Housing Market Effects of Inclusionary Zoning

Antonio Bento*
Cornell University

Scott Lowe
Boise State University

Gerrit-Jan Knaap
University of Maryland, College Park

Arnab Chakraborty
University of Illinois, Urbana-Champaign

Abstract

This article presents an empirical analysis of the effects of inclusionary zoning policies on housing prices and starts in California during the period from 1988 through 2005. The analysis compares cities with and without such policies and isolates the effects of inclusionary zoning programs by carefully controlling for spatial and temporal conditions, such as the neighborhood or school district within which the house is located and changing market conditions over time. The analysis found that inclusionary zoning policies had measurable effects on housing markets in jurisdictions that adopt them; specifically, the price of single-family houses increases and the size of single-family houses decreases. The analysis also found that, although the cities with such programs did not experience a significant reduction in the rate of single-family housing starts, they did experience a marginally significant increase in multifamily housing starts. The magnitude of this shift varied with the stringency of the inclusionary requirements. Finally, the analysis found that the size of market-rate houses in cities that adopted inclusionary zoning increased more slowly than in cities without such programs. The results are fully consistent with economic theory and demonstrate that inclusionary zoning policies do not come without costs.

* Corresponding author.

Introduction

As concerns about affordable housing have grown across the country, local governments have responded by adopting a variety of affordable housing programs. An increasing number of local governments are considering an inclusionary zoning approach, which requires developers to sell a certain percentage of newly developed housing units at below-market rates to lower income households. Although specific details of these programs vary widely, they are politically attractive because they are viewed as a way to promote housing affordability without raising taxes or using public funds.

No program, of course, is cost free. According to standard economic theory, inclusionary zoning acts like a tax on housing construction. And just as with other taxes, the burdens of inclusionary zoning are passed on to housing consumers, housing producers, and landowners. More specifically, economic theory suggests that inclusionary zoning requirements act to decrease the supply of housing at every price, raise housing prices, and slow housing construction. As a result, inclusionary zoning policies could exacerbate the affordable housing problem that they are designed to address.

Although debate over the merits of inclusionary zoning has continued for nearly three decades, no rigorous studies have been done on their effects on housing prices and starts. This article offers such an analysis. Specifically, this article presents an analysis of the effects of inclusionary zoning policies on single-family housing prices, single-family and multifamily housing starts, and the size of single-family housing units in California during the period from 1988 through 2005.

The analysis found that inclusionary zoning policies have measurable effects on housing markets. Specifically, it found that, in jurisdictions that adopt inclusionary zoning, the share of multifamily housing increases, the price of single-family houses increases, and the size of single-family houses decreases. The analysis did not examine the purported benefits of inclusionary zoning, such as whether these policies increase the supply of affordable housing or serve to integrate low- and high-income residents. Therefore, the analysis cannot ascertain whether inclusionary zoning increases social welfare. It demonstrates, however, that such benefits do not come without measurable costs.

Background

The first inclusionary zoning program was adopted in 1974 by Montgomery County, Maryland. The original Montgomery County ordinance required that 15 percent of new developments with more than 50 housing units be sold at a price affordable to low-income households. In return, the county provided developers with a density bonus that allowed them to build at a density up to 20 percent higher than the maximum density allowed by zoning. Since then, inclusionary zoning policies have grown in number and variety across the country. For example, between 1990 and 2003, the number of California communities with inclusionary zoning grew from 29 to 107 (Powell and Stringham, 2004). As of 2004, an estimated 350 to 400 local jurisdictions had inclusionary zoning programs, with the vast majority of these programs enacted in California, Massachusetts, and New Jersey (Porter, 2004).

The economic effects of inclusionary zoning are similar to those of a tax on housing construction, as show in exhibit 1. As more units are sold at a discount, the cost of development increases. Developers must raise the price on market-rate units to compensate for the cost of discounted units. As a result, the price of market-rate housing rises and the production of such housing declines. This decline in housing production can manifest as both a reduction in housing starts and as a reduction in housing size.

The features of inclusionary zoning programs vary widely, as shown in exhibit 2. The economic impacts of inclusionary zoning vary based on the different program features. A voluntary program that relies on incentives might not have any economic impacts, while a mandatory program that requires many, deep, and long-term discounts could have significant adverse economic effects.

Exhibit 1

The Economic Effects of Inclusionary Zoning

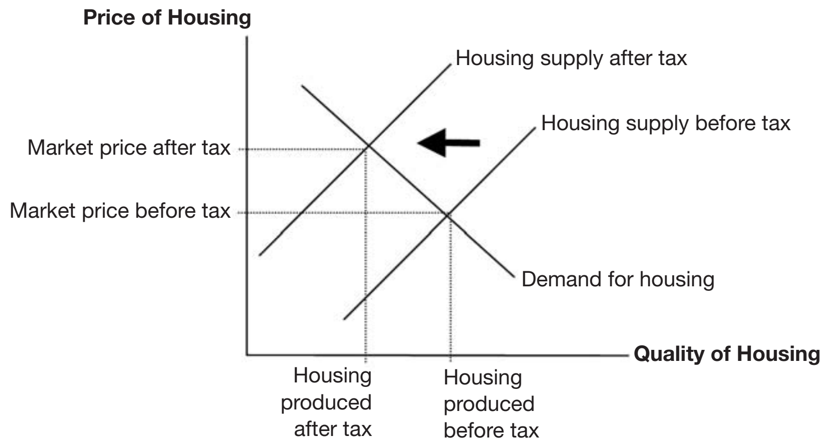


Exhibit 2

Distinguishing Features of Inclusionary Zoning Programs

Feature	IZ Programs
Size and types of developments subject to inclusionary requirements	Some programs are voluntary; others impose inclusionary requirements only on large, single-family projects; and others impose inclusionary requirements on all types of projects of all sizes.
Percent of units that must be affordable	Some programs require only 5 percent of new units to be sold at a discount; others require percentages as high as 30 percent.
Depth and duration of price discounts	The depth of price discounts often varies by the target population. For example, many programs require that units be made affordable to those at 80 percent of median household incomes, while others set different standards. The period of affordability often varies from 10 to 99 years.
Incentives or allowances offered in compensation	Most programs offer some form of incentives or compensation for providing affordable units. Incentives and compensation often include density bonuses, waivers of subdivision requirements, or fee reductions. Some programs permit payments in lieu of inclusionary units.

