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Property Tax Limitations and Mobility: Lock-in Effect of California's Proposition 13

In 2003 financier Warren Buffett announced that he paid property taxes of $14,410 (or 2.9 percent) on his $500,000 home in Omaha, Nebraska, but paid only $2,264 (or 0.056 percent) on his $4 million California home.[1] Although Buffett is known as an astute investor, his low California property taxes were not due to his investment prowess, but rather to Proposition 13. Adopted by California voters in 1978, Proposition 13 mandates a property tax rate of 1 percent plus the cost of interest on locally approved bonds. It also requires that properties be assessed at their market value at the time of purchase and allows assessments to rise by no more than the inflation rate or 2 percent a year, whichever is lower. Reassessment to full market value occurs only when the property is sold again. This means that as long as property values increase by more than 2 percent a year, homeowners benefit from remaining in the same house because their taxes are lower than they would be on a different house of

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1. Joseph T. Hallinan, "Schwarzenegger Adviser Buffett Hints Property Tax Is Too Low," *Wall Street Journal,* August 15, 2003, p. A1. Note that Proposition 13 benefits nonresident owners of California property such as Buffett, even while they avoid paying other California taxes.

the same value. Proposition 13 thus gives rise to a lock-in effect for owner-occupiers that becomes stronger over time. It also affects renters indirectly because it raises the price of owner-occupied homes and has caused many California cities to adopt rent control.[2]

In this paper we use a difference-in-difference (DD) approach to test the lock-in effect of Proposition 13 on owners and renters in California. We find that from 1970 to 2000, holding everything else constant, the average tenure length of owners in California increased by 0.66 years, or 6 percent, relative to that of owners in our comparison states. The tenure length of renters also increased over the same period, but the increase appears to be due to the widespread adoption of rent control in California cities after Proposition 13, rather than to the initiative directly. We also find that the lock-in effect of Proposition 13 varies substantially across migrant groups, with migrants to California responding more than native-born Californians. Finally, we find that the response to Proposition 13 increases sharply as the subsidy rises: owners with the lowest subsidies of $250 (typical of Fresno) increased their tenure length by less than one year, but owners with higher subsidies of $1,000 (typical of Los Angeles/Orange County) increased their tenure length by 1.2 years, and those with subsidies of $1,700–$2,600 (typical of San Francisco/San Jose) by two to three years.

In this paper we describe the property tax system in California and in our control states. We also discuss the prior literature and theory of how property tax limitations affect mobility, describe our data, and present regression results.

Property Tax Limitations

How do property taxes in California differ from those in Texas and Florida, which we use as our control states? We turn now to details about the property tax regulations in the three states.

2. A number of states copied California and adopted their own property tax limitations in the early 1980s, but the copycat reforms were less radical in that they limited the growth of property tax revenues at the jurisdiction level, rather than at the individual property level. The best known of the copycat reforms was Proposition 2½ in Massachusetts, adopted in 1980, which capped the property tax rate at 2.5 percent and limited the increase in property tax revenues of cities and towns to a maximum of 2.5 percent a year. Florida adopted a property tax limitation in 1992 that applies to individual properties (see discussion below). On Proposition 2½, see Cutler, Elmendorf, and Zeckhauser (1999), and Lang and Jian (2004).

California

Proposition 13, adopted in June 1978 as a ballot initiative, rolled back property assessments to the level that prevailed when the owner acquired the property or the level in 1975–76, whichever date was later, and cut the property tax rate to 1 percent plus the cost of locally approved bonds. Proposition 13 also limited assessment increases to the inflation rate or 2 percent a year, whichever is lower, until the next time the property is sold. At that point, the property is reassessed at market value. These provisions apply to all types of property. Several additional propositions have extended the reach of Proposition 13. Proposition 8, adopted in November 1978, requires that properties be assessed at market value if their Proposition 13 assessments exceed market value. If market value later increases to more than the Proposition 13 assessment, then the assessed value of the property shifts back to its Proposition 13 assessment.[3] Proposition 58, adopted in 1986, allows homeowners to transfer ownership of their houses to their children upon death of the parent, without losing their Proposition 13 assessments.[4] Proposition 60, also adopted in 1986, allows homeowners who are at least fifty-five years old to take their Proposition 13 assessments with them if they move to another house within the same county, as long as the new residence is of equal or lower value. Proposition 90, adopted in 1988, extended this right to intercounty moves, if the origin and destination counties have a reciprocal agreement.

Since 1978, local governments have been given the power to establish various types of special districts that issue bonds financed by property taxes or levy per parcel charges on properties within their boundaries. These charges are in addition to the 1 percent property tax rate. Some of the additional charges require voter approval by a two-thirds majority, while others require only a simple majority vote. Some are levied on all properties, while others are levied only on new development.[5]

To illustrate the long-term effect of Proposition 13, suppose buyer A purchased a house for $100,000 in 1975 (we use 1975 because Proposition 13

3. See Sheffrin and Sexton (1998) for discussion.

4. Proposition 13 allowed property transfers from parents to minor children and disabled children, but Proposition 58 extended this right to all children. See Stohs, Childs, and Stevenson (2001).

5. An example is the parcel tax of $293 a year per property levied by the Palo Alto Unified School District on all properties within its boundaries. This tax, adopted in 2001, required a two-thirds majority vote. A proposal to raise the parcel tax was defeated in November 2004. (See "Did You Know? Information about the PAUSD Parcel Tax," www.pausd.org/community/downloads/supt/parceltax.pdf [2004]).

rolled back assessments to the level prevailing in that year). Also, suppose that buyers B, C, and D purchased identical houses in 1985, 1995, and 2005, respectively. Assume that the property tax rate is 1 percent over the entire period (this assumes that there are no locally approved bonds or additional taxes), property values increase at a constant rate of 10 percent a year, and the inflation rate is 2 percent per year. Ten years later, in 1985, buyer A's property taxes have risen from $1,000 to $1,195 per year. But buyer B pays $235,800 for an identical house and recieves a property tax bill of $2,358. Another ten years later, in 1995, buyer A's taxes have risen to $1,457, but buyer C pays $611,600 for the same house and receives a tax bill of $6,116. Finally in 2005—the thirtieth anniversary of Proposition 13—buyer A's taxes have risen to $1,776, but buyer D pays $1,583,000 for an identical house and recieves a property tax bill of $15,863. Buyer A's year;y property tax subsidy is .01*$235,800 – $1,195 = $1,163 in 1985, $4,659 in 1995 and $14,087 in 2005. While these figures may seem high, they are much smaller than Warren Buffett's property tax subsidy of $37,830. Landlords receive the same benefit on their rental apartments.

From 1977 to 1987, the average property tax rate on single-family homes with Federal Housing Administration (FHA) mortgages fell from 0.0221 to 0.0055 in California, or by 75 percent, compared to a decline from 0.0167 to 0.0115, or 31 percent, in the United States overall.[6]

Texas and Florida

Texas and Florida, our comparison states, are both large Sun Belt states with high rates of domestic and foreign in-migration during the 1970–2000 period.[7] Texas and Florida before 1992 had traditional property tax systems, meaning properties are reassessed each year and assessments are set equal to market value.[8] Localities in each state determine the property tax rate, and the rate is not subject to state-imposed limitations. But in 1992, Florida adopted a Proposition 13–style tax reform, which took effect in 1995. The measure limited assessment increases for individual properties to the inflation rate or 3 percent a year, whichever is lower. Like the California initiative, assessments revert to market value only when a new sale occurs. The property tax reform

6. See O'Sullivan, Sexton, and Sheffrin (1993, table 2).

7. Using Texas and Florida as comparison states allows us to control for the increase over time in households' taste for living in warm climates.

8. See O'Sullivan, Sexton, and Sheffrin (1993, table 3).

also set the property tax rate at 2 percent. While Florida's tax reform is similar to Proposition 13, it has been in effect for a shorter period and does not constrain the growth of property taxes nearly as much as Proposition 13.

Texas has a rule that when local jurisdictions conduct a general reassessment of all properties, the jurisdiction's property tax revenues cannot increase by more than 8 percent. This limit differs from Proposition 13 in that it applies to the combined value of all properties in the jurisdiction, not to individual properties. Texas also limits the maximum property tax rate, but the limit is greater than 2 percent. In the empirical work, we treat both Texas and Florida as having no property tax limitations. As of 1987, the average effective property tax rate was 0.009 in Florida and 0.014 in Texas, compared to 0.0055 in California.[9]

Prior Literature

Two previous studies have examined the effect of Proposition 13 on household mobility. Nagy (1997) estimated the change in mobility between 1975 and 1981, using data from three metropolitan areas in California and seven metropolitan areas outside California. He found that mobility declined in both California and the comparison metropolitan areas, and the difference between them was insignificant. Nagy attributed the decline in mobility to the fact that mortgage interest rates rose over the period, so that all households that moved were forced to pay higher interest rates. Our study has the advantage of using data for a longer period.

Stohs, Childs, and Stevenson (2001) ran regressions explaining the percent of single-family detached houses that were sold during the 1995–2000 period in census tracts in two California metropolitan areas as well as in parts of Chicago and Boston. They found that the sale rate in California was lower, a difference that they attributed to Proposition 13. One problem with their analysis is that they do not attempt to control for the probability of sale before the adoption of Proposition 13. Thus if California had a lower sales rate than Illinois and Massachusetts as far back as the 1970s, their method would attribute the low sales rate in California to Proposition 13.

