**URBAN LAND PRICE: THE EXTRAORDINARY
CASE OF HONOLULU, HAWAII**

by

Louis A. Rose and Sumner J. La Croix

Working Paper No. 88-7
July 1988

URBAN LAND PRICE
THE EXTRAORDINARY CASE OF HONOLULU, HAWAII

by

Louis A. Rose and Sumner J. La Croix

July 30, 1988

The authors are, respectively, professor and associate professor, Department of Economics, University of Hawaii, Honolulu, Hawaii 96822. We would like to thank William Fischel, Kem Lowry and participants in the Asia/Pacific Microeconomics Workshop at the University of Hawaii for their helpful comments. We are, of course, responsible for all errors and omissions. The paper is forthcoming in Urban Economics.

ABSTRACT

URBAN LAND PRICE: THE EXTRAORDINARY CASE OF HONOLULU, HAWAII

By

Louis A. Rose and Sumner J. La Croix

The price of land in Honolulu is higher than in any other major U.S. urban area. In this paper we examine several determinants of the supply and demand for land and discuss their likely influence on Honolulu's land price. We utilize comparisons between demand and supply conditions in Honolulu and in the 40 most populous U.S. urban areas to ascertain the strength of the respective determinants. Our regression results confirm that natural and institutional constraints restricting the supply of land play an important role in determining price in Honolulu and in the 40-city sample.

The price of residential land in Honolulu is much higher than in mainland urban areas of the United States. According to the Federal Housing Administration (FHA, 1980), which publishes the only comparative land price data on Honolulu and other urban areas, the price of existing Honolulu home sites in 1980 averaged \$8.60 per square foot. The corresponding average in the 40 most populous mainland urban areas in 1980 was \$1.73. Average prices for 1980 ranged from \$.48 for Atlanta to \$5.57 for San Diego. Honolulu's price is an outlier in the sample, as it is more than 50 percent higher than the next highest price and five times the mean price.¹

Home sales prices also suggest that Honolulu residential land has a relatively high price. According to Downs (1983, Table 5), the median price of a Multiple Listing Service single family home in Honolulu was \$187,628 in 1981; the corresponding figure in a sample of major urban areas was \$66,400. Based on his comparison of Honolulu prices with those in other cities, Downs (p. 25) concludes that "housing prices are absolutely higher in Honolulu than almost anywhere in the United States (with the possible exception of Alaska)". Again Honolulu's price is an outlier. If the proportion of home price attributable to land is the same in Honolulu as on the mainland, then the price of Honolulu land must be 2.8 times the price of mainland land.

Our primary purpose in this paper is to examine the peculiar combination of market constraints and conditions responsible for Honolulu's high land price. Honolulu's land market differs from most U.S. urban land markets in several important respects. Honolulu is a small island (Oahu), famous for its environmental amenities; it is isolated from the mainland United States but culturally and geographically proximate to Asian and Pacific countries; state as well as local land use controls are very restrictive; private land ownership

exhibits an uncommonly high level of concentration; and foreign investment in Honolulu's business and residential land markets has been at high levels since the early 1970s. Although this combination of market attributes is unique to Honolulu, one or more of most of these characteristics can be found in many urban areas, particularly those in California and Florida.

This paper is organized as follows. In section I we examine several possible determinants of the demand for land and discuss their likely influence on Honolulu's land price. We utilize comparisons between demand conditions in Honolulu and in the 40 most populous U.S. urban areas to ascertain the strength of factors causing Honolulu's relatively high price. In section II, we repeat the same process for land supply. Section III statistically tests the power of measures of the supply and demand determinants to explain observed price variation across the 40 most populous U.S. urban areas. The regression results confirm the importance of previously tested and new variables in explaining interurban price variation in general and contribute to an explanation of Honolulu's high relative price.

I. THE DEMAND FOR URBAN LAND

We begin our analysis by briefly sketching a standard model of land rents in an urban area. Subsequently we extend the model to explain land prices, which are the capital values of the rents. Imagine that an urban area's heterogeneous land is divided into a hierarchy of (linked) homogeneous land markets. Suppose the only characteristic that distinguishes higher quality land from lower quality land is its distance from the city center where most of the area's jobs are located. Then each market is a circular belt of land located a certain distance from the city's center. The more distant the land is from the city center, the

lower is its rent; the lower rent is generated by a lower derived demand for land due to the higher costs of commuting to work. Our interest is in explaining the average rent over all the (linked) markets in the urban area.

Let us assume that the following propositions hold for this urban area. First, there is an unrestricted number of linked markets in each urban area, and each market is unrestricted by topographical features. Second, land ownership in each market is fragmented to the extent that a single landowner is unable to affect land prices by withholding his land from the market. Third, there are no government controls over land use or construction activity. Property rights are fully defined and the government does not interfere with activity in the private sector. Assuming that the propositions outlined above hold in the Honolulu land market, we begin our discussion by reviewing the effects of four previously analyzed demand variables (population, population growth, amenities, and income) and one previously unanalyzed demand variable (foreign investment in land). Maisel (1964) and Witte (1975) analyze population density and population growth in their empirical work on interurban land price variation. Witte also employs family income as an explanatory variable.² Roback (1982) analyzes the effect of amenities on land rent. Measures of these variables for Honolulu and the 40 MSA sample in 1980 are presented in Table 1.

First, the average of all market rents should be positively related to the urban area's population. A higher population implies a higher demand for land and housing in each market as well as an expansion in the number of markets containing residential units. Table 1 shows that Honolulu's MSA population in 1980 was 763,500, well below the population (957,000) of Louisville, the smallest urban area in our sample. Although population may be an important determinant of land price, it is surely not a cause of Honolulu's relatively high price.

TABLE 1
COMPARISON OF VARIABLES IN HONOLULU AND
40 MAJOR URBAN AREAS--1980

Variable	Units	Honolulu	40 MSAs Mean Value	Honolulu's Rank
Price of Land	\$/sq ft ^a	\$8.60	\$1.72	1/41
Population	residents ^b	763,000	2,811,000	41/41
Population Rate of Change 1970-1980	% increase for decade ^c	20.9	12.8	12/41
Income Per Capita	\$/year ^d	\$10,498	\$10,256	15/41
Foreign Investment Attractiveness	% of families speaking foreign language ^e	.384	.157	4/41
Amenity Level	hotel rooms per capita ^f	.0479	.0094	1/41
Dry Land	Index ^g	.470	.873	41/41
Zoning Concentration	Index ^h	1	.352	1/41

- a. U.S. Dept. of Housing and Urban Development (1980). Table 19M.
- b. U.S. Dept. of Commerce, Bureau of the Census (1983). *Census of Population, Metropolitan Statistical Areas*. Tables 3 and 4.
- c. Same as b, for 1970 as well as 1980.
- d. U.S. Dept. of Commerce, Bureau of Economic Analysis (1985), Tables 6-7.
- e. U.S. Dept. of Commerce. Bureau of the Census (1983). *Census of Population, Characteristics of the Population, Detailed Population Characteristics*. Tables 198 and 208.
- f. Evans (1985). Rooms in hotels with 20 or more rooms in SMSA divided by corresponding 1980 SMSA population. SMSA component parts and population from U.S. Dept. of Commerce, Bureau of the Census (1983). *Census of Population, Characteristics of the Population, Number of Inhabitants*. Table 30.
- g. Rose (1986b).

