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Tax Policies and Residential Mobility

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Governmental tax policies have direct consequences for public spending and the distribution of wealth among a country's population. But unintended consequences may also occur as a result of the design of those policies. We illustrate the potential impact of such unintended consequences by analyzing differences in home ownership mobility in California, Illinois, and Massachusetts that appear to result from the distinct differences in the design of real estate tax polices across these states. California's Proposition 13, which became law in 1978, limits the increase in real estate taxes to a maximum of 2% in any given year regardless of home value appreciation. With home value appreciation, Proposition 13 creates sizeable disincentives to move. The evidence from an analysis of single family home sales records in California, Illinois, and Massachusetts indicates that California's homeowners are significantly less mobile than their counterparts in Illinois and Massachusetts. The lower mobility was clearly not intended by the passage of Proposition 13, though its impact on society is potentially very significant. We recommend that countries in the process of developing tax systems for residential real estate ownership (such as China, the countries of the former USSR, and many countries in Africa) take account of such originally unintended consequences.

Keywords

California, Real Estate Tax, Residential Mobility, Unintended effect.

Introduction

The introduction of Proposition 13 in California in 1978 resulted in a dramatic change in the state's property tax system. The proposition had several key aspects, including the limiting of property tax to 1% of value, the limiting of annual increases in assessed value to 2%, and the prohibition of the imposition of new taxes on property. The only points in time at which a property is reassessed are when it is sold, transferred, or developed. In addition, Proposition 13 does not allow local voters to raise the 1% limit.[1] Extensions of Proposition 13 include the transfer of properties to spouses and children and the allowance for home owners over the age of 55 to maintain their own assessment if they move to homes with equal or lower values.[2] Most states impose a higher real estate tax and also allow for the assessment to increase at the same rate as real estate price appreciation.[3] O'Sullivan, et al. (1995b) labeled these acquisition-value and market-value tax systems, respectively.

California's legislation established 1975-1976 as the valuation base, thereby allowing for sizeable reductions in valuation during 1978 with the passage of Proposition 13. Prior to the introduction of Proposition 13, California's local governments relied heavily on property taxes. In the 1977-1978 fiscal year, approximately $10.3 billion was collected through property taxes, while California also provided an additional $1.2 billion to local governments to replace property taxes that could not be collected. On average cities had received 27% of revenue from property tax, counties 40% and schools 47%. With the introduction of Proposition 13, the financial impact included a reduction in local government revenue of $7 billion during the 1978-1979 fiscal year. However, annual state costs were also reduced, but only by $600

[1] The only circumstance in which the 1% limit was allowed to be higher was in the case of having to repay bonded debt approved by voters prior to July 1, 1978.

[2] Proposition 58 (1986) extended the original exemptions for children to all transfers. The original definition had limited exempted transfers to those between parents and minor children on the death of the parent, and between parents and disabled children of all ages. Proposition 60 (1986) allowed homeowners over the age of 55 to maintain their low assessment within the same county (only some counties), while Proposition 90 (1988) extended this to moves across some counties. While we include an age variable in our regressions to control for this issue, these two propositions are rather limited in scope. For details, see either the web site of Weiss & Weissman or that of the Assessor of the County of Sacramento.

[3] States such as Massachusetts have limits on real estate tax increases that are analogous to California's, although Massachusetts' proposition is weaker than California's. For details, see O'Sullivan, et al. (1995b).

million. As is obvious from these changes in the flow of tax revenues, the large majority of the policy debate since Proposition 13 has centered on the important public finance dimension of the proposition.[4] Our analysis, in contrast, focuses instead on some of the unintended consequences of Proposition 13.

Indeed, one of the initial and immediate consequences concerns the perceived inequities of Proposition 13, which consist of the fact that one's own annual real estate taxes depended primarily upon the purchase price of one's home. Given two comparable homes, if Family One purchased its home in 1994 for $200,000, and Family Two purchased its home in 2000 for $400,000, Family Two will have a tax bill almost twice as large.[5] These inequity problems along with the problems caused by the reduced levels of tax revenue have also been studied extensively in the literature (see O'Sullivan, Sexton, and Sheffrin [1995a, 1995b]). Note that while this literature tends to favor a modification or elimination of Proposition 13, it is still in effect, despite events such as Orange County's bankruptcy in the early 1990s.

As the above example illustrates, when housing prices appreciate, Family One has a strong incentive to remain in place. Unless assessments decrease when housing prices depreciate, there should be an incentive to sell in a down market. In other words, in comparison to tax systems in which real estate taxes increase proportionately and regularly with housing price appreciation, systems like Proposition 13 should reduce residential real estate (ownership) mobility, given a general upward drift in housing prices over time. We focused on measuring the impact of Proposition 13 on ownership mobility by comparing mobility rates in key California locations to locations in Illinois and Massachusetts. Our research results suggested that the design of real estate tax policies might have a sizeable impact on residential mobility.

The proper design of tax policies is especially important for countries still in the process of developing private property (real estate), such as the countries of the former Soviet Union, China, and many African countries. Gu and Trefzger (2000), for instance, examined these issues for China specifically. Without private property, real estate taxes are not readily imposed, with the

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[4] Some of the many papers to have examined the role of property tax and the recent property reform movement on public finance issues include: Bradbury, et al. (2001), Cutler, et al. (1999), Dye & McGuire (1997), Figlio (1998), Fischel (1989), Mieszkowski & Zodrow (1989), Poterba & Rueben (1995), and Preston & Ichniowski (1991).

[5] Family one's real estate taxes would have increased during those six years, and would now equal $2,252. Family two's taxes would equal $4,000 a year, even though they are purchasing a "comparable" home.

resulting lack of revenue for the public sector. But just as importantly, as argued by de Soto (2001), the lack of private property prevents the transformation of real assets into capital. As these countries begin to develop private property, they will develop tax policies and consider the variety of tax policies for real estate that currently exist across the world. Aside from the important issues of public finance and fairness of the tax policies for those being taxed, we encourage policymakers to consider the (previously) unintended consequences of such policies, including the potential impact on residential mobility.

