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Title

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Journal

Journal of Housing Economics, 19(4)

Authors

Khan, Matthew

Vaughn, Ryan

Zasloff, Jonathan

Publication Date

2010

DOI

10.1016/j.jhe.2010.09.001

Peer reviewed



The housing market effects of discrete land use regulations: Evidence from the California coastal boundary zone

Matthew E. Kahn^{a,d,*}, Ryan Vaughn^b, Jonathan Zasloff^c

^a UCLA, Institute of the Environment, Department of Economics, Department of Public Policy, La Kretz Hall, Suite 300, Box 951496, Los Angeles, CA 90095, USA

^b UCLA Department of Economics, Los Angeles, CA 90095-1477, USA

^c UCLA Law School, Los Angeles, CA 90095-1476, USA

^d National Bureau of Economic Research, 1050 Massachusetts Ave Cambridge, MA 2138, USA

ARTICLE INFO

Article history:

Received 13 November 2009

Available online 29 September 2010

Keywords:

Land regulation

Gentrification

Amenities

California

ABSTRACT

The California coast line borders some of the most beautiful and expensive land in the entire world. The California Coastal Commission was created in 1976 to protect the coast line and to regulate land use within the coastal boundary zone. This well defined regulatory boundary offers a unique opportunity to study the consequences of land use regulation on nearby housing located in the same political jurisdiction. Using two different geocoded data sets, we document gentrification within the boundary and discuss possible explanations for these patterns.

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1. Introduction

The California coast line borders some of the most beautiful and expensive land in the entire world. Coastal communities such as Santa Monica, Malibu, and Carmel are known for their extremely high home prices and their unique beauty. Celebrities such as Clint Eastwood and Barbara Streisand are just a few of the wealthy who live there.

Simple compensating differentials logic tells us that if coastal land is scarce and if the amenities are superb, prices will be high. Over the last 30 years, home prices along this coast have soared. Both, increased demand and binding supply constraints are likely to have caused this trend. Rising labor market returns to the skilled have increased income inequality. Los Angeles is an international city attracting wealthy people from all over the world who bid up prices in Los Angeles' most desirable communities. Gyourko et al. (2006) Superstar City logic is relevant here. In the case of the coastal California, we think of this as the rise of

"Superstar Communities" within metropolitan areas. For example, in Los Angeles there has been much greater home price appreciation in Santa Monica than in inland communities such as Compton.

At the same time that demand has been increasing, land use regulation over new construction close to the coast has sharply increased. In this paper, we take a new look at a major piece of land use regulation with clear implications for housing supply and protecting the environment. We study the housing market dynamics associated with the introduction of the California Coastal Commission (CCC), perhaps the most powerful land use authority in the nation. This Commission has created a spatial regulatory zone, the coastal boundary zone (CBZ).

This CBZ represents a spatial regulatory border. In this paper, we exploit this regulatory variation at the border using a regression discontinuity design. Land parcels inside this border face more stringent building regulation than parcels located outside of the CBZ. This differential regulation within the same local community provides a sharper test of the role of housing regulation than has been offered in past regulatory studies (Katz and Rosen, 1987; Pollakowski and Wachter, 1990; Glaeser et al., 2005; Quigley and Raphael, 2005; Schill, 2005).

* Corresponding author at: UCLA, Institute of the Environment, Department of Economics, Department of Public Policy, La Kretz Hall, Suite 300, Box 951496, Los Angeles, CA 90095, USA. Fax: +1 310 825 9663.

E-mail address: mkahn@ioe.ucla.edu (M.E. Kahn).

From a research design standpoint, the CBZ has several attractive features. First, it regulates a very valuable and unique piece of land. Second, we know when the CBZ was enacted. Third, we know its exact physical boundary and thus can use simple GIS techniques to partition jurisdictions such as Santa Monica and Malibu into parts of these places that are “inside” and “outside” of the CBZ boundary.

By focusing on housing outcomes inside and outside of a political boundary, our paper mimics the regression discontinuity strategy embodied in studies such as Black (1999) and Boustan (2008). Black compared home prices for comparable nearby homes that were physically close to each other but lay on separate sides of a school district’s boundaries. Since these homes are very close to each other, they have similar local public goods (i.e. climate, access to the CBD, crime) but their local school quality differs because they lie on opposite sides of the boundary. In our case, we will compare housing market outcomes *within* the same census place (i.e. a Santa Monica) in parts of the city that we know face more stringent housing regulation relative to other parts of the city that do not face this regulation.

We use two different data sets to test hypotheses about the CBZ’s effects. The first data set is a census tract level panel from 1970 to 2000. The second data set is a year 2008 sales transaction data base for Los Angeles County. Based on these data, we find that population density has declined within the CBZ area. Using the 1970–2000 panel data set, we document the gentrification within this zone even relative to census tracts that were wealthy in 1970 and lie in the same census places but outside the CBZ zone. Using our 2008 Los Angeles sales transaction data base, we document that quality adjusted homes are 20% more expensive inside the zone than just outside of the zone. These capitalization effects are likely to reflect both supply limitations and increased demand due to the regulation’s effects in making the coast more desirable. We are unable to disentangle these two effects (Quigley and Rosenthal, 2004).

Our study contributes to the growing housing supply literature that has examined how regulation affects equilibrium outcomes. The fundamental challenge for empirical researchers is how to identify areas facing stringent housing regulation. Gyourko et al. (2006) have pioneered inferring regulation’s severity based on the regulation tax which is calculated as the gap between market price and the marginal cost of new construction. An alternative approach adopted by scholars is to use factor methods to create regulatory scales (see Glaeser and Ward, 2008; Gyourko et al., 2008). In our study, we are able to sidestep these issues of measuring the intensity of housing regulation because we focus on a specific treatment (CBZ) that is easy to pinpoint.

