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INTRODUCTION

The growth control movement is experiencing a nationwide revival. Nowhere is this revival being more keenly felt than in southern California. Angered by metropolitan gridlock, the destruction of valued open space, apparent declines in public services, and tremendous new commercial development, citizens in Orange, Riverside, and San Diego County, as well as the City of San Diego, have turned to the initiative process to regain some measure of control over the pace and type of new development. According to a study undertaken by the California Association of Realtors, there will be 13 initiatives on the ballot in California during 1988 in which local electorates are asked to sharply limit new development. Of these 13 initiatives, 12 will be in southern California.

Calls to limit growth are matched by those who caution about possible side-effects of such attempts. Because they reduce housing, commercial space, and/or land supplies in the face of high demand, growth controls, **by definition**, distort the workings of the housing, commercial space, and land markets. Not surprisingly, one usual outcome of growth controls is that buyers are asked to pay higher prices for the restricted commodity--whether it be housing, land, or (as in the case of San Francisco), office space.

The demand for space, however, tends to be much less elastic than the demand for many types of goods. Growth prohibited from one community or part of the metropolitan area, generally "spills over" into other, neighboring communities. Consider the case of a household moving from Houston to San Diego because the household's primary wage earner has either taken, or is searching for a better job. Faced with high housing prices in a preferred San Diego neighborhood--possibly the result of growth controls--the household would probably still move to San Diego, but settle instead in a somewhat less preferred (and also somewhat less expensive) neighborhood. If there are enough such households, housing prices in less-preferred neighborhoods will also begin to rise. Thus, unless the supply of space is perfectly elastic, the price effects of growth controls can "ripple out" beyond the border of growth **controlled** communities to negatively impact **uncontrolled** communities.

Policy makers considering the imposition of growth controls are faced with two fundamental questions. First, to what extent will growth controls actually accomplish their desired ends--the amelioration of traffic congestion, the preservation of open space, or the maintenance of a specific quality of life? Second, if growth controls do in fact produce tangible benefits, what are their implicit costs--in the form of administration costs, distorted markets, and higher housing and land prices.

Ex ante answers to these questions are difficult to come by. Most studies of the costs of growth controls are undertaken **ex post**. That is, the costs of growth controls are usually evaluated several years after their imposition. Moreover, as noted below, the magnitude of potential spillover effects are rarely considered.

This paper summarizes the development of a series of empirical models of the San Diego housing market which were used to: (1) evaluate the housing price effects of a recent but temporary growth limitation initiative--the Interim Development Ordinance; and, 2) to estimate the short-term price effects of alternative follow-up policies. Before presenting the results of the empirical models, we carefully review past studies of the effects of land use controls on housing price to identify (and thus avoid) potential sources of modeling and estimation bias. Next, we offer a brief history of the growth debate in San Diego, and review the types of housing and land use control policies now being proposed--the effects of which the models must simulate. Because one of the purposes of this research is to consider the magnitude of possible spillover effects of growth controls between controlled and uncontrolled communities (or housing submarkets), we next define a set of housing submarkets in San Diego County.

The empirical results are discussed in a number of important contexts. First, the effect of the functional form on model reliability is assessed. Next, the nature of the relationship between new home supply and housing prices--an issue at the heart of any evaluation of possible building permit limitations--is investigated. Third, the magnitude of the spillover effects of the Interim Development Ordinance is estimated.

REVIEW OF PREVIOUS STUDIES

By now it is widely accepted that restrictive growth control programs push up housing and land prices(Lillydahl and Singell, 1987). Econometric studies by Gleeson (1979), Elliott (1981), Schwartz, Hansen, and Green (1981), Dowall and Landis (1982), Rosen and Katz (1986), Wolch and Gabriel (1981), and Schwartz, Hanson, Green, Moss, and Belzer (1979), and detailed case studies by Dowall (1984), Landis (1986), and Gruen and Gruen (1979) leave no doubt that restrictive land use regulations and residential growth controls can substantially increase the prices of new and existing housing. Separate studies by Nelson (1986), and Black and Hoben (1982) have traced the effects of land use controls on residential land prices. But while there is general agreement that local growth controls increase housing prices, there is considerably less agreement on the magnitude of such increases (Table 1).

Some of these difference stem from the fact that the various empirical studies consider different markets during different periods. Housing market conditions vary widely between areas, as does the ability of surrounding areas to absorb growth displaced from growth-controlled communities. Factors such as interest rates and mortgage qualifying standards, **which vary over time** also determine how local growth controls will affect housing prices. Because of these contextual differences, it is not surprising that different studies have produced different estimates of the housing price effects of local growth controls.

And yet, differing contexts are not the only source of disagreement. At least some of the differences in estimates of the price effects of land use controls can be attributed to the use of different, incomplete, and possibly biased research methodologies and policy indicators. Five types of research design and estimation issues can introduce bias:

Biased Research Methodology: As pointed out by Schwartz, Zorn, and Han (1986), one of the primary problems with many past growth control studies is that they are based on potentially biased research designs. Study designs which rely solely on comparisons of housing prices between controlled and uncontrolled communities, **after the imposition of controls** ("post-test" study designs, to use Schwartz, Zorn, and Han's terms) can not be assured of properly controlling for all inter-community differences. In such cases, price differences between communities that exist before the imposition of growth controls may be mistakenly attributed to the growth controls themselves. Schwartz, Zorn, and Han term this approach the **cross-sectional** approach, as the time series dimension is largely ignored.

A second design ("pretest-postest") focuses on before and after comparisons of the housing market within a single growth controlled community **without benefit of control community in which growth controls have not been applied.** This second methodology is also prone to problems of bias as it can not necessarily distinguish between housing price changes attributable to growth controls, and those attributable to other time-related factors such as interest rates. Schwartz, Zorn, and Han term this approach the **time-series** approach as cross-sectional comparisons are largely ignored.

A third research design combines the cross-sectional and time-series approaches by making comparisons of housing prices before and after the imposition of growth controls, between both controlled and uncontrolled communities. Schwartz, Zorn and Han see this hybrid approach as perhaps the best, but warn that it too is not free from potential bias.

Interdependence: Related to the issue of research design and data is the question of housing market interdependence. Because housing prices tend to be **interdependent** between neighboring markets (i.e., the cross-elasticity of demand between submarkets is not zero), it is very likely that restrictive growth controls, imposed in one community or submarket, will induce housing price effects in surrounding communities. Thus simple comparisons between growth controlled communities and adjacent uncontrolled communities may not be bias free. Clearly, the greater the restriction, and the larger the volume of spillover demand, the greater such external price effects are likely to be. To not include such spillover effects may be to understate the price effects of growth controls.

While interdependence is easy to understand in theory, it is difficult to isolate empirically. To do so requires, first, accurate definitions of comparable submarkets, and second, detailed information on all the housing market characteristics which both **distinguish** the various submarkets, and the characteristics which make them only partial substitutes.

Review of Previous Studies

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Table 1: Summary of Selected Growth Control Studies

Authors	Estimated Price Effect	Area & Year Studied	Data Type	Research Design	Growth Control Measures	Functional Form
Katz & Rosen (1981,1987)	17-38%	San Francisco Bay Area 1979	Individual Home Sales (N=1673)	CS	Single Dummy Variable	Log-linear
Schwartz, Zorn & Hanson (1986)	0-$5,854*	Davis California 1970-1979	New Home Sales (N=3388)	CS,TS, CSTS	Single Dummy Variable	Linear
Schwartz, Hanson & Green (1981)	13.3-24.3%	Petaluma California 1969-1977	Individual Home Sales (N=1829)	CSTS	Multiple Dummy Variables	Linear
Elliott (1981)	20-35%	San Francisco Bay Area 1969-76	Community Average Home Prices	CSTS	Ordinal measures indicating severity of controls	
Nelson (1986)		Salem, OR 1977-79	Raw Land Sales (N=209)	CS	Dummy variables for specific	Linear
Dowall & Landis (1982)	6-10%	97 San Francisco Bay Area cities 1977-79	Community Average Home Prices (N=97)	CSTS	Land & housing supplies, fees, densities	Logarithmic
Gabriel & Wolch (1980)	14%	49 San Francisco Bay Area cities 1976	Community Average Home Prices (N=49)	CS	Fees, growth control attitudes, large lot zoning	Linear

Sources: See text

Notes:
CS: Cross-sectional comparisons
TS: Time-series comparisons
CSTS: Cross-sectional and time series comparisons
* results depend on model specified

Ecological Fallacy: Studies which compare community-wide measures, such as median home price, between controlled and uncontrolled communities (Landis and Dowall, 1982; Wolch and Gabriel, 1981), can not be interpreted in the same way as studies which compare individual housing transactions between controlled and uncontrolled communities. In the former case, regression techniques can be used to determine whether there are statistically significant differences between (properly measured) home prices in controlled or uncontrolled communities, but not the magnitude of such differences. Precise estimates of the costs of growth controls requires the use of disaggregate data on housing transactions or appraisals[1].