The basic issues are presented in the second section, while the third section presents an analysis of the tax benefits to homeowners within a real options framework. The fourth section presents the data and methodology, with the results of our statistical analysis in the first second. The last section concludes.

Homeowner Mobility

We compared the real estate mobility rates in Orange and Sacramento counties in California to the rates in DuPage County, Illinois and parts of the Boston, Massachusetts metropolitan area. The expectation was that mobility in California would be lower than comparable Illinois and Massachusetts neighborhoods. We tested the null hypothesis that mobility is the same in all the states by analyzing a large number of detached home sales, as aggregated by Census Tract. The measure of mobility is the percentage of single family housing units sold in a Census Tract. Simply put, homeowners in California should be less mobile than in other states. Note that despite the Proposition 13 tax revolt, most states impose a higher real estate tax rate than California and also allow for the assessment to increase proportionately with real estate price appreciation.

The broader concern with mobility has been studied rather extensively. This literature needs consideration in order to provide a clear picture of the impact of property taxation reform. Kiel (1994) provided evidence concerning the impact of housing price changes on mobility, while studies such as Quigley & Weinberg (1977) and Henderson & Ioannides (1989) examined the influence of socio-economic and demographic factors on mobility. Quigley (1987, 2001) examined the impact of mortgage interest rates on mobility. The author finds that in both the high interest rate environment covered in the earlier paper and in more moderate conditions, as examined in the most recent paper, high interest rates do act as a barrier to mobility. Potepan (1989) extended these findings to show that current mortgage rates, and the

rate to which the homeowner is currently tied, influence homeowners when to move or to undertake improvements on their existing homes.

The issue of moving costs has been examined in a number of studies, for example, by Weinberg, et al. (1981), who examined the costs of moving, and Amundsen (1985), who considered the impact of moving costs on the optimal number and timing of moves. Englund (1985, 1986) showed that the capital gains tax applied to property creates a lock-in effect like other moving costs. This is of particular interest in the context of an acquisition value-based property tax system. Even in the cases where a transaction-based tax is not in place, since the tax liability of a homeowner will be increased upon moving, a similar effect can be viewed as occurring as a result of systems such as Proposition 13.

Finally, Boehm, et al (1991) considered the impact of a wide variety of demographic characteristics on mobility, including variables such as: housing tenure, income, family size, marital status; sex, race, age, educational status of the household head, unemployment, and occupation of the household head. South and Deane (1993), Long (1992), and Sandefur and Scott (1981) also examined relevant demographic factors of residential mobility. We draw on these studies for our choice of demographic variables that are used as controls in the regression analysis below.

Nagy (1997) measured the impact of the proposition on the SMSAs of San Bernardino, San Diego, San Francisco, and seven SMSAs outside of California to control for national trends and particularly the increase on mortgage rates that Quigley (1987) found to have a reducing effect on mobility. The data used consisted of US Bureau of the Census Annual Housing Surveys for 1975, 1978, and 1982, including micro level data on housing units and their occupants. He tested whether the mobility of homeowners increased following the introduction of the proposition using a hazard model.

Nagy (1997) found that for each of the Californian SMSAs, there was significant evidence indicating a reduction in mobility after 1978. However, similar findings were also found for each of the control sample areas. For each of the non-California SMSAs, with the exception of Philadelphia, significant findings were also observed. San Francisco showed a significantly greater decline than Philadelphia, San Diego showed a significantly greater decline than Philadelphia and Rochester, NY, while San Bernardino showed a significantly greater decline than Philadelphia, Columbus, OH, and Rochester. The author notes that due to the time period examined and the study's concentration on the short-term impact, one possible issue that may have arisen is a desire by property owners to lock in

at a low assessment. Therefore, the introduction of the proposition may have had the short-term impact of increasing mobility. The study also finds some evidence that in San Francisco, owners may have held onto properties, thereby keeping low assessments, and renting them to cover higher assessments on their new house.

The impact of Proposition 13 on the mobility of California's homeowners has not been investigated using the methodology proposed herein. In contrast to Nagy's (1997) study, we: (1) analyzed an "equilibrium," or steady-state, period of time from 1995-2000 versus a pre and post-event methodology, (2) used a longer time series, (3) analyzed the impact of changing housing prices on mobility, and (4) placed this study within a real options framework in the third section below.

Finally, aside from the other issues surrounding Proposition 13, the results of our research may have profound policy ramifications. Two examples illustrate the potential impact on policy. First, while the issues concerning the tax revenue stream and the perceived inequity may be negative features of Proposition 13, there may be real benefits if Proposition 13 reduces mobility. Aside from providing more stability within neighborhoods, California homeowners may engage in a higher degree of homeowner repair and upkeep, thus maintaining a higher quality of housing stock. This point has been noted by the U.S. Supreme Court, which upheld Proposition 13 (Nordlinger v. Hahn, 1992). Justice Blackmun's majority opinion included the comment that a state may have "a legitimate interest in local neighborhood preservation, continuity, and stability" (see O'Sullivan et al [1995b]).

Second, if housing price volatility is increased in California as a result of Proposition 13, this fact may enable us to arrive at more reliable predictions about the future. According to one scenario, the result would be that when housing prices fall, they will fall more quickly than in other states. Relating theory to the actual price movements of the housing stock should enable us to develop a fuller understanding of the dynamics of the real estate market. It is essential to consider these issues when developing or altering tax regimes. China, the former countries of the USSR, and many countries in Africa can only benefit by considering all relevant issues in the process of designing the tax regimes that best serve their own goals.

Value of the Tax Cap Option

As noted above, Proposition 13 provided several benefits to real estate owners in 1978. First, the cap on the property tax rate was set at one percent,

compared to the prior rate of two percent. Second, assessments were returned (turned back) to the 1975 assessed value. Third, increases in the assessment values were capped at two percent per year for existing homeowners. Homeowners as of 1978 received the equivalent of a one-time "windfall" tax gain, as a result of (1) and (2) above, in comparison to non-owners at the time. In addition, when considering a family's rent versus purchase decision, the benefits above make ownership more valuable than prior to 1978, placing upward pressure on housing prices. Even if such factors required time to have an impact on California's economy, the only benefit that would have a long-term impact is the tax cap (at least within California). As a result, we provided an options model for valuing the tax cap. Empirical implications follow directly and intuitively from this options approach.

