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Regulation and Property Values in the United States: The High Cost of Monopoly

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In the United States, regulation of housing is taken for granted and often justified on the same basis as regulation of pharmaceuticals, air travel, and the food supply. Few consumers are well equipped to evaluate the implications of prescription drugs for their own health or the implications of aircraft landing gear for their own safety. But even if consumers were so equipped, the costs of gathering information to evaluate producers' choices of inputs would be quite high, and the adoption of "standards" would appear to be quite natural. In some cases, choices among commodities graded by standards can be efficiently guided by the market (for example, audio equipment), but few would argue that market processes would efficiently guide choices involving health and safety.

Building Codes and Zoning Rules

In housing construction, detailed regulations motivated by consumer protection are readily accepted, at least in principle. For the most part, the regulations adopted by state and local governments governing residential construction are derived from "model codes." These model codes are, in turn, based on a research and professional

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consensus among insurance underwriters, public health associations, and engineering professionals.[1]

The professional standards applied in developing building codes include consideration of external effects as well as direct consequences of the choices of building practices and materials—for example, the potential for conflagration in setting fire protection standards and the possibility of an epidemic in setting public health standards. Despite this authority, there are lingering suspicions that interest groups may act to increase construction requirements (and costs) beyond those that would advance health and safety in the presence of external effects.[2]

Construction regulations and building codes do increase the costs of housing to producers and consumers, but these increases are presumably offset by the benefits in health and safety attributable to the higher standards imposed. Nevertheless, the possibility of "regulatory capture" observed in other regulated markets and the history of resistance to labor-saving changes in construction (for example, the slow diffusion in the permissibility of the plastic pipe in residential construction) suggest that the extent of regulation in home building is often not dictated solely by engineering or professional concerns. The potential for the exercise of monopoly power by materials providers or labor interests is quite real.

The avowed motives for the regulation of land use and residential zoning include consideration of the health and safety of residents, such as when the minimum lot sizes for single-family homes in suburbs are set with reference to the engineering requirements for septic systems. Topography, soil, and drainage factors dictate the maximum number of septic systems per acre, which, in turn, determine the minimum lot size requirement.

The extent of residential zoning extends far beyond these technical concerns, however. The normative theory that underlies the economics of externality zoning was sketched out nearly a half-century ago by Martin Bailey (1959). An appropriate parable may be the circumstances of two types of firms: "laundries," *L*, which dry clothes in the open air, and "smokestacks," *S*, which emit soot into that air. Absent zoning rules, the colocation of *L* and *S* firms reduces the economic output of the *L* firms. But a rule that segregates *L* and *S* firms geographically increases the output of the *L* firms (because more clean laundry can be produced from the same resources) without reducing the output of the *S* firms.

Ever since the Supreme Court's 1926 *Euclid* decision (*Village of Euclid, Ohio v. Ambler Realty Co.*, 272 U.S. 365 [1926]), local governments and others have recognized the validity of land use restrictions and zoning for segregating land uses within towns. The *Euclid* decision explicitly concerned the segregation of single-family from multifamily dwellings and suggested that apartments might become "nuisances" when constructed amid private houses.

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1. Indeed, as reported by Listokin and Hattis (2005), residential construction regulations adopted by U.S. states are variants of just three models: International Building Code, International Residential Code, and International Fire Code.

2. For early evidence about excess regulatory costs, see Field and Ventre (1971) and empirical analyses by Oster and Quigley (1977) and Noam (1983). See Hammit et al. (1999) for a recent survey.

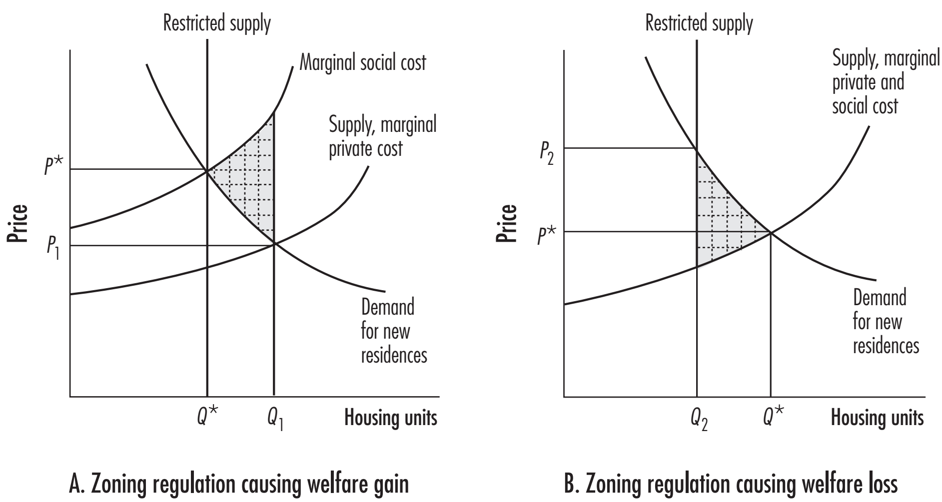
Both building codes and zoning regulations can be used to apply technical expertise to protecting consumers. Zoning regulations also can be used to address ill-defined externalities such as "nuisances" that are not based on science or engineering or on professional expertise. This difference is an important one—it increases the potential for regulatory capture and for the exercise of monopoly in the conditions governing residential building.

Monopoly Zoning

The theory of zoning just sketched out implies that regulations are imposed to achieve welfare gains. If the social cost of an activity exceeds its private costs, rules limiting the activity will lead to welfare gains as shown in figure 3.1A. In an unregulated market, the number of units freely supplied will equate demand to marginal private costs. Appropriate zoning regulations, reducing supply from Q_1 to Q^*, equate demand to marginal social costs, thereby providing a welfare gain equal to the shaded area in the figure. Alternatively, absent an externality, market actions already equate demand to marginal social costs. In this instance, as shown in figure 3.1B, the imposition of zoning rules, reducing supply from Q^* to Q_2, leads to an unambiguous decline in economic welfare. The welfare loss is indicated by the shaded area in the figure.