Inappropriate Measurement of Policy/Market Variables: Communities undertake a wide variety of growth management and control programs which affect the price and quality of development. These policies range from detailed subdivision controls, to programs which affect the amount of land which may be developed in a particular use (traditional zoning and annexation policies); from policies which affect the intensity of development on a site (zoning and subdivision controls), to policies which require developers to pay fees for specific on- and off-site public services; from programs which require developers to provide funding for specific improvements which are only loosely related to a project (exactions), to policies which restrict the amount and rate of new construction (growth controls).

Moreover, as Dowall (1984) has pointed out, in determining the market and price effects of growth management programs, **the manner in which policies are carried out** is often as significant as what is carried out. For example, two communities with similar growth management regimes may take vastly different paths and time periods to approve specific development proposals. Moreover, as the administration of a growth management system inevitably involves high degrees of discretion, there may be wide variations in outcomes, even between communities with essentially similar growth control frameworks.

The problem with many prior growth control studies is that they fail to recognize the importance of these subtleties, either in policy design or implementation, as they determine the response of the local market to growth controls. Rather, lacking reliable or consistent measures of such subtleties, many econometric studies substitute uni-dimensional measures such as dummy variables (signifying controls, or lack thereof), ordinal scales (signifying the severity of controls), or density measures (signifying, it is presumed, the excessive control of densities in growth controlled communities) as partial proxies for more detailed description of local growth management regimes. While such simplifications are not incorrect--indeed they are probably essential given the lack of good quality data and the variety of implementation approaches--they can lead to biased estimates of the price effects of growth controls policies.

Incomplete/Biased Specification: When evaluating econometric models of public policy, **what is left out of the model specifications can be as important as what is put in.** Excluding variables (either purposefully or because of a lack of data) which may add little to the overall fit of a particular model, but which nonetheless, may be correlated with other variables already **in** the model, can result is biased and inaccurate estimates of the **included variables.** Moreover, relationships which are statistically significant at one level of aggregation may not be at another. Particularly when using reduced-form models (such as hedonic housing prices) which involve "soft variables" (that is to say, unobserved), it is important to test different forms and representations of key policy variables.

Use of an inappropriate functional form for the hedonic price model can also introduce estimating bias. Regression models of the price effects of land use controls have been specified using linear forms, log-linear forms, log-log form, and assorted non-linear forms; rarely are the estimation results from one model form compared with the results of other functional forms.

Finally, recent theoretical research into housing markets (Rosen, 1974; Witte, Sumka, and Erekson, 1979) suggests that reduced-form hedonic equations, although convenient, may produce biased results when markets are segmented. To produce unbiased estimates, it is argued, a two-stage approach is necessary. First, a non-linear reduced-form equation incorporating only the physical and locational characteristics of each unitshould be estimated for each submarket. From this first stage, the marginal prices of the various characteristics should be calculated, and, in the second stage, simultaneously compared with market supply and demand factors. None of the studies yet undertaken have employed this two-stage method of evaluating the housing price effects of growth controls.

As Table 1 indicates, most of the studies of the housing price effects of growth controls undertaken thus far (including studies by the authors) suffer from one or more of these problems of bias. Thus, precise estimates of the price effects of land use controls remain to be made.

The models results which are presented below avoid some of these pitfalls, but not others. The observations are actual home transactions, and not areawide averages or medians. The research design includes both time-series and cross-sectional comparisons. Different forms and levels of aggregation of key market variables are tested. And great efforts have been made to capture or construct accurate and relaiable policy variables.

THE SAN DIEGO CONTEXT

The growth of the city of San Diego, and its surrounding communities, has been almost continuous since the end of the Second World War. The population of the city grew from 334,400 in 1950, to 876,000 in 1980. According to the San Diego Association of Governments (SANDAG), the population of the city stood at 1,031,800 as of June 1987 (Table 2).

Growth, and growth-related issues have been much on the mind of San Diegans since the late 1960s (Stepner, 1986). Throughout the early 1970s, new residential development occurred both at the suburban fringe, in newly incorporated communities such as Rancho Bernardo, and within the city of San Diego itself. During this time, San Diego's official position was to accomodate the new development generated by its expanding economy; unofficially, the city welcomed growth.

But public sentiments were changing. In his state of the city message, offered in January 1973, newly-elected Mayor Pete Wilson summarized his frustration over the continuation of unabated growth, and suggested a new policy direction:

> "What will be the shape of San Diego tommorrow? This one question raises a host of others. {For instance,} the exciting and challenging requirement that we revise and update our general plan...
>
> But also involved will be the continuing necessity oto seek, in the courts and legislature, the clear authority and tools needed to permit the city, rather than the developer, to determine the time and location of new development." (Stepner, 1986)

Finally, in 1980, after seven years of ad hoc project moratoria, consultant studies, "town meetings" to present views, and interim ordinances, the San Diego City Council adopted a new general plan explicity aimed at planning for the future growth of the city. The plan divided the

Table 2: Comparisons of Population, Housing, and Employment Growth for San Diego, San Diego County, California, and the U.S: 1970-87

	Year			Avg. Annualized %Change	
	1970	1980	1987	1970-80	1980-87
Population (000)					
City of San Diego	697.1	876.0	1,031.8 (est)	3.3%	2.7%
San Diego County	1,357.8	1,861.8	2,240.7 (est)	4.6%	2.4%
California	19,971.0	23,688.0	27,191.4 (est)	2.5%	2.0%
United States	203,302.0	226,545.8	243,815.1 (est)	1.6%	1.1%
Housing Units (000)					
City of San Diego	240.9	341.6	718.2 (est)	5.1%	2.4%
San Diego County	450.5	717.9	856.7 (est)	6.9%	2.6%
California	6,976.2	9,220.4	10,411.0 (est)	4.1%	1.8%
United States	68,672.0	88,411.0	100,308.5 (est)	3.7%	1.8%
Employment (000)					
City of San Diego	228.1	358.5	573.8 (est)	6.7%	7.0%
San Diego County	430.5	722.5	1,011.0 (est)	7.7%	4.9%
California	7,486.6	10,640.4	12,769.5 (est)	5.2%	2.6%
United States	78,678.0	99,303.0	112,434.1 (est)	3.4%	1.8%

Sources: 1987 STATISTICAL ABSTRACT OF THE UNITED STATES, U.S. Bureau of the Census
CITY AND COUNTY DATABOOK (1983, 1978), U.S. Bureau of the Census
Population and Housing Estimates for California Cities, California Dept. of Finance

city into four distinct areas:

1. Urbanized Communities: older sections of the city, built before 1965, in which conservation and rehabilitation were to be the primary development goals, and where infaill would be discouraged through the absence of impat fees.

2. Planned Urbanizing Communities: areas where development had begun but not yet reahed the buildout point. Extention of public infrastructure in these areas was to occur in a planned, and orderly fashion, consistent with project aaprovals; most new insfrastructure was to either to be provided by developers, or financed by impact fees on new development.

3. Future Urbanizing Communities: Land currently vacant, to be held as an "urban reserve" for future growth.

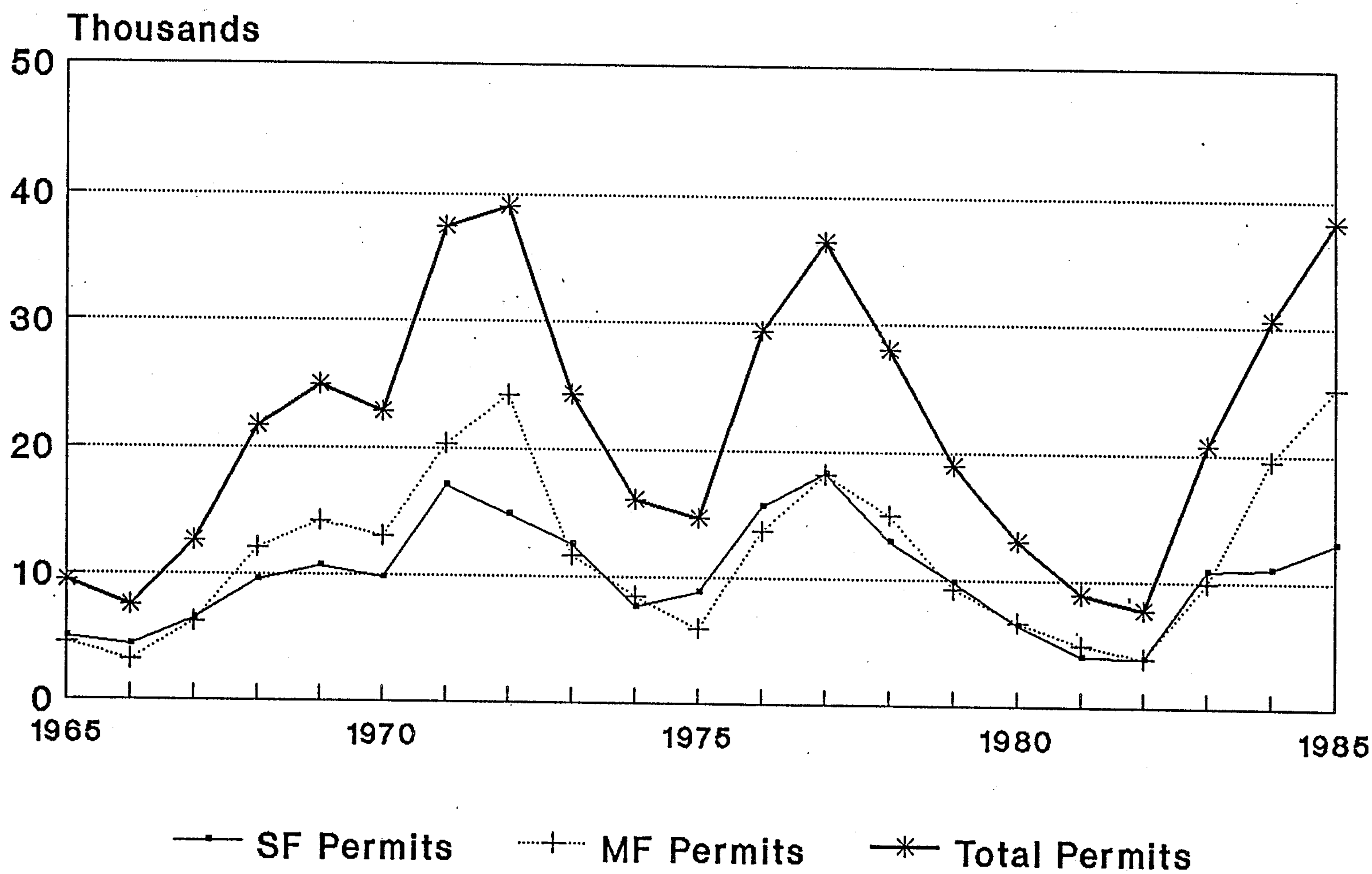
4. Open space: canyons, hillsides, and mesas, to be exempt from development.