9. See O'Sullivan, Sexton, and Sheffrin (1993, table 2). Also see Advisory Commission on Intergovernmental Relations (1995) for information on property tax limitations in all states.

Ferreira (2004) examines the effect of the provision in California that allows households to take their Proposition 13 assessments with them when they move if the homeowner or spouse is fifty-five years old or older. He finds that the probability of California households moving increases when the household head turns fifty-five years old.[10]

O'Sullivan, Sexton, and Sheffrin (1993, 1995a, and 1995b) investigate the effect of Proposition 13 on property tax receipts, using simulation methods.

Theoretical Considerations

O'Sullivan, Sexton, and Sheffrin (1995a) provide a simple model of the effect of property tax limitations on the mobility of owner-occupiers. In their model, a representative household has a fixed life span of N years, during which it occupies n different housing units for i years each, so that $n = N/i$. Households' utility from living in any particular housing unit is assumed to decay over time, at a constant rate d. This may be because the quality of the housing unit gradually declines, the quality of the fit between the household and housing unit declines, or a combination of both. Moving to a new housing unit is assumed to cost a fixed amount, C. For owner-occupiers, C includes the costs of selling one house and purchasing another (including real estate agents' fees, fixed cost of obtaining a new mortgage, and cost of moving household goods). For renters, C includes the costs of finding a new apartment, paying the security deposit, and moving household goods. Since the utility of remaining in the same housing unit declines over time while the cost of moving remains constant, households eventually prefer to move. Households choose the number of housing units they occupy over their lifetimes to maximize lifetime utility.

O'Sullivan, Sexton, and Sheffrin (1995a) show that this model has a closed form solution under a set of assumptions concerning functional form. We examine a variant of their model. Assume that the household utility function takes the additive form $U = H + X$, where H is lifetime housing consumption and X is lifetime consumption of other goods. Housing services per dwelling are denoted h. Because of decay, the housing services provided by a given dwelling after i years of occupancy are $h = \int_o^i (1 - dt)dt$. Lifetime housing

10. See Wasi (2005) for an empirical study of moving behavior by California households, which emphasizes the role of environmental amenities in location choice.

services consumed by a household equal h times the number of houses occupied, or $H = hN/i$. The price per unit of housing services provided by a dwelling is p, and annual household income is Y. If the discount rate is zero, then households' lifetime budget constraint is:

$$YN = X + phN/i + CN/i,$$

where the three terms on the right-hand side represent lifetime expenditure on other goods, housing, and moving costs. Households maximize utility over the choice of tenure length, or number of years spent in each dwelling. Their optimal tenure length per dwelling, $\tilde{i}$, is:

$$\tilde{i} = \frac{\sqrt{2C}}{\sqrt{d(1-p)}}.$$

Here, tenure length is positively related to the cost of moving, C, and negatively related to the decay rate, d. Tenure length is also positively related to the price of housing, p. This is because a higher price of housing reduces net income, so that the marginal utility of consuming other goods rises.

Effect on Owner-Occupiers

Now consider how property tax limitations such as Proposition 13 affect owner-occupiers' choice of tenure length. While the simple model just discussed has no explicit property taxes, Proposition 13 can be thought of as an increase in the cost of moving, C. When households reduce their tenure length from i years to $i - 1$ years, they lose the Proposition 13 subsidy for the ith year for each house they occupy. Because the ith year subsidy is the highest, losing it raises the cost of moving. The larger the Proposition 13 subsidy, the stronger is the household's incentive to increase its tenure length.[11]

11. One feature of Proposition 13 that the O'Sullivan, Sexton, and Sheffrin model does not capture is the fact that the initiative incorporates a put option. When the market value of housing declines or increases slowly, the Proposition 13 subsidy can become negative, since Proposition 13 assessments never fall and may rise by up to 2 percent a year. However, when this happens, owners can either petition to have their assessments lowered to market value or can move to a different house, where the new assessment will be equal to market value. These features imply that owners gain from increases in market value because their Proposition 13 subsidies increase, but do not bear the full cost of losses in market value because their Proposition 13 subsidies cannot be negative.

Effect on Renters

How does Proposition 13 affect renters' tenure length? Proposition 13 treats landlords the same as homeowners, so landlords receive higher subsidies the longer they own their rental units. But landlords are not under any legal obligation to pass on their Proposition 13 subsidies to tenants. Whether they do so is likely to depend on conditions in the rental housing market. Thus landlords will pass on their Proposition 13 subsidies to tenants if there is excess supply in the rental housing market (the same conditions under which rents are likely to be low and falling), and landlords are unlikely to pass on Proposition 13 subsidies to tenants when there is excess demand for rental housing (the same conditions under which rents are high and rising). These factors suggest that whether individual tenants benefit from the initiative depends on conditions in the local rental housing market, rather than on individual tenants' tenure length. They also suggest that in the regressions explaining renters' tenure, controls are needed for local housing market conditions.

Proposition 13 also affected renters' tenure indirectly, by increasing both the price of owner-occupied housing and the probability of rent control. When Proposition 13 was initially adopted the property tax rate fell, and this reduction was capitalized into the price of housing. For example, housing values in the San Francisco metropolitan area rose by approximately 40 percent following the adoption of Proposition 13 and similar increases presumably occurred elsewhere in California.[12] The increase in the price of owned housing made it more difficult for renters to become homeowners and thereby increased demand for rental housing. Renters' average tenure length, therefore, is predicted to rise.[13]

The other indirect effect of Proposition 13 on renters' tenure is that following the adoption of the initiative, sixteen California cities adopted rent con-

12. Rosen (1982).

13. This story would suggest that since the adoption of Proposition 13, the homeownership rate should have risen more slowly, or fallen faster, in California than in Texas or Florida. In fact, from 1970 to 2000 the average homeownership rate declined in the metropolitan areas that were most affected by Proposition 13 (see discussion below). Specifically, the homeownership rate declined by 2.8 percentage points in San Francisco, 2 percentage points in San Jose, and 0.6 percentage points in Los Angeles. In comparison, it increased over the same period by 1.1 percentage point in Florida, but declined by 1.0 percentage point in Texas. But rent control is a complicating factor (see discussion below). The overall change in the homeownership rate from 1970 to 2000 in California was an increase of 1.3 percentage points.

trol.[14] According to one source, tenant groups supported Proposition 13 because they were assured that passage would mean immediate rent reductions. When landlords did not pass on their Proposition 13 property tax savings, tenants' groups in many cities responded by sponsoring rent control legislation and ballot initiatives.[15] Rent control produces its own lock-in effect for tenants, both by capping their rent if they stay put and making alternative rental housing units scarce. We control for rent control in our empirical work.

Effect on Incentives to Migrate to California from Other States

Finally, consider how Proposition 13 affects households' decisions to move to California from other states. Suppose potential migrants to California are divided into two groups, frequent movers versus infrequent movers (corresponding to high versus low values of the decay parameter, d). Infrequent movers have an incentive to move to California from other states, since they anticipate that they will benefit in the future from Proposition 13. Frequent movers have an incentive to avoid California, since they will be harmed by the initiative. This suggests that migrants to California from other states will tend to be selected from the group of infrequent movers, since the latter are willing to pay the most for California housing. Therefore, migrants to California are predicted to respond more strongly to Proposition 13 than native-born California households.[16]

14. The sixteen California cities that adopted rent control (and the years in which it was initially adopted) are: Berkeley (1980), Beverly Hills (1979), Campbell (1983), East Palo Alto (1983), Fremont (1997), Hayward (1983), Los Angeles (1979), Los Angeles County (1979, abolished in the 1980s), Los Gatos (1980), Oakland (1980), Palm Springs (1979), San Jose (1979), Santa Monica (1979), San Francisco (1979), Thousand Oaks (1980), and West Hollywood (1985). Note that the rent control laws vary across cities in their strictness, such as in whether they allow rents to be set at market levels when tenant turnover occurs, but we ignore these differences. For purposes of constructing our rent control variable, cities that adopted rent control in 1980 are treated as not having it in 1980, because in most cases rent control was adopted after the 1980 census occurred. Information on rent control is taken from Brown, Warner, and Portman (2004), and Keating (1985).

15. See Lowe (1981) and Baird (1980).

16. An offsetting factor is that frequent movers among native-born Californians have an incentive to leave the state, while infrequent movers among native-born Californians have an incentive to stay. But moving costs are likely to make the selection effect for migrants stronger than that for natives. This is because migrants to California are only observed if they actually migrated from another state, meaning that their gains from moving exceed their moving costs. However, native-born Californians are observed as long as they did not leave for another state, meaning that their gains from moving were less than their moving costs.

This section suggests several testable hypotheses:

—California owner-occupiers are predicted to increase their tenure length after the adoption of Proposition 13 by more than owner-occupiers in other states over the same time period;

—households who migrate to California are predicted to respond more strongly to Proposition 13 than native-born California households; and

—the lock-in effect of Proposition 13 will depend on the size of the subsidy, so that it will be higher in areas where housing values are higher, increase more quickly, or both. Proposition 13 may also affect renters' tenure, but the effect is likely to be indirect.