IZ = inclusionary zoning.

Previous research on inclusionary zoning has produced mixed results. Although most research has been theoretical and dominated by case studies, some studies have sought to quantify the benefits and potential costs.

An early study by Clapp (1981) described the potential reaction of developers to inclusionary zoning programs. Tombari (2005) similarly described the potential adverse effects on housing prices and starts. Powell and Stringham (2004), in their study for the Reason Public Policy Institute, provided quantitative support for the concerns raised by Clapp and Tombari. Specifically, using data from the San Francisco Bay area, they provided evidence to suggest that inclusionary zoning makes market-priced homes more expensive, restricts the supply of new homes, and produces few affordable units.

A considerable volume of case study research, however, comes to quite opposite conclusions. Using data from Los Angeles, Rosen (2002) found no correlation between the adoption of an inclusionary housing policy and housing starts in 28 California cities. Multiple case studies by Calavita (Calavita, 2004; Calavita and Grimes, 1998; Calavita, Grimes, and Mallach, 1997) and his colleagues in California and New Jersey concluded that inclusionary zoning is a viable strategy for increasing the supply of affordable housing and mixing low- and high-income residents. The National Housing Conference (2002) drew similar conclusions in case studies conducted in Massachusetts.

In a study of the inclusionary zoning programs in the Greater Washington metropolitan area, Brown (2001) concluded that inclusionary zoning programs work best in jurisdictions with large amounts of undeveloped land and less effectively in dense, more mature metropolitan areas. The Non-Profit Housing Association of Northern California (NPH) and the California Coalition for Rural Housing (2003) published the results of a survey on the prevalence and components of inclusionary housing programs in California. The study found significant variation in both the prevalence and the components of the programs in California and concluded that the effects of such programs depend in part on such programmatic details. The study presented in the following section tests this proposition using data from the NPH survey.

Scope and Context of the Study

This article examines housing markets in local jurisdictions in California during the period from 1988 through 2005. During this period, for a number of reasons, California offers a good setting for examining the effects of inclusionary zoning. First, the state is large and includes many municipalities with distinct regulatory environments. Second, California is an often-studied state with very good data available for housing market analysis. Third, and most importantly, inclusionary zoning programs became increasingly common in California during the study period. Time-series analyses of housing markets in California from 1988 through 2005 included observations of many cities with existing inclusionary zoning policies, cities without inclusionary zoning policies, and cities that adopted inclusionary zoning policies within the study period. For each individual city in this sample we controlled for unobserved, time-invariant characteristics that might affect housing starts or the types of houses that are built. By doing so, we were able to isolate the effects of the inclusionary zoning programs, relative to other factors that might be influencing new housing developments. It is the variation in the use of inclusionary zoning across the state and over time that helps to isolate the effects of this policy from other factors.

Although the study setting is well suited for this analysis, any such analysis must be interpreted in the context of prevailing market conditions. As shown in exhibits 3 and 4, housing starts in California were strongly influenced by national business cycles during the study period. Housing starts bottomed in the early 1990s as the national economy fell into recession but increased fairly consistently as the economy recovered. New housing prices were similarly affected by national business cycles, as shown in exhibit 5 for the San Francisco and Sacramento metropolitan areas, but did not rise until 1996. The average size of a new, single-family house, however, rose slowly but consistently during the study period, as shown in exhibit 5.

Although these trends primarily reflect national business cycles, housing markets in California have several location-specific characteristics of note. According to Landis et al. (2000), since the 1980s, housing markets in California have not produced housing units commensurate with the rapid growth in demand. The specific reasons for this are numerous, although limitations in the supply of land, capital, and infrastructure are all likely factors. Regulatory constraints probably also played a role. According to Pendall, Puente, and Martin (2006), local governments in California have adopted more growth management instruments than their counterparts in other parts of the country. Thus, it is important to note that this study was conducted in markets characterized by strong demand-side pressures and significant and varied supply-side constraints.