High interest rates and recession during 1981 and 1982 provided San Diego with temporary relief from runaway growth and its problems (Figure 1). Growth problems flared again in 1983--as interest rates began declining--but with a new wrinkle. New development had been projected to occur primarily in the Planned Urbanizing Communities, where, it was assumed, developers would provide needed infrastructure. In fact, the majority of new population growth was occuring in the Urbanized Communities, and often on a piecemeal basis. Not surprisingly, such development patterns placed new burdens on the provision and funding of key public service and infrastructure.

In January 1984, Mayor Hedgecock set up a "blue ribbon" growth management review task force to determine how well the City's general plan was working. The task force concluded that the plan was working reasonably well, but that some additional safeguards were necessary to protect environmentally sensitive lands, and that closer monitoring of the plan was essential.

But other events were rendering such sentiments moot. Encouraged by falling interest rates, housing starts rose throughout the region, not just in the city. As the region's population increased, traffic congestion--particularly along key suburban links--became a major problem. Supplies of developable land within the Planned Urbanizing communties declined, and pressure mounted for the partial opening of the hitherto undeveloped Future Urbanizing Commmunities. Reacting to such changes, and perhaps more significantly to the **perception** that growth forces were once again out of control, a citizen-sponsored intiative was drawn up that would mandate citizen approval for all new development in the Future Urbanizing areas. The initiative passed overwhelmingly.

FIGURE 1: San Diego County Single-Family and Multi-Family Building Permits: 1965-1985



Still, the pace of new development accelerated. In April 1987, an Interim Development Ordinance (IDO) was introduced to limit new residential building permits to 8,000 permits annually for an 18 month period. The purpose of the IDO was to provide an 18 month "cooling-off" period during which the City could adopt a long-term growth management strategy and general plan element. The IDO measure was not formally adopted until June 1987, but until its approval, expectations were that it would be applies retroactively to April. In fact, units approved prior to June 1987 were exempt.

In the 18 months following the adoption of the IDO, several different growth management proposals would emerge. Some called for tight caps on new residential construction, perhaps as low as 4,000 units per year. Others called for tighter restrictions on the development of environmentally sensitive lands.

In June 1988, the City Council voted to place a new Growth Management General Plan element before the voters on the November 1988 ballot. The city's proposals would limit new residential construction to 7,950 units per year, for a maximum of 37,948 units for the five year period between 1989 and 1994. No specific framework for allocating permits within the city is proposed, although rates of new construction must be consistent with previously approved community area plans.

<u>The San Diego Land and Housing Markets - A Closer Look</u>

San Diego County includes 18 incorporated municipalities, the largest of which, San Diego is home to roughly 46 percent of the population of the County. Because of the County's isolation (it is separated from Orange County by Camp Pendleton), there is relatively little cross-commuting between San Diego County and other parts of Southern California. **This means that the San Diego housing, land, and labor markets are relatively distinct and autonomous.**

Taken together, these two circumstances--the city's large size relative to the county, and the county's isolation from the rest of Southern California--have important implications for the adoption of growth management and control measures by the City. First, given the size and importance of the city, any unilateral measure undertaken by the city which would substantially limit the supply of housing or residentially-developable land will have major county-wide housing price effects. Second, these housing price effects could be exacerbated by the County's relative isolation; as excess or unsatisfied housing demand could not easily "spill-over" into neighboring counties.

Should the City of San Diego adopt stringent residential growth controls, the ultimate effects of those controls would depend in part on how surrounding communities within San Diego County react. If, for example, neighboring municipalities were to loosen their own growth policies in order to accommodate the housing demand displaced from the City of San Diego, then the price effects of restrictive policies pursued by the city would tend to be confined to the city itself. We believe such a course of action to be politically unlikely.

On the other hand, if San Diego's neighbors, fearful of being forced to accommodate spillover housing displaced from the city were to react in a retaliatory manner, and implement their own residential growth controls, then the housing price effects of growth controls would be large and county-wide. A middle-ground, and the case analyzed herein, is to assume that surrounding communities would neither accommodate San Diego's spillover demand, nor retaliate with their own restrictive growth controls. Rather, they would agree to "take" what would have been their respective growth shares **as if San Diego had not acted to limit its growth share.** The implication of this view is that any increment of housing demand above San Diego's housing growth cap would simply not get built, either in the city or county. Under such a scenario, the price effects of San Diego's building permit caps would likely be felt countywide, but with differing magnitudes depending on location and submarket.

For planning purposes, San Diego County is commonly divided into 92 Community Planning Areas, or CPAs (SANDAG, 1986). The distribution of CPAs is as follows: 54 are located within in the City of San Diego, 17 are co-terminous with other incorporated municipalities, and 21 are in unincorporated areas of San Diego County. Yearly building permit data is available on a CPA basis; information on vacant, developable, and developed land supply (in acres) is available on a CPA basis for the years 1980 and 1986.

For the purposes of this analysis, the 92 CPAs were further aggregated into 10 "superdistricts," reflecting a priori assumptions about the workings of the San Diego housing market. Seven of these superdistricts (I-5 Corridor, I-15 Corridor, Northeast Central, Southeast Central, Southwest Central, Northwest Central, and South Bay) are in the City of San Diego, and the remaining three are amalgamation of smaller cities and unincorporated areas of San Diego County. The locations of the various superdistricts are shown in Figure 2; Appendix A lists which CPAs fall in which superdistricts.

MODEL SPECIFICATIONS AND RESULTS

This section uses hedonic price models to explore the relationships between single-family detached home prices in San Diego, and measures of land and housing supplies during the 1980-87 period. Given the proper interpretation, some of the results can be used to estimate how the San Diego area housing market would respond to the types of building permit caps and land supply resitriction now being considered in San Diego. Four issues are considered in this section:.

1) How sensitive are San Diego home prices to the supply of new homes, supplies of developable land, and policy intiatives such as the Interim Development Ordiance?

2) How do estimates of the price effects of local land use controls differ according to the functional form of the (estimating) hedonic housing price model?

3) How do estimates of the price effects of local land use controls differ according to how the supply variable is modeled? Are supply effects market-wide, or do they vary by submarket?