TABLE 1 (CON.)

- h. Fischel (1981) explains the method and sources for calculating the ratios. Strictly speaking, the ratio for Honolulu cannot be calculated, since there are no suburban jurisdictions apart from the urbanized area. However, the sense of the measure compels our imputation of unity.
- i. In general, means are for the 40 most populous MSAs, and ranks are for these MSAs and Honolulu. The only exception to this rule is in the zoning concentration ratio. Houston, with minimal zoning, is deleted, so the mean is for 39 MSAs and Honolulu.

Second, the average rent in an urban area should be positively related to the real per capita income of residents. At higher real per capita income, individuals demand more housing, and especially more land. This is confirmed by Harris, Tolley, and Harrell (1968) who estimate an income elasticity of demand for residential land in the range of 2.4 to 4.0. It is also supported by Witte (1977) who reports an elasticity of site price with respect to income of 1.0 for low income home buyers and 3.0 for high income home buyers. However, as shown in Table 1, Honolulu's 1980 per capita income (\$10,256) is close to the mean of the 40 most populous cities (\$10,498). This small difference is unlikely to contribute significantly to an explanation of Honolulu's high land price.

Third, people may prefer to live in Hawaii because it has a pleasant climate and beautiful scenery. Needless to say, there are amenities other than those provided by nature, such as governmental, religious, and cultural attractions as well as theatres, museums, and restaurants. The conventional wisdom concerning the effect of amenities on land prices is that consumers compete to live in urban areas with high amenity levels, thereby increasing land rents in those MSAs. Roback (1982) cautions that such a conclusion could be incorrect if the amenities not only increase consumers' utility, but also increase firms' costs of production. Roback distinguishes between *productive* amenities which decrease a firm's costs and *unproductive* amenities which increase a firm's costs. An example of a productive amenity is a beach with warm, clean water, and plenty of sun; the presence of this amenity reduces the cost to a hotel of providing a pleasant experience to hotel guests. An example of an unproductive amenity is clean air, as firms must spend resources to use a less polluting technology, thereby increasing the cost of producing goods of a given quality.

Roback argues that the prices of land and labor are simultaneously determined in two markets linked by conflicting preferences of firms and workers. If amenities are generally unproductive, then in higher amenity cities, wages will be lower, whereas rents could be higher or lower. This is because firms prefer low amenity locations while workers prefer high amenity locations. Since high rents discourage both firms and workers from locating in an area, worker equilibrium requires high rents in high amenity areas to choke off immigration, while firm equilibrium requires low rents in high amenity areas to induce firms to locate in the area. In the labor market, wages must be lower to induce firms to locate in the area.

By contrast, if amenities are generally productive, then in higher amenity cities, rents will be higher, whereas wages can be either higher or lower. Honolulu has some productive amenities (e.g., warm water for the production of tourist services) and some unproductive amenities (e.g., clean air for manufacturing), so the effect of higher amenity levels on wages and rents is theoretically indeterminate.³ Since tourism is the dominant industry in Hawaii, it seems likely that amenities are, on average, productive for Honolulu business firms.

The literature provides numerous indexes and other measures of quality-of-life across urban areas. We employ a measure previously used by Fuchs (1986, p. 134) that is the most convenient and suitable for our purpose: hotel rooms per capita.⁴ The idea behind this measure of amenities is simple. Visitor lodging is provided to people for two purposes. The first is to enjoy amenities; greater amenities attract more visitors and induce the provision of more hotel rooms. The second is to conduct business; a greater volume of business attracts more visitors and induces more hotel rooms. To eliminate the effect of the

second type of visitor on the number of rooms, we divide rooms by a variable proportional to the volume of business, the resident population. Table 1 shows that Honolulu has five times more hotel rooms per capita than the sample mean, and more than any urban area in the sample.

A fourth demand factor affecting the price of land is the rate of population growth. If individuals observe a positive rate of population growth over the past ten years, and expect the growth to continue into the future, then they will expect increasing land rents.⁵ It follows that current land price will be higher than if the past rate of population growth were zero or negative. Table 1 indicates that between 1970 and 1980 Honolulu's population grew 20.9 percent. Compared with the 40 most populous urban areas with a mean growth rate of 12.8 percent, Honolulu's relatively high rank (12) suggests that this variable may explain some of Honolulu's relatively high land price.

The demand for residential and commercial land in Hawaii by non-residents has been substantial. Non-residents own a substantial but unknown amount of Honolulu residential land, (especially under high quality condominiums and single family dwellings) and also a major portion of the commercial resort properties. These investors have, as a group, tended to drive up the price of residential land. Some of the non-residents are U.S. mainland investors, while others are subjects of foreign countries. Both groups of nonresident investors are drawn by amenities that make the combination of ownership and frequent short-term occupancy attractive.

Wealthy foreign investors living in Asian and Pacific countries with unstable governments are drawn to Honolulu, as it is perceived to be a safe haven for assets subject to confiscation by a new government. Honolulu is preferred over other U.S. urban areas because of its linguistic, cultural, and geographic

proximity to these countries. With many relatives and friends of families in Hong Kong, Taiwan, and the Philippines living in Honolulu, it is not only a more convenient investment location, but also a more appealing place for future residence than are areas on the mainland. This argument applies equally well to Miami, Los Angeles, New York, and other cities in relation to unstable Latin American countries.

Of course, nations differ in their propensity to invest in U.S. property. The nation with the largest persistent trade surplus in recent years is Japan, with a surplus much larger than that for all of the other Pacific-Asian nations combined.⁶ Honolulu is particularly attractive to Japanese investors because it has closer linguistic, cultural, and geographical ties with Japan than any other city. In the 1980 Census of Honolulu, 34% of the 634,000 respondents who reported a single ancestry indicated Japanese.⁷ Furthermore, for the last twenty years Hawaii has been a popular destination for Japanese tourists. During 1980 alone, 658,000 Japanese visited Hawaii, comprising 17% of the total visitor count.⁸

Cumulative foreign investment in the State of Hawaii between 1959 and 1983 totaled \$1.884 billion.⁹ Investors from Japan rank first with \$1.251 billion of the total. Investors from Hong Kong are second with \$201 million. Most of the investment is in real estate which totals \$1.13 billion. Hotels, a separate statistical category, are second with \$476 million.¹⁰ We cannot, however, use these data in our empirical work, as reliable interurban comparisons of foreign investment are impossible with available data.¹¹ Instead, we take the percentage of families in urban areas that speak a foreign language as a determinant of foreign demand. This measure is far from ideal, especially since some cities are notable for their high percentages of low income households of foreign

extraction, but it does capture the linguistic and cultural ties conducive to investment. Honolulu's percentage is 38.4, and its rank is fourth behind San Antonio and Miami with 48.0% and New York with 38.6%.