Exhibit 3

New Housing Construction for All Cities in California

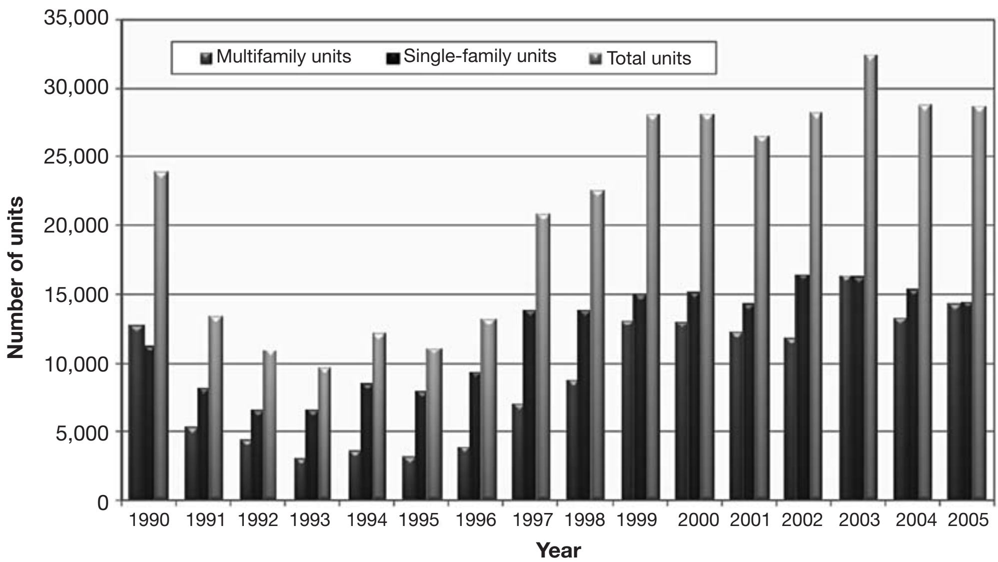


Exhibit 4

New Housing Construction for Cities in California With Inclusionary Zoning

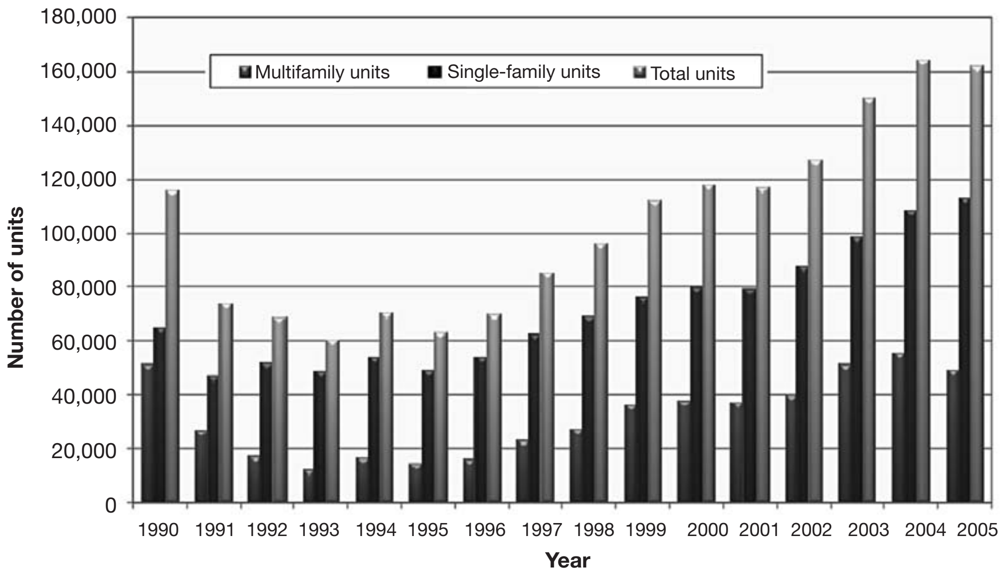
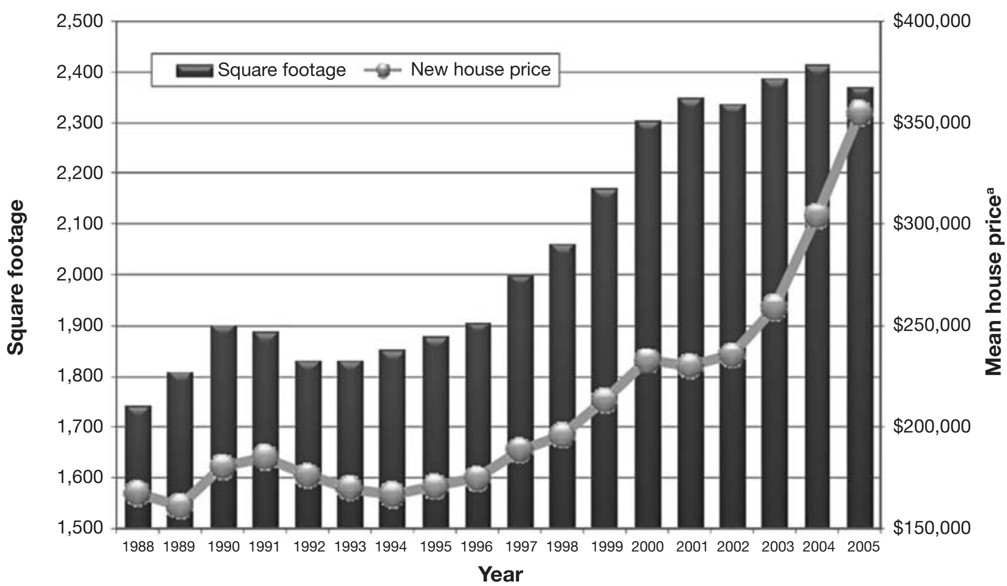


Exhibit 5

Square Footage and New House Prices in the San Francisco and Sacramento Metropolitan Areas



[a] *In 1988 dollars.*

Data and Descriptive Statistics

The data for this analysis, derived from a variety of sources, are used to compile two distinct data sets. The primary sources of these data include the California Construction Industry Research Board (CIRB), the Census Bureau, and DataQuick News Service Custom Reports. (Appendix A presents details of the data.) The first data set uses municipalities as the unit of analysis and includes information about the physical, demographic, and economic characteristics of cities throughout California, including information on location, regulatory environment, and natural setting. In addition, the data set includes information about whether the municipality had an inclusionary zoning program and, if so, when the program was first adopted. Data were obtained for the period 1988 through 2005. This first data set is used to study the effects of inclusionary zoning on the number and composition (single family vs. multifamily) of housing units built, controlling for other factors.

As shown in exhibit 6, 65 municipalities included in this study had adopted an inclusionary zoning program after 1989 but before the end of the study period. On average, the minimum project size at which a development became subject to inclusionary requirements was 12 housing units and the percentage of units that had to be made available to low-income households was 12 percent. Of the 65 municipalities with inclusionary policies, 57 percent allowed offsite allowances, 76 percent allowed in-lieu fees, 25 percent offered land dedication allowances, and 13 percent allowed developer credit transfers. The average length of time affordable units must remain affordable is 34 years, although many municipalities have stipulated that the units remain affordable in perpetuity.