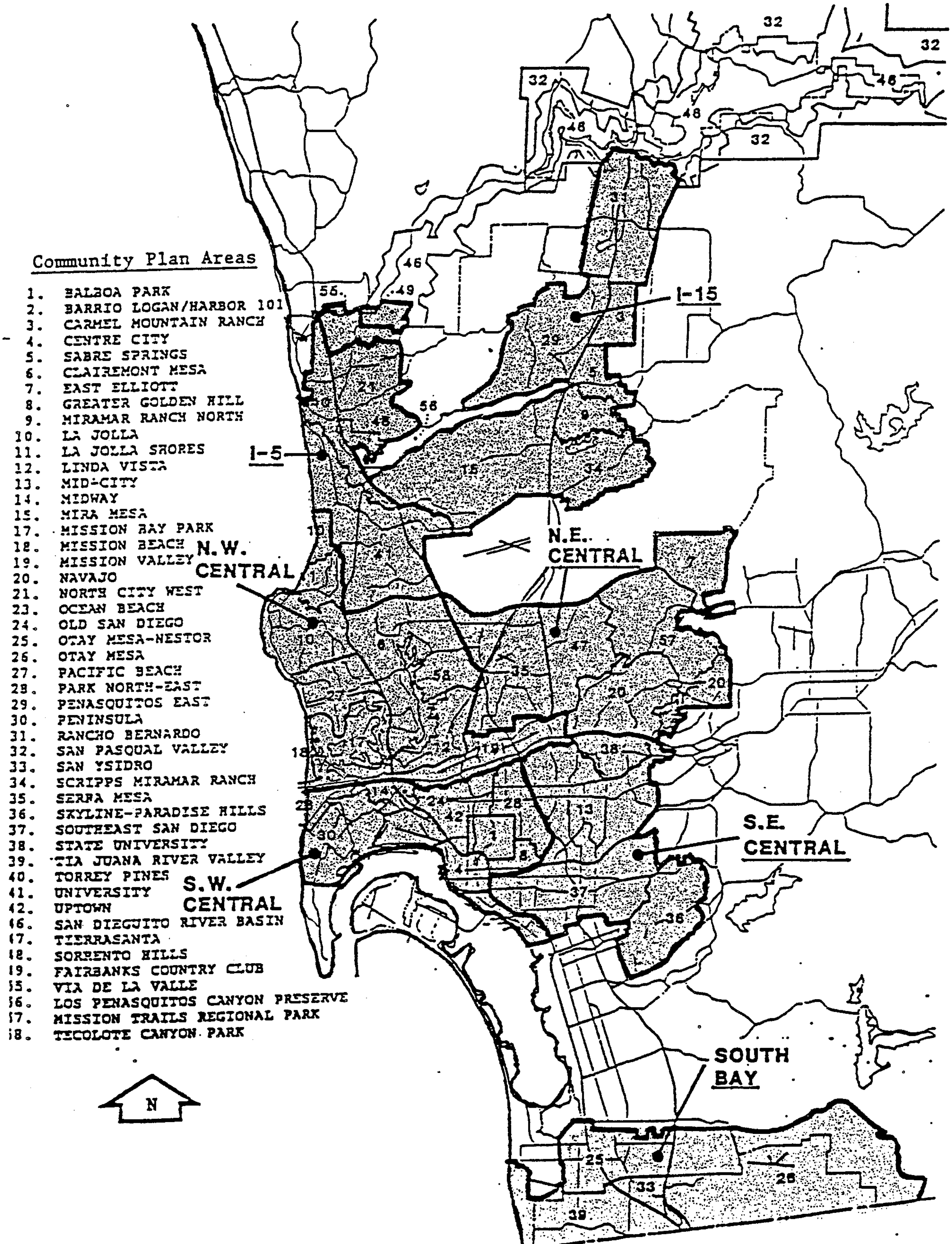
4) How has the Interim Development Ordiance affected the price of housing outside the city of San Diego?

We have used hedonic price models both to to estimate the **current** housing price effects of San Diego's Interim Development ordinance and to make inferences about the **potential** price effects of future residential building permit caps or land supply restrictions. The general form of the hedonic price model is:

Deflated Housing Sales Price =

f{Home Characteristics, Home Location, Area Income, Land and Housing Supply Measures, IDO Dummy Variable}

Figure 2: San Diego Superdistricts and Community Plan Areas



Explanation of Key Variables

The sample upon which the hedonic price equation(s) were estimated consists of 3,800 single-family homes sold over an eight year period, between January 1980 and December 1987. Information on home sales price and selected characteristics were drawn from the DAMAR Corporation's Real Estate Information System, and represent actual sales.

The sample was not drawn randomly. Rather a sufficient number of observations were drawn from each Community Plan Area, by year, to insure some degree of statistical robustness. New single-family homes were not sampled separately from existing single-family homes. To compare home prices across the sample period, listed sales prices were subsequently adjusted using the housing component of the U.S. Consumer Price Index. This deflator accounts for seasonal price variations as well as year to year inflation. Mean housing prices by year and submarket (superdistrict) are shown in Appendix C.

Housing Characteristics: The many measures describing the characteristics of San Diego's single-family housing stock were reduced to four key characteristics by considering both cross-sectional and time-series correlations. These four key characteristics include: **Square Footage**-the size of the home in square feet of living area; **Age**-the age of the home in years (new home were coded as zero); **Baths**-the number of bathrooms in the home (half baths were coded as half-baths); and **View**-a 0/1 dummy variable indicating whether or not the home had a panoramic view. Taken together, these four characteristics explain more than 50 percent of the variation in (deflated) single-family housing prices between 1980 and 1987. These four key measures are summarized by submarket (superdistrict) and year in Appendix C.

Location and Submarket: Just as housing prices vary by location **or submarket**, so too do the relationships between housing characteristics, market conditions, and housing prices. Within the framework of the general hedonic model these variations can be accounted for in two ways. First, key submarkets can be identified **a priori**, then separate hedonic equations can be estimated for each submarket, and the resulting coefficients can then be compared. A second approach, and the one taken herein, is to estimate a single hedonic equation for the entire sample, and to interpret the coefficients associated with separate submarket or locational dummy variables as the total price premium (or discount) associated with that location. In the models which follow, nine separate dummy variables were developed to indicate in which superdistrict a specific home sale was located; a tenth dummy variable, indicated whether a home was located in San Diego's South Bay superdistrict was purposefully omitted in order to guarantee a unique solution.

Access to the workplace has long been considered a key determinant of housing prices (Kain, 1962, Muth, 1969). Because San Diego is not a monocentric city (there are numerous major workplaces throughout the metropolitan area), it was necessary to develop a non-monocentric measure of workplace access. This was done by measuring the freeway distance from each Community Plan Area to the nearest two CPAs which are major employment centers. A single distance index was then developed using employment weighted average freeway distances as follows:

Workplace Distance Index =

{[(Distance from home CPA to nearest major employment CPA * Employment in that CPA) + (Distance from home CPA to next nearest major employment CPA * Employment in that CPA)]/(Employment in nearest two major employment CPAs)}

The calculated workplace distance index varied from a minimum of 1.6 miles to a maximum of 34 miles. The average distance index for all observatoins was 9.6 miles.

As indicated by the importance of the view variable above, coastal locations fetch a premium in the San Diego housing market. According to local realtors, this is true whether or not the house actually has view of the ocean! To capture the locational dimension of coastal access, (and determine whether or not coastal location is really statistically different than an individual home having a view) an additional dummy variable, **Coastal CPA,** was developed for houses located in CPAs which abut the Pacific Ocean.

Income: The argument for including a measure of household income in a hedonic price equation rests on three considerations. First, income can be an important stratifying, or submarket variable. Income levels determine mortgage qualifying standards, which, in turn determine which households can **bid for** and purchase which homes. Thus, we would expect income to be a consideration in the bid prices of houses and characteristics. Put another way, the hedonic price estimates for housing characteristics and locations (above), may differ according to household income levels. Second, prior research has demonstrated that many households have a preference for living in close proximity to others of the same socio-economic class. To the extent that households are willing to pay a premium for such preferences, such behavior is probably income-related. Third, in markets where growth controls restrict housing and land supplies, the price response may also be income related, with housing prices rising more in higher-income areas than in lower income areas. **1980 Median Family Income,** the variable used to capture the income dimension, is the 1980 median household income by Community Plan Area.

<u>Land and Housing Supply and Policy Variables:</u> Economic theory indicates that real housing prices should reflect current supplies of housing, as well as the supply of developable land available for future housing construction. All else being equal, the greater the supply of comparable housing available in the market at any one time, the lower housing prices should be. Likewise, because the demand for residentially developable land is **derived** from the demand for housing, housing prices should be lower in markets with greater supplies of residentially developable land, and higher in markets in which such supplies are physically limited, or are limited by public policy.

Three different types of measures were used to capture current land and housing market conditions. The first is a dummy variable, **IDO-Interim Development Ordinance,** indicating those houses which are located within the City of San Diego, and which sold after April 1987, the point at which the Interim Development Ordinance (IDO) was formally adopted. Because the calculation of this dummy variable dates from the point of the adoption of the IDO (April 1987) and not its formal implementation (June 1987), it includes the anticipated as well as actual effect of the IDO[2].

The second policy variable, **Lagged Single-Family Completions,** is the number of single-family housing units completed in each superdistrict during the previous year. Completions are lagged one year because we presume there to be a lag between when market conditions arise and the making of pricing decisions. From a forecasting perspective, this variable is perhaps the single most important variable in the model--as any residential permit cap pursued by the City of San

Diego would directly affect it. This data was obtained from SANDAG and is based on actual completions, as measured through the issuance of occupancy permits. As a measure of housing supply, we would expect that the lagged single-family completions variable should be negatively correlated with housing prices [3],[4].

The third policy variable, **Lagged Developable Land Ratio** is the ratio of single-family developable land (in acres) to land acreage already developed and in single-family use. Using data provided by SANDAG, this variable was calculated for each CPA on a yearly basis, and is entered into the model with a one year lag. All else being equal, we would expect this ratio to be negatively correlated with single-family housing prices. The larger this ratio, the more land remains available in a particular CPA for additional housing development. Assuming that land markets are competitive, high values for this variable should, all else being equal, reduce new home prices. The smaller this ratio, the less land available for residential development, hence the higher the eventual price of housing. The land supply variable is expressed as a ratio to reflect the wide variation in developed and developable land acreage by CPA. Mean values of the policy variables are listed by year and superdistrict in Appendix C.

Sale Year Dummy Variables: As noted above, housing prices are adjusted for season and year, according to a the U.S. CPI housing price deflator. To capture additional year-to-year variations in housing prices occurring in the San Diego market, but not throughout the nation, dummy variables were calculated for each sale year (1981 was omitted to guarantee a unique solution). Positive coefficient can be interpreted as indicating that the U.S. deflator underestimates San Diego housing prices, while negative coefficients would indicate that the national deflator overestimates San Diego housing prices.