Let $P(0)$ be the purchase price at t_0, $P(t)$ be the lognormally distributed price process with the risk-neutral dynamics:

$$dP = \alpha P dt + \sigma P dz, \tag{1}$$

where α is the expected rate of housing appreciation and σ is the instantaneous variance rate. We made the simplifying assumption that the cap will always be in-the-money, so that the assessed property value is just the purchase price scaled up by 2% per year:

$$(1.02)^n P(t_0). \tag{2}$$

Consider the tax year $s = t_0 + n$. If the property value exceeds the assessed value, the benefits from Proposition 13 are 1% of the difference between the property value and the assessed value. If the property value is less than the assessed value, no tax benefits accrue to the homeowner for that year. Thus, the tax benefit (from the tax cap) can be expressed as:

$$(0.01)max\left(P(s) - (1.02)^n P(t_0), 0\right). \tag{3}$$

Given Equations (1) and (2), Equation (3) is simply 1% of the payoff to a European call option with the property as the underlying asset and the exercise price equal to the assessed value.

With these equations, we are able to arrive at a formula for the value of the tax cap option over time. First, let us recall Merton's model (i.e., the Black-Scholes model as adjusted for dividends) for the value of a call option:

$$C(S, X, r, \alpha, \sigma, t) = Se^{(\alpha - r)t} N(d_1) - Xe^{-rt} N(d_2), \tag{4}$$

where:

$$d_1 = \frac{\ln(S/X) + (\alpha + 0.5\sigma^2)t}{\sigma\sqrt{t}} \tag{5}$$

and

$$d_2 = d_1 - \sigma\sqrt{t}, \tag{6}$$

and where r is the risk-free rate of interest, N is the standard normal cumulative distribution function. It follows that at time $t \in [t_0, t_0 + n]$, the value of the tax benefit in year $t_0 + n$ is:

$$C\left(P(t), 1.02^n P(t_0), r, \alpha, \sigma, t_0 + n - t\right). \tag{7}$$

Finally, the value of the tax cap option for a homeowner who lives in the house for exactly M more years is just the sum of the tax benefits for the individual years:

$$Cap\left(P(t), r, \alpha, \sigma, t_0, M\right) = (0.01)\sum_{n=1}^{M} C\left(P(t), 1.02^{t-t_0+n} P(t_0), r, \alpha, \sigma, n\right). \tag{8}$$

The straightforward intuition of Equation (8) is that the value to the homeowner increases through time with housing appreciation. Indeed, given a time horizon longer than M years, there may be an incentive from the tax cap to remain in the home, even if the market value of the home drops below the assessed value (e.g. if the homeowner has a long-term horizon and expects housing prices to "rebound" well before that horizon).[6]

Note also that the standard relationships that hold for a call option also hold for the Cap(.) value in Equation (8). An additional factor is the volatility of the underlying asset affects the value of an option. The direct impact of this on the housing market is important, because people will tend to buy and/or sell their homes at roughly the same time (e.g. because price appreciation has

[6] O'Sullivan, et al (1995) also demonstrated that when the inflation rate (the rate of appreciation in housing) is higher than the reassessment cap on real estate taxes within the acquisition-value tax system in California, the optimal time for remaining in a given housing unit is greater (lower mobility) than under the more standard market-value tax system, as is the case in most other states. Their approach entailed that when housing appreciation is less than the reassessment cap (2% according to California's Proposition 13), mobility should be greater in California than in other states. However, their approach is a single-period static economic model not developed within either a dynamic or expectations-based framework.

been high recently). If everyone (hypothetically) purchases at the same time, housing prices will be driven higher quickly, which may artificially increase real estate price volatility. This would be a real increase in volatility for California, but is "artificial" in comparison to a "perfect" world of no taxes or to states without Proposition 13-like regulations.[7] We focused primarily on the measurement of housing prices through time [that is, the difference between $P(t)$ and the compounded value of $P(t_0)$] in our analysis of the impact of Proposition 13 on residential mobility, and discuss our measures in more detail below.

Data, Methodology and Descriptive Statistics

The data are from two sources: (1) ESRI, which provides demographic data for 1990 and 2000 from the U.S. Census Bureau by Census Tract, and (2) 1st American Real Estate Solutions, which sells real estate transaction data by individual home sale. We collected Census Tract data for tracts in Orange and Sacramento counties in California, DuPage County in Illinois, and areas of Boston, Ma, along with single-family residential transaction data for the same tracts from 1995-2000. DuPage County and Boston are chosen as the non-California samples because they share important demographic and/or housing features with Orange County, California (which accounts for 92% of the California census tracts).[8]

The sample of real estate transactions includes information such as the: sales price, recorded date of the sale, living area in square feet, tax value, tax "bill," census tract location of the real estate, and up to 91 additional items of information specific to the real estate unit being sold. Taken together, there are 91,391 records of single-family home sales in the three states, with 19,167 sales in DuPage County, 2,730 sales in Sacramento, 62,253 sales in Orange County, and 7,241 sales in the Boston area. We combined the data for sales transactions by census tract. Descriptive statistics are provided in Table 1 for the three important resulting Census Tract variables: Number of Sales, Median Price, Median Area and the Median Price/Square Foot. The

[7] Several of the parameters in Equation (8), including volatility, are not modeled in our regressions below, either because it is reasonable to assume a constant for the parameter or because of the inability to estimate the parameters carefully (e.g. the most appropriate base case would be to assume that housing price volatility is constant over time, even though it would be possible to measure changes in this volatility measure). More precise data would allow for a direct estimate of the time a family remains in its home (date of current purchase minus date of prior purchase) and would thus also allow for a direct estimate of the M in Equation (8). But such data is not available for California. In other words, our unit of analysis is mobility within a Census Tract, not the mobility of individual family units.