As illustrated in exhibit 7, cities that adopted inclusionary programs are located throughout the state but are most common in the coastal areas, especially in the San Francisco and Sacramento metropolitan areas and the Los Angeles metropolitan area. In general, municipalities that had inclusionary zoning programs, relative to those that did not, had higher incomes, higher housing

Exhibit 6

Descriptive Statistics

Variable	Inclusionary Zoning Cities			
	Mean	Sd	Min.	Max.
Offsite allowances	57%	50%		
In-lieu fees	76%	43%		
Land dedications	25%	43%		
Developer credit transfers	13%	34%		
Target population very low income	41%	49%		
Target population low income	77%	42%		
Target population moderate income	61%	49%		
Period of affordability[a]	34	12	10	55
Minimum project size to qualify[b]	12	50	0	400
Percent of units as part of IZ	12%	6%	0%	30%
Cities (N)	65			
Observations[c]	1,011			

IZ = inclusionary zoning. N = number. Sd = standard deviation.

[a] *In years.*

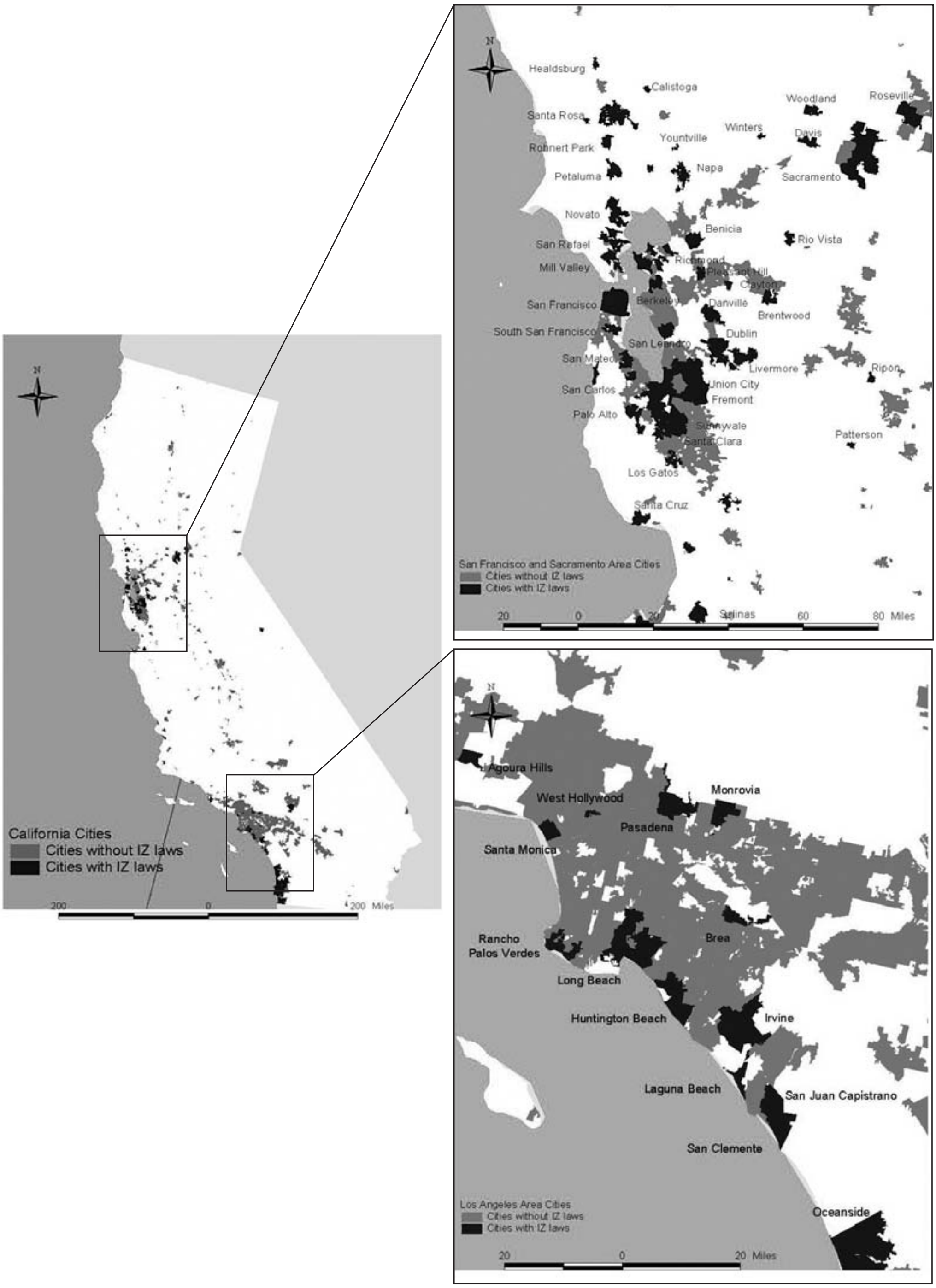
[b] *Number of units.*

[c] *Years of data * N.*

Note: The study included 65 municipalities.

Exhibit 7

Inclusionary Zoning Programs in California



IZ = inclusionary zoning.

prices, higher growth rates, and more neighbors with similar policies. In addition, these municipalities were closer to the coast.

The second data set uses new single-family home sales as the unit of analysis. This data set includes information about newly constructed housing units in the San Francisco and Sacramento metropolitan areas, and it includes the physical features of the house, the neighborhood in which the house is located, and the policies of the pertinent governmental jurisdiction—including the features of any applicable inclusionary zoning programs. The second data set was used to estimate the impacts of inclusionary zoning on the price and size of new homes sold.

Descriptive statistics of the new homes sold from 1988 through 2005 in the San Francisco and Sacramento metropolitan areas are presented in exhibit 8. The costs and size changes, mirrored in exhibit 5, indicate the recession of the early 1990s and the upward trend toward larger homes. The mean price of new home sales, even after correcting for inflation, increased steadily after 1995.