1.1. Background on the California Coastal Act of 1976

California’s Legislature created the coastal zone as part of the California Coastal Act of 1976, which declares that the “California coastal zone is a distinct and valuable natural resource of vital and enduring interest to all the people and exists as a delicately balanced ecosystem”,

“the permanent protection of the state’s natural and scenic resources is a paramount concern to present and future residents of the state and nation,” and that “it is necessary to protect the ecological balance of the coastal zone and prevent its deterioration and destruction.”¹

Generally, the coastal zone comprises a narrow strip of land running down the entire state coastline (except for San Francisco Bay), and usually extending 1000 yards from the mean high tide line. Sometimes this varies: in the Santa Monica Mountains outside of Los Angeles, for example, the zone can extend five miles inland. Figs. 1 and 2 present the CBZ boundary for Los Angeles and San Diego.

In order to protect the coastal zone, the Act created the California Coastal Commission, which holds land use jurisdiction over it, and final responsibility over “coastal development permits, (CDPs)” which are required to develop in the coastal zone.

The Commission enforces the Coastal Act through the issuance of cease-and-desist orders, if it discovers violations of either Local Coastal Programs or the Coastal Act itself. The penalties can be steep: recordation of the violation, fines up to \$30,000, and then fines of \$1000–\$15,000 as long as the violation is knowingly continued. The Commission is also authorized to ask for punitive damages.²

More than three decades after its enactment, the Coastal Commission remains one of the most politically controversial agencies in the state. Property rights activists and developers regularly complain of what they view as the Commission’s abusive behavior, accusing it of promoting a mindless anti-development attitude and maintaining hostility toward even the most harmless of projects. Environmentalists see the Commission’s attitude as a feature, not as a hindrance; they argue that without the Commission, “overdevelopment” would have destroyed the coast’s crucial environmental values.

For our purposes, this political conflict has value. Perhaps the only consensus about the Coastal Commission is that it writes, maintains and enforces some of the strictest environmental land use regulations in the country.³ The Commission itself admits that an appeal to it will take approximately 6–8 months on average to reach a final decision, although “[i]t may take longer to resolve more complicated appeals.”

The Coastal Act’s framers recognized that limiting development could lead to higher housing prices. Indeed, such a concern nearly killed the bill in the crib: key legislators withheld their votes for the Act unless it contained a mandate for the Commission to promote affordable housing. Even though this provision helped to ensure at the outset that at least some lower-income people, particularly seniors, could live in the coastal zone, it made no provision for either average or median prices. Analysts were concerned that little was known about the effects of the coastal zone on property values.⁴

¹ Pub. Res. C. § 30001.

² Pub. Res. C. § 30822.

³ See Jennifer Steinhauer, “In California, Coastal Commission Wields Vast Power,” *NY Times*, Feb. 23, 2008, at <http://www.nytimes.com/2008/02/23/us/23clemente.html> (last visited Aug. 21, 2008).

⁴ See Robert Kneisel, *Economic Impacts of Land Use Control: The California Coastal Zone Conservation Commission* (1979).

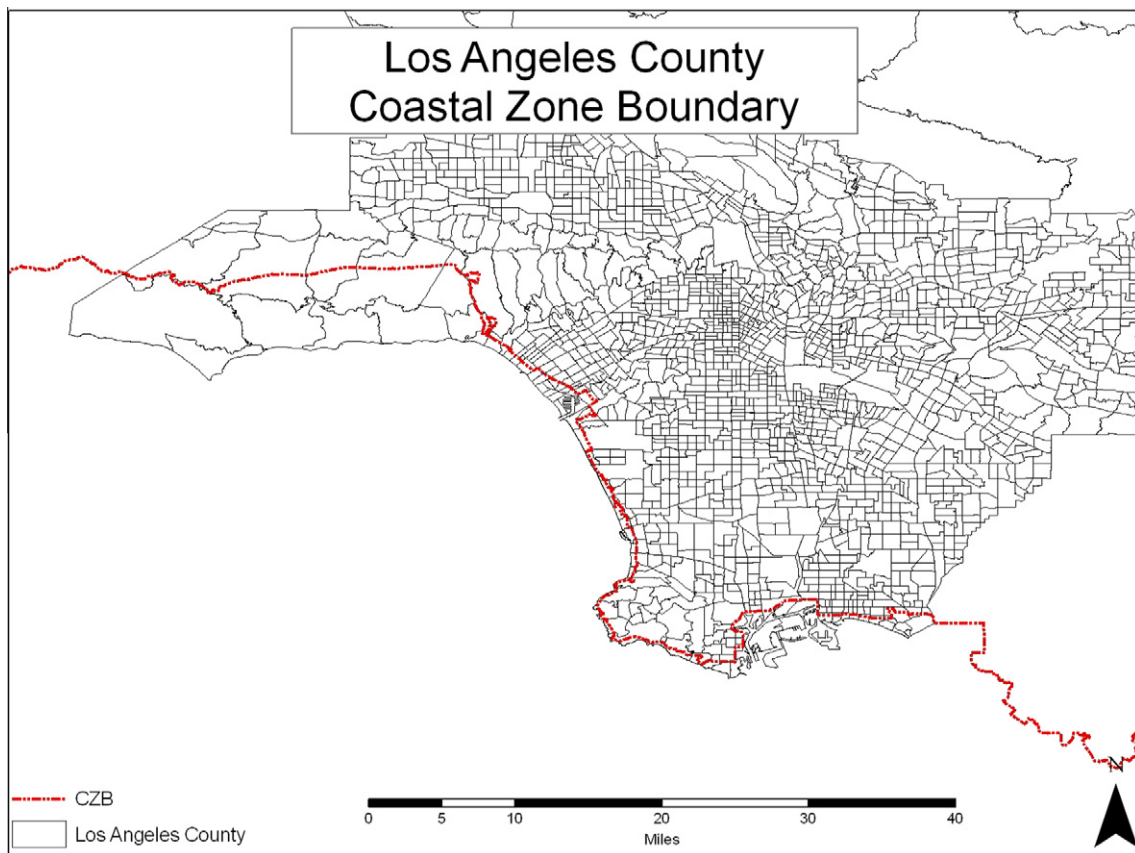


Fig. 1.