Either circumstance restricting the supply of available sites or dwellings also confers a benefit on preexisting owners as the values of their dwellings increase. Prices increase from P_1 to P^* (in figure 3.1A) or from P^* to P_2 (in figure 3.1B). This simple analysis suggests that owners of existing properties have a monetary interest in restricting growth, even in the absence of external effects that cause marginal social costs to deviate from marginal private costs.

Figure 3.1
Zoning Regulations and Welfare



Yet owners of existing properties also have an incentive to "find" external effects in urban land use patterns, so that restrictive actions reducing the housing supply will appear to be welfare enhancing rather than welfare reducing. The confusion of externalities with the exercise of monopoly power by preexisting owners need not be intentional or even conscious. But the owners of preexisting dwellings will have financial incentives to search very carefully for external effects that can justify actions to reduce the housing supply.

A SIMPLE MODEL

The importance of these effects depends empirically on the magnitude of the monopoly profits from land use restrictions. Consider a simple urban model of a closed economy of N identical consumers located at various distances x from the city center and paying transport costs of t dollars per mile to their employment locations at the urban center. They consume housing $q(x)$ at price $p(x)$ and a numeraire good. Consumers have preferences over q and p, and they have identical incomes y, leading to identical levels of utility $\bar{u}$, so that

$$(1) \qquad U(y - p[x]q[x] - tx, q[x]) = \bar{u}.$$

In equation (1), the first argument of the utility function is the income left to spend on the numeraire good after choosing housing and its location. In equilibrium, competition among consumers leads to identical levels of well-being. Also in equilibrium, the marginal rates of substitution between housing and the numeraire good equal their relative prices, so that

$$(2) \qquad \frac{U_2(y - p[x]q[x] - tx, q[x])}{U_1(y - p[x]q[x] - tx, q[x])} = p(x).$$

With constant returns to scale, housing suppliers choose an amount of land, $L(x)$, and a capital intensity, $S(x)$—that is, a ratio of capital, $K(x)$, to land to produce housing, $S(x) = K(x) / L(x) = L(x)\, h(S[x])$ according to the production function $h(.)$.

Profit maximization implies

$$(3) \qquad p(x)h'(S[x]) = i, \text{ and}$$

$$(4) \qquad p(x)h(S[x]) - iS(x) = r(x).$$

Equation (3) determines the capital intensity for profit-maximizing production, given an exogenous capital cost i. Equation (4) represents the zero-profit condition for competitive producers.

The region must be in equilibrium in two senses. First, at the edge of the area, at distance $\bar{x}$, the value of land r must be high enough to bid land away from its alternative use where its price is r_a, so that

$$(5) \qquad r(\bar{x}) = r_a.$$

Second, the supply of housing must equal the demand within the region as a whole so that

$$\text{(6)} \qquad \int_0^{\bar{x}} 2\pi x \frac{h(S[x])}{q(x)}\, dx = N,$$

where the left-hand side of the equation integrates the population density over the entire circular region. Equilibrium in the region is fully characterized by these six equations in six unknowns: $p(x)$, $r(x)$, $q(x)$, $s(x)$, $\bar{u}$, and $\bar{x}$.

Now suppose some quantity of land is zoned as open space. The amount of land chosen is designated by its distance from the center, x^*, and the number of radians, k. Figure 3.2 is a schematic of the stylized metropolitan area indicating the amount of open space (the shaded part of the annulus) reserved by the zoning regulation. Under these conditions, the population must still fit into the built-up region, which includes $(2\pi - k)$ radians past distance x^*, or

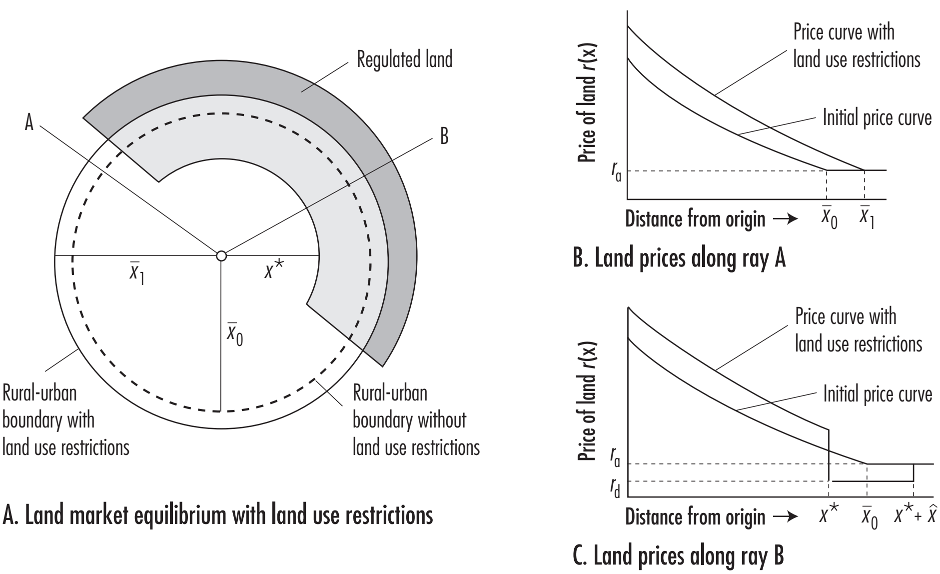
$$\text{(7)} \qquad \int_0^{x^*} 2\pi x \frac{h(S[x])}{q(x)}\, dx + \int_{x^*}^{\bar{x}} (2\pi - k) x \frac{h(S[x])}{q(x)}\, dx = N.$$

The new equilibrium is obtained by substituting (7) for (6) and solving the equation. The amount of land in the region "downzoned" is the section of the annulus described by the zoning rule x^* and the angle k.