Data and Summary Statistics

Our data are taken from the Integrated Public Use Microdata Series (IPUMS), which combines a 1 percent random sample of households from the 1970 Census of Population and Housing and 5 percent random samples of households from the 1980, 1990, and 2000 Censuses of Population and Housing.[17] We include all households living in metropolitan areas in California and, as controls, all households living in metropolitan areas in Florida and Texas. We selected our control states, Texas and Florida, because like California they are large Sun Belt states with warm climates, and they experienced substantial domestic and foreign in-migration over our sample period. Our sample includes all households living in metropolitan areas that met the census definition of a metropolitan area as of 1970.[18] Households with heads younger than twenty-five years old are dropped. Unweighted sample sizes are approximately 48,000 in 1970 and between 350,000 and 450,000 in each of the later years.

IPUMS gives households' tenure length in their current housing units in intervals of up to one year; two to five years; six to ten years; eleven to twenty years; twenty-one to thirty years; and more than thirty years. We set

17. Integrated Public Use Microdata Series (IPUMS), Minnesota Population Center, University of Minnesota (www.ipums.org [2004]).

18. As metropolitan areas grow, new counties are incorporated. These are included in our sample.

individual households' tenure length at the midpoint of the relevant range, or forty years for those whose tenure length is more than thirty years.[19]

Models of the Lock-In Effect

We estimate a treatment effects model. Our basic specification is:

$$Y_{hmt} = aA_m + bB_t + \beta_t T_{st} + dX_{hmt} + e_{hmt}, \quad (1)$$

where
h : household index,
t : time index,
either state s or metropolitan area m : location index,
Y_{hmt} : number of years that household h in metropolitan area m in year t has lived in its current residence,
A_m : a set of metropolitan area fixed effects (Austin, Texas is omitted),
B_t : a set of year fixed effects (1970 is omitted), and
T_{st} : a set of treatment effects.

We include fixed effects at the metropolitan area level rather than the state level to take account of differences across metropolitan areas in average tenure length that existed before the adoption of Proposition 13.[20] The treatment effect T_{st} consists of separate interactions between the California dummy and dummy variables for 1980, 1990, and 2000—years when Proposition 13 was in effect. The three β_t coefficients measure the difference-in-difference, or the change in average years of tenure from 1970 to 1980, 1990, or 2000 for California households minus the change in average years of tenure over the same period for Texas and Florida households. Because the effect of Proposition 13 is predicted to increase over time, we expect that the values of β_t will increase as more years have elapsed since 1970. Finally, X_{hmt}

19. For 1970, the categories are less than one year, two years, three years, four to six years, seven to ten years, eleven to twenty years, more than twenty years, and "always lived here." We code "more than twenty years" as 35.5 years, and "always lived here" as age of the household head minus fourteen years.

20. Average tenure length by metropolitan area in 1970 ranges from 7.2 years in Fort Lauderdale–Hollywood–Pompano Beach, Florida to 13.4 years in Beaumont–Port Arthur–Orange, Texas. In California in 1970, the range is from 7.6 years in Ventura to 12.5 years in Stockton.

is a vector of control variables that include individual household and housing characteristics and metropolitan area characteristics for each of the relevant years. We estimate equation (1) both with and without the control variables. Also, since Proposition 13 affects owners and renters differently, we estimate equation (1) separately for each group.

We also break down the treatment effects by migration status. To do so, we estimate a difference-in-difference-in-difference (DDD) model of the following form:

$$(2)\quad Y_{hmt} = aA_m + bB_t + cC_n + \beta_t I_{st} + \beta_n I_{sn} + \beta_{nt} I_{nt} + \beta_{nst} T_{nst} + dX_{hmt} + e_{hmt},$$

where

C_n : a set of dummy variables for migrant group (native-born households are omitted),

I_{st}, I_{sn}, and I_{nt} : state-time, state-migrant group, and year-migrant group interactions, respectively,

T_{nst} : a set of interactions of California, years after 1970, and migrant groups other than native-born.

Coefficient β_{nst} measures the DDD for migrants or immigrants relative to native-born households, or the DD for the particular migrant group minus the DD for native-born over the same period.[21] Again, we estimate equation (2) both with and without the vector of control variables, and we estimate it separately for owners versus renters. In all regressions we cluster the error terms by state-year.[22]

Results without Control Variables

Table 1a gives average tenure length by year for owner-occupiers versus renters, and for residents of California versus Texas and Florida. Average tenure length for owner-occupiers in California in 1970 was 10.76 years, compared to 10.68 years for owners in Texas and Florida in the same year. By 2000, these figures had risen to 13.44 years in California versus 11.69 years in Texas and Florida. Table 1a also gives difference-in-differences for California versus the other states. From 1970 to 1980, 1990, and 2000, they were

21. See Gruber (1994) for discussion of DDDs.

22. We do not use interval regression, since we cannot both use it and cluster the error terms. If we use interval regression but do not cluster the error terms, the coefficients remain virtually the same. All regressions use weights to make the sample representative.

Table 1a. Average Tenure Length for Metropolitan Area Residents, 1970–2000[a]
Number of years, except as indicated

	1970	*1980*	*1990*	*2000*
Owners				
California	10.76	11.11	12.68	13.44
Texas and Florida	10.68	10.35	11.94	11.69
Difference-in-difference	n.a.	0.68	0.66	1.67*
since 1970		(0.83)	(0.95)	(0.78)
Renters				
California	4.30	4.48	4.67	5.25
Texas and Florida	4.06	3.96	3.49	4.04
Difference-in-difference	n.a.	0.28	0.93**	0.98**
since 1970		(0.19)	(0.22)	(0.09)

Source: Authors' calculations.
*Statistically significant at the 0.05 level; **statistically significant at the 0.01 level.
a. The samples consist of owner and renter households living in California metropolitan areas as well as in Texas and Florida metropolitan areas in 1970, 1980, 1990, and 2000. All calculations use weights. Robust standard errors clustered by state-year are given in parentheses.

0.68, 0.66 and 1.67 years, where only the last figure is statistically significant. The difference-in-difference from 1970 to 2000 is 16 percent of the average tenure length in 1970.

Turning to renters, average tenure length in 1970 was 4.30 years in California versus 4.06 years in Texas and Florida, but by 2000 it had increased to 5.25 years in California, while falling slightly to 4.04 years in Texas and Florida. The difference-in-difference from 1970 to 2000 was about 0.98 years, or 23 percent of renters' average tenure length in 1970. The large DD value is surprising, since Proposition 13 has a more indirect effect on renters than owners. The DDs from 1970 to 1990 and 2000 are both statistically significant at the 1 percent level.

Table 1b breaks down these figures by migration status, where the categories are households living in the household head's state of birth (native-born); migrants that moved to the state from a different U.S. state (out-of-state migrants); and immigrants that moved to the state from another country. As discussed above, the theory predicts that migrants respond to Proposition 13 more strongly than do native-born households.

For native-born owner-occupiers, the difference-in-difference between tenure length in California versus Texas and Florida from 1970 to 2000 is only 0.25 years and is not statistically significant. But the DDDs for migrants versus native-born homeowners are large and very statistically significant for all three periods: 2.3 from 1970 to 1980, 3.6 in 1990, and 3.3 years in 2000.

Table 1b. Regression Results without Controls: Differences in Tenure Length by Migration Status, 1970–2000[a]

	1970 to 1980		*1970 to 1990*		*1970 to 2000*	
	DD	*DDD*	*DD*	*DDD*	*DD*	*DDD*
Owners						
Native-born	–0.72**		–1.3*		0.25	
	(0.15)		(0.43)		(0.41)	
Out-of-state migrant		2.3**		3.6**		3.3**
		(0.13)		(0.39)		(0.50)
Immigrants		0.51		0.50		–0.31
		(1.4)		(1.3)		(1.4)
Renters						
Native-born	–0.20		0.61**		0.65**	
	(0.14)		(0.12)		(0.09)	
Out-of-state migrant		0.74*		0.65*		0.84*
		(0.30)		(0.30)		(0.30)
Immigrants		0.06		–0.30		–0.15
		(0.33)		(0.36)		(0.41)

Source: Authors' calculations.

*Statistically significant at the 0.05 level; **statistically significant at the 0.01 level.

a. Difference-in-difference (DD) indicates the change in average tenure length of native California households minus the change in average tenure length of native Texas and Florida households over the same time. Difference-in-difference-in-difference (DDD) indicates the DD for migrant or immigrant households minus the DD for native-born households. The samples consist of owner and renter households living in metropolitan areas in California as well as Texas and Florida in 1970, 1980, 1990, and 2000. All calculations use weights. Robust standard errors clustered by state-year are given in parentheses.

For native-born renters, the DDs from 1970 to 1990 and 2000 are both about 0.6 years (larger than the figures for homeowners), while the DDDs for migrants versus native-born renters over the same period are 0.65 from 1970 to 1990, and 0.84 years in 2000 (both statistically significant). Thus the results without control variables support the theoretical prediction that migrants to California from other states responded more strongly to Proposition 13 than did native-born households. But the DDD figures for immigrants relative to native-born households are never statistically significant.

These initial results suggest tentatively that Proposition 13 had several important effects. First, the tenure of both owners and renters increased in California relative to the control states. Second, migrants to California from other states responded more strongly to Proposition 13 than did native-born California households, suggesting that California migrants were disproportionately selected from the group of infrequent movers. Third, the response of renters to Proposition 13 is surprisingly large—in some cases even larger in absolute terms than that of owners. We reexamine these results with controls next.