1.2. The Economic Consequences of the CCA

The CCA regulates a small but very important strip of land. As a share of all of California, the CCA tracts represent 1% of total land area and 3.2% of the state's total population in the year 1970. To highlight the simple supply and demand forces we believe underlie our empirical results consider Figs. 3 and 4. Fig. 3 presents a supply and demand graph for housing in the CCA area before and after the regulation. The standard result is that regulation raises prices and reduces the quantity of housing. Fig. 4 adds an extra nuance. We argue that this regulation not only restricts supply but it also increases demand for two different reasons. First, the CCA is amenity enhancing and this will increase demand. Second, the CCA acts as a commitment device, households can buy housing and know that in the future there will not be new construction.

This regulatory barrier to entry may trigger a social multiplier effect if rich people want to live in a beautiful area and live next to other rich people. This may be due to social networking or the expectation that fancy restaurants and stores will locate close by to serve them (Waldfogel 2008; Guerrieri et al., 2010). The net effect of these dynamics (as shown in Fig. 4) is that home prices will rise while the net effect of regulation on housing units is ambiguous. Again, our point is that the supply regulation may trigger a demand increase. The Superstar cities

research has taken the subset of “superstars” as exogenously determined. In our “Superstar community” case, the regulation has actually played a key role in creating these communities. Since the coast is a unique asset, such communities cannot be replicated and this creates rents for land owners.

It might not seem obvious why CCC authority would have such an impact on the desirability of housing inside a relatively small area like the coastal zone. After all, one of the goals of the Coastal Act is to improve the environmental quality of the seashore, which even those just outside the coastal zone can enjoy.⁵

But why should the Coastal Commission be any different from a local land use authority? We suggest that because the Commission lacks the incentives faced by local governments, its permitting requirements will tend to focus on neighborhood amenities rather than the fiscal and political issues favored by municipalities. Suppose a

⁵ The city of Huntington Beach does not allow any development on the shore side of Pacific Coast Highway, while the city of Newport Beach does. There is a striking photographic example of this difference at the Santa Ana river mouth that marks the border between these two cities. A photo demonstrating this fact with Huntington on the left (with no houses on the sand), Newport on the right is available at <http://www.californiaoceanline.org/cgi-bin/timecompare.cgi?image=200604027&latdeg=33.621370&longdeg=117.971355&flags=0&year=2006&hidden=0&oneimage=1987/8703133-2006/200604027->.

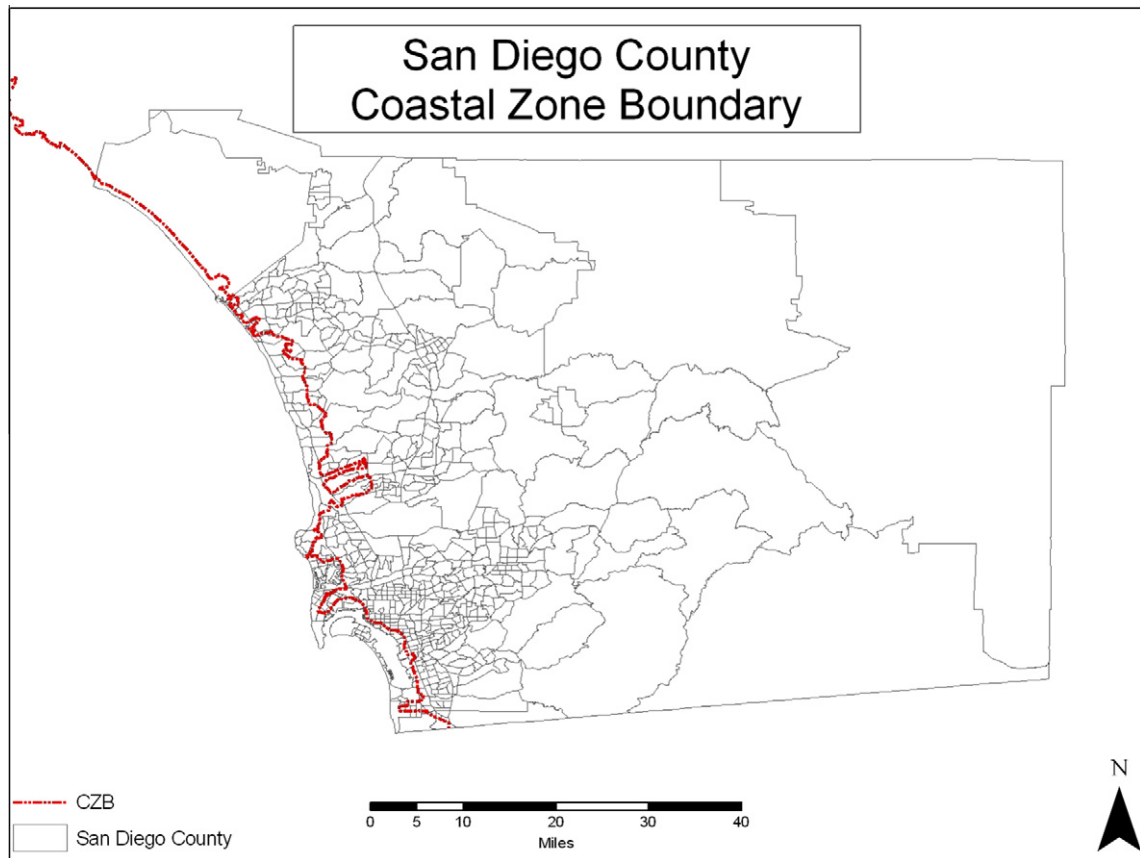


Fig. 2.