It can be shown that holding x^* constant yields

$$\text{(8)} \qquad \frac{\partial p}{\partial k} > 0,\ \frac{\partial q}{\partial k} < 0,\ \frac{\partial S}{\partial k} > 0,\ \frac{\partial r}{\partial k} > 0,\ \frac{\partial \bar{u}}{\partial k} < 0,\ \frac{\partial \bar{x}}{\partial k} > 0.$$

Figure 3.2
Equilibrium Urban Land Use and Land Prices Under Regulation



A. Land market equilibrium with land use restrictions

B. Land prices along ray A

C. Land prices along ray B

Other things being equal, an increase in the angle k, increases the amount of land zoned to prohibit or limit development. This will cause housing prices to rise everywhere and housing consumption to decrease everywhere, reducing consumer well-being. Meanwhile, housing densities and land prices will increase, causing the city to expand.

Increasing x^* means locating the area zoned to prevent development on less valuable land farther from the urban center. It can be shown that

$$(9) \qquad \frac{\partial p}{\partial x^*} < 0, \frac{\partial q}{\partial x^*} > 0, \frac{\partial S}{\partial x^*} < 0, \frac{\partial r}{\partial x^*} < 0, \frac{\partial \bar{u}}{\partial x^*} > 0, \frac{\partial \bar{x}}{\partial x^*} < 0.$$

Holding k constant, increasing x^* (that is, moving the area zoned to prohibit development farther from the center) decreases the price of housing throughout the region, increases housing demand, and decreases residential densities in the region. This action also decreases land rents, increases consumer welfare, and reduces the expansion of the urban-rural boundary and thus the size of the city. Clearly, if x^* is chosen so that it is outside the limit of urban development that would occur from market forces alone (that is, if $x^* \geq \bar{x}$), the regulation will impose no losses on consumer welfare at all.

Quantitative results can be obtained only by calibrating the model to real or stylized data. The model has been solved elsewhere (Quigley and Swoboda 2005) using data that approximates conditions in the Tucson metropolitan statistical area (MSA) in 2000; Cobb-Douglas functional forms were used for utility and housing production.[3] The results of this calibration demonstrate that when only a small percentage of the region's land is removed from development by zoning, there are nevertheless substantial increases in the rents and prices of land—that is, the land not directly affected by the regulations. These price increases lead to rather large losses to renters and newcomers to the region. The principal distributional effect of these regulations is to reduce the well-being of the region's housing consumers, renters, and newcomers. Existing landowners make large gains in all simulations of the model.

Even when small areas of the stylized region are designated for large-lot development or for open space, and even when these areas are peripherally located, the numerical results suggest that there are substantial losses to consumers and large gains to landowners.

The Economic Effects of Real Zoning Rules

Even though the notion of zoning just presented is highly stylized, it provides some perspective for reviewing the types of zoning rules actually imposed. Table 3.1 (simplified from Levine 1999) presents one taxonomy of land use regulatory categories. For residential development, the taxonomy includes caps on building permits issued, zoning land as open space, and requirements for referenda or special

3. The utility function is calibrated so that households spend a quarter of their incomes on housing, and the production function—is calibrated so that land is 30 percent of the input to housing produced by developers (see Quigley and Swoboda 2005).

Table 3.1
Land Use Regulatory Categories

Residential development	Building permit cap Population cap Floor area ratio limit Downsizing to open space/agricultural use Reduction in permitted residential density Referendum for density increase Supermajority in legislative body for density increase
Land planning	Growth management element Moratoria Urban growth boundary Tiered development Subdivision cap
Adequate public facilities (APF) requirements	 Highways Mass transit Parking Water supply Water distribution Water purification Sewage collection Sewage treatment Flood control
Service capacity restrictions	Roads Water supply Water distribution Wastewater collection/treatment capacity Wastewater treatment quality Flood control

Development impact fee coverage	Administration
	Traffic mitigation
	Mass transit
	Parking
	Water:
	    Service
	    Treatment
	Sewer
	Flood control
	Parks/open space
	Natural resources
	Schools
	Libraries and arts
	Other development fees

Source: Adapted from Levine (1999).

reviews to permit density increases. Other rules on land planning include moratoria on development and the imposition of urban growth boundaries. Rules involving "adequate" public facilities raise the possibility of denying new development because of its anticipated effects on road congestion, water supply, or sewage treatment facilities.

Some of the categories listed in table 3.1 are clearly related to the control of externalities in growing metropolitan regions, and they appear to be efficiency enhancing, as depicted in figure 3.1A. Other categories—growth boundaries, open space regulations, downzoning—all appear to be consistent with the stylized representation in figure 3.1B. They reduce the permitted residential density in the shaded area, increasing land prices (and the values of existing homes) and rents and decreasing the welfare of renters.

Because zoning and growth regulations are so complex, empirical analyses of their effects on housing markets are problematic. In 1990 a detailed review of the early empirical literature was provided by Fischel in a widely circulated paper published by the Lincoln Institute of Land Policy. A more recent review of some 40 empirical studies was produced by Quigley and Rosenthal (2005). Both of these reviews stress the difficulty of drawing general conclusions about the magnitudes of land use regulations on prices—largely because the samples are small and the regulations themselves are so hard to characterize quantitatively. For the most part, the empirical studies reviewed about the effects of zoning rules on housing prices are based on small samples of disparate regulations imposed in a single town or metropolitan area. Nevertheless, one conclusion emerges: land use restrictions typically result in higher housing prices.

More general conclusions can be drawn from the three current research projects documented in the next section.