Exhibit 8

Descriptive Statistics—San Francisco and Sacramento Metropolitan Areas New Home Sales

Year	Number	Mean Cost[a] ($)	Mean Number of Bathrooms	Mean Number of Bedrooms	Mean Floor Space[b]
1988	14,580	167.68	2.31	3.07	1.74
1989	21,165	161.31	2.36	3.22	1.81
1990	18,694	180.66	2.42	3.35	1.90
1991	12,526	185.27	2.41	3.28	1.89
1992	11,158	176.67	2.36	3.24	1.83
1993	8,022	170.02	2.38	3.30	1.83
1994	13,189	167.12	2.39	3.35	1.85
1995	11,718	170.87	2.42	3.39	1.88
1996	13,813	175.26	2.43	3.37	1.91
1997	15,482	188.78	2.48	3.47	2.00
1998	15,768	195.86	2.49	3.49	2.06
1999	17,834	213.63	2.55	3.57	2.17
2000	17,977	233.04	2.61	3.62	2.30
2001	18,967	230.40	2.64	3.67	2.35
2002	21,954	235.82	2.60	3.58	2.34
2003	20,773	259.16	2.63	3.58	2.39
2004	21,827	304.15	2.68	3.61	2.41
2005	23,268	354.67	2.67	3.50	2.37
Avg.	16,595	209.46	2.49	3.43	2.06

[a] *Thousands of dollars in 1988 dollars.*

[b] *Thousands of square feet.*

Methods

To explore the effects of inclusionary zoning, we conducted a multivariate statistical analysis of housing starts, prices, and size. The results are presented in exhibits 9 through 12. Exhibits 9 and 10 present the stock and composition effects of inclusionary zoning on housing starts. Exhibit 11 presents the effects of inclusionary zoning on housing prices. Exhibit 12 presents the results of the analysis on housing size. Each analysis includes city-level "fixed" effects to capture market-specific differences between jurisdictions that are assumed constant over time.

This analysis of housing starts specified the dependent variable as the percentage change in housing units so that the coefficients could be interpreted as elasticities—that is, the percentage change in starts resulting from a percentage (or unit) change in the dependent variable. Controls included city and year fixed effects that allowed us to account for any unobserved city-level characteristics (such as proximity to the coast, elevation, or desirable amenities) and for characteristics that are uniform across cities but vary across time (such as changing market conditions or statewide recessionary periods).

The analysis of housing prices specified the dependent variable as the logarithm of the sales price, and the analysis of house size specified the dependent variable in 1,000 square feet of living space.[1] As with the housing starts models, we controlled for unobserved spatial and temporal characteristics of the houses that might affect their prices. Specifically, we controlled for the year and quarter the home was sold and for the neighborhood and school district within which the house is located. These controls allowed us to carefully account for any outside factors that may have influenced housing prices, thus isolating the effects of the inclusionary zoning programs.

Results

In this section, we present the key results of this study. We focus on effects on housing starts, composition of housing starts, prices of new homes sold, and the size of new homes sold.

Effects on Housing Starts

As column 1 of exhibit 9 shows, our findings indicate that inclusionary zoning programs had a small and insignificant effect on total housing starts during the study period. The analysis suggests that housing starts in municipalities were 0.15 percent greater in municipalities with an inclusionary zoning program compared to those without. This estimate, however, is not statistically significant at the 90-percent confidence level.

As column 2 of exhibit 9 shows, our findings indicate that inclusionary zoning programs had a small and statistically insignificant effect on single-family housing starts. The analysis suggests that single-family housing starts were 0.19 percent lower in municipalities that had an inclusionary zoning program compared with those that did not. This estimate, however, also is not statistically significant at the 90-percent confidence level.

As column 3 of exhibit 9 shows, our findings indicate that inclusionary zoning programs had a small and statistically insignificant positive effect on multifamily housing starts. The estimate indicates that multifamily housing starts were 0.36 percent higher in municipalities that had an

[1] To capture the potential endogeneity of the inclusionary zoning variable, we included a 1-year lag of the dependent variable in the regression. Although lagging the dependent variable is not the ideal instrument for treating endogeneity, we had no better variables that should be correlated with the inclusionary zoning variable and not with the dependent variable.

Exhibit 9

New Housing Stock Change Models

Model Dependent Variable: $([HU_{t+1} - HU_t] / HU_t)(*100)$	(1) Total Housing Units	(2) Single-Family Housing Units	(3) Multifamily Housing Units
Inclusionary zoning program	0.1536	– 0.1885	0.3601
	(0.1478)	(0.1918)	(0.2605)
$[HU_t - HU_{t-1}]$	1.03e-05	4.32e-05	3.93e-06
	(2.22e-06)***	(4.00e-06)***	(1.71e-06)**
Observations	5,509	5,509	5,509
City fixed effects	Yes	Yes	Yes
Year controls	Yes	Yes	Yes
R-squared	0.07	0.14	0.01

HU = housing units.
** Significant at 10%.*
*** Significant at 5%.*
**** Significant at 1%.*
Note: Robust standard errors are in parentheses.

inclusionary zoning program compared with those that did not. Once again, however, this estimate is not statistically significant at the 90-percent confidence level.

Effects on Composition of Housing Starts

As column 1 of exhibit 10 shows, our estimates indicate that the adoption of inclusionary zoning had a significant effect on the share of single-family housing starts. Holding all other variables constant, the share of single-family housing starts in municipalities that implemented inclusionary zoning programs was nearly 7 percentage points lower than the share in those municipalities that did not implement such a program. This result is very significant: the chances are less than 0.01 percent that there was no effect of inclusionary zoning on this ratio of housing mix.

As columns 2 and 3 of exhibit 10, respectively, show, the effect of inclusionary zoning on housing mix varied significantly with the percentage of housing units required to be sold to low-income households and with the minimum project size subject to inclusionary zoning requirements. Compared with jurisdictions without inclusionary zoning programs, municipalities with an inclusionary zoning program in which the percentage of new homes to be sold at a discount requirement was more severe (greater than 10 percent of a project's units) experienced a 12-percent shift from single-family to multifamily housing starts. Similarly, the inclusionary zoning regulation resulted in a 10-percent shift from single-family to multifamily housing starts in jurisdictions with an inclusionary zoning program in which the threshold that required participation in the inclusionary zoning program was more severe (for example, inclusionary zoning regulations that apply only to projects with fewer than 10 units).