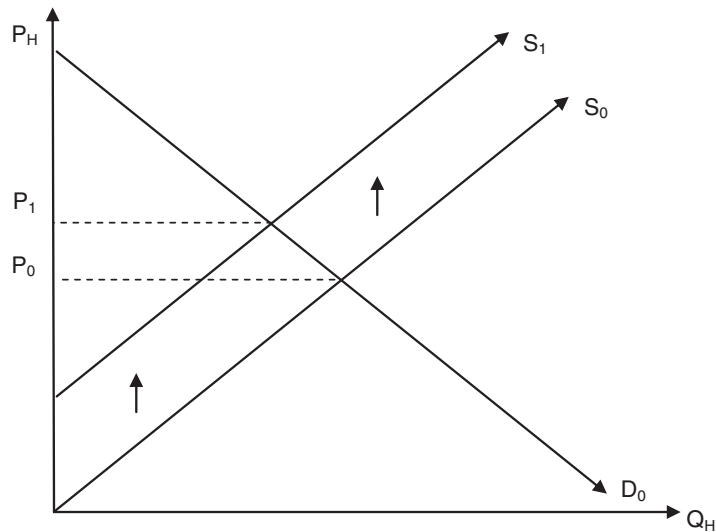


Fig. 3. Direct effects of land use regulation.

developer wants to place a strip mall near the beach. Local residents may hate the project, but city officials might be tempted for two reasons: (1) under California law, the sales tax revenue will go to city coffers; and (2) local elected officials might receive substantial campaign contributions

from the developer. The Commission will have little interest in either issue.

Indeed, this scenario helped create the Coastal Act in the first place: environmentalists became convinced that given the incentives cities faced, local governments would be

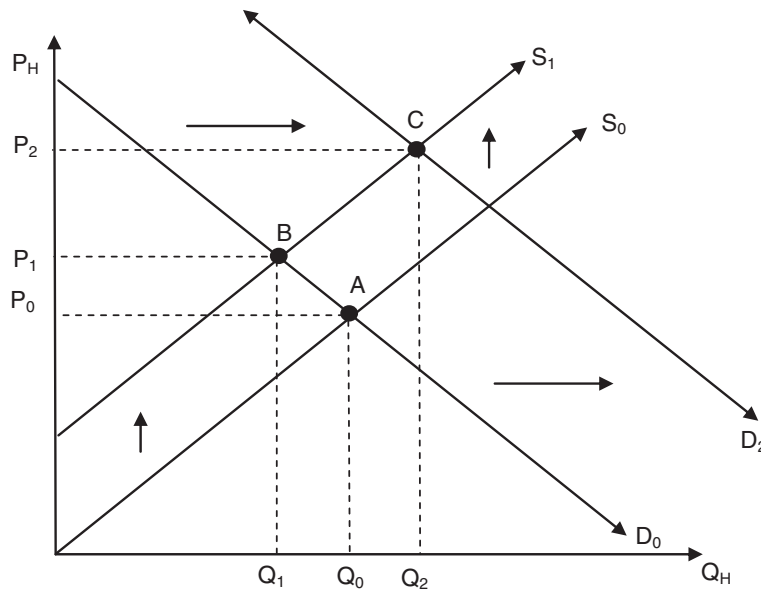


Fig. 4. Effects of land use regulation when regulation enhances local amenities.

unable or unwilling to prevent “overdevelopment”. The overall point, however, holds: the Coastal Commission is more likely than a local government to insist on amenities and/or reject development that some might find objectionable.

1.3. Empirical strategy

We use two different data sets and a regression discontinuity strategy to test several hypotheses related to the consequences of the enactment of the CBZ. The first data set will examine housing market outcomes and community demographics dynamics before and after the regulation is enacted. The second cross-sectional data set will allow us to implement a regression discontinuity design for examining effects inside and outside of the CBZ border.

In the first set of results, we will use a census tract level panel data where we will observe each census tract in the years 1970, 1980, 1990 and 2000. Define the unit of analysis as tract I in place j at time t . We estimate various versions of Eq. (1).

$$Y_{ijt} = \alpha_j + \beta_j * \text{Time}_t + \delta_t * \text{CBZ}_{ijt} * 1(\text{year dummy}_t) + \text{controls}_{ijt} + U_{ijt} \quad (1)$$

In Eq. (1), we include both a place specific fixed effect and a place specific time trend (time). By including these place specific fixed effects and time trends, we are controlling for place specific gentrification time trends (for example if Malibu becomes more desirable).

Given these controls, the key parameters of interest are the δ_t . This is the coefficient on the coastal boundary zone dummy (CBZ) and it is interacted with year time dummies. If we reject that δ_t equals zero, then this indicates that tracts within the CBZ boundary are experiencing differential trends in a specific outcome than tracts within the same place that lie outside the CBZ boundary.

While our 1970–2000 census tract panel has many strengths, we recognize that its geography is crude and

census tract self reported valuation may introduce measurement error. In the second set of econometric regressions, we will use transaction data for the universe of properties sold in Los Angeles County in 2008. Using the information on each sales transaction’s exact address, we have geocoded these properties. This information is crucial for determining whether each property lies inside or outside the CBZ line. We create a dummy variable that equals one if the property lies within the Commission’s regulatory zone (and this is called CBZ). We will estimate regressions of the form presented in Eq. (2). The unit of analysis is property I in zip code j at time t .

$$Y_{ijt} = \text{Zip}_j + \text{Month}_t + \beta_j * f(\text{Distance to Beach}) + \delta_t * \text{CBZ}_{ijt} + \beta_3 * \text{Structure}_i + U_{ijt} \quad (2)$$

We control for zip code fixed effects. Intuitively, within a zip code we are comparing sales transaction data for homes inside and outside the CBZ. We also include month fixed effects to capture macro time trends. Note the discontinuity approach, we are controlling for a polynomial of the home’s distance to the beach. The CBZ line differs across the County, but we are explicitly testing for jumps based on the estimates of δ_t . This approach builds on Boustan (2008) and earlier regression discontinuity work (see Black (1999) and Holmes (1998)).