II. THE SUPPLY OF URBAN LAND

When we started our analysis we made three assumptions about the supply side of the land market. We assumed that (1) land ownership is fragmented; (2) there is an infinite number of linked, topographically unrestricted markets; and (3) government does not intervene in the land market. In this section of the paper we relax each of these assumptions in order to present salient features of the land market in Honolulu.

A. NATURAL LAND SUPPLY RESTRICTIONS

Let us first relax the assumption that there is an infinite number of topographically unrestricted markets surrounding the central job area. This step is particularly desirable in the case of Honolulu, as it is a small island of only 380,000 acres. Oceans and lakes also restrict the supply of urban land in San Francisco, Chicago, and many other mainland cities, though to a lesser degree.

Rose (1986b) provides an index that measures the extent to which water restricts the supply of urban land. The index is based on the premise that a parcel of land in a market close to an urban center contributes more to the urban land supply than does a parcel of the same size in a more distant circular belt market. This suggests that we can measure urban land supply as the sum of weighted market areas, net of water, where the weights decrease with distance from the center. By selecting exponentially declining weights that are asymptotic to zero, we ensure that the sum is finite, even if the number of

linked markets is large.¹² The index for an urban area is its sum relative to the sum for a hypothetical urban area on a featureless plane with an infinite number of arid linked circular belt markets.

The Honolulu land supply index is .47, meaning that due to the ocean's restriction, Honolulu has only 47 percent of the land--in weighted acres--that would be available in the hypothetical unrestricted area. This can also be seen in the map of Oahu displayed in Figure 1. An additional natural restriction on the supply of urban land is the mountainous terrain that often rises steeply from near sea level up to elevations of 4000 feet. The *Hawaii State Data Book* lists 23,799 acres or 6 percent of the island as "pali [mountain] and barren land," presumably unfit for urban use.¹³ If the index incorporated terrain as well as water restriction, the Honolulu index would be approximately .44. On the mainland, about half of the 40 most populous areas are landlocked, so their indexes approach 1.0. The lowest index is .52 for San Francisco, and the mean for the 40 areas is .87. Because there is negligible unusable terrain in almost all of these cities, we can conclude that Honolulu has only half of the land naturally available to these mainland cities. This factor surely contributes to Honolulu's higher land price.

We can make a plausible partial estimate of Honolulu's low index value on its land price by using Kau and Sirman's (1981) estimate of the price elasticity of demand for residential land. They estimated elasticities in 31 mainland cities for each year in 1966-78, and then estimated an equation to explain elasticity variation in terms of time, region, and city size. The equation predicts an elasticity of -.66 for Honolulu in 1980. There are, however, two reasons why the Honolulu price elasticity for urban land is likely to be less than that for mainland residential land: (1) urban land is a more broadly

OAHU
(HONOLULU CD)

30mi

defined factor than residential land;; and (2) Honolulu's geographical and cultural distance from other cities means that land in those cities is not a close substitute for land in Honolulu. If we assume the price elasticity for urban land in Honolulu is $-.50$ and is constant over the price range relevant to our calculation, we find that relative to the mainland U.S., Honolulu's 50 percent decrement in land implies a 100 percent increment in price from \$1.60 up to \$3.20 per sq. ft.

B. CONCENTRATED LAND OWNERSHIP

Next let us relax our assumption that ownership of Oahu's land is fragmented. Although all of the land in Honolulu is not owned by a monopolist, ownership is more highly concentrated than in any other U.S. urban area. This is the legacy of the nineteenth-century Hawaiian monarchy and the island's sugar plantation economy. Between 1845 and 1855 property rights in land were converted from a feudal land system into a system of alienable private property rights.¹⁴ Large blocs of land were retained by the king and the government, and foreigners purchased large tracts of land for fledgling sugar plantations. Concentration of land ownership increased considerably during the next 100 years as operators of large-scale sugar plantations acquired government lands and small holdings from Native Hawaiians. Consolidation in the sugar industry after 1930 further concentrated land holdings. The number of sugar plantations in Hawaii fell from 47 in 1930 to 38 in 1940, 28 in 1950, 25 in 1965, and 14 in 1985.¹⁵ In addition, the five firms which served as factors for plantations acquired majority holdings in virtually all sugar plantations during the Great Depression of the 1930s when sugar producers were unable to repay loans tendered to them by the factors.

Concentration was also facilitated by the large land holdings left by Princess Bernice Bishop, heir to many of the king's lands. Upon her death in 1887 her will mandated that the lands be held in a charitable trust, the income from which is dedicated to the education of Native Hawaiians at the Kamehameha Schools. Since her will specified that the trustees should not sell the trust's land if at all possible, the Bishop Estate was the largest private landowner in 1964, owning 22.77 percent of the land on Oahu.

Table 2 provides the most recent set of ownership and concentration statistics. In 1964, 68 percent of the island was privately owned, and 32 percent publicly owned. The three largest private owners had almost 59 percent of the privately held land. The State of Hawaii and the United States each owned approximately 45 percent of the public land, and the City of Honolulu had the remainder.¹⁶ Ownership concentration can be conveniently summarized by the calculation of Hirschman-Hirschman indexes which can vary between zero for a perfectly competitive market and 10,000 for a monopoly. The index calculated from privately owned shares of privately owned land is 1213, and the index calculated from privately and publicly owned shares of total land is 999.¹⁷ Since an index value below 1000 is often interpreted as a sign of a competitive market, the concentration would not appear to be sufficient to lead to higher land prices or rents.¹⁸

Stigler (1964, Ch. 5) has suggested that industrial concentration in a single industry may lead to higher prices if it reduces the costs associated with establishing, monitoring, and enforcing a cartel agreement. In addition, a smaller number of producers in the cartel implies that the cost to a cartel participant of free-riding on any aspect of the agreement increases, thereby

TABLE 2
CONCENTRATION OF LAND OWNERSHIP ON OAHU, 1964

	Acres Owned in Fee Simple ^a	Percentage of Total Land
Privately owned land	259,096	68.04
Bishop Estate	59,007	
Campbell Estate	50,260	
Castle & Cooke	42,399	
Harold Castle	9,377	
Zion Securities	6,374	
Smaller owners ^b	91,719	
Publicly owned land	121,704	31.96
State of Hawaii	56,676	
United States	55,109	
City & County of Honolulu ^c	9,923	
Total Land on Oahu	380,700	100.00