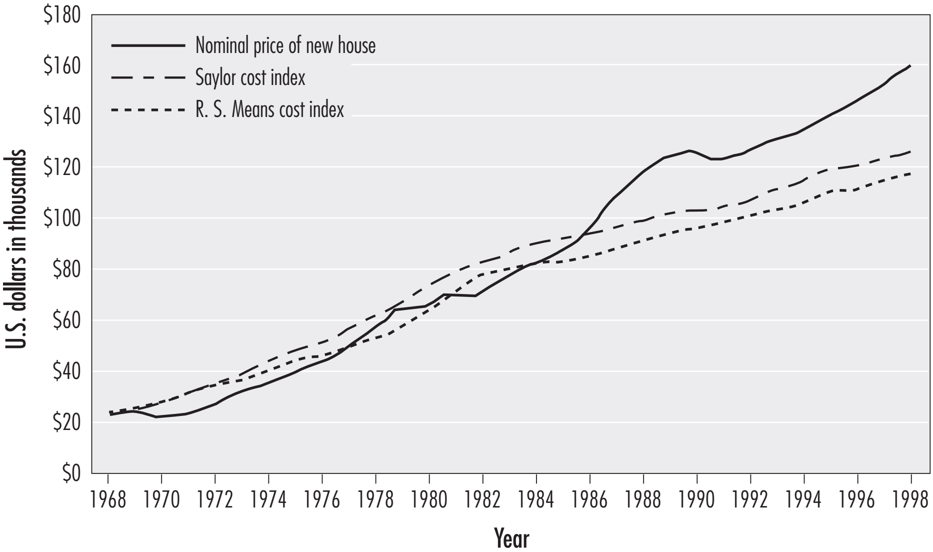
Recent Empirical Evidence

Each of the research projects described in this section seeks to capitalize on a more systematic opportunity to observe the importance of zoning regulations to metropolitan housing prices. Two of these projects are based on larger-scale surveys of the regulatory environment, and the third is based on the kind of information used routinely by engineering firms in projecting the costs of new construction.

CONSTRUCTION ENGINEERING AND COST DATA

The methodology recognizes metropolitan and regional variations in production technologies and variations in labor costs to generate estimates of the nonland component of new construction for stylized building projects. Cost information is generated by metropolitan area and type of project over time. At least three national firms regularly publish estimates of the costs of supplying commercial and residential real estate, and construction firms often rely on these estimates when submitting bids. Figure 3.3, adapted from Quigley and Raphael (2004b), illustrates trends in new housing costs as reported by two of these firms over a 30-year period. It presents the national average cost of high-quality, single-family residential construction, net of land, between 1968 and 1998, as estimated by the R. S. Means Company and Saylor

Figure 3.3
Nominal Housing Prices and Construction Costs, 1968–1998



Source: Adapted from Quigley and Raphael (2004b).

Publications Inc.[4] The estimates, which are benchmarked to 1968, show the steady increase in nominal building costs from about $24,000 in 1968 to over $100,000 in 1998. The figure also depicts the nominal price of new, single-family detached housing as reported by the U.S. Department of Housing and Urban Development (HUD) during the same period, also benchmarked to 1968. The three series follow a common trend through about 1986. From that point, the cost of a new home diverged from the cost of its nonland inputs, increasing more rapidly in the 1990s. By the end of the period, the average cost of new housing was about 30 percent higher than the average cost of the nonland inputs to produce housing.

The cost of land has increased so much more rapidly than the cost of materials for several reasons. In growing metropolitan areas, land prices are bid up as more firms and households compete for space. But a prominent reason for the increase in land prices is the growing importance of zoning regulations, which cause land to be scarcer in supply.

In a series of recent papers Glaeser, Gyourko, and Saks have used the kind of engineering data reported in figure 3.3 in an attempt to disentangle the extent to which land use regulation increases the cost of housing (see Glaeser and Gyourko 2003; Glaeser, Gyourko, and Saks 2005a, 2005b, 2005c). One piece of evidence, combining observations on the market prices of housing output and engineering estimates of the cost of nonland inputs, is provided by building conditions in Manhattan;

4. These data are compiled from R. S. Means Building Construction Costs (various years) and Saylor Publications Residential Construction Costs (various years).

another is provided by aggregate comparisons from other metropolitan areas whose average housing prices can be observed in the American Housing Survey (AHS).

In their analysis of new construction and housing prices in Manhattan, Glaeser, Gyourko, and Saks (2005d) estimate the gap between output prices and the marginal costs of condominiums, which they interpret as the monopoly profits attributable to land use regulation. In the absence of regulation, the number of stories chosen by developers in planning new construction would equate the marginal costs of adding a floor to the output price of the housing produced (and its average cost of production). If the number of stories is reduced artificially by regulation, then output prices and average costs will exceed marginal costs.

For Manhattan, the authors assemble construction cost data on condominiums and apartments by geographical area and by the number of stories in buildings. The construction cost estimates they rely on do not include the price of land and do not make allowances for the fixed costs of site preparation, engineering consulting, architectural services, and other "soft costs." The construction cost data thus approximate the marginal cost of adding another story to the apartments or condominiums at the time they are built.

The calculations confirm that residential construction is quite expensive in Manhattan, largely because labor costs are so much higher there than elsewhere. Marginal costs are increasing with the number of stories in construction. The authors compare the cost estimates they obtain with data on the selling prices of condominiums in Manhattan during the period 1984–2002. The ratio of selling prices to construction costs is cyclical, reflecting small variations in the underlying cost series and large variations in the demand for condominiums over the business cycle. However, the ratio of selling prices to supply costs is always well above 1.0. In 10 of the years, the ratio is above 1.5, with a minimum of 1.2 in 1996 and a maximum of 2.1 in 2002. The authors interpret these figures as estimates of the added cost of regulatory constraints on production. The estimates are high indeed; the selling prices of finished condominiums are about twice the estimated costs of physically producing comparable dwellings. Moreover, these comparisons make no adjustment for the fact that the condominium sales observed are for depreciated (used) dwellings, while the cost estimates are for undepreciated (new) dwellings.

Glaeser and his colleagues have extended this work to compare the costs of producing single-family housing with the average selling prices of housing across a sample of metropolitan markets. In one analysis (Glaeser, Gyourko, and Saks 2005a), the authors compare estimates of physical construction costs, derived from R. S. Means data for single-family housing, with AHS survey data on housing prices. These comparisons reveal a substantial cross-sectional variation in the "markup" of construction costs to the selling prices of housing. In about half of the 21 metropolitan comparisons reported, the ratio of selling prices to construction costs deviates little from 1.0. In other markets, however, particularly coastal markets and particularly in California, the ratio greatly exceeds 1.0. The authors interpret variations in the magnitude of this ratio as variations in the "regulatory tax" imposed by the restrictions on building activities.