1.4. Census tract level panel data and regression results

The census tract data is from the Urban Institute and Census Geolytics’ Neighborhood Change Database. This is a set of repeated cross sections from the 1970, 1980, 1990 and 2000 decennial censuses at the census tract level normalized to 2000 tract geography.⁶ These data contain

⁶ A full explanation of the tract conversion process and the potential errors that might be raised is available at http://www.gsd.harvard.edu/gis/manual/censuscdb/ncdb_docs/SpecialIssues.pdf.

Table 1A

Summary statistics census tracts within five miles of the coastline.

	Outside CBZ		CBZ		All	
	Mean	SD	Mean	SD	Mean	SD
<i>1970 Sample</i>						
Total housing units	1073	690	1042	875	1069	718
Population density	6342	5227	4744	5577	6119	5304
Average Household income	54273	29007	57534	42192	54687	30995
Average price	125003	41681	143925	48453	127335	43008
Centroid within CBZ					0.140	0.347
N	1421		231		1652	
<i>2000 Sample</i>						
Total housing units	1750	729	1903	1030	1771	779
Population density	9290	7416	6153	5729	8852	7285
Average household income	69573	38431	85081	42940	71731	39443
Average price	310488	193883	477309	242023	333081	208947
Centroid within CBZ					0.140	0.347
N	1421		231		1652	

the evolution of demographic characteristics and transit ridership for exactly the same geographic areas over time. Census tracts are sufficiently small geographically such that they capture much of the demographic variation across neighborhoods.

Using GIS software, we calculated for each census tract its centroid's distance to the beach and we calculated whether or not the centroid lies within the CBZ. If the centroid does lie within the CBZ, we will refer to this as one of the "treated" tracts.⁷

Our tract panel data set includes all Californian census tracts whose centroid is within five miles of the ocean.⁸ We drop the counties that comprise the San Francisco Metropolitan Area. These counties comprise the San Francisco Bay Area Zone. This is a separate regulatory zone that was in place before the Coastal Act of 1976. To avoid studying multiple regulatory programs and given that we do not have data for the "pre-period" we simply drop these tracts. We focus on census tracts located in incorporated places.

The upper panel of Table 1a reports the sample means for our data in the years 1970 and 2000. It is important to note that 1970 represents the "pre-regulation" year. This simple table of means highlights several important points. First the CBZ set of tracts represents 14% of the sample. This relatively small size reduces concerns about general equilibrium effects. If the CBZ has a causal effect of displacing economic activity away from the coast, such activity will be scattered across the other 86% of the sample and this reduces concerns that the "control areas" are treated. The second point to note is the rough similarity between CBZ tracts and control tracts in the base year of 1970 in terms of average household income and home prices. By the year 2000, there is a sharp divergence between these two sets of tracts. As of the year 2000, average household

income is about 16% higher in the CBZ relative to the average outside the CBZ and average prices are about 23% higher.

Coastal locations may be gentrifying, not because of binding regulation, but due to exogenous factors. Following the logic of Gyourko et al. (2006)'s "Superstar Cities", superstar Communities near the California coast may be experiencing rising home prices simply due to rising demand and a limited set of housing opportunities. We test this claim by identifying census tracts whose centroid is within five miles of a beach but lie outside of the CBZ. For this set of tracts, we identify the subset of tracts that were rich in 1970. To identify these tracts, we calculate the 80th percentile of the 1970 tract average household income distribution for the California counties that lie along the coast but dropping the San Francisco metropolitan area counties. Using this 80th percentile cutoff, a tract is "rich" if its average household income exceeds this 80th percentile value. We will refer to this subset of tracts as the "Rich Tracts". A tabulation of our tract data based on the 1970 cross-section reveals that there are 1652 total tracts in our sample. Of the 231 tracts whose centroids are within the CBZ, only 43 of these were "Rich Tracts" and the remaining 188 where "Non-Rich Tracts".

In Table 2, we report results where we test whether there is differential gentrification over time in tracts within the CBZ zone versus in tracts within five miles of the beach that were wealthy in 1970. We argue that the "exogenous Superstar Cities" hypothesis would predict roughly equal gentrification in both sets of tracts.

Table 2 reports four different regressions based on Eq. (1). The omitted category is a tract not in the CBZ that is not Rich based on its 1970 average household income. The top four rows indicate relative to 1970 by the year 2000, average household income had increased by 19% more in CBZ tracts than in the non-CBZ tracts in the same census place. The fourth column shows that home prices in the CBZ appreciated relatively more. The average home price in the CBZ tracts increased by 25% more between 1970 and 2000 relative to non-CBZ tracts in the same census place. In 1970, the CBZ/non-CBZ price differential was 6% and this grew to 31% by the year 2000.

⁷ We recognize that parts of some census tracts that we code as being within the CBZ will actually lie outside the CBZ. But, it is important to note that this is biased against us. Consider a tract whose centroid is within the CBZ but that has 40% of its area lying outside the CBZ. Our tract average data represents a weighted average with 60% treated and 40% untreated but we will assume that 100% of the tract is treated. Any "treatment effect" that we recover below would understate the "true" treatment effect.

⁸ In 1970, five million people lived in the census tracts we study and by the year 2000, eight million people lived in our study area.

Table 2

Panel census tract regressions.