	Fee Acres as % of Privately Owned Acres	Cumulative Percentage
Major Private Owners		
Bishop Estate	22.77	22.77
Campbell Estate	19.40	42.17
Castle & Cooke	16.36	58.54
Harold Castle	3.60	62.14
Zion Securities	2.46	64.60

	Fee Acres as % of Privately and Public Owned Acres	Cumulative Percentage
Major Private & Public Owners		
Bishop Estate	15.50	
State of Hawaii	14.88	30.38
United States	14.47	44.85
Campbell Estate	13.20	58.05
Castle & Cooke	11.13	69.18

a. Horowitz and Finn (1967). Tables 30 and 35.

b. Acreage owned by smaller owners is the imputed residual from the publicly owned land and the five largest private land owners.

c. City and County acreage, not provided in Horowitz and Finn, is for 1965. Source is

increasing the viability of the cartel. However, the argument does not carry over well to the land market. A prerequisite for a cartel to establish a price exceeding the competitive price is that the industry output rate be reduced. But a land cartel does not "produce" a flow of land each period--the total stock of the good is essentially fixed. Rather than reduce a nonexistent rate of output, a land cartel must reduce the service flow emanating from its fixed stock of land. This can be accomplished if cartel participants remove some of their lands from the urban market and allocate them to a lower valued activity. If the correct amount is removed from the urban market, then the remaining land will sell (rent) at the monopoly price.¹⁹

Three difficult problems must be resolved before a land cartel can operate successfully. First, cheating (i.e., selling or renting additional land) by cartel members must be controlled if a cartel is to survive. The incentives to cheat in a cartel are substantial, as a cheater can sell additional units of the product at the cartel price, which is above the marginal cost of producing the product. The cheating problem is exacerbated in a land cartel, as the additional units of land which would be placed on the market are already held in inventory--they do not have to be produced at positive cost. Unless the cartel can make side-payments to some of the owners--those who have large tracts of land which have been withheld from their highest valued use--these owners will have weak incentives to participate in the cartel.²⁰

Second, cartel agreements must be negotiated and enforced. These costs tend to be lower when the interests of the cartel members are similar, i.e., they have the same marginal and average costs of production. Holdings of large landowners in Honolulu are, however, quite heterogeneous with respect to their state of development. Some landowners possess land most of which has already

been developed and leased for use as homesites. Others own land that is predominantly used for agriculture. The second group is likely to favor more development than the first group. For the cartel to prosper, a system of side-payments would have to be developed to compensate the second group for not developing their land.

Finally, Coase (1972) has discovered an obstacle to land sales at the supracompetitive price established by a cartel. The buyer of a parcel assumes the risk of a large capital loss if the cartel breaks up and sells (rents) the land previously withheld from the market. After the new sales of the previously withheld land have been completed, the stock of land in urban use will be higher, and land will sell at a lower price. Thus the supracompetitive price can be maintained only if buyers can be assured that the stock of land initially withheld from the market has been *permanently* removed. Coase concludes that "with complete durability [of a product], the price becomes independent of the number of suppliers and is always equal to the competitive price." Being a monopolist of a completely durable good does not command any monopoly rents unless buyers can be assured that they will not suffer a capital loss due to sales (or leases) of the land withheld from the market.²¹ In sum, buyers of land from a land cartel must be concerned not only with cheating by cartel members at any given point in time, but also with the long run durability of the cartel.

The above reasoning leads to the conclusion that even in a highly concentrated land market, landowners are less likely to operate an effective cartel than firms in other industries with similar concentration. Certainly we have no evidence that agreements between the owners exist, that monitoring activities are being undertaken, or that explicit side-payments are being made to owners withholding land from the market. Nor, in view of their likely il-

legality, would we expect to easily observe such activities.

The absence of an effective cartel should not be construed to mean that monopoly power is completely absent from Honolulu land markets. Some large landowners may own sufficiently large proportions of the land in specified markets that, acting independently, they will be able to exercise some limited degree of monopoly power in that market. An example of such a market could be Hawaii Kai, a Honolulu suburb which is mostly owned by one large nonprofit institution, the Bishop Estate. Nonetheless the degree of monopoly power which the Bishop Estate would be able to exercise is limited by competition from other suburban areas in Honolulu and by potential buyers' anticipation of the monopolist's subsequent sale of land currently withheld from the market.

C. ZONING AND CONCENTRATION

Let us now relax our last assumption: that government does not intervene in the land market. Our perspective on land use in Honolulu changes, as government regulation of land markets affects the market price of land. Stigler (1971) argues that most industry regulation is structured to support the interests of incumbent producers. Industry concentration increases the probability that the industry will obtain favorable regulation, as free-riding by producers is reduced; in addition, the cost of organizing a small group (of producers) is lower than the cost of organizing a large group (of producers or consumers) for political action. Peltzman (1976) extends Stigler's analysis by arguing that regulation is structured to serve the interests of the dominant political coalition which can include consumers as well as producers. Fischel (1985) applies their general analysis to the land market to explain how owners and users of urban land use the political process to influence zoning and land

use decisions of government regulatory agencies.²²

We begin our analysis by initially accepting Stigler's contention that the dominant political coalition generally serves the interests of the industry's producers. Since the stock of land in Honolulu is given, we assume that the coalition is dominated by the owners of developed land and those parties deriving rents from the developments. These parties have an interest in restricting the amount of land which is zoned for urban development. However, the demand for land as homesites has increased over time due to rapid increases in real per capita income and population. In a competitive model of a rapidly urbanizing area, developers purchase agricultural land which is developed into additional residential land.

A cartel of developed land owners gains if they can reach an agreement to restrict such land conversion, as residential land prices increase above their competitive levels. Our analysis in Section II-B concluded, however, that a land cartel is less likely to survive than cartels in other similarly concentrated industries. The central message of this section is that a land cartel is feasible if governmental institutions can be utilized to overcome some of its natural disabilities. Recall that for a land cartel to charge a monopoly rent or price, there must be some means of ensuring (1) that landowners curtail the amount of land they allocate to residential (urban) use, and (2) that landowners do not cheat on their agreements with the cartel. As Stigler has previously emphasized, government regulatory agencies can solve both problems. They can hear arguments by different landowners concerning the withdrawal of their land from the market. Once the agency specifies which land will be withheld, the police powers of the state can be invoked by the agency or by the cartel's members to ensure that landowners do not use the withheld land for unauthorized

purposes.