[8] References below the states should be interpreted as indicating the data for the counties as specified above.

dependent variable, percentage of Detached HU sold in Tract, is defined as the number of sales in a Census Tract for a given year scaled by the total number of detached HUs in the Census Tract as of 1990. The numerator is calculated on the basis of the sales data, while the denominator is from Census Bureau data. This variable is discussed in more detail below.

Demographic data about census tracts includes the following housing unit (HU) variables: median housing unit value, number of HUs, and percent of detached HUs. In addition, the following standard demographic variables are reported in Table 1: Number of Housing Units in Tract, HU Detached in Tract (%), Median Area (Sq Ft), Male (%), White (%), Married (%), Born in the Same State (%), College Graduate (%), Unemployed (%), Living in Poverty (%), Executive/Professional (%), Household Income > $50K (%), and Age > 55 years (%).

An important concern when comparing states and/or counties is the similarity of the sample populations. This paper focuses on the impact of real estate taxes on residential ownership mobility. Mobility depends upon a wide variety of factors, and if the sample populations are chosen without proper controls, the similarities and/or expected differences across the geographic units may be due to omitted variables rather than real estate taxes. In order to minimize this potential problem we: (1) choose counties which are demographically similar (Orange and DuPage counties) and (2) control for demographic differences across all states/counties. Let us briefly address the similarity of Orange and DuPage counties.

Orange and DuPage counties are both wealthy, historically Republican, and heavily-populated suburban counties adjacent to major cities. They were also the location of fast growth economies during the 1990s, due in part to the development of major "hi-tech" corridors centered in Irvine, CA and Naperville, IL, respectively. Lucent Technologies, among others, has a major presence in DuPage County, while Broadcom is headquartered in Orange County. The respective 1995 populations are 853,458 for DuPage County and 2,563,971 for Orange County; their greater metropolitan areas experienced 12.7% and 11.1% growth rates, respectively, from 1990 to 2000.[9] One major difference between Orange and DuPage counties is housing prices, with the median single housing unit (HU or family residence) costing $262,435 over the 1995-00 period in Orange County ($150/sq. ft.), versus only $181,262 in DuPage ($123/sq. ft.). Given this large disparity, we also used housing data for Sacramento, where the median price was $155,340 ($94/sq. ft.) over the same period, along with data from the Boston area,

[9] U.S. Census Bureau, *Population Change and Distribution*, Census 2000 Brief.

where prices are more consistent with those in Orange County (median prices in Boston were $233,483 and $123/sq. ft.).

Table 1: Descriptive Statistics by State

	California (535 Tracts)					Illinois (76 Tracts)				
	Mean	Median	Std Dev	MIN	MAX	Mean	Median	Std Dev	MIN	MAX
# Housing Units in Tract	1,814	1,519	1,242	23	7,027	2,529	2,397	847	1,051	4,171
HU Detached in Tract (%)	73.2%	77.8%	43.6%	15.7%	99.6%	67.1%	62.9%	20.7%	27.0%	99.4%
# Sales	74	52	54	1	588	114	113	50	13	255
% of Detached HU Sold in Tract	5.7%	4.9%	10.0%	1.2%	25.2%	8.1%	6.9%	5.3%	0.9%	26.7%
Median Area (Sq Ft)	1,733	1,645	1,089	504	3,214	1,259	1,229	198	868	2,128
Median Price	$254,027	$230,000	$112,250	$85,000	$807,500	$181,262	$164,000	$48,569	$113,500	$328,000
Median Price/Square Foot	$145	$137	$96	$72	$1,022	$123	$138	$49	$5	$223
Male (%)	49.7%	49.8%	48.7%	46.3%52	55.8%	49.1%	49.4%	1.7%	43.9%	52.5%
White (%)	83.4%	85.0%	84.9%	.3%	96.4%	91.7%	91.5%	3.3%	84.9%	96.1%
Married (%)	47.9%	48.0%	35.1%	27.8%	60.7%	48.5%	49.5%	3.7%	39.9%	53.9%
Born in the Same State (%)	9.7%	8.7%	16.1%	0.0%	22.7%	13.1%	12.8%	4.7%	6.1%	22.6%
College Graduate (%)	14.9%	14.9%	10.3%	3.1%	26.6%	19.8%	19.9%	2.8%	14.5%	26.0%
Unemployed (%)	2.1%	1.8%	3.4%	0.2%	9.9%	1.6%	1.5%	0.4%	0.8%	2.5%
In Poverty (%)	4.5%	3.1%	10.8%	0.0%	70.4%	2.3%	1.5%	1.8%	0.4%	7.9%
Executive/Professional (%)	38.3%	37.5%	21.1%	11.4%	62.5%	43.8%	43.7%	4.9%	34.9%	51.8%
Household Income > $50K (%)	58.4%	59.3%	12.5%	10.8%	91.1%	57.8%	58.2%	12.9%	39.2%	89.7%
Age > 55 years (%)	18.5%	17.1%	16.8%	6.3%	51.0%	15.3%	14.2%	5.4%	6.6%	29.6%
	Massachusetts (424 Tracts)					All States				
	Mean	Median	Std Dev	MIN	MAX	Mean	Median	Std Dev	MIN	MAX
# Housing Units in Tract	1,646	1,542	802	133	4,117	1,798	1,571	987	23	7,027
HU Detached in Tract (%)	12.5%	9.3%	14.2%	0.1%	80.7%	47.9%	51.2%	34.7%	0.1%	99.6%
# Sales	9	4	11	1	69	50	32	65	1	588
% of Detached HU Sold in Tract	6.3%	4.5%	5.4%	0.6%	26.5%	6.1%	4.8%	4.5%	0.6%	26.65%
Median Area (Sq Ft)	1,853	1,699	724	647	6,868	1,751	1,626	579	504	6,868
Median Price	$233,483	$136,250	$303,608	$8,000	$2,245,000	$240,268	$195,000	$208,989	$8,000	$2,245,000
Median Price/Square Foot	$123	$89	$118	$3	$777	$135	$126	$86	$3	$1,022
Male (%)	47.8%	47.3%	3.2%	40.0%	62.5%	48.9%	49.0%	2.5%	40.0%	62.5%
White (%)	53.2%	60.8%	36.5%	0.8%	99.0%	71.6%	82.6%	28.8%	0.8%	99.0%
Married (%)	27.1%	26.8%	7.0%	13.5%	45.4%	39.4%	42.7%	11.9%	13.5%	60.7%
Born in the Same State (%)	5.7%	5.1%	4.1%	0.0%	15.4%	8.3%	8.2%	4.9%	0.0%	22.7%
College Graduate (%)	10.4%	7.9%	7.2%	0.7%	28.8%	13.4%	14.0%	6.5%	0.7%	28.8%
Unemployed (%)	4.7%	4.6%	2.0%	0.0%	10.7%	3.1%	2.4%	2.1%	0.0%	10.7%
In Poverty (%)	18.5%	18.4%	9.7%	2.4%	51.0%	10.1%	5.5%	10.2%	0.0%	70.4%
Executive/Professional (%)	28.8%	27.2%	11.4%	5.2%	60.9%	34.8%	35.7%	11.6%	5.2%	62.5%
Household Income > $50K (%)	25.5%	24.6%	10.6%	2.2%	53.1%	44.9%	46.2%	21.4%	2.2%	91.1%
Age > 55 years (%)	18.4%	17.4%	6.4%	7.7%	37.4%	18.2%	17.1%	7.1%	6.3%	51.0%