Results with Control Variables

Tables 2a and 2b give summary statistics for the vector of control variables X_{hmt}, broken down by year, by California versus Texas and Florida, for owners and renters. The controls include individual household and housing characteristics and metropolitan area characteristics. For Texas and Florida to be good control states for California, the control variables must take account of trends that differed over time between them. Tables 2a and 2b suggests several trend differences. First, over the period from 1970 to 2000, the percent of households that were migrants from other states fell more sharply in California than in Texas and Florida. For owners, the decrease was from 63 to 39 percent in 2000 in California, while the figure remained nearly constant at about 50 percent in Texas and Florida. For renters, the decline was from 65 to 31 percent over the same period in California, compared to a decline from 50 to 38 percent in Texas and Florida. In addition, California had more immigrants than Texas and Florida in all the years from 1970 to 2000. Another difference is that housing prices rose more sharply relative to household income in California than in Texas and Florida. We constructed a housing "unaffordability" index, which equals median housing value in the metropolitan area divided by individual household income.[23] For owners in California, the index increased from 5.2 in 1970 to 18.1 in 2000, while the increase over the same period in Texas and Florida was only from 5.6 to 8.9. A third difference (as discussed above) is that a number of California cities adopted rent control starting in 1979. We constructed a rent control index that measures households' probability of living in a jurisdiction that has rent control.[24] Over the period 1980–2000, the average probability that households in California lived in jurisdictions with rent control was 0.36 for renters and 0.24 for owners, compared to zero in Texas and Florida.[25] The metropolitan area characteristics are the unemployment rate, rate of growth

23. Household income is sometimes reported as zero or negative. Therefore, we set the household-level minimum ratio of median housing value to individual household income at 0.3. Note that our income variable is actually family total income rather than household income, since household income is not available for 1970.

24. For 1990 and 2000, this variable is at the Public Use Microdata Area (PUMA) level. PUMAs are the smallest geographic units identified in the IPUMS. They can be either groups of small cities or subdivisions of larger cities. There were approximately 200 urban PUMAs in California in 1990 and 2000. For 1980, larger geographic units are used, and there are only about fifty in California.

25. Under state law in Texas and Florida, localities are not allowed to adopt rent control. See Glaeser (2002).

Table 2a. Summary Statistics, Owners, 1970–2000[a]

	1970		1980		1990		2000	
Variable	*California*	*Florida and Texas*	*California*	*Florida and Texas*	*California*	*Florida and Texas*	*California*	*Florida and Texas*
Years in residence	10.76	10.68	11.11	10.35	12.68	11.94	13.44	11.69
Income, in 2000 dollars								
Family total	58,997	49,204	57,834	50,383	75,424	60,378	84,543	70,630
From welfare	137	59	155	104	146	115	28	21
Race dummies (white)								
African American	0.05	0.09	0.06	0.10	0.05	0.10	0.05	0.10
Hispanic	0.11	0.09	0.11	0.11	0.13	0.14	0.17	0.18
Asian	0.02	0.00	0.05	0.01	0.08	0.01	0.11	0.02
Other	0.00	0.00	0.01	0.00	0.01	0.00	0.03	0.01
Education dummies (high-school dropout)								
High school	0.30	0.26	0.28	0.28	0.19	0.23	0.17	0.22
Some college	0.18	0.13	0.24	0.19	0.32	0.27	0.32	0.30
Bachelor	0.09	0.08	0.12	0.12	0.19	0.18	0.22	0.21
Postgraduate	0.10	0.07	0.16	0.11	0.14	0.11	0.15	0.12
Marital status dummies								
Married	0.80	0.79	0.73	0.73	0.69	0.68	0.66	0.65
Separated	0.01	0.01	0.02	0.02	0.02	0.02	0.02	0.02
Divorced	0.05	0.05	0.10	0.09	0.11	0.11	0.12	0.14
Widowed	0.10	0.13	0.10	0.13	0.11	0.13	0.10	0.11
If children age ≤ six	0.21	0.20	0.16	0.16	0.17	0.16	0.16	0.15
Number of children	1.41	1.31	1.08	1.00	0.93	0.85	0.96	0.85
Age dummies (26–35 years)								
36–45 years	0.24	0.22	0.22	0.20	0.25	0.24	0.24	0.25
46–55 years	0.26	0.23	0.21	0.19	0.20	0.18	0.25	0.23

56–65 years	0.18	0.19	0.19	0.18	0.17	0.17	0.17	0.16
66 years and up	0.17	0.21	0.18	0.23	0.22	0.26	0.23	0.24
Migration status dummies (native-born)								
Migrant	0.63	0.50	0.57	0.52	0.48	0.52	0.39	0.48
Immigrant	0.13	0.08	0.15	0.10	0.20	0.14	0.26	0.19
Housing type (multifamily)								
Single-family detached	0.93	0.94	0.87	0.85	0.86	0.85	0.82	0.83
Single-family attached	0.02	0.00	0.05	0.03	0.08	0.05	0.09	0.05
Employment status (not in labor force)								
Employed	0.78	0.75	0.75	0.70	0.71	0.67	0.67	0.67
Unemployed	0.02	0.01	0.02	0.01	0.02	0.02	0.02	0.02
Self-employed	0.13	0.13	0.13	0.12	0.14	0.13	0.14	0.12
Retired	0.13	0.16	0.14	0.19	0.18	0.22	0.19	0.20
Metropolitan characteristics								
Metropolitan area growth rate	31.44	37.06	16.99	38.34	25.58	27.91	13.50	25.87
Metropolitan area unemployment rate	2.30	1.19	1.85	1.27	1.69	2.02	1.72	1.61
Unaffordability index	5.19	5.55	10.00	7.83	16.34	8.57	18.07	8.88
Rent control, percent	0.00	0.00	0.42	0.00	0.20	0.00	0.19	0.00
Median housing value growth rate	32.16	33.94	42.47	31.29	22.92	–21.00	–2.45	7.86
No. of observations[b]	29,985	19,978	192,892	153,145	238,307	190,572	269,127	246,108

Source: Authors' calculations from data described in text.
a. All figures are means. Omitted categories are given in parentheses.
b. Unweighted.

Table 2b. Summary Statistics, Renters, 1970–2000[a]

	1970		1980		1990		2000	
Variable	*California*	*Florida and Texas*	*California*	*Florida and Texas*	*California*	*Florida and Texas*	*California*	*Florida and Texas*
Years in residence	4.30	4.06	4.48	3.96	4.67	3.49	5.25	4.04
Income in 2000 dollars								
Family total	36,057	33,044	30,648	28,896	38,504	32,542	41,243	36,246
From welfare	636	197	704	276	820	248	279	76
Race dummies (white)								
African American	0.10	0.19	0.11	0.18	0.11	0.18	0.11	0.20
Hispanic	0.14	0.14	0.18	0.18	0.23	0.21	0.29	0.27
Asian	0.03	0.00	0.05	0.01	0.08	0.02	0.11	0.03
Other	0.00	0.00	0.01	0.01	0.01	0.00	0.04	0.03
Education dummies (high-school dropout)								
High school	0.29	0.23	0.29	0.29	0.21	0.24	0.19	0.23
Some college	0.17	0.12	0.22	0.19	0.31	0.28	0.29	0.28
Bachelor	0.07	0.06	0.09	0.09	0.14	0.15	0.17	0.15
Postgraduate	0.08	0.06	0.10	0.08	0.08	0.07	0.09	0.08
Marital status dummies								
Married	0.48	0.56	0.38	0.42	0.41	0.39	0.41	0.36
Separated	0.06	0.06	0.07	0.07	0.06	0.07	0.06	0.07
Divorced	0.17	0.13	0.22	0.21	0.20	0.23	0.19	0.23
Widowed	0.15	0.15	0.12	0.14	0.09	0.10	0.08	0.08
If children age ≤ six	0.20	0.23	0.17	0.18	0.22	0.20	0.21	0.18
Number of children	0.91	1.09	0.77	0.82	0.93	0.82	0.98	0.80
Age dummies (26–35 years)								
36–45 years	0.19	0.20	0.19	0.18	0.26	0.25	0.28	0.27
46–55 years	0.17	0.16	0.13	0.13	0.13	0.12	0.18	0.17

56–65 years	0.14	0.14	0.11	0.11	0.08	0.08	0.09	0.08
66 years and up	0.18	0.19	0.16	0.18	0.13	0.13	0.12	0.12
Migration status dummies (native-born)								
Migrant	0.65	0.50	0.54	0.48	0.43	0.45	0.31	0.38
Immigrant	0.17	0.12	0.21	0.16	0.29	0.21	0.39	0.29
Housing type (multifamily)								
Single-family detached	0.34	0.40	0.25	0.27	0.25	0.25	0.24	0.23
Single-family attached	0.04	0.03	0.06	0.05	0.08	0.06	0.07	0.05
Employment status (not in labor force)								
Employed	0.68	0.72	0.68	0.70	0.72	0.74	0.66	0.69
Unemployed	0.04	0.02	0.04	0.03	0.04	0.04	0.04	0.03
Self-employed	0.06	0.07	0.07	0.06	0.08	0.07	0.09	0.07
Retired	0.15	0.16	0.14	0.16	0.11	0.11	0.10	0.10
Metropolitan characteristic								
Metropolitan area growth rate	25.96	36.33	14.19	36.87	23.58	27.31	12.10	26.04
Metropolitan area unemployment rate	2.35	1.22	1.84	1.26	1.72	2.06	1.75	1.65
Unaffordability index	9.77	9.67	21.43	16.20	29.47	21.95	31.56	15.04
Rent control, percent	0.00	0.00	0.56	0.00	0.31	0.00	0.31	0.00
Median housing value growth rate	32.24	34.15	42.49	32.27	23.54	−22.29	−2.72	8.26
No. of observations[b] (unweighted)	21,635	9,740	133,100	71,806	159,739	97,144	186,512	114,237

Source: Authors' calculations from data described in text.
a. All figures are means. Omitted categories are given in parentheses.
b. Unweighted.

of population over the previous ten years, and rate of growth of median housing value over the previous ten years. Housing value increased more rapidly in California than Texas and Florida, but population growth rates were higher in Texas and Florida. Other variables shown in tables 2a and 2b have similar trends over time.