	(1)	(2)	(3)	(4)
	Log(household income)	Log(housing units)	Log(population density)	Log(home price)
Tract centroid in CBZ	–0.026 [0.041]	–0.245 [0.144]*	–0.047 [0.135]	0.055 [0.034]*
Tract centroid in CBZ*1980 dummy	0.063 [0.027]**	0.363 [0.137]***	0.008 [0.058]	0.156 [0.017]***
Tract centroid in CBZ*1990 dummy	0.153 [0.033]***	0.148 [0.125]	–0.057 [0.073]	0.138 [0.026]***
Tract centroid in CBZ*2000 dummy	0.189 [0.037]***	–0.039 [0.123]	–0.200 [0.098]**	0.252 [0.031]***
Rich tract in 1970	0.435 [0.021]***	0.101 [0.066]	–0.444 [0.079]***	0.295 [0.018]***
Rich tract in 1970*1980 Dummy	0.033 [0.018]*	–0.191 [0.055]***	0.052 [0.036]	0.027 [0.010]***
Rich tract in 1970*1990 Dummy	0.019 [0.019]	–0.112 [0.060]*	–0.042 [0.046]	0.011 [0.016]
Rich tract in 1970*2000 Dummy	–0.026 [0.020]	0.027 [0.055]	–0.029 [0.052]	0.016 [0.020]
Log(distance to coast)	0.017 [0.023]	0.016 [0.042]	0.151 [0.058]***	–0.057 [0.017]***
Log(distance to CZB)	0.154 [0.057]***	–0.066 [0.075]	–0.441 [0.075]***	0.156 [0.029]***
Log(Area)		–0.092 [0.041]**		
Year fixed effects	Yes	Yes	Yes	Yes
Place fixed effects	Yes	Yes	Yes	Yes
Place-time fixed effects	Yes	Yes	Yes	Yes
Constant	8.880 [0.638]***	1.493 [1.225]	10.291 [0.969]***	10.223 [0.369]***
Observations	6401	6592	6469	6251
R-squared	0.589	0.472	0.546	0.826

Tract level clustered standard errors in brackets.

All tracts within five miles of the beach.

* Significant at the 10% level.

** Significant at the 5% level.

*** Significant at the 1% level.

It is well understood that the CBZ introduces a costly, time consuming process for obtaining new permits for building. In column (2), we study the dynamics of total housing units for census tracts inside and outside of the CBZ.⁹ In the 1970 baseline, there were 29% fewer housing units in the CBZ tracts than in the non-CBZ tracts. A strict interpretation of the coastal boundary zone would say that this regulation should cause a decline in this number as it becomes more difficult to build. Perhaps surprisingly, we estimate a positive 1980*CBZ interaction and a positive 1990*CBZ interaction; the coefficient is negative in 2000 but statistically insignificant. One explanation for these results is that the CBZ increases the quality of life and this increases the demand to live there at the same time that it raises the cost of supplying housing units. The third column reports time trends in tract population density. In 1970, there was no statistically significant difference in population density between the CBZ and non-CBZ tracts but as this regulation is phased in we see a monotonic drop in the relative population density in the CBZ tracts such that by the year 2000 population density has declined by 20% in the CBZ tracts relative to the non-CBZ tracts.

By limiting property tax growth, Proposition 13 (passed in 1978) locks in households in desirable areas. In results available on request, we find that the share of the population who are ages 5–17 shrinks by two percentage points in the treatment tracts between 1970 and 2000 relative to the control tracts. We find no statistically significant differential in this children share between 1970 and 1980. This suggests that within the CBZ that households are remaining in homes after their children have moved out. Such households enjoy a low property tax on a high amenity property and have the option to sell the home to their children. If households pursue this strategy, then this would generate the finding that housing units do not change over time but population density does decline.

To further explore how population density differs just inside and outside the CBZ boundary, we have created a year 2000 Census block group data base. Block groups are smaller than census tracts. We focus on the same sample of counties used for our census tract panel. We keep only the block groups that are within five miles of the beach. Using a sample of 4412 block groups we estimate a log-linear regression with place fixed effects of the form

$$\begin{aligned} \text{Log}(\text{Density})_j = & \text{Place} + \beta_j * f(\text{Distance to Beach}) \\ & + \delta * \text{CBZ}_{ij} + U_{ij} \end{aligned} \quad (3)$$

⁹ In the housing units regression, we control for the census tract's land area. To our surprise, this variable has a negative coefficient. Our results are robust to dropping this from the regression.

Controlling for a cubic in distance to the beach, we estimate a coefficient of δ equal to -0.753 with a t -statistic of -9.03 . In the year 2000, population density is much higher just outside the boundary than inside the boundary. This suggests that the Coastal Commission's regulations are constraining households who want to live near the beach. We recognize that households may also be clustering just outside the boundary because the CBZ has made proximity to the coastal area even more desirable.

The middle four rows of Table 2 report our test of whether tracts that were rich in 1970 and located within five miles of the coast experienced the same gentrification trends as the CBZ tracts. We reject this hypothesis. As would be expected, the tracts whose average household income was greater than the 80th percentile of the distribution in 1970 have much higher income and home prices in 1970. Note the small statistically insignificant coefficients for "Rich Tract in 1970*2000 Dummy". This means that between 1970 and 2000 that the CBZ tracts had a

much greater increase in average income and home prices than the tracts outside the CBZ but close to the beach that were rich in 1970. This evidence suggests to us that the observed CBZ appreciation cannot be explained by "exogenous" demand for living in the best parts of the metropolitan area.

In Table 3, we run the same regressions for the subsample of Los Angeles region tracts. For the subset of tracts in Orange County, Ventura County and Los Angeles County, Albert Saiz graciously shared his topographical data with us. We converted these data into a tract level measure. For details on these data see Saiz (2010). For each tract in our sample in these counties, he has provided us with a topography variable measuring the share of the tract's area that is sloped. Such topography makes it difficult to build new housing but it may be desirable. We estimate an augmented version of Eq. (1) where we also include the tract's mountain share interacted with the census year dummies.

Table 3
Panel census tract regressions in the Los Angeles area.