Note: The following variables are defined per year in a given Census Tract: # Sales of Detached HUs, Median Area, the median square feet of living space in the homes sold, Median Price, Median Price/Square Foot, and % of Detached HU Sold in Tract. The following variables, which include the phrase 'in Tract,' are defined for a given Census Tract as of 1990: # Housing Units and % of HU Detached Sold. 'HU' signifies Housing Units. The remaining variables are demographic variables as based upon 2000 census data and are defined by percentage of individuals within a given Census Tract.

State to state comparisons for the above variables and the remaining demographic variables are presented in Table 1 (a separate panel for each state along with a panel for all states are presented). The demographic and housing data for California and Illinois are much more similar to one another than they are to those for Massachusetts. The California and Illinois census tracts are largely composed of single family dwellings, with individuals who have good jobs (38% of the employed in California have executive/professional jobs, as do 44% in Illinois), are predominately Caucasian (83% and 92%, respectively), highly educated, and wealthy. Roughly one-half of the population in these two states are married. Virtually all of these characteristics differ in comparison to Massachusetts, where the census tracts have a much lower percentage of single family dwellings and only 54% of the individuals are White, and almost 18% live in poverty. Only 29% of the employed in Massachusetts have executive/professional jobs, and only 26% earned an income greater than $50,000 (opposed to 58% for CA and IL). It should be noted that we do not analyze statistical differences across states for the above census tract characteristics, because these variables are used to minimize the omitted variables problem.

The variable of interest for our analysis is the percentage of detached HUs sold in census tracts.[10] Descriptive statistics for this variable are also reported in Table 1. Consider the rationale for using this variable. The method for estimating single family residence mobility is to calculate the percentage of single family (detached) housing units (detached HUs) that are sold among all detached housing units as of 1990 in each census tract for each sample year.[11] Census tracts with a higher percent of homes being sold per year have higher mobility. If this value (the percent of homes sold in a year) is not random, then the presumption must be that either a direct or a latent variable is responsible for the pattern detected. Our fundamental hypothesis is that mobility in California is significantly less than that in states without real estate tax laws like Proposition 13. Since Massachusetts is part of the sample, it is important to note that Massachusetts recently passed a law that is similar to, though weaker than, California's Proposition 13. Consequently, we expect that mobility is highest in Illinois, and that Massachusetts has higher mobility than California.

Importantly, the Percent of Homes Sold variable can be converted into a value that represents an estimate of how long people tend to own their homes

[10] Mobility among families or individuals in rental housing is not included in our study, because these residents do not pay real estate taxes (directly).

[11] Since this method relies on 1990 census tract data, the estimate of the percentage age of SFRs which are sold in a given year yields a lower percentage age when the number of HUs increases during the 6-year sample period. However, as noted above, the population increases in Orange and DuPage counties from 1990 to 2000 are very comparable.

in a census tract. For example, if the percent is 5%, then 5% of the people in the geographic region sell their homes each year, entailing that the average household remains in their home for 20 years (1.00/0.05). Considering Table 1, we note that the average (mean of the medians) across the 1995-2000 period for California is 5.7%, 6.3% for Massachusetts, and 8.1% for Illinois. These translate into 17.5, 15.9, and 12.3 years, respectively, the amount of time families remain in their homes. We examine the statistical significance of these differences in the next section. But the prima facie evidence suggests that Californians who live in single family residences are less mobile.

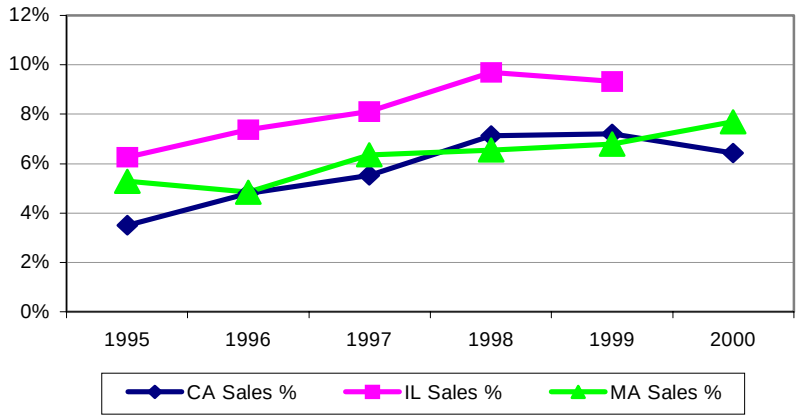
The differences in the percentage of homes sold in the different states that are evident in Table 1 may not hold across all years of the sample period. As a result, we also display the mean of the percent of Detached HUs sold by year and state in Figure 1. Without exception, mobility is higher in Illinois than in either Massachusetts or California, and the percentage of homes sold in California is less than in Massachusetts during four of the six sample years. There is also a noticeable increase in the median prices of the homes sold for all states from 1995 to 2000, which obviously corresponds to the economic boom during this period. The most important question is whether the mobility in California is significantly lower than in Illinois and Massachusetts, and whether such differences can be attributed to Proposition 13.