All the variables and measures included in the model specifications are summarized in Table 3.

Testing the Baseline Model: Functional Form

The question of which functional form of the hedonic price model is theoretically most appropriate is still being debated (Halvorsen and Pollakowski, 1980)[5]. Lacking a theoretical determination, the choice of functional form is usually made on the presumed nature of the relationships between the variables {e.g., linear, multiplicative, etc.}, and on the empirical basis of which form best fits the data. Table 4 presents the results of the baseline model using the three most common functional forms: linear, multiplicative (transformed by logarithms), and exponential (transformed by natural logarithms).

Overall, the choice of functional form does not greatly affect the overall fit or the reliability of most of the coefficient estimates. The exponential model form, with an r-squared of .69, fits the observed data slightly better than the log-linear model (r-squared = .67) or the simple linear model (r-squared =.66). Moreover, with a few exceptions--discussed below--the pattern of standard errors and coefficient significance is generally similar across the three functional forms.

Results of the Linear Model: Although the linear model is slightly inferior to the multiplicative or exponential model in its ability to fit the data, its coefficient estimates are easiest to interpret. Evaluated at the sample mean, each additional square footage of living space adds $63 to the price of a San Diego home, while each additional bathroom adds $5,790. Housing unit age is also positively correlated with price in the San Diego market, as each additional year of age adds $420 to the price of a typical home. And San Diego homes with a view of the ocean sell at a $15,980 premium when compared with homes lacking a view. Not surprisingly, there is a very strong relationship between income and housing prices. All else being equal, single-family homes in CPAS in which the 1980 median family income was $1,000 higher than the sample mean of $19,519, sold for $4,000 more than the typical home.

Table 4 also indicates that there are significant price-based submarkets within the larger San Diego housing market. At the most expensive extreme, single-family homes in the North County Superdistrict commanded a $61,000 premium when compared to homes in the (baseline) South Bay Superdistrict. In fact, homes in eight of San Diego's nine superdistricts sold at significant premiums when compared with the (baseline) South Bay Superdistrict; only in the Northeast Central area did homes not sell at a premium. All else being equal, homes in coastal CPAs sold for $31,000 more than homes in inland areas.

Consistent with economic theory, the farther a home is from a major employment center, the lower its price. Judging from the results of the linear model, home prices fell by $1,316 for every

Table 4: Hedonic Price Estimates of the Costs of Housing and Land Use Controls in San Diego: 1981-87
(Comparing Different Functional Forms of the Basic Model)

VARIABLES IN THE EQUATION	Type	LINEAR FORM		MULTIPLICATIVE (Log-Log)		EXPONENTIAL (Log-lin	
		Coefficient	t-stat	Coefficient	t-stat	Coefficient	t-stat
HOME CHARACTERISTICS							
Square Footage		0.063	36.89	0.611	34.16	0.00004	35.64
Age		0.420	7.09	-0.0045	-2.12	0.002	4.69
Baths		5.790	3.72	0.0405	2.40	0.062	6.31
View	(0/1)	15.980	8.86	0.0556	10.79	0.105	9.17
INCOME MEASURE							
1980 Median Family Income		0.004	17.97	0.373	15.15	0.000002	17.50
LOCATIONAL VARIABLES							
I-15 Corridor Superdistrict	(0/1)	40.698	4.87	0.082	4.40	0.253	4.76
I-5 Corridor Superdistrict	(0/1)	19.299	4.46	0.064	4.54	0.197	7.17
NE Central Superdistrict	(0/1)	-4.660	-1.18	0.041	3.30	0.057	2.27
SE Central Superdistrict	(0/1)	14.088	3.67	0.053	4.21	0.101	4.15
SW Central Superdistrict	(0/1)	33.528	7.86	0.178	14.62	0.326	12.01
NW Central Superdistrict	(0/1)	14.218	3.67	0.107	8.75	0.206	8.35
South Bay Superdistrict	(0/1)	Omitted		Omitted		Omitted	
North County Superdistrict	(0/1)	61.239	10.44	0.05	3.22	0.358	9.60
East County Superdistrict	(0/1)	14.534	3.80	0.029	2.25	0.122	5.00
South County Superdistrict	(0/1)	20.684	4.79	0.055	3.81	0.167	6.07
Coastal CPA	(0/1)	31.333	16.23	0.077	13.59	0.176	14.35
Distance Index		-1.316	-8.65	-0.025	-2.28	-0.005	-5.14
YEAR DUMMY VARIABLES							
1982	(0/1)	-7.347	-2.07	-0.027	-2.68	-0.062	-0.50
1983	(0/1)	-10.424	-3.86	-0.029	-3.68	-0.078	-2.63
1984	(0/1)	-10.546	-4.02	-0.03	-3.84	-0.079	-3.84
1985	(0/1)	-6.022	-2.24	-0.018	-2.43	-0.044	-4.53
1986	(0/1)	-1.562	-0.06	0.000056	0.08	0.008	-2.96
1987	(0/1)	-19.590	-0.66	0.007	0.84	0.010	0.45
LAND AND HOUSING SUPPLY							
Lagged SF Completions-Superdistrict		-0.005	-4.04	0.0065	0.78	-0.000003	-4.02
Lagged Developable Land Ratio		-19.886	-11.79	-0.003	-1.60	-0.101	-9.40
Interim Development Ord.	(0/1)	5.149	1.81	0.0212	2.60	0.034	1.90
CONSTANT		-54.006	-9.56	-1.518	-13.92	3.548	98.695
R-squared		0.66		0.67		0.69	
Standard Error		31.43		0.09		0.20	
F:		236.70		236.90		264.19	
F-significance		0		0.000		0	
Observations (N)		2966		2962		2966	

additional mile a homebuyer had to travel to work (above the sample mean of 9.6 miles).

Also consistent with economic theory is the negative relationship between housing prices and the supply of new housing completed in the previous year. For every additional new home built within a San Diego County superdistrict between 1981 and 1987, the average price of new and existing single-family homes in that superdistrict declined by $5.00. While the supply effect may not seem like very much on a per unit basis, averaged across an entire superdistrict, it is quite significant. All else being equal, the price of a typical San Diego single-family home fell $2,000 between 1985 and 1986, simply by virtue of the greater new home supply available in the latter year. Clearly, policies which limit the supply of new housing in San Diego County, whether pursued countywide, or by individual municipalities, will significantly increase the price of housing throughout San Diego.

Developable land supplies are also significantly related to San Diego housing prices. All else being equal, given a 20 percent increase in the 1987 **lagged developable land ratio**, housing prices would decline by approximately $4,500.

In contrast to the housing and land supply variables, the dummy variable indicating whether a home had sold after the imposition of the Interim Development Ordinance (IDO) is only marginally significant. All else being equal, homes in the City of San Diego which sold after April 1987 were $5,149 more expensive than homes which sold before April, or homes which sold outside the City of San Diego. However, as indicated by the t-statistic, the estimating error around this estimate is quite large. The price effects of the IDO are discussed in greater detail below.

<u>Results of the Multiplicative (Logarithmic) and Exponential Models:</u> While the overall fit of the multiplicative model is similar to that of the linear model, there are some significant variations in the pattern of coefficient values and significance. This is most evident in the case of the land and housing supply variables. Whereas the coefficients of both the **single-family completions** variable and the **lagged developable land ratio** are of the expected sign and strongly significant in the linear model, neither coefficients is statistically significant in the linear model. By contrast, the coefficient of the **Interim Development Ordinance** dummy variable is strongly significant in the multiplicative model, but only marginally significant in linear model. We strongly suspect that

these differences result solely from the logarithmic transformations used to linearize the multiplicative model. For example, whereas the values of all the other interval variables (e.g., square footage, 1980 median household income) are clustered in a relatively narrow range (see Table 3), the housing and land supply variables (as well as the age value) take on a much wider distribution of values. Using logarithms to linearize these variables results in vastly different value ranges, and thus different coefficient significance levels.

This problem is also present, albeit to a lesser degree, in the results of the exponential model: the coefficients of variables with high coefficients of variation are slightly less significant in exponential model than in the linear one. At the same time, the pattern of coefficient significance and sign are consistent between the linear and exponential models.

These discussion are more than just splitting of statistical hairs. Acceptance of the linear or exponential forms implies that there would be signficant housing price increases associated with policies that either limit new single-family home construction, or restrict supplies of residentially developable land. Acceptance of the multiplicative form implies that because land and housing supplies are not highly correlated with housing prices, the housing price effects of supply restrictions would be insignificant.

One Market or Many?

One of the key policy questions to be addressed by this research is whether a **single city-wide cap** on single-family home construction would have a different effect on the price of housing than if **separate limits** were imposed on each submarket. Put another way, do housing prices respond differently to supply shifts in the overall market than to supply changes in local submarkets?

