# Proposition 13 and the Implicit Subsidy to Housing Prices in Los Angeles County

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**Abstract**

We perform a panel-data assessment of the accumulative effect of Proposition 13 on housing unaffordability and asset inequality in Los Angeles County 87 cities of during 2019-2024. We use an applied urban land economics model where the long-run distortionary effects of Proposition 13 are evidenced by an increasing cadastral ratio between land and improvements value, and between market price and total cadastral value. In contrast to most contributions on the topic, our urban land economics model explicitly models the neutral (negative) effect of the property tax rate on land value. We use OLS, IV and SUR System panel estimations to test the conceptually predicted hypotheses on the relationships between the main variables. We use the results to propose a land-based tax that still maintains tax relief on improvements, a less politically resisted option to modify Proposition 13.

**Keywords:** Spatial Economic Analysis, Property Taxes; Housing Markets; Los Angeles County; Proposition 13.

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## 1. Introduction

It is an appealing idea to offer property tax relief to homeowners in markets experiencing high price growth. However, existing academic evidence and the use of urban land economics theory point to a less straightforward effect. The direct effect of assessment caps is a decrease of the tax burden, benefiting existing homeowners. However, it also reduces real estate rotation, decreasing housing supply and increasing its prices for new potential homeowners.

Proposition 13, a tax relief measure implemented in California in 1978 has accumulated almost 50 years of limited cadastral value assessment increases, largely contributing to its current crisis of housing supply and affordability. Existing academic evidence has highlighted that Proposition 13 has worsened affordability, exacerbated inequality, and decreased housing production. However, the measure continues to be popular among voters and policy makers of all affiliations. In this paper, we make a contribution by offering a conceptually driven set of tests that emphasizes the relationships between two key ratios: a) the ratio between market price and total cadastral value; and b) the ratio between cadastral land and improvements value.

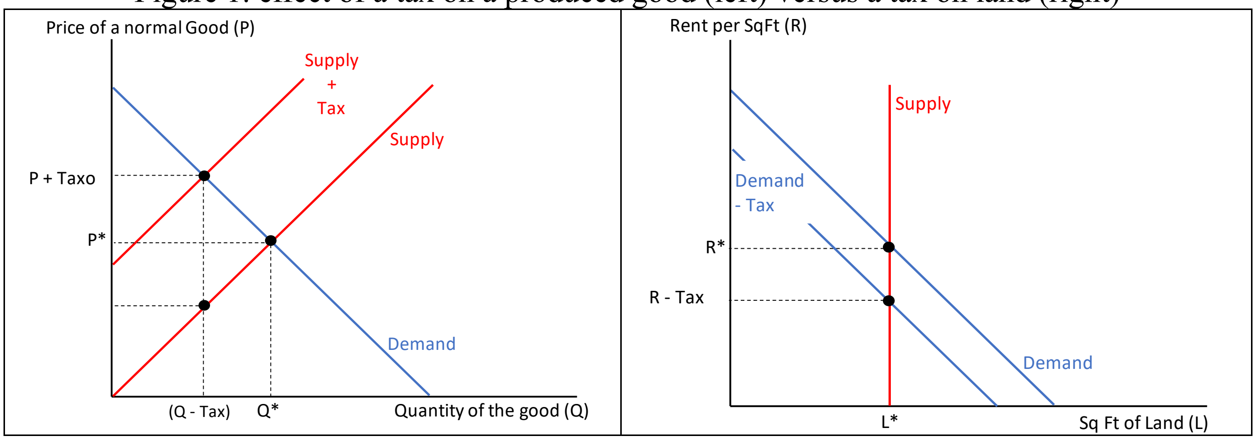
We merge two sources of housing information to assemble our main database, Corelogic for transaction prices, and Los Angeles County Assessor for cadastral values. With this data we compiled a panel database for the 87 cities in Los Angeles County during 2019-2024. The panel data regressions include OLS, IV, and SUR estimations to verify that the cadastral ratio has an increasing effect on the ratio between market housing prices and cadastral values, and that the cadastral ratio itself is determined by the housing prices. In addition, we verify that the property tax has a negative effect on the value of land, responding precisely to the fact that Proposition 13 distortions have made cadastral land value disproportionate in relation to improvements. These results point to a policy reform proposal type split-rate or land-based property tax, while offering tax relief to homeowners.