A more recent extension of this logic is a comparison of selling prices and construction costs for a panel of more than a hundred metropolitan areas during the period 1950–2000 (Glaeser, Gyourko, and Saks 2005a). These comparisons document a substantial increase in the ratio of selling prices to construction costs during the period, beginning especially during the 1980s (consistent with the aggregate trends reported in figure 3.3). The comparisons also reveal an increasing dispersion of these ratios across metropolitan areas.

A great many other factors also affect the relationship between labor and materials costs and housing output, one of which is changes in land prices attributable to regulation. Thus, attributing all these differences to "regulation" is reminiscent of the growth accounting debate of the 1960s. Attributing a residual to "regulation" and labeling it so is an overstatement that is recognized by the authors. But the weight of all this evidence suggests quite clearly that land regulation is an important contributor to the escalation of housing prices.

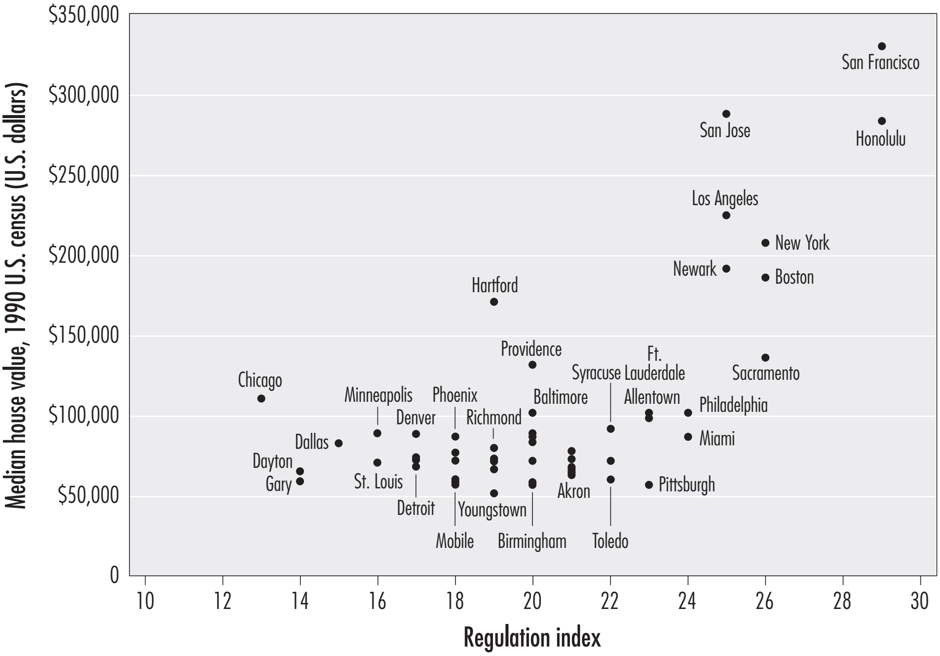
GENERALIZING SURVEY EVIDENCE

The second and third current research projects currently under way each seek to extend for systematic statistical analysis sample survey evidence on zoning and land use rules gathered for other purposes. The second project, by researchers at the University of Wisconsin, has extended survey information on regulation originally gathered by Linneman et al. (1990) and Buist (1991) to a larger sample of metropolitan areas. The third project, by researchers at the University of California, Berkeley, has aggregated and utilized data originally gathered by Glickfeld and Levine (1992) for the Lincoln Institute for Land Policy. In contrast to the approach by Glaeser, Gyourko, and Saks described earlier, both of these approaches measure land use regulation—or at least certain aspects of land use regulation—directly. They thus offer the possibility of measuring the statistical effects of regulation directly, rather than inferring the effects of regulation by subtraction.

In the second research project, Malpezzi (1996) sought to summarize the large number of measurements of local regulation aspects gathered by Linneman and his associates (from an 11-page questionnaire survey) in a small set of variables describing the regulatory milieu of each jurisdiction sampled. He proceeded by applying a standard factor analytic framework to the correlations among the attributes of regulation measured in the original survey. His analysis suggested, however, that a straightforward aggregation of seven measures of local regulation contained most of the information in the principal components. Thus, most of the variation in the many aspects of local government building regulation could be measured by estimates of approval time for single-family housing projects, for multifamily projects and for rezoning, as well as a few other measures (see Malpezzi 1996, 222–224). Malpezzi's detailed analysis of the regulatory index suggested that it was highly correlated with the course of housing values and rents, with building permits issued, and with home ownership rates across metropolitan areas. Figure 3.4 presents the raw relationship between metropolitan housing prices and regulation.

In related work, Malpezzi and Green (1996) explore the relationship between this derived measure of regulation and prices in the left tail of the distribution of housing values. They analyze a sample of 44 metropolitan areas for which the regulation measure could be constructed and for which estimates of the distributions of housing values and rents could be obtained from HUD. Regressions relating log housing prices at the lowest quartile to regulatory stringency reveal a strongly non-

Figure 3.4
Housing Prices and the Malpezzi Regulation Index (55 metropolitan areas)