Exhibit 10

New Housing Composition Change Models

Dependent Variable: % Single-Family Units$_t$+1 (*100)	(1)	(2)	(3)
Inclusionary zoning program	– 6.8868 (1.9365)***		
Inclusionary zoning program requiring 10% or less of the units for low-income households		– 2.9150 (2.5151)	
Inclusionary zoning program requiring more than 10% of the units for low-income households		– 12.1033 (2.8076)***	
Inclusionary zoning program and a threshold of less than 10 units			– 9.6961 (2.1297)***
Inclusionary zoning program and a threshold of 10 or more units			– 0.9995 (3.7497)
Percent of single-family units$_t$	0.0671 (0.0173)***	0.0664 (0.01734)***	0.0663 (0.01734)***
Observations	5,880	5,880	5,880
City fixed effects	Yes	Yes	Yes
Year controls	Yes	Yes	Yes
R-squared	0.03	0.03	0.03

** Significant at 10%.*
*** Significant at 5%.*
**** Significant at 1%.*
Note: Robust standard errors are in parentheses.

Effects on Prices of New Homes Sold

Estimates of the effects of inclusionary zoning programs on housing prices are presented in exhibit 11. As column 1 shows, our estimates indicate that inclusionary zoning programs raise housing prices by approximately 2.2 percent. Also, as columns 2 and 3 show, our estimates indicate that the effects on inclusionary zoning are greater in higher priced housing markets. Specifically, our estimates indicate that inclusionary zoning programs lowered the price of housing that sold for less than $187,000[2] (in 1988 dollars) by about 0.8 percent and increased the price of housing that sold for more than $187,000 by about 5.0 percent.

Effects on the Size of New Homes Sold

Estimates of the effects of inclusionary zoning on the size of single-family housing are presented in exhibit 12. As column 1 shows, our estimates indicate that the implementation of an inclusionary zoning program lowers the mean housing size by approximately 48 square feet. Further, as columns 2 and 3 show, the effects of inclusionary zoning on housing size are greater on lower priced homes. Specifically, our estimates indicate that houses that sold for less than $187,000 are approximately 33 square feet smaller in inclusionary zoning jurisdictions, while houses that sold for more than $187,000 are larger in inclusionary zoning jurisdictions by a statistically insignificant amount.

[2] Using the Federal Housing Finance Agency's house price index for California, this amount is equivalent to $657,090 in 2007 dollars.

Exhibit 11

The Effect of Inclusionary Zoning on New Housing Values

Dependent Variable: Cost in 1988 Dollars	(1)	(2)	(3)
House price sample[a]	All	< $187,000	> $187,000
Inclusionary zoning program	0.022 (0.003)***	– 0.008 (0.004)***	0.050 (0.003)***
Observations	298,715	149,253	149,462
Beds, baths, and floor space included	Yes	Yes	Yes
Census block group boundary fixed effects	Yes	Yes	Yes
Year of sale controls	Yes	Yes	Yes
Quarter of sale controls	Yes	Yes	Yes
School district boundary controls	Yes	Yes	Yes
Lot size controls	Yes	Yes	Yes
Dummies for missing data	Yes	Yes	Yes
Clustered errors at the block group level	No	No	No
R-squared (within)	0.60	0.31	0.58

[a] *In 1988 dollars.*

* *Significant at 10%.*

** *Significant at 5%.*

*** *Significant at 1%.*

Notes: Robust standard errors are in parentheses. Sample includes all Bay Area and Sacramento new house sales of homes with fewer than 12 bedrooms or bathrooms, less than 30,000 square feet of living space, and more than 250 square feet of living space and that cost more than $20,000.

Exhibit 12

The Effect of Inclusionary Zoning on Square Footage of New Houses

Dependent Variable: New House Interior Square Footage (Floor Space)/1,000	(1)	(2)	(3)
House price sample[a]	All	< $187,000	> $187,000
Inclusionary zoning program	– 0.048 (0.006)***	– 0.033 (0.007)***	0.001 (0.008)
Observations	298,715	149,253	149,462
Beds and baths included	Yes	Yes	Yes
Census block group boundary fixed effects	Yes	Yes	Yes
Year of sale controls	Yes	Yes	Yes
Quarter of sale controls	Yes	Yes	Yes
School district boundary controls	Yes	Yes	Yes
Lot size controls	Yes	Yes	Yes
Dummies for missing data	Yes	Yes	Yes
Clustered errors at the block group level	No	No	No
R-squared (within)	0.53	0.52	0.46

[a] *In 1988 dollars.*

* *Significant at 10%.*

** *Significant at 5%.*

*** *Significant at 1%.*

Notes: Robust standard errors are in parentheses. Sample includes all Bay Area and Sacramento new house sales of homes with fewer than 12 bedrooms or bathrooms, less than 30,000 square feet of living space, and more than 250 square feet of living space and that cost more than $20,000.

Conclusions

Although inclusionary zoning programs have been around for some time, they remain controversial. Proponents argue that such programs are effective tools for increasing the supply of affordable housing and for helping to integrate low- and high-income residents. Opponents argue that such programs impose cost burdens on developers, increase the price of market-rate units, and lower the supply of market-rate housing. This study provides no new information about the validity of the arguments of the proponents; however, it does offer new information about the arguments of the opponents.

