We measure the regulatory stringency of a given city by the number of these growth control measures adopted by each city at the time of the survey. Since the survey was conducted during the early 1990s, the snapshot corresponds to the beginning of the decade that we analyze.

C. Exploratory Relationships

We explore several simple hypotheses to assess the impact of regulation on housing costs in California cities. First, we measure the extent to which housing costs are higher in cities with more stringent regulation, following the work of, Green 1999, Malpezzi 1996, Malpezzi and Green 1996, and Pollakowski and Wachter 1990. We test cross-sectional relationships at two points in time, 1990 and 2000. We also test whether the change in housing costs over the decade is larger in more regulated cities.

Next, we investigate the link between regulatory stringency at the beginning of the 1990s and the growth of the housing stock over the subsequent decade. Using data on residential building permits issued by each city between 1990 and 2000, we assess whether the growth in the housing stock is affected by the regulatory stringency of the city. (See Mayer and Somerville, 2000) We test for the effect of additional regulatory provisions, with and without controls, upon the decennial growth in the housing stock.
Finally, we test for variations in housing supply elasticities among relatively regulated and relatively unregulated cities. We assess whether a consistent pattern holds for California cities by stratifying the sample into cities that are more intensely regulated and those less intensely regulated; we test for differences in the relationship between the change in the housing stock and the change in housing prices.

2. Empirical Results

A. Housing Costs and the Degree of Regulatory Stringency

Table 1 present a series of linear regressions of the housing price indices measured at the city level on the number of regulatory provisions adopted by the city. For each of the price indices, the table presents the coefficient on the growth control regulation index using three dependent variables: the 1990 log housing price index, the 2000 log housing price index, and the within-city changes in the log housing price index over the decade. The table reports results for two specifications: (1) a simple bivariate regression of housing prices on the regulation measure, and (2) specification (1) plus 58 county dummy variables.

The bivariate results indicate that each additional regulatory measures is associated with a statistically significant 3 percent (1990) and 4.5 percent (2000) increase in the prices of owner occupied housing, and a significant 1 percent (1990) and 2.3 (percent) increase in the price of rental housing. Moreover, housing prices grew at a statistically distinguishable faster rate in more regulated cities. For both indices, adjusting for county level fixed effects reduces the point estimates considerably. Nonetheless, the marginal cross-sectional effects are highly significant, indicating that within counties the more regulated cities have higher housing prices. Adjusting
for fixed effects eliminates the positive correlation between the change in housing prices over the decade and the degree of regulation at the beginning of the decade.

Thus, housing prices and rents are indeed higher in cities with more stringent regulation of development and land use.

B. Growth in the Housing Stock via New Construction and the Degree of Regulatory Stringency

Local land use regulations restricting and managing urban growth are likely to (1) inhibit increases in the supply of housing available at a given point in time, and (2) dampen the responsiveness the housing stock to increases in demand over time. We now explore whether the sensitivity of housing supply depends on the stringency of land use regulation.

We first estimate the growth in the housing stock during the 1990s that is attributable to new construction. We add residential building permits issued by for each city, for new single family and multi-family units over the decade to the number of dwellings at the beginning of the decade and compute log growth in the housing stock attributable to new construction. We then assess whether growth in the housing stock via new construction is related to the extent of regulation at the beginning of the decade.

Table 2 presents regression estimates of the effect of growth restrictions on growth in the housing stock through new construction between 1990 and 2000. The dependent variables in Table 2 are logarithmic changes in all housing units, in single-family units, and in multi-family housing units. The table presents a simple regression of the growth in housing units on the number of restrictions as well as a regression that also includes the change in the relevant housing price index over the decade, where the change in the price indices proxies for variation in housing demand across cities.
For all units, the number of restrictions is negatively correlated with growth in the housing stock. This effect is insignificant in the first specification and marginally significant in the second. The results are considerably stronger for single-family units. Restrictions exert a negative effect on housing supply in both specifications, with the results increasing slightly when the change in the relevant price index is added to the specification. Finally, there is no evidence of a relationship between growth in the multi-family unit housing stock and the number of growth restrictions.

C. The Price-Elasticity of Housing Supply and the Degree of Regulation

In all regressions in Table 2, the change in the price index is positively correlated with the change in housing units. Since both variables are expressed in logarithms, the coefficient on the price index can be interpreted as an estimate of the price elasticity of housing supply. While the OLS estimates presented in Table 2 suffer from a clear identification problem, the basic results suggest an alternative test for an effect of growth restrictions on housing supply. Namely, does the elasticity of housing supply differ between more regulated and less regulated cities? Here, we estimate housing supply elasticities for more and less regulated cities.