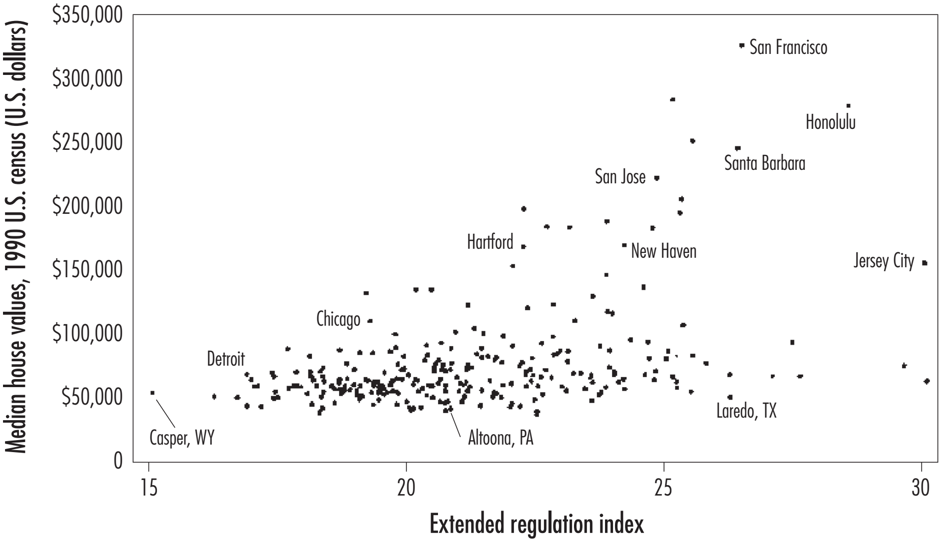
Source: Malpezzi (1996).

linear relationship. Housing values at the bottom of the distribution increase with the extent of land use regulation, and they increase far more than proportionately with the measure of regulatory stringency.

In subsequent work, Malpezzi, Chun, and Green (1998) analyze the relationship between the regulation index, derived from Linneman's survey of 55 metropolitan areas, and a variety of metropolitan aggregates. Using these aggregates and a series of locational indexes as instruments, they generalize the measure to impute measures of regulatory stringency to 272 metropolitan areas. Figure 3.5 reports the resulting raw relationship between metropolitan housing prices and this imputed measure of regulation. A detailed analysis of this larger data set relates metropolitan housing prices, adjusted for hedonic quality, to demographic characteristics and to variations in the level of regulation across metropolitan areas. The analysis confirms the strong positive relationship between housing prices—adjusted for their hedonic quality characteristics—and the level of regulation in a metropolitan area.

In a more recent paper, Green, Malpezzi, and Mayo (2005) use these same measures of regulatory stringency to investigate variation in the supply elasticity of single-family housing across 45 metropolitan areas over 18 years. For each metropolitan area, they regress the percentage change in the housing stock on the number of new building permits per dwelling on the annual log change in the

Figure 3.5
Housing Prices and Extended Regulation Index (272 metropolitan areas)



Source: Data provided by Stephen Malpezzi in 2006.

Office of Federal Housing Enterprise Oversight (OFHEO) price index in that metropolitan area. The procedure yields an estimate of the elasticity of housing supply for each of the 45 metropolitan areas.

A subsequent analysis of the determinants of these supply elasticities confirms that heavily regulated areas exhibit low elasticities. Lightly regulated, growing metropolitan areas exhibit high supply elasticities. Stagnant metropolitan areas exhibit low elasticities regardless of the level of regulation. A regression relating the supply elasticity to the stringency of regulation has a highly significant and negative coefficient. Increased regulation inhibits the adjustment of housing supply to price signals.

A recent paper by Hwang and Quigley (2006) examines the dynamic effects of regulation using the measures introduced by Malpezzi and his associates. The authors estimate a dynamic model of the course of housing prices, vacancies, and residential construction across 74 metropolitan areas during the 1987–1999 period. The stringency of regulation is found to cause a significant reduction in the supply response to housing price pressures—in a variety of specifications and experiments. Simulation exercises, using standard impulse response techniques, document the importance of regulation in affecting the timing of market responses to regional economic conditions. In more regulated markets, the levels of housing prices increase more in response to shocks to the economy, and the price increases resulting from exogenous shocks are far more persistent over time.

The third research project relies on a detailed survey of the regulatory regimes of California cities and towns conducted by Glickfeld and Levine (1992). This project also relates variations in measures of regulatory stringency derived from the survey responses to housing outcomes using detailed jurisdiction-level data for California. The analysis documents the effects of these locally enacted rules on housing outcomes—the distribution of households by race and ethnicity and variations in the prices of single-family housing and apartments.

Rosenthal (2000) creates two summary measures of the detailed descriptive data (also collected using an 11-page questionnaire) gathered in the original Glickfeld and Levine (1992) survey. His measure of the "hospitality" of jurisdictions to new development is based on a composite of responses to nine survey questions measuring the extent to which California cities provide assistance or encouragement in the development process. The underlying responses include, for example, the willingness of jurisdictions to provide "fast tracking" to developers confronting regulation and the willingness of jurisdictions to rezone land to higher densities. Similarly, his measure of "exclusivity" in local regulation is based on 10 measures restricting residential development, ranging from restrictions on building permits or on population growth to the adoption of urban growth boundaries. Rosenthal's analysis, based on the 1990 U.S. Census, reveals that the measures of exclusivity and hospitality are strongly related to economic outcomes, and they have perceptible effects on levels of residential segregation by race.

In a more recent paper, Quigley, Raphael, and Rosenthal (2004) use these characteristics of California cities, exclusivity and hospitality, as instruments for population growth and the growth in single-family housing in those cities during the 1990s. Their empirical results, analyzing changes in the distribution of population by race in California cities, suggest that the underlying zoning rules were quite important in affecting changes in the racial and ethnic composition of cities in California's metropolitan areas during the 1990s. Whether by accident or by choice, the land use policies adopted by California cities have a causal relationship to the distribution of minority households within metropolitan areas.

In a third set of papers, Quigley and Raphael (2004b, 2005) use the same underlying survey data to define an index of restrictiveness for California cities in a manner parallel to that used by Malpezzi for U.S. metropolitan areas. The authors base their study on a simple count of the number of growth controls imposed as a measure of the restrictiveness of the regulatory environment in any city. The underlying growth controls include restrictions on the number of permits allowed or the extent of population growth permitted, rezoning land for agricultural use or downzoning land, and growth management measures or growth boundaries. Figure 3.6 shows the spatial distribution of land use restrictions and their incidence among coastal communities. For comparison, figure 3.7 shows the spatial distribution of the median prices of owner-occupied housing in 2000.