Table 3 gives the results of estimating equation (1) with control variables (results for owners are on the left and those for renters are on the right).[26] Coefficient estimates are presented in columns 1 and 3, and robust standard errors clustered by state-year are given in columns 2 and 4. Statistical significance at the 10 percent, 5 percent, and 1 percent levels are indicated by single, double, and triple asterisks, respectively. The qualitative results are remarkably similar for owner-occupiers versus renters, although the coefficients tend to be smaller in absolute value for renters—not surprising, since renters' average tenure length is much shorter. In both regressions, tenure length rises steeply with age—households with heads older than age sixty-five have 13.39 additional years of tenure if they are owners and 5.69 additional years if they are renters, compared to households with heads aged twenty-six to thirty-five. Tenure length falls with income and education and is lower for married, separated, and divorced household heads than for single household heads. Households with young children have lower tenure length, presumably because they often move to accommodate the needs of children, but additional children in the household are associated with slightly greater tenure length. Average tenure length for African American and Hispanic households is longer than for whites. Migrants from other states and immigrants have shorter tenure than native-born households, regardless of whether they are owners or renters. Living in a single-family detached house is associated with 4.67 additional years of tenure for owners and 1.24 additional years for renters, compared to living in multifamily housing. The coefficient of the housing unaffordability index is positive for owners but negative for renters; it is not significant in either regression. However, the rent control index is positive and highly significant for both groups—the coefficients are 0.92 and 0.98 years, respectively. The coefficient for owners seems implausibly large

26. In these regressions, households whose total income was top-coded are treated as having the highest income level, which was $75,000 in 1980, $400,000 in 1990, and $999,997 in 2000. To check whether the results are sensitive to how the highest income levels are coded, we reran the regressions with additional dummy variables for households with top-coded income in each year, and also reran the regressions without the top-coded households. The results for the treatment variables were essentially unchanged.

Table 3. Regression Results with Controls: Explaining Tenure Length of Owners and Renters[a]

	Owners		*Renters*	
Variable	*Coefficient*	*Standard error*	*Coefficient*	*Standard error*
Income in thousands of dollars				
Family total	–.008***	.0007	–.0006	.0006
From welfare	.006	.02	–.04***	.009
Race dummies (white)				
African American	0.95***	0.25	0.76***	0.17
Hispanic	0.32*	0.16	0.34***	0.06
Asian	–0.46*	0.23	–0.10	0.15
Other	–0.20	0.11	–0.10	0.07
Education (high-school dropout)				
High school	–0.25	0.16	–0.16**	0.06
Some college	–1.02***	0.18	–0.40***	0.06
Bachelor	–1.60***	0.11	–0.64***	0.05
Postgraduate	–1.60***	0.12	–0.67***	0.08
Marital status				
Married	–0.78***	0.20	–0.87***	0.06
Separated	–0.79***	0.17	–1.29***	0.07
Divorced	–0.65***	0.11	–0.79***	0.05
Widowed	1.79***	0.13	–0.38***	0.10
If children age ≤ 6	–1.48***	0.12	–0.17***	0.04
Number of children	0.19***	0.03	0.06***	0.01
Age dummies (26–35 years)				
36–45 years	2.54***	0.12	1.20***	0.11
46–55 years	6.17***	0.18	2.44***	0.20
56–65 years	10.07***	0.41	3.82***	0.20
66 years and up	13.39***	0.61	5.69***	0.26
Migration status dummies (native-born)				
Migrant from out-of-state	–1.51***	0.21	–0.47***	0.08
Immigrant	–3.24***	0.21	–0.72***	0.07
Structure dummies (multifamily)				
Single-family detached	4.67***	0.39	1.24***	0.09
Single-family attached	0.69**	0.30	0.41***	0.05
Employment status (not in labor force)				
Employed	–0.54**	0.21	–0.14***	0.03
Unemployed	–0.87***	0.15	–0.44***	0.07
Self-employed	0.24	0.12	0.06	0.05
Retired	0.58***	0.17	0.26*	0.12

(continued)

Table 3. Regression Results with Controls: Explaining Tenure Length of Owners and Renters[a] *(continued)*

	Owners		*Renters*	
Variable	*Coefficient*	*Standard error*	*Coefficient*	*Standard error*
Year dummies				
1980	0.46**	0.17	0.39**	
0.141990	1.88***	0.22	0.53**	0.19
2000	1.99***	0.21	0.86***	0.16
Other variables and constant				
1980*CA	–0.34	0.21	–0.35*	0.19
1990*CA	0.26	0.31	0.28	0.25
2000*CA	0.66**	0.31	0.44*	0.23
Metropolitan area growth rate	–0.02***	0.00	0.00*	0.00
Metropolitan area unemployment rate	0.06	0.25	–0.07	0.13
Unaffordability index, thousands	.007	.01	–.00005	.01
Rent control, percent	0.92***	0.12	0.98***	0.12
Median housing value growth rate	0.00	0.00	0.00	0.00
Constant	2.70***	0.51	2.31***	0.24
Metro dummies	Yes		Yes	
R-squared	0.36		0.17	

Source: Authors' calculations.
*Statistically significant at the 0.10 level; **statistically significant at the 0.05 level; ***statistically significant at the 0.01 level.
a. Omitted categories are given in parentheses.

since few owners are on the margin between owning and renting (rent control is discussed below).

The difference-in-difference results are given near the bottom of table 3. For owners, the DDs are –0.34 from 1970 to 1980, 0.26 from 1970 to 1990, and 0.66 from 1970 to 2000, where only the result for 2000 is statistically significant ($p = .056$). In comparison, the DDs in the model without controls (given in table 1a) were 0.68, 0.66, and 1.67, respectively, and only the result for 2000 was statistically significant ($p = .055$). Thus adding controls to correct for other differences between California and the comparison states, including higher immigration to California, lower out-of-state migration, and larger increases in housing prices over the period, substantially reduces our estimates of Proposition 13's effect on owners' tenure. However, the additional controls do not change the pattern of statistical significance. Turning to renters, the DDs in table 3 are –0.35, 0.28, and 0.44, respectively, where the result for 2000 is marginally significant ($p = 0.08$). In comparison, when we estimated the DDs without controls (see table 1a), the coefficients were substantially larger and the results for both 1990 and 2000 were strongly statistically significant ($p = 0.001$ and 0.000, respectively). Thus for renters, adding

Table 4. Regression Results with Controls: Differences in Tenure Length by Migration Status, 1970–2000[a]

	1970 to 1980		*1970 to 1990*		*1970 to 2000*	
	DD	*DDD*	*DD*	*DDD*	*DD*	*DDD*
Owners						
Native-born	–0.89**		–0.65		–0.05	
	(0.39)		(0.47)		(0.40)	
Migrants		0.94		1.58**		1.52***
		(0.62)		(0.52)		(0.44)
Immigrants		0.055		–0.01		–0.56
		(1.82)		(1.53)		(1.44)
Renters						
Native-born	–0.63**		0.12		0.20	
	(0.20)		(0.26)		(0.19)	
Migrants		0.42*		0.33		0.50**
		(0.20)		(0.19)		(0.19)
Immigrants		0.02		–0.50		–0.55
		(0.81)		(0.75)		(0.69)

Source: Authors' calculations.
a. DD = Difference-in-difference. DDD = Difference-in-difference-in-difference. ??? are given in parentheses.
*Statistically significant at the 0.10 level; **statistically significant at the 0.05 level; ***statistically significant at the 0.01 level.

controls changes the picture substantially and suggests that factors other than Proposition 13—particularly rent control—were largely responsible for the increase in renters' tenure over the period.[27]

The results of the breakdown of treatment effects by migrant status are presented in table 4. As in the results without controls, migrant households responded much more strongly to Proposition 13 than native-born households. The DD results for native-born owner-occupiers are negative, but the DDD results for migrants relative to native-born are 1.58 years for 1970 to 1990

27. A complication is that the rent control index is correlated with the treatment variables—the correlations for owners between rent control and CA*1980 are 0.33, CA*1990 are 0.09, and CA*2000 are 0.09, and the figures for renters are similar. We reran both of the regressions in table 3 without the rent control index in order to examine how the treatment effect coefficients would change. For renters, leaving out rent control caused all of the treatment effect coefficients to become more positive, and the coefficients of both CA*1990 and CA*2000 became statistically significant at the 5 percent and 1 percent levels, respectively (the coefficient of CA*2000 was 0.64 and significant at the 1 percent level). This suggests that when the rent control index is omitted, the treatment effects pick up the combined effect of both rent control and Proposition 13 on renters' tenure. For owners, dropping the rent control index also caused the coefficients of the treatment effects to increase, but the increase was much smaller and the significance levels remained unchanged. Thus for owners, the treatment effects do not appear to be picking up the effect of rent control. But we do not have a good explanation for why our rent control index has such a large and significant effect on owners' tenure.