## 2. Conceptual Framework

Traditional property taxes mix two different types of tax, the one based on the value of improvements, considered one of the worst types of tax, and the one based on pure land value, considered the ideal type of tax. This statement derives from basic economic theory that suggests that improvements are the result of construction activity, and when taxed, its quantity supplied decreases and its price increases. In contrast, land value is the capitalization of pure site rent; when taxed, its value decreases without changing the quantity and type of improvements (Wenzer, 1999;

Dye & England, 2009). This result is known as the Henry George Theorem (Arnott, 2004; Nell, 2019), which we represent in Figure 1. The left side of the figure shows that a tax increases the price of a produced good to $(P + Tax)$ while decreasing its quantity to $(Q - Tax)$. In contrast, the right side of the figure represents the land market, where a tax cannot increase its price due to land supply inelasticity: every plot of land comprises a location monopoly, it is an irreproducible geographical feature. Therefore, the tax can only be paid by reducing the potential to pay residual land rent on the demand side (Garza, 2019).

Figure 1: effect of a tax on a produced good (left) versus a tax on land (right)




The political economist Henry George argued that a tax on pure land value would be enough to cover all the government fiscal needs, while not affecting economic activity or laborers' income (Dye & England, 2009). This is why the land tax is considered an ideal source of public finance revenue; it is neutral to the market. Our empirical testing models build upon modern interpretations of Henry George (Arnott & Stiglitz, 1976), using a Rosen (1979) and Roback (1982) urban economics theoretical framework to detect accumulative (long-run) policy effects in spatial general equilibrium.

In the Rosen-Roback framework, if all the cities in a national or regional system of cities charge a Georgian land tax, the corresponding urban system will reach its optimal long-run equilibrium in the built environment and construction. The land values will be determined by cities' economic and demographic size under the condition of equalization of utilities. If not all the cities charge the tax, or they have different tax rates, there will be capital shifts and development migration across the urban system, such that the tax might not be neutral (Brueckner, 1986; Yang, & Hawley, 2022).

The tax will also be non-neutral when not charged on the total differential land rents. This is the case of Proposition 13 in California, where the freezing of the cadastral value makes it diverge from the market price in the long-run.

In this paper we endeavor at testing the effect of the property tax rates on the ratio between cadastral land and improvements value, and between market price and total cadastral value. We cannot perform an impact assessment because we do not have information as far back as the 1970s, when Proposition 13 was enacted. This is why we rely on our adaptation of the Rosen-Roback-Brueckner theoretical framework to verify the simultaneous long-run effect of the tax rate on both: the ratio between market price and cadastral value, and the ratio between cadastral land and improvements value.