The Quigley and Raphael analysis documents the remarkable extent to which land use regulation increases housing costs in California cities. The authors find a positive relationship between the degree of regulatory stringency and housing prices for both owner-occupied units and rental units. This relationship is evident in the 1990 and 2000 cross sections, as well as in the changes in housing prices and rents over the decade of the 1990s. Figure 3.8 reports the raw relationship between regulation and constant quality housing prices for owner-occupied housing. The relationship between the number of restrictive regulations imposed by cities and

Figure 3.6
Spatial Distribution of Land Use Regulations in California, 2000

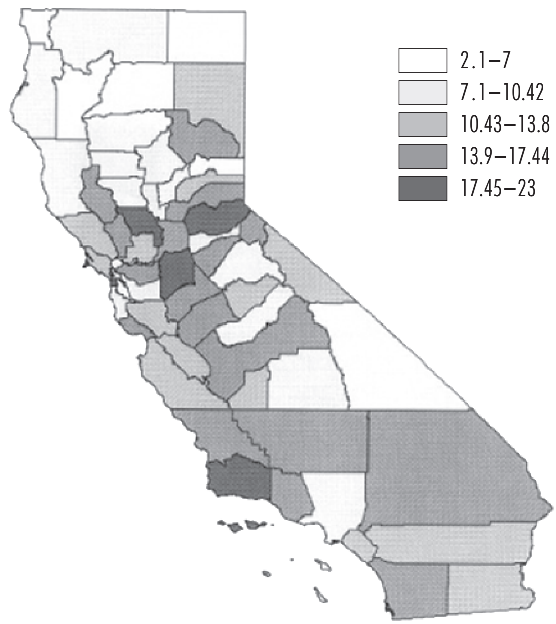


Figure 3.7
Spatial Distribution of Median Housing Prices in California, 2000

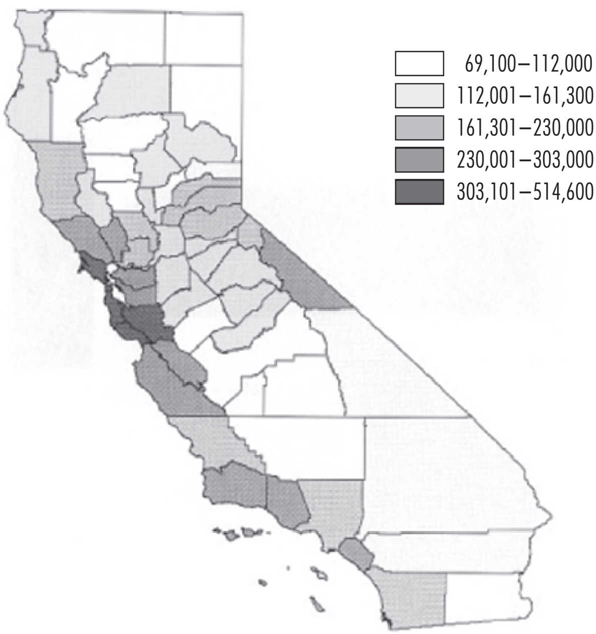
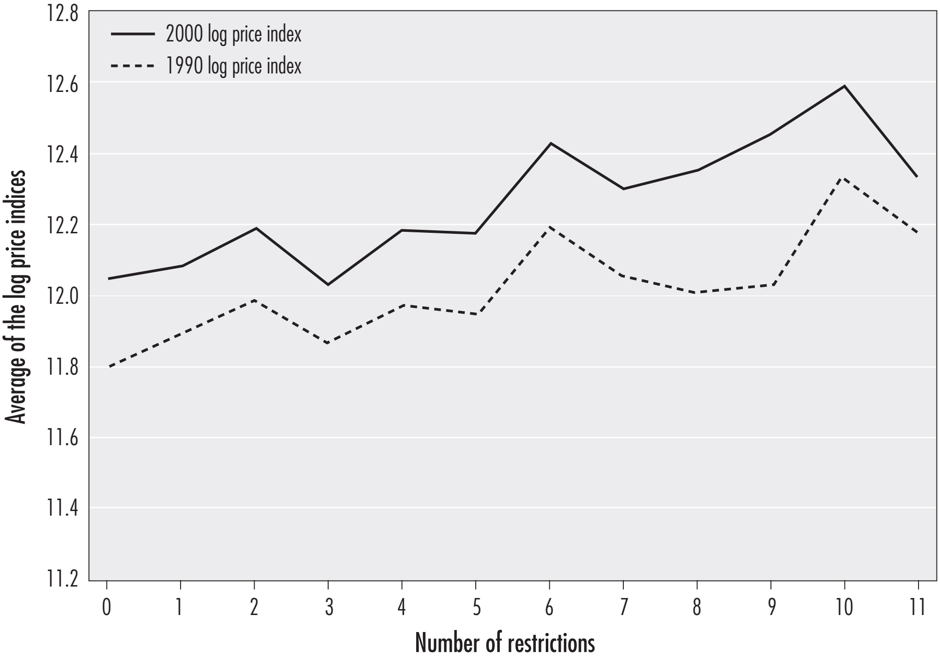


Figure 3.8
Average Price of Constant Quality Owner-Occupied Housing by the Number of Growth-Restricting Measures, 1990 and 2000



Source: Quigley and Raphael (2004b).

log housing prices is roughly linear, suggesting that housing prices increase roughly exponentially with the number of restrictive regulations.

Quigley and Raphael (2004b) also find evidence that new housing construction is lower in more regulated cities relative to less regulated cities. Housing price appreciation in more regulated cities exceeded the comparable price changes in less regulated cities. The strongest evidence of the impact of regulation on housing cost is the estimates of the supply elasticity of housing for regulated and unregulated jurisdictions. Using instrumental variables that control for the endogeneity of regulation, the authors find that the responsiveness of the housing stock via new construction is weaker in the more regulated cities relative to the less regulated cities. Moreover, the difference in responsiveness is greatest for the supply of multifamily housing units, the source of supply that is most frequently the target of regulation.