Some land owners who have undeveloped land which is restricted to a lower valued use (e.g., agriculture) will oppose the regulatory actions. To reduce their opposition, partial compensation for their losses could be paid. Hawaii state law (Hawaii Revised Statutes, Ch. 246) allows the owners of agricultural lands to dedicate them to continued agricultural use for several years in exchange for favorable property tax treatment. The tax breaks are legal versions of the side-payments one would expect in a private land cartel to landowners who restrict their land to lower valued uses.

Regulation can also help to overcome the difficulties identified by Coase (1972). Prospective buyers of land must be persuaded that land initially withheld will be permanently withheld from the market if developed land is to be sold at a monopoly price. One way to persuade buyers that the restrictions are permanent is to imbue the regulatory agencies with a politically popular mission: to ensure that environmental quality is maintained by zoning some land as "conservation" or "agricultural" land. Popular support for such goals may prevent the agency from reneging on its commitments in the future. Both goals can be accomplished if the agency promulgates rules increasing the cost of converting "conservation" land to urban use.

We hypothesize that the Hawaii State government and the Honolulu City government both act to ensure that the interests of the producers' coalition are enhanced. The State laws most relevant to our hypothesis are the State Land Use Law and Coastal Zone Management Law. The State Land Use Law, the first such law in the nation, established the State Land Use Commission which exercises zoning powers. The Coastal Zone Management Law requires the City Council to adopt a process to regulate development; the City's Shoreline Management Act requires

the Council to approve or deny most development proposals.

The most relevant City law is the Oahu Development Plan. This plan, which was drawn up by the City's Department of General Planning and was adopted by the City Council, has been incorporated by the City's Department of Land Utilization (DLU) in its revision of the Comprehensive Zoning Code. Among other things, the revised code down-zoned some land previously authorized for residential use. In addition to the Plans and Code, the City Council has enacted a subdivision ordinance, a grading ordinance and a building code. The two ordinances are administered by the DLU and the Code by the Building Department.²³

The existence of these regulations means that developers will incur costs resulting from studies required by the government agencies, infrastructure to meet subdivision ordinances, and project design changes mandated by the agencies. In addition to these observable costs, the costs of project delay are considerable, as the State and County typically require a total of four to six years to approve a project.²⁴ Some projects are delayed forever, as the regulatory process's hurdles prevent some developers from applying for permits to build potentially economic developments.

If, as we are suggesting, the large landowners benefited from the establishment of restrictive government institutions, then it may well be that these landowners were the primary force underlying their establishment. In a recent book, *Land, Politics and Power*, Cooper and Daws (1985) document the power and political connections of the major landowners -- especially 25 years ago when the State Land Use Law was established. Although political power is more widely dispersed today, there is the possibility that the large landowners have played some role in the more recent establishment of land use policies and laws. One is the 1974 law that enables owners of agricultural lands to dedicate them to

continued agricultural use in exchange for favorable property tax treatment. Another is the conservative land use policies of the Department of Land and Natural Resources, which manages most of the State owned land.

The establishment of a landowners cartel via state and local land use agencies was facilitated by the concentration of zoning power in Honolulu. Although all major urban land markets on the mainland except Houston have zoning power, Honolulu is quite unique in its concentration of this power. According to the so-called monopoly zoning hypothesis initially set forth by White (1975), this concentration can make a substantial difference in the price of real property. White's argument begins with homeowners who seek to maximize their property value by persuading their local governments to zone restrictively. By curtailing development and construction of new homes, restrictive zoning increases the prices of existing homes. This strategy works best if a single zoning authority has jurisdiction over the entire urban area land market. It could also work if a few separate jurisdictions were to act as a cartel of governments by colluding to curtail land's availability for housing. If, however, there is a large number of small local governments, the strategy will probably not work because of the difficulty of securing coordinated zoning from the different governments. One of many small local governments cannot, by restricting the number of homes in its jurisdiction by 50 percent, have any significant effect on the supply of homes in the urban area. But a large monopoly government with jurisdiction throughout the urban area can, by the same zoning policy, curtail the urban area's supply of homes by 50 percent, thereby substantially increasing their price.²⁵ In sum, the extent to which the zoning strategy raises home prices is positively related to the monopoly power possessed by the zoning jurisdictions.

The concentration of governmental zoning power is far greater in Honolulu than in mainland urban areas. There is a two-tier public monopoly controlling land use throughout the entire island. First, the State zones land and second, the island has only one local government which also zones land and regulates development. In contrast, on the mainland, states generally do not zone land; urban land markets usually are zoned by numerous local governments. According to a 1980 count, the numbers of local governments with zoning powers in the 40 most populous urbanized areas, excepting Houston, varied widely.²⁶ At one end of the distribution, some of the less populous areas have few governments: Charlotte has 2, Tampa 3, and Norfolk 5; whereas the more populous areas have more governments: New York has 360 and Chicago 347. The average is 72.²⁷

To incorporate the effect of zoning concentration into our empirical analysis, we employ a measure of monopoly zoning power developed by Fischel (1981). His urban area concentration ratio is analogous to the four-firm ratio used in studies of industry concentration. Fischel's zoning power measure is the fraction of the urban area's land market that is contained by the four largest (in area) suburbs. The advantage of using a concentration rate over the count of governments is that it incorporates more information on the size distribution of local governments. The average concentration ratio for the 40 city sample is .352 and the distribution of monopoly power over the sample is quite wide. The highest concentration ratios are observed in Richmond (.825), Norfolk (.801), and Baltimore (.780). The lowest ratios are observed in Minneapolis (.035), Columbus (.052), and Los Angeles (.074).

III. EMPIRICAL ANALYSIS

In this section we examine the empirical significance of the demand and supply variables discussed above. Although we were unable to find data on land ownership concentration, we have managed to measure--roughly in some cases--the five demand variables and two supply variables listed in Table 1.

The tests are based on regressions of price on selected combinations of the seven variables. The data are for 39 of the 40 mainland urban areas; Houston is excluded because it has no zoning jurisdictions, and we want to test the effect of zoning jurisdiction concentration. All variables are in logarithms, so the coefficients are elasticity estimates; all regressions have been corrected for heteroskedasticity. Our results are presented in Table 3. Column 1 shows results published and discussed at length in a previous study by Rose (1986a).²⁸ All five variables have coefficients of the expected sign and are significant at either the 1 percent or 5 percent level. They explain 54 per cent of the sample's price variation.²⁹

One can obtain a rough idea of each variable's relative contribution towards Honolulu's relatively high land price by multiplying its estimated coefficient by the percentage difference between Honolulu's value of the variable and the sample mean. Of course, Honolulu's lower population negatively contributes but the other four variables positively contribute to the price differential. The two variables with the greatest explanatory power are the dry land and zoning concentration supply variables.³⁰ The regression predicts that the Honolulu land price will be \$2.60 which is 51 percent greater than the sample mean but substantially below Honolulu's actual price of \$8.60.