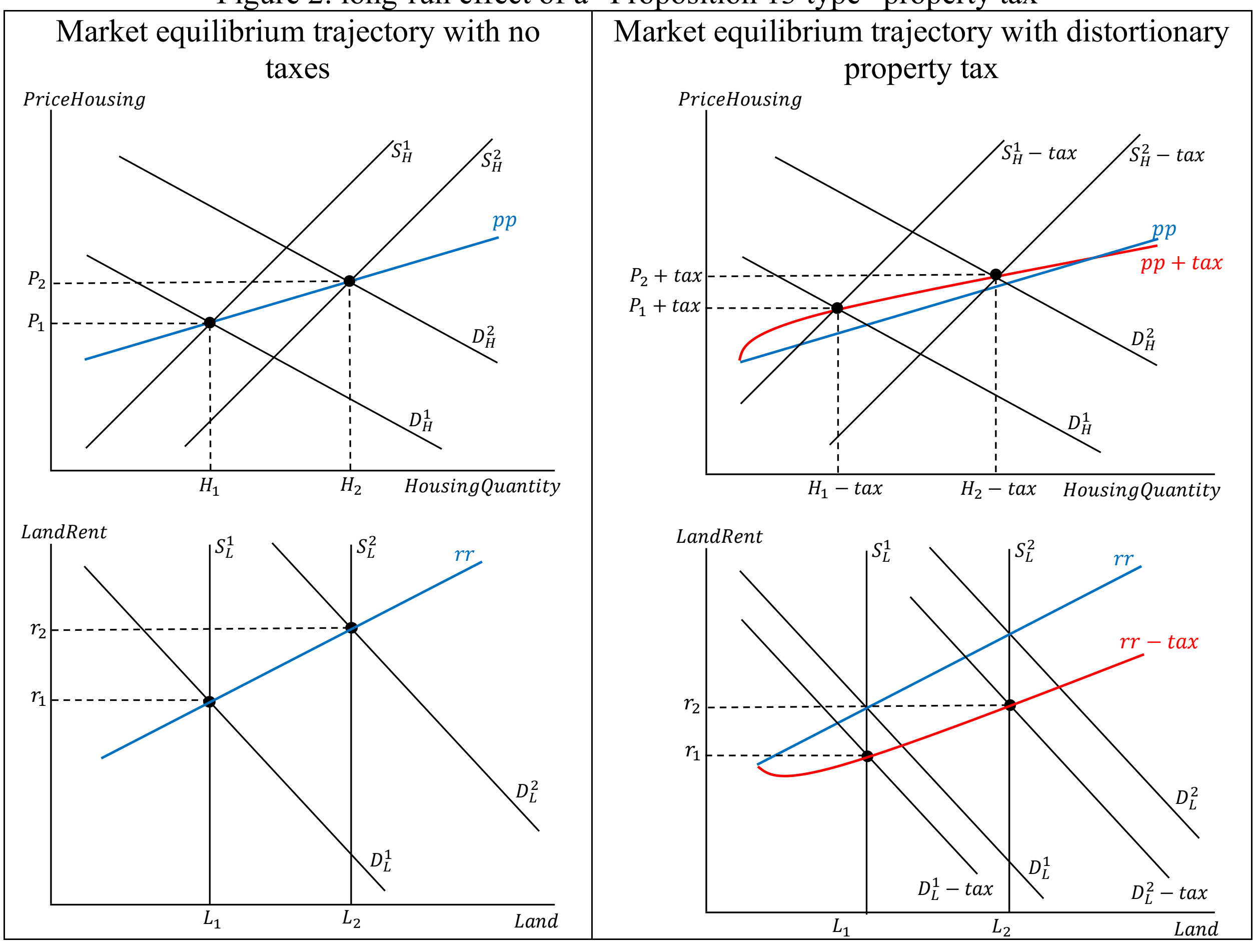
In our conceptual framework, due to Proposition 13 distortions, land represents a higher and increasing proportion of the total value in the long-run. We will show evidence of this feature in the cities of Los Angeles County in Section 3 below. Our simplified theoretical structure shows that even though we have a traditional property tax levied on both the land and improvements value, in the long-run a higher proportion of the tax is charged on land than on improvements[1]. Figure 2 represents our reasoning.

The upper-left graph of Figure 2 shows the housing market for a metropolitan region experiencing economic and population growth in the long-run. The lower-left graph shows its derived urban land market. The figure highlights two periods and their equilibria: the initial period 1 with corresponding equilibrium levels of housing price $(P_1)$ and quantity $(H_1)$, which in turn determine the land used $(L_1)$ and its corresponding residual rent $(r_1)$. The supply of housing is positively sloped because it can be increased via construction, in contrast, the supply of land is perfectly inelastic (Evans, 2008; Costello, 2014; Park, 2024). In the long-run, period 2 in the graph, the housing supply shifts to the right $(H_2)$, requiring more land $(L_2)$. However, due to city growth, the demand shifts even further to the right to $D_H^2$, increasing housing prices to $P_2$ on the line $pp$ and land rents to $r_2$, on the more than proportional line $rr$ (Garza & Gonzalez, 2021).