Proposition 13 and Homeowner Mobility in California

In this section we present the results of t-tests of the difference in means of the percentage of homes sold across the different states, and then we examine the regression results concerning homeowner mobility. We first conduct t-tests of the differences in means for the percentage of single family residences sold (detached housing units – DHUs) across California, Illinois, and Massachusetts, and then run regressions of this variable on a variety of potential explanatory and control factors. The t-test results confirm the hypothesis that Proposition 13 increases the stability of home ownership in California.

As reported in Table 2, Panel A, the mean percentage of homes sold across the 500 sample census tracts in Illinois and Massachusetts is 6.55%, and that for the 535 census tracts in California is 5.75%. These means are for all six years during the sample period, 1995-2000. Whether assuming equal or unequal variances, the difference in these means is statistically significant beyond the 0.01 confidence level, with t-statistics of 2.86 and 2.82, respectively.

Figure 1: Percentage of Detached Housing Units Sold by State and Year



Panels B and C consider California's mobility versus both Illinois and Massachusetts. Mobility in California is clearly lower than in Illinois, with the residents of Illinois moving 40% more often (8.07% of the homes sold in Illinois compared to the 5.75% for California). Mobility in Massachusetts is much closer to that in California, with 6.28% of homes sold in Massachusetts. Yet mobility is significantly lower in California than in Massachusetts, though only at the 10% level of significance (see Panel C of Table 2). Is this lower mobility in California attributable to the impact of Proposition 13?

The implications of an underlying analytic framework are important. As Figure 1 illustrates, mobility (the percentage of DHUs sold) in California increases with housing appreciation, a trend apparently not consistent with the options model presented in Equations (1) – (8). One issue is whether this trend also holds within regressions which control for other factors. But other issues are related. Most importantly, a family's decision to move to another home is not dictated solely by the tax benefits of the decision. At least two additional factors have strong influences on a family's decision to purchase a new home. One is that the family may be growing and needs more space. A second is that a family may simply desire a larger home, "regardless" of cost. The data used in our analysis does not allow for such factors to be measured directly. Consequently, we include one additional variable that may have an impact on ownership mobility, namely the median price per square foot.

Table 2: T-Tests of the Difference in Means for the Percentage of Single Family Residences Sold

Panel A: The Percentage of Detached Residences Sold in California Versus Illinois and Massachusetts

STATE	N	Mean	Std Dev	Std Error
Illinois and Massachusetts	500	6.55%	0.055	0.002
California	535	5.75%	0.034	0.001

Levene's Test for Equality of Variances

	F	Sig.	*t*-stat	df	Sig. (2-tailed)
Equal variances assumed	72.85	0.000	2.86	1033	0.004
Equal variances not assumed			2.82	830	0.005

Panel B: The Percentage of Detached Residences Sold in California and Illinois

STATE	N	Mean	Std Dev	Std Error
Illinois	76	8.07%	0.053	0.006
California	535	5.75%	0.034	0.001

Levene's Test for Equality of Variances

	F	Sig.	*t*-stat	df	Sig. (2-tailed)
Equal variances assumed	17.758	0.000	5.112	609	0.0000
Equal variances not assumed			3.728	84	0.0003

Panel C: The Percentage of Detached Residences Sold in California and Massachusetts

STATE	N	Mean	Std Dev	Std Error
Massachusetts	424	6.28%	0.054	0.003
California	535	5.75%	0.034	0.001

Levene's Test for Equality of Variances

	F	Sig.	*t*-stat	df	Sig. (2-tailed)
Equal variances assumed	65.379	0.000	1.847	957	0.065
Equal variances not assumed			1.757	678	0.079

Note: The number of observations (N) refers to the number of Census Tracts within the location(s) specified. The mean is of the percentage of Detached HUs sold per Census Tract across all sample years (1995- 2000).

We use Median Price/Sq Ft as a second indicator of price appreciation. This measure is widely used to indicate the "real" price of a home, in that it is a price/unit of real estate, instead of a broader measure of the price appreciation of housing as measured by the increase or decrease of median housing prices. One potential drawback of using this measure is that it may also reflect a family's ability to pay higher prices (e.g. be a substitute for household income).[12]

However, given the other non-measurable factors or variables that may influence a family's decision to purchase a (new) home, the primary issue

[12] It should be noted that the regression results in Table 3 clearly indicate that they are not substitutes.

will be whether the percentage of homes sold in California is less than that in other states, after controlling for other factors that we measure. In order to determine whether mobility is significantly different in California in comparison to Illinois and Massachusetts, we create dummy variables for the Illinois and Massachusetts observations (IL Dummy and MA Dummy – a dummy for California is not included because the sum of the three equals the summer vector). If the coefficient estimates for these two dummy variables are positive and statistically significant, then mobility in California is significantly less than in the other two states. Taking all factors into consideration, the primary impact of Proposition 13 should be that residential mobility in California is less than that in other states which do not have regulations that are as strong as Proposition 13.

Tables 3 and 4 report the regression results. The regressions use the percentage of detached housing units (DHUs) sold for a given year and census tract as the dependent variable. The set of regressions in Table 3 is intended to be diagnostic, as will be explained shortly. The regression results reported in Table 4 serve as the primary results of our analysis. But we are also interested in discovering whether prices, home values, or age influence the sale of homes. As a result, we also included variables for the median price/square foot, housing appreciation, and median age in the Census Tract, as decomposed by state.