	(1)	(2)	(3)	(4)
	Log(household income)	Log(housing units)	Log(population density)	Log(home price)
Tract Centroid in CBZ	-0.006 [0.052]	-0.019 [0.203]	-0.276 [0.220]	0.025 [0.065]
Tract centroid in CBZ*1980 dummy	0.066 [0.025]***	0.055 [0.099]	0.046 [0.092]	0.208 [0.024]***
Tract centroid in CBZ*1990 dummy	0.186 [0.045]***	0.062 [0.098]	0.095 [0.101]	0.236 [0.045]***
Tract centroid in CBZ*2000 dummy	0.239 [0.054]***	0.163 [0.088]*	-0.121 [0.169]	0.339 [0.059]***
Rich tract in 1970	0.497 [0.031]***	0.002 [0.093]	-0.359 [0.097]***	0.301 [0.029]***
Rich tract in 1970*1980 dummy	0.045 [0.014]***	0.108 [0.039]***	-0.014 [0.045]	0.088 [0.016]***
Rich tract in 1970*1990 Dummy	0.058 [0.022]***	0.057 [0.045]	-0.132 [0.052]**	0.066 [0.022]***
Rich tract in 1970*2000 dummy	0.077 [0.026]***	0.098 [0.051]*	-0.199 [0.059]***	0.121 [0.026]***
Mountain land share	0.981 [0.207]***	0.250 [0.535]	-3.062 [0.426]***	0.491 [0.122]***
Mountain land share*1980 dummy	0.022 [0.065]	0.242 [0.117]**	0.212 [0.148]	0.118 [0.060]**
Mountain land share*1990 dummy	0.206 [0.086]**	0.210 [0.136]	0.132 [0.171]	-0.003 [0.095]
Mountain Land Share*2000 Dummy	0.202 [0.105]*	-0.079 [0.179]	0.069 [0.221]	0.416 [0.136]***
Log(distance to coast)	0.074 [0.029]**	0.119 [0.090]	0.073 [0.085]	-0.003 [0.030]
Log(distance to CZB)	0.136 [0.053]**	-0.042 [0.148]	-0.087 [0.124]	0.185 [0.068]***
Log(area)		-0.143 [0.118]		
Year fixed effects	Yes	Yes	Yes	Yes
Place fixed effects	Yes	Yes	Yes	Yes
Place-time fixed effects	Yes	Yes	Yes	Yes
Constant	9.150 [0.571]***	7.418 [1.638]***	10.008 [1.366]***	9.660 [0.710]***
Observations	2257	2275	2273	2196
R-squared	0.663	0.143	0.455	0.826

Tract level clustered standard errors in brackets.

All tracts within five miles of the beach.

* Significant at the 10% level.

** Significant at the 5% level.

*** Significant at the 1% level.

Table 1B

Summary Statistics. 2008 Los Angeles County Sample.

	Outside CBZ		CBZ		All	
	Mean	SD	Mean	SD	Mean	SD
Within CBZ					0.111	0.314
1(Price <\$25,000)	0.016	0.126	0.054	0.226	0.020	0.141
Pool	0.197	0.398	0.161	0.368	0.193	0.395
Single detached home	0.654	0.476	0.447	0.497	0.631	0.482
Price	710134	714837	1210245	1175662	765413	794839
Year built	1962.593	21.673	1971.080	25.598	1963.495	22.276
Indoor area	1583.872	1068.641	1697.476	1284.226	1596.429	1095.077
Distance to coast	4.066	2.441	1.093	1.854	3.737	2.559
N	10421		1295		11716	

In the Los Angeles area in 1970, there was no statistically significant difference in household incomes or home prices in CBZ tracts relative to the control tracts. By the year 2000, home prices and household incomes have increased by much more inside the CBZ than outside. In the Los Angeles region, the initially rich tracts do experience income and home price appreciation but at a much smaller rate than the CBZ tracts. These differentials are statistically significant. The bottom four rows present the mountain results. In the areas featured a mountain slopes, home prices and incomes have appreciated by more over time. It is important to note that the Mountains variable has a mean of 0.05 and a standard deviation of 0.14 so the mountain results are not quantitatively large. As shown in the population density column, densities are much lower in the mountain areas indicating that it is difficult to build there. These within metropolitan area results confirm [Saiz's \(2010\)](#) cross-city findings. They are relevant for us because it is possible that inelastic housing supply could be caused by exogenous factors (i.e. mountains) rather than by “man-made” regulation. By including both variables in the same regression, we have tested this claim.

1.5. Results based on the Los Angeles County 2008 micro data

We restrict our attention to those sales that are within eight miles of the coast. For each property, we pinpoint whether the property lies within the CBZ or not. [Table 1b](#) reports the summary statistics. Of the 11,716 observations in our sample; 7% of them lie within the CBZ. The average sale in the CBZ is roughly double in price compared to the average home not in the CBZ and is 11 years newer. There is a large difference in condominiums versus single family homes in the two areas. Only 45% of the sales in the CBZ are single family homes while 65% of the sales outside of the CBZ are single family homes.

To further test for the CBZ effect, we adopt a simple regression discontinuity approach similar to [Black \(1999\)](#). For a given outcome indicator Y , we regress this on a zip code fixed effect and the home's distance to the beach. It is important to note that this is a continuous variable. Controlling for the home's zip code and a cubic in distance to the beach, we include a dummy variable indicating whether the home is in the CBZ.

[Table 4](#) reports the first set of results using our transaction data base. Homes within the CBZ are on average 5

years younger and sixteen percentage points less likely to be a single detached dwelling. We find no statistically significant effect of CBZ status on the interior space of the housing unit. In all of these regressions, the control group is the set of home sales in the same zip code that lie just outside the CBZ.¹⁰

[Table 5](#) reports our hedonic price regressions where the dependent variable is the log of the sales price. In columns (1–3), the sample includes all sales within five miles of the coast while in columns (4 and 5) we narrow in only sales within two miles of the coast.