To address this question, three separate linear hedonic price models, each incorporating slightly different measures of the housing supply variable, were estimated. In the first model, the measure of new home supply is the number of single-family completions in the prior year across all of San Diego County. This single-market model (Model I) presumes that the price effect of an additional unit of housing supply would be the same, countywide, regardless of its location. In the second model (Model II), the new housing supply variable is the number of single-family completions in the prior year for the superdistrict in which the observation is located. This single-market model presumes that the price effect of an additional unit of supply will vary depending on the submarket, but that the relationship between new supply and price is the same county wide. Single-family completions in the previous year in the pertinent superdistrict is also the measure of supply in the third model (Model III), although this time, each supply variable is entered into the model separately. This multi-market model presumes that the price effect of an additional unit of housing supply will vary depending on the submarket, **and that the relationship between new supply and price also varies by submarket.**

The results of of the three housing unit supply models (Table 5) show that from the supply side, at least, the San Diego housing market consists of several submarkets, not a single, unified market. While the various measures of goodness of fit (r-squared and the standard error of the estimate) do not vary greatly between the three models, the importance of the various supply measures certainly do. In particular, we note that a single, San Diego countywide measure of new supply is neither positively or negatively correlated with single family home prices (Model I). By contrast, the superdistrict-based measure of new supply (Model II) is significantly correlated with housing prices; for every additional home built in a particular superdistrict, the price of all other homes in that same superdistrict decline by $5.00. Turning to the results of Model III, we note that the relationship between new supply and housing prices also varies by superdistrict. In some superdistricts (The I-5 Corridor, the South Bay) the relationship is strongly negative, indicating, all else being equal, that a decrease in new construction will lead to increases in the prices of all housing--both new and existing--in those superdistricts. In other superdistricts (Northeast Central, South West Central), there was no apparent relationship between new housing supply and housing prices. Finally, and somewhat curiously, the supply effect in the I-15 Corridor superdistrict would seem to be positive, indicating that each addition to the supply of housing actually **added** to the price of housing.

Table 5: Hedonic Price Estimates of the Cost of Housing and Land Use Controls in San Diego: 1981-87
(Comparing Different Forms of the New Housing Supply Variable)

VARIABLES IN THE EQUATION	Type	SINGLE-MARKET: Countywide Supply		SINGLE-MARKET: Superdistrict Supply		MULTI-MARKET: Superdistrict Supply	
		Coefficient	t-stat	Coefficient	t-stat	Coefficient	t-stat
HOME CHARACTERISTICS							
Square Footage		0.064	38.23	0.063	36.89	0.06220	37.65
Age		0.448	7.96	0.420	7.09	0.393	7.04
Baths		4.81	3.15	5.790	3.72	6.009	4.00
View	(0/1)	16.64	9.38	15.980	8.86	16.294	9.32
INCOME MEASURE							
1980 Median Family Income		0.0034	17.46	0.004	17.97	0.003570	18.68
LOCATIONAL VARIABLES							
I-15 Corridor Superdistrict	(0/1)	17.88	2.27	40.698	4.87	-67.230	-3.33
I-5 Corridor Superdistrict	(0/1)	-7.59	-2.44	19.299	4.46	4.141	0.79
NE Central Superdistrict	(0/1)	-21.76	-6.69	-4.660	-1.18	-39.940	-8.64
SE Central Superdistrict	(0/1)	-8.5	-3.09	14.088	3.67	-19.890	-2.57
SW Central Superdistrict	(0/1)	13.91	4.19	33.528	7.86	-8.827	-0.81
NW Central Superdistrict	(0/1)	-3.27	-1.05	14.218	3.67	-23.026	-5.50
South Bay Superdistrict	(0/1)	Omitted		Omitted		Omitted	
North County Superdistrict	(0/1)	19.81	6.36	61.239	10.44	29.670	5.60
East County Superdistrict	(0/1)	-10.39	-3.92	14.534	3.80	-20.164	-2.62
South County Superdistrict	(0/1)	-7.93	-2.92	20.684	4.79	-22.687	-4.58
Coastal CPA	(0/1)	30.01	15.69	31.333	16.23	32.047	16.92
Distance Index		-1.08	-7.54	-1.316	-8.65	-1.229	-8.69
YEAR DUMMY VARIABLES							
1981	(0/1)	Omitted				-1.409	-0.50
1982	(0/1)	Omitted		-7.347	-2.07	-8.525	-2.63
1983	(0/1)	-0.675	-0.17	-10.424	-3.86	-10.497	-3.84
1984	(0/1)	-4.7	-1.88	-10.546	-4.02	-10.526	-4.53
1985	(0/1)	-4.06	-1.85	-6.022	-2.24	-5.640	-2.96
1986	(0/1)	-3.02	-1.04	-1.562	-0.06	Omitted	
1987	(0/1)	Omitted		-19.590	-0.66	0.255	0.12
LAND AND HOUSING SUPPLY							
Lagged SF Completions-County		0.000063	1.02				
Lagged SF Completions-Superdistrict				-0.005	-4.04		
By Superdistrict							
I-15 Corridor Superdistrict	(0/1)					0.163	3.85
I-5 Corridor Superdistrict	(0/1)					-0.0159	-6.47
NE Central Superdistrict	(0/1)					0.00356	0.24
SE Central Superdistrict	(0/1)					-0.004	-0.43
SW Central Superdistrict	(0/1)					0.1285	0.82
NW Central Superdistrict	(0/1)					0.0186	1.30
South Bay Superdistrict	(0/1)					-0.2375	-8.26
North County Superdistrict	(0/1)					-0.00555	-4.12
East County Superdistrict	(0/1)					-0.0044	-0.64
South County Superdistrict	(0/1)					-0.0000065	-0.03
Lagged Developable Land Ratio		-14.54	-9.72	-19.886	-11.79	-20.788	-13.24
Interim Development Ord.	(0/1)	5.86	2.15	5.149	1.81	4.621	1.67
CONSTANT		-43.97	-5.74	-54.006	-9.56	-20.312	-3.91
R-squared		0.66		0.66		0.68	
Standard Error		31.3		31.43		30.73	
F:		251.63		1236.70		188.25	
F-significance		0		0.00		0.00	
		3094		2966		3083	

Simulating the Price Effects of a Building Permit Cap

The results of the the various models can be used to predict how a recently-proposed citizens intiative which would reduce residential building permits to 4500 per year (from the 1987 level of approximately 10,000) would affect single-family housing prices throughout the San Diego area. Because this analysis does not consider the feedback effects of higher housing prices on housing demand, the forecasts are necessarily short-term.

Forecasts were developed using the single-market (Model II) presented in Table 5. Two sets of supply reduction scenarios were considered. In both scenarios, we assumed that total residential permits would be reduced to 4500 per year. Based on the current 50-50 mix between single-family and multi-family permits, this would mean that a maximum of 2250 single-family permits would be issued per year. This corresponds to a 55 percent reduction in single-family permits. In the case of Scenario A, this reduction was distributed proportionately across the seven superdistricts within the City of San Diego (that is, single-family permits were reduced 55 percent in each superdistrict from 1987 levels).

In reality, an across-the-board proportional reduction in permits is unlikely. What is more likely is that homebuilders would attempt to build proportionately more units in high-price areas (such as the I-5 Corridor, and the I-15 Corridor), and disproportionately fewer units in low-priced areas such as the South Bay. Thus, a second scenario, Scenario B, was developed, in which new supply was distributed among the superdistricts on the basis of both recent construction activity **and** price: superdistricts in which housing prices were high were allocated proportionately more single-family permits than superdistricts in which prices were low. As in Scenario A, citywide, only 2250 single-family permits were allocated in total.

Readers should realize that both Scenario A and Scenario B respresent gross simplifications. In reality, the pattern of permit reductions would likely be much more haphazard and uneven than assumed in either scenario.

The two sets of forecasts are shown in Table 6. Looking first at Scenario A, we estimate that a 55 percent reduction in single-family building permits in the City of San Diego would raise the prices of every single-family home in the city by an average of $2,623, or about two percent.

Table 6: One-year Estimates of the Housing Price Effects of an Annual 4500 Unit Residential Building Permit

SCENARIO A: Proportional Reduction

	City of San Diego Superdistricts	Baseline: No Building Permit Cap		55% Single Family Building Permit Reduction		Price Difference	
		Units Permitted	Estimated Price	Units Permitted	Estimated Price	$	%
1	I-15 Corridor	888	$170,300	174	$171,300	$1,000	0.59%
2	I-5 Corridor	2416	$138,770	1087	$145,420	$6,650	4.79%
3	NE Central Superdistrict	222	$130,440	190	$131,050	$610	0.47%
4	SE Central Superdistrict	337	$143,950	151	$144,880	$930	0.65%
5	SW Central Superdistrict	1236	$158,890	556	$162,290	$3,400	2.14%
6	NW Central Superdistrict	115	$145,190	53	$145,510	$320	0.22%
7	South Bay Superdistrict	283	*	127	*	*	*

SCENARIO B: Reduction Inversely Proportional to Current Prices

	City of San Diego Superdistricts	Baseline: No Building Permit Cap		55% Single Family Building Permit Reduction		Price Difference	
		Units Permitted	Estimated Price	Units Permitted	Estimated Price	$	%
1	I-15 Corridor	888	$170,300	209	$171,200	$900	0.53%
2	I-5 Corridor	2416	$138,770	1107	$145,300	$6,530	4.71%
3	NE Central Superdistrict	222	$130,440	91	$131,000	$560	0.43%
4	SE Central Superdistrict	337	$143,950	154	$144,800	$850	0.59%
5	SW Central Superdistrict	1236	$158,890	633	$161,900	$3,010	1.89%
6	NW Central Superdistrict	115	$145,190	53	$145,500	$310	0.21%
		283	*	3	*	*	*

* South Bay observations omitted from the model

Not surprisingly, home prices would rise most sharply in the superdistricts in which new supply would be most sharply cut. In the I-5 Corridor, for example, where single family building permits would decline from 2416 units to 1087 units, average home prices would rise by approximately $6,650, or 4.79 percent. On the other hand, we estimate that average home prices would rise by only $610 in the North Central Superdistrict, an area which there has been relatively little recent construction. The results for Scenario B are quite similar. This reflects the reality that the "dampening" effects of any type of price-based permit reallocation would probably be small relative to price effects of supply constraints.