($p = .01$) and 1.52 years for 1970 to 2000 ($p = .006$). Compared to the results without controls, the DDDs are smaller, but the results remain strongly statistically significant. For renters, the DDDs with controls are also smaller and less significant than those without controls, but the basic pattern remains. The DDD from 1970 to 2000 is 0.50 years with controls and significant at the 5 percent level, compared to 0.84 without controls. The DDD from 1970 to 1980 is 0.42 and significant at the 10 percent level, compared to 0.74 without controls.

Overall, when we control for individual and metropolitan area characteristics and for the presence of rent control, we find that Proposition 13 caused the average tenure of owner-occupiers in California to increase by 0.66 years relative to the increase for owner-occupiers in the control states, or by about 6 percent. The results for renters are more ambiguous, but they suggest that the spread of rent control rather than the adoption of Proposition 13 was probably responsible for most of the increase in renters' tenure length in California. When we decompose the effect of Proposition 13 by migrant group, we find that Proposition 13 had little effect on the tenure of native-born owners and renters, but it caused the tenure of owners and renters who were migrants from other states to increase by about 1.5 years and 0.5 years, respectively, relative to that of native-born owners and renters.

Effects of Higher Proposition 13 Subsidies

In this section we compute an individual household–specific measure of the Proposition 13 subsidy and use it to examine how tenure length responds to changes in the subsidy level. The census asks owner-occupiers both the market value of their homes and their property taxes. Our measure of the Proposition 13 subsidy for homeowners in California equals (property tax rate) * (market value) − (actual property taxes). To take account of locally approved bonds and other charges, we use a property tax rate of 1.1 percent. All subsidy figures are corrected to 2000 dollars. Note that this calculation of the Proposition 13 subsidy ignores the fact that Proposition 13 also mandated a large and permanent reduction in the California property tax rate.

The top panel of table 5 shows the average Proposition 13 subsidy by metropolitan area for all metropolitan areas in California in 1980, 1990, and 2000.[28]

28. In 1980 the census did not ask households a separate question about their property taxes. Instead, it asked only for the combined amount paid for property taxes and insurance. Therefore, in order to compute the Proposition 13 subsidy measure, we had to predict property taxes by

Table 5. Proposition 13 Subsidies for California Metropolitan Areas and Hypothetical Proposition 13 Subsidies for Texas and Florida Metropolitan Areas, 1980–2000[a]

2000 dollars

Metropolitan area	*1980*	*1990*	*2000*
California			
Bakersfield	1,145	390	–60
Fresno	1,412	478	266
Los Angeles–Long Beach	1,654	1,807	980
Anaheim–Santa Ana–Garden Grove	1,779	1,723	1,083
Sacramento	1,183	1,076	528
Salinas–Sea Side–Monterey	1,744	1,744	1,879
San Diego	1,678	1,400	1,021
San Francisco–Oakland–Vallejo	1,726	1,745	1,698
San Jose	1,701	2,130	2,625
Santa Barbara–Santa Maria–Lompoc	1,804	1,822	1,868
Riverside–San Bernardino	1,208	910	242
Stockton	1,179	924	406
Ventura-Oxnard–Simi Valley	1,497	1,722	1,055
Texas (hypothetical values)			
Austin	n.a.	–467	–933
Beaumont–Port Arthur–Orange	n.a.	–49	–325
Corpus Christi	n.a.	–276	–764
Dallas–Fort Worth	n.a.	–248	–826
El Paso	n.a.	–295	–805
Houston-Brazoria	n.a.	–406	–924
San Antonio	n.a.	–268	–756
Florida (hypothetical values)			
Fort Lauderdale–Hollywood–Pompano Beach	n.a.	4	–410
Jacksonville	n.a.	56	68
Miami-Hialeah	n.a.	–322	–504
Orlando	n.a.	254	–28
Tampa–St. Petersburg–Clearwater	n.a.	109	–114
West Palm Beach–Boca Raton–Delray Beach	n.a.	57	–264

Source: Authors' calculations.
n.a. Not available.
a. All subsidies equal .011* market value – actual property taxes. Figures are averages by metropolitan area.

The highest average subsidy levels over the entire period were in the San Jose, San Francisco, Salinas, and Santa Barbara metropolitan areas, while the lowest were in Bakersfield and Fresno. Average subsidy levels remained fairly con-

household in 1980. To do so, we estimated a regression explaining property taxes as a function of property taxes plus insurance for California owners in 1990. We used the results of this regression to predict property tax payments for California owners in 1980. The 1980 figures in table 5 therefore are less reliable than the 1990 and 2000 figures.

Table 6a. Distribution of Property Tax Subsidies in California, 1980–2000[a]
2000 dollars

Quartile	*1980* *(1)*	*1990* *(2)*	*2000* *(3)*
Quartile 1 (lowest)	220	−117	−553
Quartile 2	989	994	381
Quartile 3	1,617	1,885	1,121
Quartile 4 (highest)	3,596	3,505	3,362

Source: Authors' calculations.
a. Subsidies equal .011*market value − actual property taxes. Figures are averages by quartile.

stant in real terms from 1980 to 1990, but fell in real terms in most metropolitan areas from 1990 to 2000. This reflects the recession that occurred in southern California (but not northern California) during the 1990s.

For comparison purposes, we also computed hypothetical Proposition 13 subsidies for Texas and Florida metropolitan areas in 1990 and 2000, using the same procedure and tax rate. These hypothetical figures represent the subsidies that Texas and Florida households would receive if Proposition 13 applied to them. These figures are shown in the lower half of table 5. The hypothetical Proposition 13 subsidy figures are uniformly negative in Texas, which suggests that actual property tax rates in Texas relative to market value are higher than the 1.1 percent rate assumed in these calculations. The figures for Florida metropolitan areas are mainly positive in 1990 and negative in 2000, suggesting that actual property tax rates rose from below 1.1 percent to higher than this figure during the 1990s.[29]

In order to examine how Proposition 13 subsidies vary, we divided the subsidy distributions for California homeowners in 1980, 1990, and 2000 into quartiles. Table 6a shows the average subsidy value by quartile. The distribution is quite unequal. In 1990 the average household in the highest quartile received a subsidy of about $3,500, compared to an average subsidy of −$117 in the lowest quartile. The figures for 2000 are similar, except that households in the lowest quartile were worse off.

29. Actual average 1987 property tax rates in Texas were 1.4 percent and in Florida were 0.9 percent. The results for Florida are consistent with the Florida property tax limitation that went into effect in 1995, which specifies a 2 percent property tax rate (discussed above). The hypothetical subsidy values in Texas in 2000 are affected by the so-called Robin Hood school finance plan, which transfers property taxes from richer to poorer school districts. Hoxby and Kuziemko (2004) show that the plan caused property values in urban Texas school districts to fall during the late 1990s.

Table 6b. Years of Tenure for Owner-Occupiers in California, by Subsidy Quartile, 1980–2000

Years

Subsidy quartile	*1980*	*1990*	*2000*
Quartile 1	10.26	8.18	9.31
Quartile 2	11.53	11.23	11.37
Quartile 3	11.51	13.33	14.93
Quartile 4	10.91	17.86	18.09

Source: Authors' calculations.
a. Figures are averages by quartile.

Table 6b gives mean tenure length by quartile for homeowners in California in 1980 through 2000. In 1980 tenure length of California households had little relation to the subsidy level, which is not surprising since Proposition 13 had only been in effect for a little over one year. But by 1990, average tenure length was strongly related to the subsidy level—it was 8.2 years in the lowest quartile, 11.2 years in the next quartile, 13.3 in the next, and 17.9 years in the highest quartile. The figures for 2000 are similar. These results suggest that the mobility response to Proposition 13 varies strongly depending on the size of individual households' subsidies and is very large for households in the top half of the subsidy distribution.[30]

These figures may be influenced by other factors that affect mobility. We therefore run regressions that explain tenure length as a function of the household-specific Proposition 13 subsidy and the same control variables as in table 3. We use two specifications. In the first, the sample is owner-occupiers in California in 1970, 1990, and 2000. We drop observations in 1980 because we cannot compute the Proposition 13 subsidy as accurately as in 1990 and 2000 (see the discussion above). We include the actual subsidy level and, in order to allow the response to higher subsidy levels to vary, we also include the subsidy level squared. This specification uses cross-sectional differences in the subsidy level within California. The second specification uses difference-in-difference, where the sample is all owner-occupiers in California as well as Texas and Florida in the same three years. In this regression we include the actual subsidy for California households and the hypothetical subsidy for Texas and Florida households. We also include the subsidy times a dummy

30. The results for 1990 and 2000 in table 6b also reflect the effect of migration to California, where the most recent migrants have both low tenure and low Proposition 13 subsidies.