The second regression (column 2, Table 3) includes an amenities variable that is measured by the number of hotel rooms in the MSA. Its coefficient is

TABLE 3
PRICE REGRESSIONS

	1	2	3	4
Population	0.264*** (2.87)	0.450*** (3.15)	0.158* (1.64)	0.299** (1.94)
Population Change	0.255*** (4.33)	0.335*** (4.91)	0.221*** (4.01)	0.280*** (4.62)
Income	2.01*** (3.72)	1.95*** (3.37)	2.05*** (3.67)	2.00*** (3.47)
Dry Land Supply	-0.754*** (-3.00)	-0.815*** (-3.19)	-0.628*** (-2.91)	-0.689*** (-3.10)
Zoning Concentration	0.182*** (3.00)	0.176*** (2.82)	0.139*** (1.94)	0.142** (2.03)
Amenities		-0.231** (-1.71)		-0.154 (-1.18)
Non-Resident			0.235** (2.17)	0.198** (1.97)
Constant	-17.20*** (-3.60)	-17.40*** (-3.29)	-16.78*** (-3.32)	-16.98*** (-3.19)
$\bar{R}^2$	.540	.562	.586	.588
SE	.367	.358	.348	.347
F	9.92 (5,33)	9.12 (6,32)	9.98 (6,32)	8.75 (7,31)

All variables are in logarithms. The numbers in parentheses below the coefficients are t-statistics. One, two and three asterisks indicate one tail significance levels of 10, 5, and 1 percent, respectively. The numbers in parenthesis below the F-statistics are degrees of freedom for the F-tests.

negative and significant at the 5 percent level.³¹ In view of Roback's theory, this suggests that the nature of production in most of the sampled urban areas is such that amenities are unproductive, i.e. they raise production costs. This implies that industries generally do not employ amenities as an important resource, but are constrained in their operations by the amenities. However, casual observation strongly suggests that amenities contribute to the production of tourism services, the dominant industry in Honolulu.

Since some cities have amenities which contribute to land price and other cities have amenities which depress land price, use of this regression to predict the price of land in a city for which we have prior information about the amenities/price relationship is unwarranted. Since the relationship between Honolulu's amenities and industry production costs is negative rather than positive, we do not believe it would be appropriate to use this regression result to predict the price of land in Honolulu. The regression is still useful, however, as it can be used to predict land price when information about the relationship between amenities and production costs for a city is unavailable.

The third regression (column 3, Table 3) excludes amenities and includes non-resident investment; it is measured by the percentage of families in which a foreign language is spoken in the home. The coefficient is positive and significant at the 5 percent level. The introduction of this variable causes the population coefficient to become insignificant at the 5 percent level, and it marginally improves the $\bar{R}^2$ from .54 to .59. The marginal contribution of this variable to Honolulu's land price is to increase it by 34 per cent; the regression predicts a land price of \$3.37 in Honolulu which is the closest of our three estimates to Honolulu's actual price.

The interpretation of this result as clear evidence of the effect of non-

resident demand on land's price is clouded by three factors. First, there may be interaction between the foreign language and population variables; the correlation coefficient is .49. Second, preferences for the holding of wealth in the form of land are apparently stronger among first and second generation families than among residents generally; in this case the estimated coefficient may reflect the demand for "brown gold" by first and second generation families rather than foreign investment demand. Third, much of the non-resident demand for land in urban areas is not foreign but domestic; in Honolulu much of the non-resident demand is by Californians. The estimated coefficient does not reflect the importance of this influence on land price.

Table 3 also displays the results of a fourth regression incorporating both the amenities and foreign investment variables. The population coefficient becomes significant again, but the amenities coefficient is not. This regression predicts a Honolulu price of \$2.51. While this is almost 50 per cent above the sample mean, it is far below the observed price of \$8.60.

The specification and measurement errors responsible for the poor predictions are difficult to correct. Proper measures of the amenities and non-resident investment demand variables will be difficult to construct. The conditions that induce local governments to restrict residential development have not been adequately investigated. Moreover, a concentration ratio is too crude of a measure to fully capture the incentive of governments to restrict development. Finally, structural modelling which accounts for relationships between the independent variables may improve the empirical specification and results.

IV. CONCLUSION

Our empirical results suggest that to explain the price of land across urban areas, it is important to consider natural and contrived supply restrictions as well as demand variables. Natural aspects of land supply have been generally ignored by the urban literature. Yet Rose's dry land supply index is significant in all 4 regression estimates and contributes more than any other variable to an explanation of an observation outside the 40-city sample, Honolulu. Public policies have artificially restricted land supply in several major urban areas. California's Coastal Zone Commission, the Minneapolis-St. Paul Metropolitan Council, and the Dade County, Florida Board of Commissioners are the most notable mainland governmental institutions with monopoly zoning power affecting large urban areas. Surely these institutions owe their existence in part to the desire of influential residents to protect environmental amenities. But as we have shown above, such institutions also be used to further restrict the supply of land to the urban market, thereby increasing land prices. While it is difficult to separate the two functions of these institutions, it is important to realize that they enact policies not just to protect the environment, but also to increase the wealth of the politically dominant voter coalition.

REFERENCES

- Coase, R.S. 1972. "Monopoly and Durability." *Journal of Law and Economics* 15 (April): 143-150.
- Cooper, G. and G. Daws. 1985. *Land and Power in Hawaii*. Honolulu: Benchmark Press.
- Downs, A. 1983. *Leasehold Tenure and Home Values in Hawaii*. Washington, D.C.: Unpublished manuscript.
- Evans, J.B. 1985. *Hotel and Travel Index* 47 (Winter 1985-86) New York: Murdoch Magazines.
- Fischel, W.A. 1980. "Zoning and the Exercise of Monopoly Power: A Reevaluation." *Journal of Urban Economics* 8 (Nov.): 283-293.
- _____. 1981. "Is Local Government Structure in Large Urbanized Areas Monopolistic or Competitive?" *National Tax Journal* 34 (March.): 95-104.
- _____. 1985. *The Economics of Zoning Law*. Baltimore: Johns Hopkins.
- Fuchs, Victor R. 1986. *The Health Economy*. Cambridge: Harvard University Press.
- Greenlees, J.S. 1982. "Sample Truncation in FHA Data: Implications for Home Purchase Indexes." *Southern Economic Journal* 48 (April): 917-931.
- Hamilton, B.W. 1978. "Zoning and the Exercise of Monopoly Power." *Journal of Urban Economics* 5 (Jan.): 116-130.
- Harris, R.N., G.S. Tolley, and C. Harrell. 1968. "The Residence Site Choice." *Review of Economics and Statistics* (May): 241-247.
- Heller, R. 1973. *The Economic and Social Impact of Foreign Investment in Hawaii*. Honolulu: University of Hawaii, Economics Research Center.
- Honolulu City Council. 1978. *Comprehensive Zoning Code*. Ch. 21. Honolulu: City Clerk.
- _____. 1981-1983. *Development Plan Ordinances*. No. 81-79, 80 and 83-6,7,8,9,10,11. Honolulu: City Clerk.
- _____. 1984, 1985. *Special Management Area Ordinances*. No. 84-4, 85-105. Honolulu: City Clerk.
- Horowitz, R.H. and J.B. Finn. 1967. *Public Land Policy in Hawaii: Major Landowners*. Report No. 3. Honolulu: Legislative Reference Bureau.