To some, these estimates of the price effects of what are highly restrictive building permit caps might seem too low. In fact, the types of growth restrictions now being discussed in San Diego have never been attempted before in a major housing market. They are essentially beyond the bounds of historical experience. Thus, the results of econometric models **which are based on historical experience**, may be biased. It is quite possible that a 55 percent reduction in new home supply would push up single-family home prices by more than the two percent per year rate indicated above.

It is also important to remember that the estimated price increases would apply to **all** homes, not just to **new** homes. Thus, any cap on new home construction would make also increase the price of the existing stock. Averaged over the total stock of single-family homes in San Diego, this means that growth controls of the type envisioned would add approximately two percent to the price of San Diego single-family homes **per year**. Moreover, to the extent that new homes would be made relatively more scarce than existing homes, there might be additional (albeit short-term) price increases associated with new homes.

The fact that new single-family home construction in the municipalities surrounding San Diego would **not necessarily** be limited also serves to moderate the estimated price effects of proposed building permit caps. In 1986, for example, single-family building permits in the City of San Diego accounted for less than half of single-family permits in all of San Diego County. Thus, what would be draconian building permit cut when considered on a citywide basis, appears to be substantially less severe when considered on a contywide basis.

This last finding indicates the importance of other municipalities as a "pressure relief" valve for San Diego housing demand. If, instead of continuing their current policies, the communities around San Diego were to react to the city's building permit cutbacks by enacting their own reductions, then the price effects of proposed cuts would be much larger, and much more widespread.

THE HOUSING PRICE EFFECTS OF THE INTERIM DEVELOPMENT ORDINANCE

Criticism of the Interim Development Ordinance has generally centered on the fear that it would push up housing prices by restricting supply. And as the results presented in Table 4 make apparent, this has in fact happened, albeit not to the extent some had feared. Exactly how far has the "ripple-effect" of the IDO extended? Has the price effect been limited to the City of San Diego--the only jurisdiction legally bound by the IDO? Or, has it extended into other parts of the county as well?

Five different version of the basic model were tested to specifically assess the price effects of the IDO, and the existence of possible spillovers:

I. A model including both pre-IDO and post-IDO dummy variables for home sales **across** San Diego County (including those in the City).
II. A model including different pre-IDO and post-IDO dummy variables for home sales **within** and **outside** the City of San Diego.
III. A model including pre-IDO and post-IDO dummy variables for home sales **only within** the City of San Diego.
IV. A model including both pre-IDO and post-IDO dummy variables for home sales **outside** the City of San Diego.
V. A model including both pre-IDO and post-IDO dummy variables **by superdistrict** for home sales across San Diego County.

In order to simplify things, only homesales during the 1985-87 period were considered. Coefficient estimates for the five models are included in Appendix D.

Regardless of the models selected, the pre-IDO dummy variables were not found to be statistically significant. The post-IDO dummy variables, on the other hand, were consistently significant. All else being equal, homes inside the City of San Diego which sold after April 1987 were consistently more expensive than similar homes sold before April 1987.

Table 7 (which evaluates the model results at the respective variable means), presents a clearer picture of the price effect of the IDO. Looking across San Diego County, homes which sold after

Table 7: The Price Effects of the Interim Development Ordinance (IDO) by Location

Model	Housing Market	Estimated Average New Home Price (in 000) Pre-IDO	Post-IDO	Difference	%Diff
I.	All San Diego County	$132.1	$139.3	$7.2	5.5%
III.	City of San Diego Only	$144.2	$155.2	$11.0	7.6%
IV.	Outside City of San Diego	$127.9	$134.2	$6.2	4.9%

Notes: Model numbers refer to Appendix D.

the imposition of the IDO cost $7,200 more than homes which sold before the IDO was imposed. Thus, **countywide,** the effect of the IDO was to increase housing prices by 5.5 percent. By contrast, **within** the City of San Diego, the IDO added approximately 7.6 percent, or $11,000 to the average price of single-family housing. Significantly, the IDO also appears to have had an inflationary effect on the prices of **outside** the City of San Diego. According to the model results, single-family homes outside the city which sold after the imposition of the IDO cost 4.9 percent more than comparable homes which sold before the imposition of the IDO. Thus, at least some of the price effect of the IDO has spilled over into the uncontrolled segment of the San Diego housing market.

Because of the significance of these findings--that the IDO has had spillover housing price effects beyond the boundaries of the City of San Diego--a clarification of the IDO dummy variable is in order. The IDO dummy variable does not quantitatively measure the imposition of the IDO; rather it is a simple nominal value assigned to housing transactions which occurred after the imposition of the IDO. In interpreting it as an IDO variable, we assume that all other factors which would push up housing prices are fully and properly captured in the other variables. To the extent that there are other significant market changes which occurred after the imposition of the IDO but which are not otherwise captured in the other variables included in the model, the accuracy of the IDO price effect estimate can be questioned.

This caveat not withstanding, we believe the model results to be generally reliable. Clearly, the imposition did have some effect on housing prices throughout the San Diego area. Moreover, the predicted incidence of the effect--higher in fast growing areas--is consistent with theory.

It is also conceivable that at least some of the price effects of the IDO might be anticipatory. That is, believing (but not necessarily knowing) that the imposition of the IDO would sharply reduce supply below the market level, some homesellers and homebuilders acted immediately to extract the maximum scarcity rent. And at least some homebuyers, reading the same sets of imperfect market signals, were willing to pay the inflated prices. Thus, the short-term effect of the IDO could have been exaggerated. Put another way, in the short-run, the anticipated reduction in supply attributed to the IDO might actually be greater than the actual reduction in supply. If no such reduction ultimately emerges, and if the types of regulation which eventually replace the IDO are less restrictive than the IDO, then the IDO effect should then gradually dissipate. On the other hand, if the types of regulation which replace the IDO are more restrictive, then the model results presented in Table 7 leave little doubt that prices will rise in response.

CONCLUSIONS

By now, it is widely accepted (even among the supporters of growth controls) that local public policies which restrict the supply and availability of new housing will ultimately result in higher home prices. What is less obvious are: 1) the magnitude of such increases, and; 2) the extent to which growth controls enacted in one community or housing market will affect housing prices in adjacent communities or markets.

This paper is both an **ex post** evaluation of the housing price effects of San Diego's Interim Development Ordinance (IDO), and an **ex ante** analysis of how specific growth caps might affect housing prices in the near future. Using historical data on housing transactions for all of San Diego County, we estimate that as of January 1, 1988, the Interim Development Ordinance, adopted by the City of San Diego in April 1987, added approximately $11,000 (or 7.6 percent) to the average price of all single-family homes within the city of San Diego, and $6,200 (or 4.9 percent) to the average price of price of single-family homes outside the city of San Diego but within the broader San Diego Housing Market. Significantly, this price response may have stemmed from buyer and seller perceptions of a new home shortage, rather than the existence of an actual shortage.

Turning to our forecasts, we estimate that the one-year housing price effect of a proposed residential building permit cap of 4500 dwelling units per year would be $2,600. Not surprisingly, the price effects would be greater in the areas of San Diego in which growth is currently concentrated, and correspondingly smaller in slow-growing areas of San Diego.

We note that these estimates are somewhat lower than some previous estimates of the housing price effects of growth controls. While some of this discrepancy may be the result of differences in research methodology, we believe that, on balance, the economic effects of growth policies undertaken by the city of San Diego are, and will be very much dependent on the size and composition of the San Diego county housing market, and upon the severity of the growth-limiting policies undertaken by San Diego's neighbors. It is worth noting, for example, that because of the size of the larger San Diego market, a 55 percent reduction of single-family housing starts in the City of San Diego would correspond to only a 20 percent reduction in new single-family starts countywide.

This finding should certainly not be taken as an endorsement of residential growth controls. Rather, having quantified the costs of such controls, it should serve to initiate a discussion of whether such controls deliver corresponding levels of benefit, or, for that matter, any level of benefit. How effectively, for example, will local growth controls slow the growth of traffic congestion? Will slow-growth policies slow the conversion of open space to urban uses? And how will building permit caps affect the fiscal base of the cities which enacts them? These are difficult questions to answer, and the answers will likely differ from community to community. But until they are answered, and the potential benefit side of the growth control equation is more fully examined, the growth control debate will continue oto be dominated by the issue of housing costs.