Overall, our findings show that inclusionary zoning programs had significant effects on housing markets in California from 1988 through 2005. Although cities with existing or new programs during the study period did not experience a significant reduction in the rate of single-family housing starts, they did experience a statistically insignificant increase (at a 90-percent confidence level) in multifamily housing starts. As a consequence, our findings show that cities with inclusionary housing programs experienced a significant and relatively large increase in the ratio of multifamily to single-family housing production. That is, having an inclusionary housing program increased a city's multifamily housing starts share by 7 percent. The reasons for this shift are relatively clear. Housing markets in California cities, persistently constrained by regulatory barriers, expanded rapidly during the 1990s as the national and California economies recovered from the 1991 recession. Inclusionary zoning programs in cities where they were adopted placed a small additional burden on single-family development and less of a burden on multifamily development. Under the pressure of growing demand, single-family starts declined slightly and multifamily starts increased significantly. The economic recovery, paired with a more rigid regulatory environment, caused a significant shift toward multifamily housing development during the 1990s. This shift was greater in cities that required a larger percentage of the new units to be sold at below-market rates and in cities that required inclusionary units in developments with smaller numbers of units. No net effect, however, was evident on total housing starts.

Findings also indicate that housing prices in cities that adopted inclusionary zoning increased approximately 2 to 3 percent faster than in cities that did not adopt such policies. In addition, our findings show that housing price effects were greater in higher priced housing markets than in lower priced markets. That is, housing that sold for less than $187,000 (in 1988 dollars) decreased by only 0.8 percent, but housing that sold for more than $187,000 increased by 5.0 percent. These findings suggest that housing producers, in general, did not respond to inclusionary requirements by slowing the rate of construction of single-family housing but did pass the increase in production costs on to housing consumers. Further, housing producers were better able to pass on the increase in costs in higher priced housing markets than in lower priced housing markets.

Finally, our findings indicate that the size of market-rate houses in cities that adopted inclusionary zoning increased more slowly than in cities without such programs. Specifically, our findings show that housing size in cities with inclusionary zoning programs was approximately 48 square feet smaller than in cities without inclusionary programs. Further, most of the reductions in housing size occurred in houses that sold for less than $187,000. These findings suggest that inclusionary zoning programs caused housing producers to increase the price of more expensive homes in markets in which residents were less sensitive to price and to decrease the size of less expensive homes in markets in which residents were more sensitive to price.

Once again, these results must be understood in context. The California housing market expanded rapidly over the 1990s as pent-up demand exploded following the 1991 recession. The imposition of inclusionary zoning requirements was not strong enough to slow the overall rate of housing production but did cause a measurable shift from single-family to multifamily housing production. The magnitude of this shift varied with the stringency of the inclusionary requirements. The imposition of inclusionary requirements was strong enough, however, to cause a rise in housing prices and a reduction in housing size. Price effects were larger in high-priced markets, and size effects were larger in low-priced markets.

These results are fully consistent with economic theory and demonstrate that inclusionary zoning policies do not come without cost. In robust housing markets, such as those of California during the 1990s, inclusionary zoning requirements were not strong enough to slow the rate of housing production, although they did cause housing prices to rise and housing size to fall. In less robust markets, it is more likely that inclusionary requirements have stronger effects on housing starts than on housing prices and size. Confirmation of such speculation, however, is beyond the scope of this study.

Appendix A

The data set used for this analysis has four main components: (1) California housing construction data—measures of housing construction in California's cities from 1988 through 2005; (2) city-specific housing attributes—data relating to the physical, demographic, and economic characteristics of California's cities; (3) inclusionary zoning data—city-specific data relating to the inclusionary zoning regulations that have been implemented in California's cities; and (4) Consumer Price Index (CPI) data.

California Housing Construction Data

This section provides details on the data that were used to construct the stock and composition of housing in California as well as the data that were used to analyze new housing construction in the San Francisco and Sacramento metropolitan areas.

Changes in Housing Stock and Composition

The California Construction Industry Research Board (CIRB) provided aggregate house construction data. The data include total new residential building permit counts, by number of units, for all cities in the 58 California counties from 1988 through 2005. CIRB provided the building classification, in which the new residential building permits were divided into two groups: (1) single-family housing, which includes detached, semidetached, rowhouse, and townhouse units; and (2) multifamily housing, which includes duplexes, three- to four-unit structures, and apartment-type structures with five units or more.[3]

[3] Rowhouses and townhouses are included as single-family housing when each unit is separated from the adjacent unit by an unbroken ground-to-roof wall or firewall. Condominiums are included as single-family housing when they are of zero-lot-line or zero-property-line construction; when units are separated by an air space; or, when units are separated by an unbroken ground-to-roof or firewall. Multifamily housing also includes condominium units in structures of more than one living unit that do not meet the single-family housing definition above.

The data detailing the existing housing stock in each city were collected from the Census Bureau for the 1990 census year. These estimates include a measure of the number of single-family houses and multifamily houses in each city in 1990. The intra-annual housing stock totals for the 1991–2005 housing years were calculated by adding the 1990 Census housing stock to the number of homes constructed in the previous year.[4] These estimates were calculated for single-family and multifamily units and for the total number of housing units.

New House Construction in the San Francisco and Sacramento Metropolitan Areas

Individual new house sales data were collected from DataQuick News Service Custom Reports. The initial data set received from DataQuick included 415,303 observations, covering all new house sales in the San Francisco and Sacramento metropolitan areas for the 1988-through-2005 timeframe. Specifically, the data include new single-family and multifamily housing sales in 11 counties in the San Francisco area (Alameda, Contra Costa, Marin, Monterey, Napa, San Francisco, San Mateo, Santa Clara, Santa Cruz, Solano, and Sonoma Counties) and 8 counties in the Sacramento area (Butte, El Dorado, Fresno, Nevada, Placer, Sacramento, San Joaquin, and Stanislaus Counties).

Unfortunately, a number of observations in the initial data set were missing house characteristics data.[5] Of the initial data provided by DataQuick, approximately 298,715 observations were of a quality that they could be used in the hedonic estimation. Of the 298,715 observations, each sale included the following data: the parcel number of the house; the date of sale (day, month, and year); the price of sale; the city, ZIP Code, and latitude/longitude of the house; and the lot size, number of bathrooms, number of bedrooms, and square footage of the house.