Kau, J.B. and C.F. Sirmans. 1979. "Urban Land Value Functions and the Price Elasticity of Demand for Housing." *Journal of Urban Economics* 6 (Jan): 112-21.

_____. 1981. "The Demand for Urban Residential Land." *Journal of Regional Science* 21 (Nov): 519-28.

LaCroix, S.J. and J. Roumasset. 1988. "The Evolution of Private Property in Nineteenth-Century Hawaii." Unpublished manuscript, University of Hawaii, 1988.

Maisel, S.J. 1964. "Price Movements of Building Sites in the United States--A Comparison Among Metropolitan Areas." *Papers of the Regional Science Association* 12: 47-60

Muth R. 1971. "The Derived Demand for Urban Residential land." *Urban Studies* 8 (Oct): 243-254.

Peltzman, S. 1976. "Toward a More General Theory of Regulation." *Journal of Law & Economics* 19 (Aug): 211-40.

Roback, J. 1982. "Wages, Rents, and the Quality of Life." *Journal of Political Economy* 90 (Dec): 1257-78.

Rose, L.A. 1986a. "Urban Land Supply: Natural and Contrived Restrictions." *Journal of Urban Economics* (forthcoming).

_____. 1986b. "Urban Land Supply: The Effect of Topographical Restriction on Price." Unpublished manuscript.

State of Hawaii, Dept. of Planning and Economic Development. 1970, 1983, 1985. *State Data Book*. Honolulu: Dept. of Planning and Economic Development.

State of Hawaii Legislature. 1987. *Hawaii Revised Statutes*, chs. 205, 205A, 246, 516, 519. Honolulu: Hawaii State Legislature.

Stigler, G.J. 1968. *The Organization of Industry*. Homewood, Illinois: Irwin, Inc.

_____. 1971. "The Economic Theory of Regulation." *Bell Journal of Economics* 2(Spring): 3-21.

U.S. Dept. of Commerce, Bureau of the Census. 1975. *Bureau of the Census Historical Statistics of the United States: Colonial Times to 1970*. Washington: U.S.G.P.O.

_____. 1983. *Census of Population, Characteristics of the Population, Detailed Characteristics*. Washington: U.S.G.P.O.

_____. 1983. *Census of Population, the Population, Number of Inhabitants, United States Summary*. Washington: U.S.G.P.O..

_____. 1984. *Census of Population, Metropolitan Statistical Areas Supplementary Report*. Washington: U.S.G.P.O..

_____. 1984. *Population and Land Area of Urbanized Areas for the United States and Puerto Rico: 1980 and 1970, Supplementary Report*. Washington: U.S.G.P.O..

_____. 1986. *Statistical Abstract of the United States*. Washington: U.S.G.P.O..

U.S. Dept. of Commerce, Bureau of Economic Analysis. 1984. *Local Area Personal Income, Summary 1978-83*. Washington: U.S.G.P.O..

U.S. Dept. of Commerce, International Trade Administration, Office of Trade and Investment Analysis. 1985. *Foreign Direct Investment in the United States: Completed Transactions, 1974-1983, Vol. III, State Location*. Washington: U.S.G.P.O..

U.S. Dept. of Housing and Urban Development. 1980. *FHA Homes: Data for States and Selected Areas on Characteristics of FHA Operations Under Section 203*. Washington: U.S.G.P.O..

U.S. Dept. of Labor, Bureau of Labor Statistics. 1981. *News* (April 22). Washington: B.L.S.

White, M.J. 1975. "Fiscal Zoning in Fragmented Metropolitan Areas," in *Fiscal Zoning and Land Use Controls*. (E.S. Mills and W.E. Oates, eds.) Lexington, Mass.: Heath-Lexington.

Witte, A.D. 1975. "The Determination of Interurban Residential Site Price Differentials: A Derived Demand Model with Empirical Testing." *Journal of Regional Science* 15 (Dec.): 351-364.

FOOTNOTES

1. The well-known limitations of these data on FHA-insured homes are explained in Muth (1971) and Greenlees (1982). The data have been previously analyzed by Muth (1971), Witte (1975), Roback (1982), and Rose (1986a).

2. Maisel (1964) and Witte (1975) are two seminal studies of land price variation. Both include population density in their specification, but do not provide a clear rationale for its inclusion. On this point Maisel is silent and Witte simply asserts that it is a measure of the price of raw land. In this paper we explain why urban population and urban land supply, two variables not present in Maisel and Witte, ought to be included. Of course, population is the numerator, and our land supply variable is the appropriate denominator, for the calculation of population density.

We omit three variables found by Maisel and/or Witte to be statistically significant: The price of a new home in Maisel, the size of a site in Witte, and the price of farm land in both. We omit home price as an independent variable because it includes the dependent variable, land price, and because it would be more appropriate to treat home price, along with the size of a site, as endogenous to a more complete model. We omit farm land price because there are no available comparative data on Honolulu and other urban areas. The farm land price data used by Maisel and Witte are averages for entire states and are available for mainland states only.

3. Roback's empirical results (1982, pp. 1268-75) suggest that households pay for higher amenity levels in the form of lower wages rather than higher rents.

4. Some widely used indexes lack a theoretically sound basis. A prime example is Liu (1976) whose index weights are arbitrarily assigned. Others employ estimated prices of city attributes as weights. These are obtained from hedonic wage regressions. Well-known examples are Nordhaus and Tobin (1972) and, more recently, Roback (1982). These conceptually superior indexes are not available for Honolulu and the sample of 40, and/or their composition is short on the types of amenities for which Honolulu is famous.

5. The population growth variable could also be listed as a supply variable. If demand growth is, at least in part, unanticipated, then it may take time for land supply to be prepared for residential or business development. The supply of prepared residential land sites would only partially adjust to unanticipated changes in demand during the initial period due to constraints on expansion of development activity in the short run.

6. The persistent Japanese trade surplus with the United States leading up to 1980, the year of our land price observations, is evident in these surplus figures (in millions) calculated from U.S. Dept. of Commerce, Bureau of the Census (1975, 1986): \$334 in 1965, \$1223 in 1970, \$1862 in 1975, and \$9924 in 1980. The 1965 and 1970 figures are calculated from the 1975 source, Series U317-334 and U335-352. The 1975 and 1980 figures are calculated from the 1986 source, Table 1434. We are aware, of course, that capital flows between the

countries and foreign investment in specified urban areas have numerous determinants.