In [Table 5's](#) column (1), we create a dummy variable that equals one if the sales price is less than \$25,000. Across all 11,716 properties in our data set only 2% of the sales are for less than this price. But, according to the results in [Table 5](#) column (1), CBZ homes have a much higher probability of being “too cheap”. Note that the regression coefficient equals two percentage points. One explanation for this fact is that home owners in the CBZ transfer these properties to related family members anticipating that this is a wise investment.

In [Table 5](#) columns (2–5), we estimate the standard hedonic home price regressions excluding sales for less than \$25,000.¹¹ When controlling for zip code and month of sale fixed effects, we find that homes that are further from the beach sell for a lower price. When controlling for all of these explanatory variables, we find that homes just within the CBZ zone sell for over a 20% price premium. In a similar spirit as [Black's \(1999\)](#) findings on school boundaries, this is strong evidence of a regression discontinuity. This result is robust to focusing just on homes within two miles of the beach. As shown in columns (3) and (5) of [Table 5](#), our hedonic price estimate is also robust when controlling for a set of home structure attributes.

Our preferred explanation for this result is a social multiplier effect similar to what is reported in [Bayer et al. \(2007\)](#). Those who buy within the CBZ gain access to a unique environmental amenity and the CBZ's “barrier to entry” leads to a richer set of people living within this zone. If close proximity to very wealthy neighbors is a normal good, then people will be willing to bid more for the homes within the CBZ. In addition, those who

¹⁰ Distance to the beach is measured in kilometers.

¹¹ We drop these observations because we do not believe that they are market transaction prices. Results for the full sample including these observations are available on request.

Table 4
2008 Los Angeles County regressions.

	(1)	(2)	(3)	(4)
	Year built	Log(Living space)	Pool	Single family dwelling
In CBZ Dummy	5.015 [0.868]***	0.002 [0.018]	−0.004 [0.021]	−0.163 [0.017]***
Distance to coast	−1.597 [0.948]*	0.055 [0.019]***	0.025 [0.020]	0.043 [0.019]**
Distance ²	0.806 [0.280]***	−0.015 [0.006]***	−0.003 [0.006]	−0.026 [0.006]***
Distance ³	−0.094 [0.023]***	0.001 [0.000]*	−0.000 [0.000]	0.003 [0.000]***
Month fixed effects	Yes	Yes	Yes	Yes
Constant	1962.762 [1.223]***	7.278 [0.025]***	0.127 [0.026]***	0.725 [0.025]***
Observations	11265	11262	7396	11716
R-squared	0.238	0.275	0.205	0.312

Standard errors in brackets.

* Significant at the 10% level.

** Significant at the 5% level.

*** Significant at the 1% level.

Table 5
Los Angeles County sales price hedonic regressions.

	(1)	(2)	(3)	(4)	(5)
		Full sample		Within two miles of coast	
	Too cheap	Log(home price) ^a	Log(home price) ^a	Log(home price) ^a	Log(home price) ^a
In CBZ dummy	0.020 [0.006]***	0.242 [0.018]***	0.206 [0.013]***	0.244 [0.019]***	0.214 [0.014]***
Distance to coast	0.032 [0.007]***	−0.000 [0.019]	−0.022 [0.014]	−0.110 [0.058]*	−0.103 [0.042]**
Distance ²	−0.008 [0.002]***	−0.000 [0.006]	0.003 [0.004]	0.087 [0.045]*	0.054 [0.033]
Distance ³	0.001 [0.000]***	−0.000 [0.000]	−0.000 [0.000]	−0.019 [0.010]*	−0.010 [0.007]
Single family home		0.545 [0.010]***	0.396 [0.011]***	0.464 [0.015]***	0.393 [0.015]***
Log(living space)			0.674 [0.009]***		0.665 [0.013]***
Pool			−0.000 [0.008]		−0.015 [0.013]
Year built			0.002 [0.000]***		0.002 [0.000]***
Constant	0.018 [0.008]**	12.874 [0.026]***	5.026 [0.390]***	13.017 [0.033]***	4.782 [0.507]***
Observations	11716	11177	11177	5044	5044
R-squared	0.061	0.672	0.819	0.697	0.838

Standard errors in brackets.

^a Excluding “Too Cheap” observations.

* Significant at the 10% level.

** Significant at the 5% level.

*** Significant at the 1% level.

buy inside the CBZ will not have to be concerned about potential developers seeking to build unwanted structures near their backyards.

2. Conclusion

The California Coastal Act is a distinctive piece of land use regulation. Its intent is to preserve a unique environmental asset. This paper has used two different data sets to document the unintended consequences of this environmental/land use regulation. We find that this regulation has led to increased population density within the

CBZ area and that gentrification has taken place within the CBZ.

From a research design standpoint, the coastal boundary zone has several attractive features. While the land area is relatively small, this regulation covers billions of dollars of land value. A fundamental challenge that has plagued the empirical housing supply literature is noisy measures of the intensity of housing regulation. In our case, we know exactly when and where the regulation was enacted. While we cannot provide an exact measure of the “regulatory tax” for attempting to build within the boundary, from our study of the legal requirements for complying with its rules, it is clear that this regulation is costly.

Our census tract panel data set and the Los Angeles transaction data results together suggest that this regulation has triggered both supply and demand effects that on net have gentrified the area. We have not attempted to disentangle how much of the price appreciation over time or the discontinuity in price we document is due to supply side factors versus demand side factors. Future work should focus on developing an empirical strategy for unbundling these two effects.

Acknowledgments

We thank the Haynes Foundation and the Richard Ziman Real Estate Center at UCLA for generous research funding. We thank the editor, two reviewers, Byron Lutz, and seminar participants at USC, the UCLA Law School and the July 2009 AREUA International Meetings at UCLA. We thank Aubrey Michi for excellent research assistance.

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