City-Specific Housing Attributes

This section provides details on the geography and census data associated with each individual city in the data set as well as the school district boundary data associated with each individual new house sold in the San Francisco and Sacramento metropolitan areas.

Geographic Characteristics of the Data

The process for creating the data set used four different levels of geography from the U.S. census: census block group, ZIP Code, city, and county. The census geographic files were provided in a geographic projection as ArcView Geographic Information System (GIS) Cartographic Boundary Files and were normalized to the 2000 geography by GeoLytics, Inc.

The main unit of measurement in the analysis of the supply of housing is the consolidated city. A total of 468 cities were reported in the year 2005, 4 of which (Aliso Viejo, Elk Grove, Goleta, and

[4] Therefore, the housing stock in year t is represented by: $HS_{1990+t} = HS_{1990} + \sum_{t=1}^{16} HG_{1989+t}$ where *HS* is the total housing stock in year t, and *HG* is the number of homes built in year t. This process assumes that there is no loss in the existing housing stock and that the new housing stock is not a replacement of the old stock.

[5] Of the initial 415,303 observations received from DataQuick, 5,679 were missing sales price information; 98,805 were missing bed, bath, and square-footage information; and 67,788 were missing latitude and longitude information. (Note that some of the observations listed above overlap in terms of omitted information.) An additional 438 observations with latitude and longitude information were located outside the San Francisco and Sacramento areas.

Rancho Cordova) do not match with the census geographies because they were incorporated after the year 2000.

The ArcView GIS consolidated city shapefiles were used with a GIS line shapefile that was constructed to represent the California coast. The shortest distance (in kilometers) from the centroid of each city to the coast was then calculated using ArcView GIS, with a range from a maximum of 312 km (the city of Needles, in San Bernardino County) to less than a few hundred meters.

Census Data

The demographic variables in the analysis come from GeoLytics' provision of the 1990 Census long form files and include "places" data (cities, towns, and incorporated places that have legally prescribed boundaries, powers, and functions) for the cities and towns in California. The data include the following:

1. Total population.
2. Total land area.
3. Ethnicity (percent White, Hispanic, Black, Asian, and other for each city).
4. Per capita income.
5. Household income.
6. Total housing units.
7. Percent vacant housing units.
8. Percent owner-occupied housing units.
9. Percent single-family detached housing units.
10. Median year of construction for all housing units.

The total population and total land area variables were used to construct a population density value for each city. This variable is measured as the total population of the city divided by the total land area of the city in square kilometers.

School District Boundaries

In California, a student's "home school district," be it elementary or secondary, is assigned by virtue of the residential location. More often than not, a student will attend the nearest school in the district, but this is not uniformly true. Any student can attend any school within the district, as long as space is available; likewise, a student may petition to attend a school outside the district, again dependent on available space. For this reason, the 1:1 assignment of a school to a student without information on that assignment was impossible to create.

The analysis, however, controlled for the different school district boundaries. In the individual house sales model, each observation was spatially matched to its respective elementary and secondary school district. Cartographic boundary files of the school districts, as defined in the year 2000, were collected from the Census Bureau.

Inclusionary Zoning Data

City-level data on inclusionary zoning regulations were taken from the *Inclusionary Housing in California: 30 Years of Innovation* study (2003), conducted by the California Coalition for Rural Housing and the Non-Profit Housing Association of Northern California, during 2002 and early 2003. The survey includes detailed information about how local inclusionary zoning programs are structured.[6] The data collected from the survey include the following:

1. The year the inclusionary zoning policy was adopted.
2. The minimum project size.
3. The percentage of units required.
4. The targeted income group (very low, low, middle income).
5. Alternatives to construction (offsite allowances, in-lieu fees, land dedication allowances, and developer credit transfers).
6. The length of affordability.

Missing information from the survey was collected through personal contact with those cities or counties that did not respond to the survey or was taken from the Reason Public Policy Institute's "Housing Supply and Affordability: Do Affordable Housing Mandates Work?" (The list of unresponsive cities includes Fairfax, Los Gatos, Port Hueneme, Del Mar, Gonzales, Long Beach, Morro Bay, Vista, Woodland, and Menlo Park.)

Consumer Price Index Data

Consumer Price Index data were used to normalize the house sales price to a base year of 1988. The CPI statistics were provided by the U.S. Department of Labor, Bureau of Labor Statistics. The annual average CPI was calculated for all urban consumers, using all consumable items, for residents of the San Francisco-Oakland-San Jose Metropolitan Statistical Area in California, using a base year of 1988. These data are publicly available from the U.S. Department of Labor's Bureau of Labor Statistics under series IDs (CUURA422SA0) and (CUUSA422SA0).[7]

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[6] The Inclusionary Housing Policies sample includes 95 cities and 12 counties (not including San Francisco County, which incorporates a single city). These 95 cities represent roughly 20.3 percent of the total sample of cities in California.

[7] As a robustness check, different CPI values were used to normalize the house sales price data, including an all-U.S. urban average, a West Coast urban average, and the all-U.S. housing average (which is available only at the all-U.S. average level of aggregation). The San Francisco-Oakland-San Jose CPI is, on average, 1.5 to 3.7 percent larger than the other CPIs used, with a maximum difference of +7.1 percent and a minimum difference of -2.3 percent, depending on the year. Our model results are robust to the type of CPI used, but the Akaike information criterion goodness-of-fit test prefers the San Francisco-Oakland-San Jose CPI for the normalization method.

Authors

Antonio Bento is an associate professor of applied economics and management at Cornell University.

Scott Lowe is an assistant professor of economics at Boise State University.

Gerrit-Jan Knaap is a professor of urban planning at the University of Maryland, College Park, and the director of the University of Maryland National Center for Smart Growth Research and Education.

Arnab Chakraborty is an assistant professor of urban and regional planning at the University of Illinois, Urbana-Champaign.

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