We define less regulated cities as those with either one or zero growth restrictions and more regulated cities as those with two (the median) or more growth restrictions. To account for the endogeneity of the change in the price index, we construct an instrumental variable that forecasts employment growth in the city using state-level employment trends. Specifically, we calculate the distribution of employment by three-digit SIC codes for each city at the beginning of the decade and use the initial employment distribution coupled with decennial employment growth rates at the state level to forecast the growth in employment for each city. This variable predicts shifts in the demand for housing in the locality. This measure is independent of supply
conditions, since variation in this variable is determined by the overall growth rate of the state and the pre-determined industrial composition of each city’s employment base. In a longer version of this paper, we present evidence of a very strong first stage relationship between our forecasted employment growth measure and the changes in our housing price indices.

Table 3 presents the principal results. Panel A presents estimation results where the dependent variable is the log change in the housing stock and the key explanatory variable is the weighted average change in the price indices. Panel B presents results for owner-occupied units, while Panel C presents results for rental units. For unregulated cities and regulated cities, we estimate two models: a reduced form regression of the quantity change on the predicted change in employment; and an instrumental variables estimate of the coefficient on the log price change (the supply elasticity) when the predicted change in employment is used as an instrument.

For the growth in the overall housing stock, we find a marginally significant (at the 8 percent level) and positive supply elasticity for unregulated cities and a negative and marginally significant (at the 7 percent level) negative effect for regulated cities. The results are somewhat weaker for the owner-occupied housing units (no measurable elasticity in unregulated cities and a marginally significant negative effect of a log price change in regulated cities). The strongest contrast occurs in the rental market. For unregulated cities, the IV estimate of the price elasticity of supply is approximately 0.36. For regulated cities, the estimate is zero.

3. Conclusion

In summary, our analysis reveals several patterns consistent with the proposition that land-use regulation increases housing costs in California cities. First, we find a positive relationship between the degree of regulatory stringency and housing prices for both owner-
occupied units as well as rental units. This relationship is evident in both the 1990 and 2000 cross-sections as well as for the changes in housing prices and rents over the decade.

We also find evidence that new housing construction is lower in more regulated cities relative to less regulated cities. Holding constant the change in the price indices over the decade, we find that the change in the housing stock driven by new construction is muted in cities with greater degrees of regulation. While this relationship may be driven by unobserved differences in the changes in housing demand over the decade, this is unlikely. As the initial results suggest, housing price appreciation in more regulated cities exceeded the comparable price changes in less regulated cities. These two results combined indicate that those cities with the greatest increases in housing demand experienced the lowest increases in new housing supply.

Our strongest evidence of an impact of regulation on housing costs comes from the estimates of the supply elasticity of housing for regulated and unregulated jurisdictions. Using a plausibly exogenous predictor of changes in housing demand, we find that the responsiveness of the housing stock via new construction is weaker in more regulated cities relative to less regulated cities. Moreover, the difference in responsiveness is greatest for the supply of multi-family housing units, the source of supply that is most frequently the target of regulation.
References


Table 1
Regression Estimates of the Effect of the Number of Growth Restrictions on Rental and Owner-Occupied Housing Prices

<table>
<thead>
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</tr>
</thead>
<tbody>
<tr>
<td>No controls</td>
<td>0.031</td>
<td>0.045</td>
<td>0.011</td>
<td>0.015</td>
<td>0.023</td>
<td>0.008</td>
<td></td>
</tr>
<tr>
<td>(0.007)</td>
<td>(0.008)</td>
<td>(0.003)</td>
<td>(0.004)</td>
<td>(0.004)</td>
<td>(0.002)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>County fixed effects</td>
<td>0.010</td>
<td>0.011</td>
<td>0.001</td>
<td>0.006</td>
<td>0.008</td>
<td>0.002</td>
<td></td>
</tr>
<tr>
<td>(0.004)</td>
<td>(0.005)</td>
<td>(0.002)</td>
<td>(0.002)</td>
<td>(0.003)</td>
<td>(0.002)</td>
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Standard errors are in parentheses. Figures in the table provide the coefficient on the number of growth restricting measures that each city had in place at the time of the survey.
Table 2

Regression Estimates of the Effects of Growth Restriction on the Log Change in the Housing Stock Caused by New Permitted Units, 1990 to 2000

<table>
<thead>
<tr>
<th></th>
<th>Log Change in All Units&lt;sup&gt;a&lt;/sup&gt;</th>
<th>Log Change in Single-Family Units&lt;sup&gt;b&lt;/sup&gt;</th>
<th>Log Change in Multi-Family Units&lt;sup&gt;c&lt;/sup&gt;</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of restrictions</td>
<td>-0.002 (0.002)</td>
<td>-0.004 (0.002)</td>
<td>0.001 (0.001)</td>
</tr>
<tr>
<td>Change in Price Index</td>
<td></td>
<td>-0.005 (0.002)</td>
<td>0.000 (0.001)</td>
</tr>
<tr>
<td></td>
<td>0.106 (0.003)</td>
<td>0.055 (0.034)</td>
<td>0.195 (0.030)</td>
</tr>
</tbody>
</table>