7.State of Hawaii, Dept. of Planning and Economic Development (1983), Table 19.

8.State of Hawaii, Dept. of Planning and Economic Development (1983), Table 182.

9.State of Hawaii, Dept. of Planning and Economic Development (1983), Table 619.

10.Because 72% of the 1983 State real property tax valuations are in Honolulu, it is likely that a commensurate amount of the foreign investment occurred in Honolulu. To put these investment figures in perspective, the value of all real property in Honolulu, as assessed for tax purposes in 1983, was \$33.5 billion. See State of Hawaii, Dept. of Planning and Economic Development (1983), Table 239.

11.The U.S. Department of Commerce, International Trade Administration (1985) has published foreign direct investment statistics by U.S. city and foreign sources for the period 1974-1983. However, the statistics are quite incomplete, and unworthy of use for our purposes.

12.The sum of weighted acres for an urban area is:

$$A = \sum_{u=0}^{\bar{u}} s(u) e^{-gu} + c$$

where u is distance from the urban center, $\bar{u}$ is a practical summation bound of 30 miles, $s(u)$ is the number of acres, net of water, at various distances from the center, g is a population density gradient of .22, and c is a small imputed correction for land at distances greater than 30 miles from the center. The method is fully explained in Rose (1986b).

13.State of Hawaii, Dept. of Planning and Economic Development (1983), Table 38.

14.La Croix and Roumasset (1988) discuss in detail the economic and historical background of the property rights transition.

15.See Horowitz and Finn (1967), pp 3-12 and State of Hawaii, Department of Planning and Economic Development, 1986, p. 588.

16.The City of Honolulu is also the county of Honolulu. The City covers the entire island of Oahu. Thus our data include central city and suburban neighborhoods.

17.An improvement over the standard Herfindahl Index would be to calculate it using weighted land shares, where the weights are those used to derive the urban land supply. Unfortunately, our land ownership data set is inadequate for this purpose.

18.Barriers to entry in the Honolulu land market are prohibitively high, as the stock of land is fixed.

19. A restriction on land use for a period of 10 to 20 years at plausible discount rates would enable the monopolist to make initial sales at a near monopoly price. The later sales of the withheld land would still generate future capital losses, but their discounted value today would be relatively small.

20. Entry into the land market is blocked, so a land cartel does not have to worry as much about entry. However, a new owner of a cartel firm could decide to cheat if the firm had large blocks of undeveloped land.

21. It is unnecessary for the land to be completely withheld from the market. It must, however, be put to a use which does not substitute for the use to which the other land is put. If, for example, the primary demand for land comes from individuals who want land for residential use, then the withheld land could be leased or sold under the provision that it would never be used as a homesite, that it would only be used for, say, crop production. Land which can only be used to grow crops is not a good substitute for land which can be used as a homesite.

22. In Chapter 10, Fischel describes stylized jurisdictions with typical geographical, economic, and political characteristics. Then for each type of jurisdiction, he explains the government's zoning decisions. In homogeneous suburban jurisdictions homeowners have a majority of the votes, and there is very little interest group politics; the result is a tendency to excessively restrict new development. On the other hand, in heterogeneous central cities and rural areas, organized interest groups are better able to influence pro-development decisions through log-rolling and vote trading within the regulatory agencies. Finally, Fischel argues that voting and lobbying at State zoning agencies are likely to lead to restrictive decisions. Although the suburban and central city jurisdictions do not exist in Honolulu (all land is in the same jurisdiction), and although the Hawaii State Land Use Commission does not closely resemble Fischel's stylized State agency, our analysis does incorporate the political conditions and forces that determine his taxonomy.

23. It is interesting to observe that the regulatory apparatus has acquired more layers over time. With the establishment of the State Land Use Commission in 1961, the dominant political coalition was able to change the structure of land property rights by controlling a single regulatory agency. Since the regulations were put into place, however, it has served the coalition's interest to increase the cost of overturning the new arrangements, so they have created layers of obstacles to the conversion of land from rural to urban use. This has prevented cheating on the "cartel" agreement, and raised the cost to alternative coalitions working to overturn the regulations. By controlling one or more of the several critical junctures in the regulatory process, the coalition has often succeeded in blocking land use conversion.

24. It is fair to point out that the extent to which these claims characterize regulatory obstacles in Honolulu has not been carefully substantiated.

25. Fischel (1980; 1985, Ch. 10) persuasively argues that the most appropriate place to look for monopoly zoning is in monopoly suburbs, rather than in pro-development central cities. In the case of Honolulu, that distinction cannot be made since all land is in the same jurisdiction.

26. The sources and rules for counting jurisdictions are provided in Fischel (1981).

27. Hamilton's and Fischel's have tested the monopoly zoning hypothesis in housing markets. Hamilton concludes, "The evidence, though certainly not conclusive, indicates that interurban housing-price variations of as much as 50% may be due to this phenomenon." Fischel (1980, p. 292) obtains inconclusive results, yet states that "[t]he potential impact of metropolitan government land monopolies seems too great to dismiss the monopoly zoning hypothesis." If the potential is great in housing, it should be greater in land, since zoning more directly affects land markets. And if the potential appears to be great on the basis of studies conducted with mainland data, then for three reasons, the potential ought to be greater in Honolulu. First, as we previously argued, the price elasticity of demand for land ought to be lower in Honolulu, providing greater incentive to curtail supply and increase price. Second, Honolulu not only has a local government zoning monopoly -- it also has a State government zoning monopoly. Finally, it is difficult to imagine as powerful a voting coalition in mainland urban areas as there is in Honolulu, as the interests of homeowners, large landowners, the tourist industry, and the agricultural labor union are all based on the consequences of a landowners cartel.

28. See Table 4, Column 1. The t-statistics are larger in the present paper than in the prior paper due to corrections for heteroskedasticity.

29. The measures of two variables in the regression differ slightly from those in Table 1. Population change is increased by a constant (8.9) to avoid negative changes that would prevent the computation of logarithms. Dry land is measured in weighted acres, rather than an index of weighted acres. (See Rose (1986b).

30. In the case of dry land supply, $(-.754) (.470-.873)/.873 = .348$; i.e., Honolulu's relative paucity of dry land implies a price 35% above the sample mean price. The other percentages are -19% for population, 5% for income, 16% for population change, and 34% for zoning concentration.

31. The amenities variable in the regression is actually thousands of hotel rooms, rather than hotel rooms per capita. Because population is also included as a regressor, and because the regressors are entered as logarithms, the division of hotel rooms by population is redundant. The sample mean is 18,560,000 rooms, and Honolulu has 36,550,000 rooms.