Interpretation

The three research projects just described reinforce and extend understanding of the consequences of local land use regulation in urban areas. Housing prices are much higher in areas with more stringent land use regulation, and housing supply is much less responsive to economic incentives in such areas. These analyses do not "prove" that the observed price increases are not justified by the control of externalities. But it seems difficult to imagine that externalities per se could be important enough to rationalize these large effects.

And yet other types of externalities can surely underlie the restrictive regulations imposed: fiscal and social. If the potential residents of new housing or higher-density housing receive more in locally provided services than they pay in local taxes, this new housing would produce a negative fiscal externality. The appropriate remedy would be to charge marginal residents appropriately for the services they consume and not to deny entry by regulation.[5]

Alternatively, the external effect may be purely social, such as when the regulatory barriers are designed to zone out lower-income or minority households. Of course, explicit racial or ethnic zoning is illegal, but as the analysis by Quigley, Raphael, and Rosenthal (2004) suggests, land use regulation in California has the same implicit effect.

Some recent work seems to suggest that these regulatory effects will become more important over time—even if the regulations themselves do not become more restrictive. For example, Gyourko, Mayer, and Sinai (2004) have drawn attention to the increased dispersion in housing prices across cities, which may be attributable to rising household incomes and inelastically supplied housing—for example, from restrictive regulation of land. If cities vary in their levels of amenity and if urban amenities are income elastic in demand, then an increase in income will increase demand more in some kinds of cities (called "superstar cities" by Gyourko, Mayer, and Sinai) than in others. If housing is supplied inelastically in some high-amenity cities, then prices will be bid up and the dispersion of prices across cities will be larger. The authors present a simple model that suggests that the ratio of housing prices to rents will be higher in superstar cities simply because consumers and investors expect incomes to increase. Rising incomes by themselves will lead to larger increases in demand for housing in superstar cities, and this demand will be anticipated by consumers. Housing prices in superstar cities, relative to rents in those cities, will be bid up today because consumers anticipate that rising incomes will increase housing asset values in the future.

The empirical results on regulation can provide a crude test of the magnitudes involved. In the absence of dynamic considerations, housing values V are merely the capitalized value of the rent streams R they generate. Capitalization depends only on the interest rate i. Increases in amenity levels A will increase the ratio of prices to rents. Regulatory barriers (Reg) reduce the elasticity of housing supply, increasing the ratio of housing prices to rents, so that

$$V/R = f(i, A, \text{Reg}). \tag{10}$$

Here this relationship is explored using a panel of metropolitan areas for which annual information is available on housing prices, rents, amenities, and the

5. Alternatively, as argued famously by Mills (1979), this is a good reason to favor the abolition of residential property taxes.

Malpezzi regulation index shown in figure 3.5.[6] The data consist of an unbalanced panel of 5,905 annual observations of 274 metropolitan areas for various periods between 1983 and 2005. The simple relationship between housing prices, rents, and interest rates,

$$\log(V/R) = \underset{(46.45)}{0.962} - \underset{(46.24)}{0.456} \log(i), \tag{11}$$

is highly significant, with the *t* ratios (in parentheses) over 40 and with an r-squared of 0.27. As interest rates have declined secularly, housing prices have increased relative to rents.

When the amenity variable is added to the model and when it is allowed to vary over time *t* so that

$$\log(V/R) = \underset{(37.48)}{1.038} - \underset{(39.60)}{0.484} \log(i) - \underset{(5.78)}{0.135} (10^{-4})\, A^2\, t, \tag{12}$$

the amenity variable is highly significant,[7] and the explained variance is somewhat higher (0.34). Higher levels of amenity are associated with increases in the ratio of housing values to rents over time.

When the regulation variable is included in an analogous specification,

$$\log(V/R) = -\underset{(2.10)}{0.087} - \underset{(6.66)}{0.114} \log(i) + \underset{(23.30)}{0.261}(10^{-4})\, \mathrm{Reg}^2\, t, \tag{13}$$

higher levels of regulation are associated with increases in the ratio of housing prices to rent.[8]

Finally, when both variables are included together,

$$\log(V/R) = \underset{(4.63)}{0.202} - \underset{(8.89)}{0.159} \log(i) - \underset{(8.04)}{0.179}(10^{-4}) A^2\, t + \underset{(24.02)}{0.269}(10^{-4})\, \mathrm{Reg}^2\, t, \tag{14}$$

both variables are highly significant, and the r-squared is 0.35. Higher levels of regulation have led not only to higher housing prices, but also to increases in the ratio of housing prices to rents. Moreover, the markups of housing values over rents have increased over time.

Interpreted literally, the coefficients in equation (14) suggest that, holding amenities and regulation constant, the ratio of housing prices to rents increased by

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6. Housing prices are available by MSA and year from OFHEO. "Fair Market Rents" (estimated rents at a common percentile of the rent distribution) are published by HUD by MSA and year. The amenity variable is the cumulative score of a variety of amenities, as compiled by Greulich (2005) from the *Places Rated Almanac* (Chicago, IL: Rand McNally, 1999). The Malpezzi regulation index is from figure 3.5. Amenity and regulation vary by MSA. Interest rates are from Freddie Mac historical series and are reported annually.

7. Lower scores represent a higher rating (the mean of this variable is 9.8 in the data).

8. The mean of this variable is 21.3 in the data.

18 percent between 1983 and 2005 as mortgage interest rates declined from 13.2 to 5.9 percent. In 1983 the ratio of housing prices to rents was 1 percent higher in a heavily regulated metropolitan area (with a regulation index of 25) relative to a lightly regulated metropolitan area (with a regulation index of 15). By 2005 the ratio of housing prices to rents was 28 percent higher in the more regulated housing market.

Although these numerical estimates should be taken with a grain of salt, it does appear that secular increases in incomes will lead to an even greater dispersion in housing prices as a result of regulatory barriers to the functioning of housing markets.

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