Table 7a. Regression Results Explaining Tenure Length as a Function of the Property Tax Subsidy, 1970, 1990, 2000[a]

	Homeowners in	
Variable	*California, 1970, 1990, 2000 (1)*	*California, Texas, and Florida, 1970, 1990, 2000 (2)*
Subsidy	0.0012**	0.00063**
	(0.000105)	(0.00015)
Subsidy squared	1.33e-8	
	(1.72e-08)	
Subsidy*CA*1990		0.0014**
		(0.00024)
Subsidy*CA*2000		0.00063*
		(0.00019)

Source: Authors' calculations.
*Statistically significant at the 0.05 level; **statistically significant at the 0.01 level.
a. Control variables are the same as in table 3. Robust standard errors clustered by year-state are given in parentheses.

for California in 1990, and the subsidy times a dummy for California in 2000.[31] Here the subsidy term is intended to capture how the factors that determine the subsidy (property taxes and housing value) affect tenure, while the subsidy times the California dummy captures the additional effect of Proposition 13 on California households. In both specifications, the same control variables as in table 3 are also included.

The results are given in table 7a, with robust standard errors clustered by year-state in parentheses. In the first specification in column 1, the subsidy variable is highly significant, but the subsidy squared is not. In the second specification in column 2, all three subsidy variables are highly significant.[32]

Table 7b gives the predicted effects of higher Proposition 13 subsidies on tenure length, using the results from both regressions in table 7a. We evaluate the effect on tenure length at the average subsidy levels prevailing in four different California metropolitan areas in 1990–2000, representing the range

31. In the second specification, we use a tax rate of 1.1 percent to compute the subsidy figures for all households, including Florida households in 2000.

32. We would have liked to instrument for the subsidy level, since longer tenure itself leads to higher subsidies whenever property values increase by more than 2 percent a year. But our efforts to find a good instrument were unsuccessful. This means that the results in table 7b could be biased upward due to endogeneity.

Table 7b. Predicted Increase in Years of Tenure at Varying Levels of the Proposition 13 Subsidy[a]

Subsidy in 2000 (dollars)	*(1)*	*(2)*
250 (Fresno/Riverside)	0.64	0.25
1,000 (Los Angeles/Orange County)	1.21	1.0
1,700 (San Francisco/Santa Barbara)	2.1	1.7
2,600 (San Jose)	3.2	2.6

Source: Authors' calculations.
a. Based on the regressions in table 7a.

from lowest to highest Proposition 13 subsidies. Using the first specification, reported in column 1, Proposition 13 caused the average tenure of homeowners to increase by 0.64 years in Fresno and Riverside, where the average subsidy is approximately $250, while it increased by about 1.2 years in Los Angeles/Orange County, where the average subsidy level is about $1,000. The largest increases in tenure length occurred in San Francisco, Santa Barbara, and San Jose, where average subsidy levels ranged from $1,700 to $2,600 and increases in tenure length ranged from about two years to more than three years. Using the second specification, reported in column 2, and averaging the coefficients of subsidy*CA*1990 and subsidy*CA*2000, the predicted effects of Proposition 13 are smaller. They are 0.25 years in Fresno/Riverside, 1.0 year in Los Angeles/Orange County, and 1.7 to 2.6 years in the Bay Area. Under either specification, these results suggest that Proposition 13 caused a large decline in the mobility of owner-occupiers in the coastal areas of California.

Our results also suggest that an unintended effect of Proposition 13 was to transfer public funds from inland to coastal California residents. This is because following the adoption of Proposition 13, the state of California took over responsibility for funding public education. The combination of higher property values and uniform school spending would normally have led to a transfer of tax revenue from coastal to inland California, since property values are higher on the coast. But because Proposition 13 held down property tax collections, the transfer was much smaller.

Conclusion

In 1992 the U.S. Supreme Court upheld Proposition 13, in part because it furthered the policy goals of increasing "local neighborhood preservation,

continuity, and stability."[33] Our results suggest that Proposition 13 definitely furthered continuity and stability, since it caused a substantial increase in the average tenure length of California households relative to that of households in other states. From 1970 to 2000, the average tenure length of California homeowners increased by 0.66 years relative to that of homeowners in Texas and Florida—a 6 percent increase relative to average tenure of California owners in 1970. For renters, the evidence is ambiguous. Renters' tenure did increase substantially in California after 1970. But the main effect of Proposition 13 was probably to encourage the adoption of rent control in California cities, and it was the rent control that caused an increase in renters' tenure length. We also find that out-of-state migrant households responded more strongly to Proposition 13 than did native-born households. From 1970 to 2000, the tenure length of migrant homeowners increased by 1.5 years and the tenure length of migrant renters increased by 0.5 years relative to that of native-born homeowners and renters. Finally, the effect of Proposition 13 on mobility varies widely, depending on the size of the subsidy, with the largest effects occurring in coastal California cities where the subsidy levels are highest. From 1970 to 2000, average tenure length increased by a few months in inland California cities, but by about one year in Los Angeles/Orange County and two years in the Bay Area. Whether the Proposition 13–induced increases in continuity and stability have been worth the cost in lost tax revenue and redistribution from inland to coastal California communities remain subjects for further research.

33. *Nordlinger* v. *Hahn,* 60 U.S.L.W. 4563–74 (1992).

Comments

Steven M. Sheffrin: Wasi and White use an econometric approach to quantify the lock-in effect that stems from the assessment provisions of Proposition 13. These provisions limit increases in property taxes to 2 percent a year as long as the owner of the property does not change. The authors' econometric method is based on analyzing the differences in the behavior of homeowners and renters in California versus Texas and Florida, two other states that experienced rapid growth and immigration over the last two decades but did not have the assessment features of California. The underlying data indicate sharp increases in tenure for both homeowners and renters in California relative to Texas and Florida. The authors find that these differences remain after they introduce a wide range of controls, although the magnitude of the effects does decrease.

As background, it is important to point out that the tax benefits to homeowners under Proposition 13 depend on when their property was purchased. The research that O'Sullivan, Sexton, and I conducted indicates that the largest beneficiaries of Proposition 13 were the owners of property before the passage of the proposition in 1978 who had their assessments rolled back to the values that prevailed in 1975.[1] By 1990, many of these owners were elderly. For example, in Los Angeles County, 82 percent of the homeowners older than sixty-five years had owned their homes since 1975. Purchasers of homes after that time had various experiences. In the early 1990s, for example, housing prices fell in Los Angeles County and recent purchasers did not benefit from the assessment provisions of Proposition 13. However, in the late 1990s purchasers throughout California did gain substantially.

Comparing California with Texas and Florida, Wasi and White find that Proposition 13 increases tenure overall by 1.67 years for homeowners and 0.98

1. O'Sullivan, Sexton, and Sheffrin (1995b).

years for renters. With a systematic set of econometric controls—including measures for rent control and an affordability index for housing—these estimates fall to 0.66 years for owners and 0.44 years for renters. These effects are estimated over the entire range of homeowners and renters in California, not just those with largest gains from Proposition 13. In the second part of their paper, the authors look at the lock-in effects relative to the magnitude of the tax benefits under Proposition 13. For a subsidy level of $2,600 per year, as the authors find for San Jose, California, their estimates predict an increase in tenure for homeowners between 2.6 and 3.3 years.

These effects are substantially larger than in prior research. In our own work, which used simulation methods, we estimated a lock-in effect of approximately a year for the subsidy levels that prevailed in San Jose. Quigley's (1987) econometric results based on a mortgage lock-in effect were also of similar magnitude. Wasi and White's estimates are approximately three times as large as prior estimates, even with a large set of controls in the regression.

As the authors recognize, the tax subsidy of Proposition 13 increases with tenure length. Thus any factor (observed or unobserved) that increases tenure length will also increase the measured Proposition 13 subsidy. Any regression method that tries to estimate the causal effects of the tax subsidy on tenure length must cope with this important confounding effect. The authors do try to control for the endogeneity of the Proposition 13 subsidy through their econometric methods, but they may not have eliminated all of the endogeneity in their approach. This may account for the size of their estimate.

One important data note: the key tenure data in their study are based on rather broad reporting intervals, and the authors use the midpoint of the intervals in their empirical work. This raises some econometric issues that could be addressed: Does the use of this procedure cause any potential bias in the results? Should the midpoint be used as a point estimate or should the points in the interval be weighted by a survivor function for tenure?

Two aspects of their empirical results are somewhat problematic. First, they find relatively large effects for renters. Proposition 13 does not provide any direct benefits to renters—just to owners of properties. The effects on renters must therefore be caused by indirect effects in the housing market precipitated by Proposition 13. The authors do postulate two mechanisms, higher housing prices caused by Proposition 13 and an increased probability of rent control, but this aspect of their theory is relatively underdeveloped. It also fails to give any quantitative indication of how important the indirect

effects should be. Many other factors besides Proposition 13 contribute to changes in housing prices, and rent controls stem from a variety of factors and vary sharply in their operation and efficacy.

Second, they find that migrants from other states, both homeowners and renters, are very strongly affected by Proposition 13. In some cases the magnitude of the results is just not plausible. For example, in table 4, migrant homeowners increased their tenure by a full year by 1980, only two years after the passage of Proposition 13. The authors argue that infrequent movers will move to California to take advantage of the assessment provisions. There are two difficulties with this argument. First, it requires infrequent movers to decide to move from another state. Second, no migrants before 1978 would have known about Proposition 13. As can be seen, owners before 1978 were the primary beneficiaries of Proposition 13 and they cannot have been self-selected. In my view, the migrant indicator variable must be capturing some other, unobserved factor in the data.

The data in table 1a do show, however, that tenure increased in California relative to Texas and Florida. If this is not due to Proposition 13, what could have caused the increase in observed tenure for homeowners and renters? A full answer may have to do with the vast population and environmental changes that have occurred in California over the last few decades.