NOTES

1. Even when using disaggregate observations, it may be useful to introduce aggregate measures (for example, building permits, median incomes, or neighborhood characteristics.) **if such measures are accurate indicators of supply and demand conditions.**

2. A second dummy variable indicating those houses located in the San Diego which sold after June 1987--the point at which the IDO actually went into effect--was tested and found not be significantly different from zero. The finding that the price effect of the IDO begins at its adoption and not at its implementation, is consistent with the view that profit-maximizing home-sellers and homebuilders, recognizing that the IDO would effectively reduce supply, would attempt to extract additional monopoly profits as soon as possible. Moreover, because it typically takes longer to develop new housing than the three month period between adoption (April) and implementation (June), the ability of homebuilders to "get in under the wire" would be limited. Anecdotal evidence from selected San Diego homebuilders supports the contention that housing prices did in fact rise in response to the adoption of the IDO.

3. From the perspective of measuring the actual supply of housing on the market, completions and/or permits are both somewhat flawed. This is because the supply of housing on the market includes both new for-sale housing **and** existing homes for resale. In looking only at new home completions, we assume that the sellers of existing homes, unlike homebuilders, do not decide when to sell their homes according to current prices. That is, lifestyle and equity concerns outweigh current market conditions in determining precisely when an the seller of an existing home will bring it to market. Put another way, existing home sellers are assumed to be absolute **price-takers**, while homebuilders and developers have some small, but nonetheless real, power over price.

4. Vacancy rates are an additional measure of market tightness, and the price effects of market tightness. Single-family vacancy rates were obtained from SANDAG for each CPA and year. They were tested against deflated prices and found not to be statistically significant.

5. Using Box-Cox transformations, maximum-likelihood estimating procedures, and cross-sectional micro-data, Halvorsen and Pollanski (1979) evaluated the appropriateness of the linear, log-linear, and semi-log functional forms of the hedonic housing price model. They rejected all three as being statistically biased.

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Appendix A: Observations of Sale Prices by San Diego Superdistricts and Community Plan Areas

Superdistrict	Community Plan Area No./Name	Sample Observations	Median Price
1. I-5 Corridor	1421 North City West	35	$216,000
	1440 Torrey Pines	7	$193,000
		---	--------
		42	$212,000
2. I-15 Corridor	1429 Penasquitos East	119	$143,000
	1409 Miramar Ranch North	11	$133,000
	1415 Mira Mesa	127	$111,000
	1434 Scripps Miramar Ranch	120	$172,000
	1431 Rancho Bernardo	76	$179,000
		---	--------
		453	$148,000
3. Northeast Central	1435 Serra Mesa	88	$109,500
	1420 Navajo	127	$116,000
	1447 Tierrasanta	84	$143,000
		---	--------
		299	$122,000
4. Southeast Central	1436 South Bay Terrace	46	$87,000
	1444 Skyline-Paradise Hills	86	$77,000
	1413 Mid-City	128	$90,500
	1438 State Universtiy	86	$117,000
	1437 Southeast San Diego	49	$68,000
		---	--------
		395	$90,000
5. Southwest Central	1430 Peninsula	116	$171,000
	1442 Uptown	45	$133,000
	1423 Ocean Beach	20	$111,500
	1408 Golden Hill	65	$101,000
	1428 North Park	78	$91,500
		---	--------
		324	$129,000
6. Northwest Central	1406 Clairmont Mesa	127	$114,000
	1499 University South	40	$145,000
	1427 Pacific Beach	50	$161,500
	1418 Mission Beach	16	$159,500
	1412 Linda Vista	67	$103,000
		---	--------
		300	$126,000
7. South Bay	1425 Otay Mesa-Nestor	129	$93,000
SAN DIEGO CITY TOTAL		1,942	$123,000

Appendix B: Housing Price Deflators

Year	Month	Price Deflator (1967=100)	Year	Month	Price Deflator (1967=100)
1980	January	247.3	1983	November	327.0
1980	February	250.5	1983	December	327.4
1980	March	254.5	1984	January	329.2
1980	April	257.9	1984	February	331.0
1980	May	261.7	1984	March	331.5
1980	June	266.7	1984	April	333.2
1980	July	265.1	1984	May	334.6
1980	August	265.8	1984	June	336.2
1980	September	267.7	1984	July	338.1
1980	October	271.1	1984	August	339.5
1980	November	273.8	1984	September	341.4
1980	December	276.9	1984	October	341.2
1981	January	279.1	1984	November	340.9
1981	February	280.9	1984	December	341.2
1981	March	282.6	1985	January	342.0
1981	April	284.8	1985	February	343.6
1981	May	288.5	1985	March	344.7
1981	June	292.2	1985	April	345.9
1981	July	297.0	1985	May	348.5
1981	August	299.7	1985	June	350.4
1981	September	303.7	1985	July	351.6
1981	October	303.5	1985	August	352.9
1981	November	304.2	1985	September	353.8
1981	December	305.2	1985	October	354.4
1982	January	306.1	1985	November	355.0
1982	February	307.3	1985	December	355.8
1982	March	306.7	1986	January	356.8
1982	April	309.4	1986	February	356.5
1982	May	313.8	1986	March	357.0
1982	June	317.5	1986	April	358.0
1982	July	319.2	1986	May	358.5
1982	August	320.1	1986	June	361.2
1982	September	319.7	1986	July	361.5
1982	October	320.7	1986	August	362.4
1982	November	319.0	1986	September	363.7
1982	December	316.3	1986	October	363.0
1983	January	317.9	1986	November	361.7
1983	February	318.5	1986	December	362.1
1983	March	318.6	1987	January	363.9
1983	April	320.3	1987	February	365.1
1983	May	321.8	1987	March	366.4
1983	June	323.1	1987	April	367.7
1983	July	324.5	1987	May	368.9
1983	August	324.8	1987	June	371.3
1983	September	326.4	1987	July	372.5
1983	October	326.8	1987	August	374.9

Source: U.S. Dept. of Labor, Bureau of Labor Statistics, 1987

APPENDIX D: Coefficient Estimates for Interim Development Ordinance Models

VARIABLES IN THE EQUATION	Type	{Model 0} FULL SAMPLE No IDO Effect	{Model I} FULL SAMPLE IDO Effect	{Model II} FULL SAMPLE IDO by City & Outside City	{Model III} City of SAN DIEGO Only	{Model IV} Outside SAN DIEGO Only
		Coefficient	Coefficient	Coefficient	Coefficient	Coefficient
HOME CHARACTERISTICS						
Square Footage		0.064	0.065	0.064	0.054	0.075
Age		0.434	0.432	0.435	0.419	0.309
Baths		4.320	4.298	4.330	7.009	-3.840
View	(0/1)	14.690	14.587	14.793	18.412	8.587
INCOME MEASURE						
1980 Median Family Income		0.0036	0.0036	0.004	0.0015	0.0072
LOCATIONAL VARIABLES						
I-15 Corridor Superdistrict	(0/1)	60.680	59.125	59.155	48.555	Omitted
I-5 Corridor Superdistrict	(0/1)	n/s	12.197	15.488	24.869	Omitted
NE Central Superdistrict	(0/1)	n/s	n/s	n/s	14.529	Omitted
SE Central Superdistrict	(0/1)	14.122	13.569	14.488	11.120	Omitted
SW Central Superdistrict	(0/1)	36.098	35.596	35.170	27.448	Omitted
NW Central Superdistrict	(0/1)	18.108	17.835	17.444	26.733	Omitted
South Bay Superdistrict	(0/1)	Omitted	Omitted	Omitted	Omitted	Omitted
North County Superdistrict	(0/1)	57.320	57.031	64.502	Omitted	55.016
East County Superdistrict	(0/1)	15.379	15.054	14.467	Omitted	Omitted
South County Superdistrict	(0/1)	19.339	19.129	20.663	Omitted	14.794
Coastal CPA	(0/1)	34.570	34.545	34.540	42.903	32.510
Distance Index		-1.425	-1.425	-1.439	n/s	-1.795
YEAR DUMMY VARIABLES						
1985	(0/1)	Omitted	Omitted	Omitted	Omitted	Omitted
1986	(0/1)	3.573	3.587	3.534	n/s	n/s
1987		5.498	Omitted	Omitted	Omitted	Omitted
LAND AND HOUSING SUPPLY						
Lagged SF Completions-Superdistrict		n/s	n/s	n/s	n/s	n/s
Lagged Developable Land Ratio		-25.106	-24.959	-25.115	7.809	-27.653
INTERIM DEVELOPMENT ORDINANCE						
Before April 1987-All	(0/1)					
All Locations		Omitted	n/s		n/s	n/s
City Only				n/s		
Outside City Only				n/s		
After April 1987-All	(0/1)					
All Locations		Omitted	7.225		10.992	6.243
City Only				8.726		
Outside City Only				n/s		
By Superdistrict						
I-15 Corridor Superdistrict						
NW Central Superdistrict						
Constant		-60.723	-60.277	-60.136	-28.679	-114.664
R-squared		0.68	0.68	0.68	0.72	0.711
Standard Error		30.125	30.097	30.11	26.197	30.377
F:		191.04	182.5	173.96	139.5	138.850
F-significance		0	0.000	0	0	0
N		1845	1845	1845	1117	805.000