The regressions reported in Table 3 examine the relationships between the percentage of DHUs sold and the explanatory (and control) variables for each state independently. These regressions are intended to detect differences across states so that the regression results of Table 4 may be reasonably interpreted. The demographic studies cited above detail broad relationships between demographic variables and mobility, and the results of Table 3 are generally consistent with this literature. People in lower income brackets, for example, tend to move more often than those in higher income brackets, though the Illinois data are weakly inconsistent with this trend. It is at least useful, and arguably essential, to understand how such variables interact across the samples from the various states. The results in Table 3 certainly illustrate some interesting differences among the states.

Note first that none of the coefficient estimates and/or their statistical significance for the variables in Table 3 is completely consistent across all three states. The most consistent results are that older people tend to move less often, but not significantly so in Illinois (t-stats for the Age > 55 years (%) variable of –3.59 and –5.64 for California and Massachusetts, respectively), and those born in the same state move more often (but the only significant estimate is for Illinois).

Table 3: OLS Regression Results of the % of Detached Housing Units Sold

Variables	California	Massachusetts	Illinois
Constant	−0.125	−0.019	0.504 **
	(−1.60)	(−0.33)	(2.10)
Median Price/Sq Ft	−0.0001 **	0.0002 ***	0.000
	(−2.15)	(4.92)	(0.38)
% Detached in Tract	−0.070 ***	−0.094 ***	0.022
	(−6.05)	(−4.34)	(0.64)
Price Appreciation	0.066 ***	−0.013 ***	0.002
	(5.30)	(−4.09)	(0.07)
Male (%)	0.059	−0.047	−2.140 ***
	(0.45)	(−0.44)	(−5.66)
White (%)	0.0014	0.036 ***	0.611 ***
	(0.10)	(2.62)	(3.23)
Married (%)	0.409 ***	0.271 ***	−0.419
	(4.29)	(4.04)	(−1.51)
Born in Same State (%)	0.040	0.058	0.445 ***
	(1.18)	(0.66)	(3.66)
College Graduate (%)	−0.080	0.032	0.607 ***
	(−0.87)	(0.33)	(3.58)
Unemployed (%)	−0.031	0.394 ***	7.388 ***
	(−0.17)	(2.59)	(4.24)
In Poverty (%)	0.103 **	0.056	−0.734 *
	(2.17)	(1.50)	(−1.72)
Executive/Professional (%)	0.028	0.202 ***	−0.055
	(0.72)	(3.97)	(−0.29)
Household Income > $50K (%)	−0.021	−0.117	0.018
	(−0.54)	(−3.17) ***	(0.18)
Age > 55 years (%)	−0.176 ***	−0.260 ***	−0.080
	(−3.59)	(−5.64)	(−0.65)
N	535	500	76
F	20.77 ***	23.63 ***	22.22 ***
Adjusted R^2	0.33	0.37	0.79

Notes: (1) The dependent variable in the regression is the % of Detached Housing Units Sold in a Census Tract during the sample years (1995-2000). The independent variables are defined as follows: Median Price/Sq Ft is the median $price per square foot of all detached homes sold in the Census Tract, % Detached in Tract is the percentage of housing units during 1990 which were detached, Price Appreciation is the Median $Price of the Detached residences sold for a given year in the Census Tract scaled by the Median Value of all housing units in the Census Tract as of 1990. The remaining variables are demographic variables as from the 2000 Census, whose values are for the sample Census Tract. T-statistics are reported in parentheses, and results are corrected for heteroskedasticity.

(2) Asterisks (***, **, *) for the coefficient estimates indicate statistical significance at the 1%, 5%, and 10% levels, respectively.

Several other regression results in Table 3 warrant mentioning. Higher housing costs per unit (Median Price/Sq Ft) are associated with lower mobility in Illinois, but with significantly higher mobility in Massachusetts, while Price Appreciation has the opposite impact for these two states. The price appreciation result for California conflicts with one of the basic expectations about the impact of the value of the tax cap (the third section

above) on mobility. This result is confounded by the trend through time, however, because housing prices increased steadily during the sample period in California (see Figure 1). The unit cost of housing is an alternative measure of the value of the tax cap for individuals, at least in part because it is independent of the size of a home and thus provides for an indirect control of the fact that families may move because they require larger accommodations.

Table 4: OLS Regression Results of the % of Detached Housing Units Sold with Relevant Variables Partitioned by State

Variables		Coefficient Estimate	T-Ratio
Constant		−0.101 **	−2.31
CA	Median Price/Sq Ft	−0.0001 **	−2.11
MA	Median Price/Sq Ft	0.0002 ***	5.23
IL	Median Price/Sq Ft	0.0002 **	2.40
CA	Price Appreciation	0.065 ***	4.60
MA	Price Appreciation	−0.013 ***	−4.21
IL	Price Appreciation	−0.068 ***	−3.60
CA	Age > 55 years (%)	−0.123 ***	−3.70
MA	Age > 55 years (%)	−0.195 ***	−4.07
IL	Age > 55 years (%)	0.199 **	2.44
MA Dummy		0.038 ***	2.76
IL Dummy		0.061 **	2.42
% Detached in Tract		−0.073 ***	−7.71
Male (%)		0.092	1.09
White (%)		0.040 ***	3.82
Married (%)		0.129 ***	2.89
Born in Same State (%)		0.074 **	2.02
College Graduate (%)		−0.057	−0.85
Unemployed (%)		0.340 ***	3.27
In Poverty (%)		0.065 **	2.56
Executive/Professional (%)		0.116 ***	3.65
Household Income > $50K (5)		−0.006	−0.26
N		1035	
F		27.96 ***	
Adjusted R^2		0.35	

Notes: (1) The dependent variable in the regression is the % of Detached Housing Units Sold in a Census Tract during the sample years (1995-2000). Variables with CA, MA, or IL appearing first are variables which have the value for the state when the observation was associated with the state, and zero otherwise. The independent variables are defined as follows: Median Price/Sq Ft is the median $price per square foot of all detached homes sold in the Census Tract, Price Appreciation is the Median $Price of the Detached residences sold for a given year in the Census Tract scaled by the Median Value of all housing units in the Census Tract as of 1990, % Detached in Tract is the percentage of housing units during 1990 which were detached. MA Dummy equals one when the observation is for Massachusetts and zero otherwise, and IL Dummy equals one when the observation is for Illinois and zero otherwise. The remaining variables are demographic variables as from the 2000 Census, whose values are for the sample Census Tract. Results are corrected for heteroskedasticity.