At least in the coastal areas, growth control has been an important factor. The legal framework, through the California Environmental Quality Act, has also played an important role in slowing new construction. Moreover, in some areas, such as San Francisco, limited land availability has simply collided with increasing population growth. The result of all these factors has been less new construction in the face of increased population growth. As a result, housing prices and rents in the coastal areas have increased and new growth has moved to the central valley.

Moving costs are likely to increase as the price of housing increases, for example, through increased selling costs. If this is indeed the case, the simple turnover model in the paper predicts fewer moves, reduced turnover, and longer tenure times. As tenure times increase, so do the Proposition 13 subsidies. With higher rents and less mobility of homeowners, it is likely that renter tenure would also increase. These effects are more likely to be pronounced in the coastal areas, where the Proposition 13 premiums were the largest.

This alternative explanation then suggests that growth controls and other factors that limited new construction led to higher housing prices and rents, lower turnover, and increased subsidies under the assessment provisions in

force under Proposition 13. Proposition 13 did transfer benefits to long-term homeowners, but it was not the principal cause generating the increases in observed tenure. Untangling the true lock-in effect from Proposition 13, when other factors also lead to longer tenure times, is a difficult task. The Wasi-White paper makes a nice start on this problem.

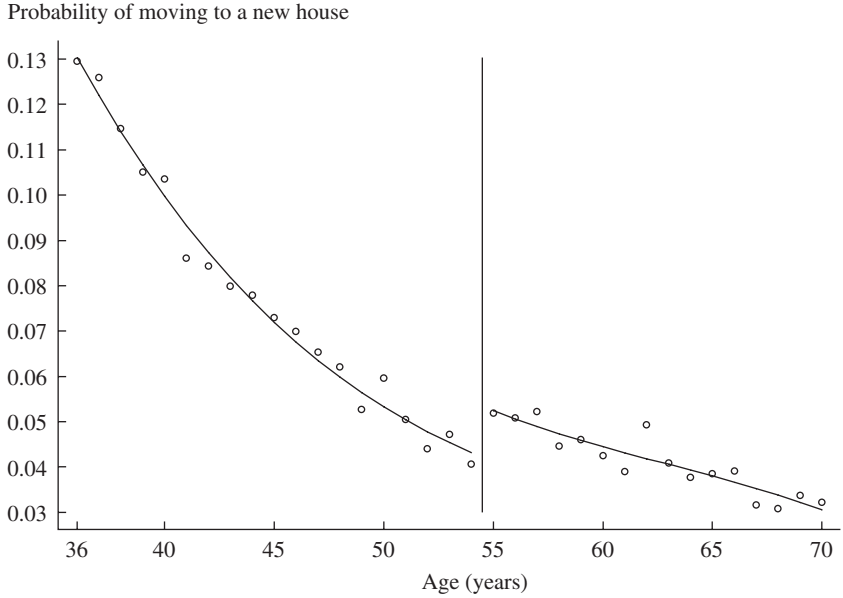
Fernando Vendramel Ferreira: The passage of Proposition 13 in 1978 was one of the most important public finance events in recent California history. Its effects still reverberate today, as recurrent state budget deficits compromise funding of education and other essential public services. Although several studies analyzed the financial impacts of Proposition 13, only a few researchers have looked at its unintended consequences. The work by Wasi and White is a welcome effort to expand and generalize previous results concerning the impact of Proposition 13 on household mobility.

The lock-in effect of California's Proposition 13 is very intuitive: households respond to those property tax incentives by staying longer in the same house. As a result, average tenure for households in California has increased since 1978. At the same time, households living in cities with highly valued real estate should experience larger property tax benefits, and consequently, longer tenure. Those main findings are consistent with the pioneering work of O'Sullivan, Sexton, and Sheffrin (1995), as well as my own recent work.

Specifically, Ferreira (2004) looked at a pair of propositions passed in the late 1980s, Propositions 60 and 90, to precisely estimate the lock-in effect. Those propositions allowed homeowners who were fifty-five years old and older to transfer the Proposition 13 tax benefit to another house under certain conditions. If the tax benefit from Proposition 13 matters, a sharp discontinuity in mobility rates for homeowners aged fifty-five or older should be observed. This research design allows the estimation of the impact of moving costs on mobility, all else equal. As indicated in figure 1, fifty-five-year-olds in California in 1990 had a 1.2 percent higher rate of moving (on a base of approximately 4 percent) when compared to fifty-four-year-olds. This shift in mobility rates was empirically consistent with a 15 percent difference in property taxes faced by homeowners aged fifty-four and fifty-five years. No evidence of a discontinuity was found for other control groups, such as renters in California in 1990, homeowners in Texas in 1990, and homeowners in California in 1980.

Wasi and White interestingly approach the same idea from another angle by comparing mobility rates across California and Texas since 1970. The authors

Figure 1. Probability of Moving for California Homeowners, by Age, 1990[a]



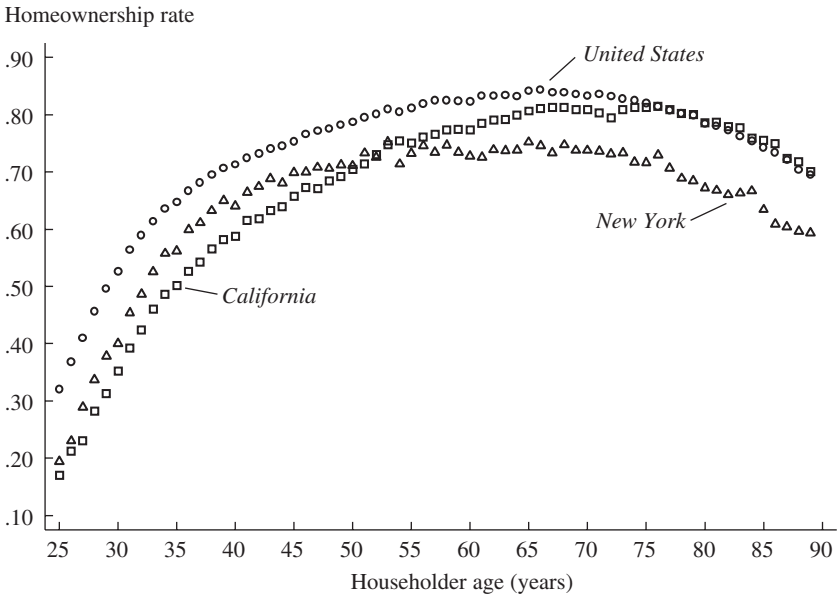
Source: Ferreira (2004).

a. Each dot represents the probability of moving for homeowners by age, calculated as the number of new movers in 1989–90 divided by the total number of homeowners by age. Age is the greater of the ages of household head and spouse. The vertical line is composed by predicted values of a polynomial regression of probability of moving on age, dummy for age fifty-five or older, and interactions of these components.

investigate broader effects of Proposition 13 on mobility, including mobility rates by race. Besides confirming results from the previous literature, the authors shed light on new topics, such as general equilibrium consequences of Proposition 13 for renters.

The generalization of the lock-in effect comes at a cost to their empirical work though, given that some confounding factors potentially bias their estimates. The most evident issue is that states (and people living in those states) are different in several dimensions, observed and unobserved to researchers. This is a cumbersome problem to solve in the absence of a more cohesive research design. This might be one of the reasons that Wasi and White find the effects of Proposition 13 insignificant for 1990. Also, Wasi and White acknowledge the need for a sharper instrumental variable when estimating the structural impact of the tax benefit on household mobility. The endogeneity problem arises because higher property tax benefits have a direct relationship with house prices and homeowner tenure. Such an instrument is extremely

Figure 2. Homeownership Rates by Age[a]



Source: U.S. Census 2000, IPUMS.
a. Each dot represents the average homeownership rate by householder age group.

hard to find, unless one has access to true panel data. Finally, the mechanism through which renters are affected by Proposition 13 is still open to further clarification.

Despite those empirical difficulties, Wasi and White demonstrate the importance of exploring new ideas in this field of research. There are still several unanswered questions, such as: What are the effects of Proposition 13 on house prices?[1] How does Proposition 13 compare with traditional zoning and regulation? What are its effects on business survival (yes, Proposition 13 also applies to commercial and industrial properties)? Finally, the welfare question: Is Proposition 13 the most efficient way to transfer resources from young families to senior homeowners?

Ferreira (2004), for example, points out that Proposition 13 generated large gaps in property tax payments for different age groups in California.

1. Rosen (1982) found a big and positive impact of Proposition 13 on house prices. The recent trend of increasing house prices makes this subject much more important today.

Figure 2 shows another potential side effect of Proposition 13: homeownership rates for young families in California sometimes barely reach half of the national average for similar age groups according to the 2000 U.S. Census data, and such differences are not observed for senior citizens. In fact, homeownership rates in California converge to the national level with homeowners' age. This convergence is not observed in other states, such as New York. Furthermore, this striking pattern cannot be found in the 1970 Census data. Of course, other potential factors, such as the skyrocketing house prices in California and household sorting, could explain differences in homeownership rates across states. But the patterns observed in figure 2 should spark the curiosity of fellow researchers.

Proposition 13 has now survived for twenty-seven years, and more unintended consequences are likely. Will this law ever be modified? Several groups evidently are opposed to any change in this property tax legislation, including homeowners and antitax associations. Despite monetary and ideological reasons for taking a position with respect to Proposition 13, more academic research is needed in this camp, and Wasi and White are clearly contributing to this debate.

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