Standard errors are in parentheses. The sample of cities used in each regression is restricted to observations where the change in the housing stock over the decade does not exceed 100 percent.

a. Measured by the log of the sum of owner-occupied units in 1990, rental units in 1990, and all residential building permits issued over the decade minus the log of the sum of 1990 owner-occupied and rental units.

b. Measured by the log of the sum of owner-occupied units in 1990 and new single-family residential permits issued over the decade minus the log of owner-occupied units in 1990.

c. Measured by the log of the sum of the rental units in 1990 and multi-family building permits issued over the decade minus the log of 1990 rental units.

d. For the first two regressions, the change in the price index is a weight average of the change in the rental and owner-occupied index, where the weights are given by the proportion of housing in 1990 that is owner occupied and rental. For the second two regressions, the change in the price index refers to the change in the owner-occupied price index. In the final two regressions, the change in the price index refers to the change in the rental units price index.
Table 3
IV Estimates of the Housing Supply Elasticity for Relatively Regulated and Relatively Unregulated Cities Using Regressions of the Log Change in the Housing Stock Against the Change in the Relevant Price Index

Panel A: Overall Change in the Housing Stock Against the Average Increase in Prices

<table>
<thead>
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<th>Unregulated Cities</th>
<th>Regulated Cities</th>
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<tr>
<td></td>
<td>Reduced Form</td>
<td>IV</td>
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<tr>
<td>Change in Average Price</td>
<td>-</td>
<td>0.171</td>
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<tr>
<td>Index</td>
<td>(0.091)</td>
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<tr>
<td>Predicted Change in Employment</td>
<td>0.436</td>
<td>-</td>
</tr>
<tr>
<td>F-Stat a</td>
<td>(0.228)</td>
<td>(0.0001)</td>
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</table>

Panel B: Change in the Single-Family Housing Stock Against the Increase in Owner-Occupied Housing Prices

<table>
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<th>Regulated Cities</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Reduced Form</td>
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</tr>
<tr>
<td>Change in Owner-Occupied Price Index</td>
<td>-</td>
<td>0.074</td>
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<tr>
<td>Predicted Change in Employment</td>
<td>0.237</td>
<td>-</td>
</tr>
<tr>
<td>F-Stat a</td>
<td>(0.308)</td>
<td>(0.0001)</td>
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Panel C: Change in the Multi-Family Housing Stock Against the Increase in Rental Housing Prices

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<th>Regulated Cities</th>
</tr>
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<tbody>
<tr>
<td></td>
<td>Reduced Form</td>
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</tr>
<tr>
<td>Change in Rental Price Index</td>
<td>-</td>
<td>0.358</td>
</tr>
<tr>
<td>Predicted Change in Employment</td>
<td>0.646</td>
<td>-</td>
</tr>
<tr>
<td>F-Stat a</td>
<td>(0.198)</td>
<td>(0.0001)</td>
</tr>
</tbody>
</table>

Standard errors are in parentheses. All regressions include a constant term.

a. This statistics is the F-statistic on the predicted employment change variable in the first stage regression of housing price indices on the predicted employment change.
Notes

* University of California, Berkeley, CA 94720. This paper benefited from the comments of Rucker Johnson and Katherine O’Regan. A more complete version of the paper appears at http://urbanpolicy.berkeley.edu

1 Cities are required to submit plans for the allocation of vacant land to development (called housing “elements”), but there are few sanctions if sufficient land is not reserved for regional housing needs and no sanctions at all if cities subsequently deny developers permission to build on any land so reserved. There is no “as of right” allowing developers to proceed with construction when projects comply with existing regulations.
2 This relies upon the “geographic correlation engine” developed at the University of Missouri, http://mdc2.missouri.edu/websas/geocorr2k.html. Details of these calculations are reported in the longer version of our paper at http://urbanpolicy.berkeley.edu
3 These include restrictions on building permits, population growth limits, requiring adequate service levels for new residential development, rezoning from residential to agricultural usages, reducing permitted density, and requiring voter approval or supermajority council votes for upzoning.
4 These include requiring adequate service levels for non-residential development, restricting the amount of commercial and industrial building, rezoning commercial land to less dense uses, and height restrictions.
5 These measures include growth management elements in the commercial plan, urban limit lines, and other control measures.
6 For the single-family unit models, we use the change in the owner-occupied price index as the key control variable, while for the multi-family unit growth model we use the change in the rental price index. For the overall growth model, we calculate the weighted average of the changes in the owner-occupied and rental price indices, using the proportion of housing units in 1990 that are owner-occupied and renter-occupied as weights.