(2) Asterisks (***, **, *) for the coefficient estimates indicate statistical significance at the 1%, 5%, and 10% levels, respectively.

The fact that households in single family neighborhoods (% Detached in Tract) are more stable is confirmed within California and Massachusetts, but not Illinois. For California, a higher percentage of married people are positively related to mobility, while in Massachusetts, a higher percentages of married people, higher percentages of unemployed, and a higher level workforce (Executive/Profession (%)) are all related to higher mobility. Finally, for Illinois, higher percentages of males, Whites, college graduates, and the unemployed are all associated with higher mobility.

In summary, the results in Table 3 provide only mixed support for the expected relationship between mobility and the benefit from the tax cap due to Proposition 13, with the Price Appreciation not supporting the hypothesis and the Median Price/Sq Ft providing support for the hypothesis. It should be noted that the basic expectation from option theory, as outlined in the third section above, applies at the level of the individual household, while all of our variables are measured at the level of Census Tracts. This fact, that we use aggregate measures, may mask the underlying behavior. Nonetheless, only the results of the regressions reported in Table 4 address the central issue, whether mobility in California is lower than that in other states.

The regression results presented in Table 4 depend upon interpreting the MA and IL Dummy variables appropriately. Each variable equals one when the observation is associated with the respective state, and zero otherwise. Since they are included jointly, but without the related CA Dummy variable, their coefficient estimates indicate the difference in the dependent variable (percentage of DHUs Sold) between each of these states and California. The estimates of 0.038 for Massachusetts and 0.061 for Illinois (significant at the 1% and 5% levels of significance, respectively) support the contention that homeowner mobility is significantly greater in these states than it is in California. While it is not possible to rule out the influence of all other variables (the omitted variables problem), the large variety of variables included as controls suggests that California's lower mobility is due to Proposition 13, because it is the major difference which remains between the states.

The final concerns are whether the price factor for homes or age displays the expected impact on mobility. The statistical results for the decomposed Median Price/Sq Ft and Price Appreciation variables are equivalent to those in Table 3. Namely, with increases in the Median Price/Sq Ft in California, mobility decreases (percentage of DHUs Sold decreases), and with housing Price Appreciation in California, mobility increases. Again, the first of these supports the contention that the tax benefit from the ceiling on real estate tax increases due to Proposition 13 significantly reduces homeowner mobility in California.

Does the age 55 extension of the tax benefits of Proposition 13 have an impact on mobility?[13] Simply put, since there are some allowances for individuals who are 55 years of age or older to maintain their assessment value upon a purchase and sale, the expectation would be that mobility is greater for the elderly. The coefficient estimate for the CA Age > 55 years (%) variable, in conflict with expectations, is negative and statistically significant, indicating that elderly people in California are less mobile than their younger counterparts. There are several potential explanations for this pattern. First, many Californians may not be aware of the relevant propositions. Second, the propositions are actually very limited in scope, and thus may have at most a very marginal impact on the decision to move. Finally, the expected increase in mobility may occur as a spike at the ages 55-57, for example, and would thus not be revealed by a variable which groups all ages above 55 years.

There are several qualifications concerning the generalizabilty of our statistical analyses. First, since the data is limited in scope, the results concerning residential mobility are not conclusive. Nonetheless, the primary point still holds that unintended consequences of governmental policies must be considered. Second, the data for all years of our sample period, 1995-2000, are pooled in the regressions. This may introduce problems of autocorrelation across the sample, which cannot be readily controlled, given data limitations. Finally, while scaling our variables by year is desirable, it is not possible, because Census Data are available only every ten years. For example, the dependent variable (percentage age of Detached HUs sold in a Census Tract) is measured for each year of the sample period, even though the base year for the total number of detached HUs in a Census Tract is 1990. Ideally, the total number of detached HUs would be "updated" each year. Despite these limitations, our results are meaningful, at least in part because we apply our procedures consistently across all Census Tracts and years.

Conclusion

We find that home ownership mobility in California is significantly lower than in other states, namely Illinois and Massachusetts, after controlling for a wide variety of demographic and housing factors. This result provides support for interpreting the tax benefits to homeowners from California's Proposition 13 as providing disincentives to move from a home in which they have settled. The tax benefits accrue to California homeowners largely because their annual real estate tax bill can increase at a maximum of 2% per

[13] See footnote 2 above.

year (the tax cap), regardless of any higher general housing appreciation. With a 100% increase in housing prices over a period of 5 or more years, certainly a realistic prospect in California, the tax savings from not moving are substantial. For example, if the assessment value of the home in 1995 is $200K and assessment value of a comparable home in 2000 is $400K, a homeowner who moves to the comparable home pays approximately 81% more in taxes.

This tax benefit increases for individual households with housing appreciation. While we do not find that this relationship holds at the aggregate level (we are only able to measure mobility at the Census Tract level), regression results indicate that higher housing prices per unit in California (CA Median Price/Sq Ft) are associated with lower mobility. This latter result at least indirectly supports the contention that the tax cap benefit reduces mobility in California, when compared to mobility in other states.

The underlying issue is how tax laws impact individual behavior, which in turn may or should influence government policy. Proposition 13 was not passed in order to reduce mobility. Indeed, the public finance literature focuses on the reduced tax revenue for states (California) and local governments. One purpose of our research is to indicate that unintended consequences of original laws may be as significant as the original intent of legal measures. If reduced homeownership mobility in California is a consequence of Proposition 13, as our research suggests, it was certainly unintended by the original proponents, who were almost solely seeking tax relief.

Finally, since the design of (real estate) tax policies may have consequences extending well beyond those initially intended, we recommend that countries such as China, the former countries of the USSR, and many in Africa which are currently designing such policies (or may do so in the future) also take such unintended consequences into account. While measuring the impact of such unintended consequences may be difficult, they should not be ignored.

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