[1] The effect could be comparable to a Split Rate Tax, where land is taxed more than proportionally than improvements (Brunori, 2004; Kwak & Mak, 2011).

A traditional property tax is charged on land and improvements and has two contradicting effects: a) housing is a produced good, therefore the tax on improvements shifts the housing supply to the left, increasing its price and decreasing its quantity; and b) land is not a produced good and the tax on land shifts the land demand to the left by diminishing payment capacity, decreasing land rent without changing the quantity of land, which was pre-determined by the equilibrium in the housing market (England, 2018).

Figure 2: long-run effect of a "Proposition 13 type" property tax




The California case in the long-run after Proposition 13 is presented as an extreme version of these effects on the right side of Figure 2. The upper right graph shows that the tax more strongly shifts the housing supply to the left in period 1 ($S_H^1 - tax$), when the housing stock is new and improvements represent a larger proportion of total housing value, than in period 2 ($S_H^2 - tax$), when due to Proposition 13 the stock of housing is stagnant and has depreciated (Kok, et al., 2014).

This long-run effect of the property tax distortion manifests as an initially steeper $(pp + tax)$ red line, which however in the long-run converges to the original $pp$ line. The figure also shows that the changing effect of the tax on housing prices transfers to the land rent as a divergent trend between the original $rr$ and the $(rr - tax)$ lines. This means that in the long-run this traditional property tax should have a sizable negative effect on land values, as per the Henry George theorem[2].

To test the process depicted on the right side of Figure 2, we will use single and multiple equation (system) panel regression on the ratio between residential cadastral values and market prices in the cities of Los Angeles County during 2019-2024. We cannot perform a traditional impact assessment given the fact that Proposition 13 was enacted in 1978. We can however evaluate its effect on the ratio, the proportions between the $pp$ and $rr$ lines in Figure 2. This empirical strategy and its corresponding specification process are offered in section 4.

## 3. Case Study and Data

Our case study comprises the 87 cities of Los Angeles County, most of them part of the corresponding Los Angeles Metropolitan Statistical Area (MSA). The city of Los Angeles proper is excluded in this version of the analysis, but we will include it in future research performed at the level of census tracks.

### 3.1 Proposition 13 and Housing Markets

Proposition 13 was elevated as a ballot in California in 1978, after a series of tax strikes by homeowners. The proposition states that the property tax is based upon the appraised value in 1976 with annual increases attached to an inflation factor, not to exceed 2% per year. The reappraisal of

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[2] Notice that the amounts of land used $(L_1)$ and $(L_2)$ are the same as in the left side, because the land component of the property tax is neutral to the market, as explained above. In other words, the available land is now being used less intensively with lower constructive and/or population densities

property values occurs only when: 1) there is a change in ownership, or 2) there is new construction.

In principle, Proposition 13 was implemented to offer tax relief to homeowners in expensive and fast-growth housing markets (Sexton, 1999). However, the tax strikes that preceded it have also been associated with local exclusionary reactions to social integration attempts, for example, the unification of Los Angeles school districts during the 1970s (Fischel, 2015; Danforth, 2023).

Proposition 13 has had three effects identified in the academic literature: a) it is an incentive to homeownership by decreasing housing operation costs. However: b) it has decreased housing stock rotation, by effectively reducing the property tax bill the longer a housing unit remains out of the market. This incentive has decreased housing market rotation and supply, increasing prices (Schwartz, 1997). Finally: c) Proposition 13 advantages are canceled with new construction, which is an incentive to maintain an outdated stock of housing. Traditionally, zoning and density restrictions make it hard to develop new housing units in California. Proposition 13 makes it even harder by incentivizing the retention of plots of land occupied by an outdated stock of housing (Sexton et al., 1999)

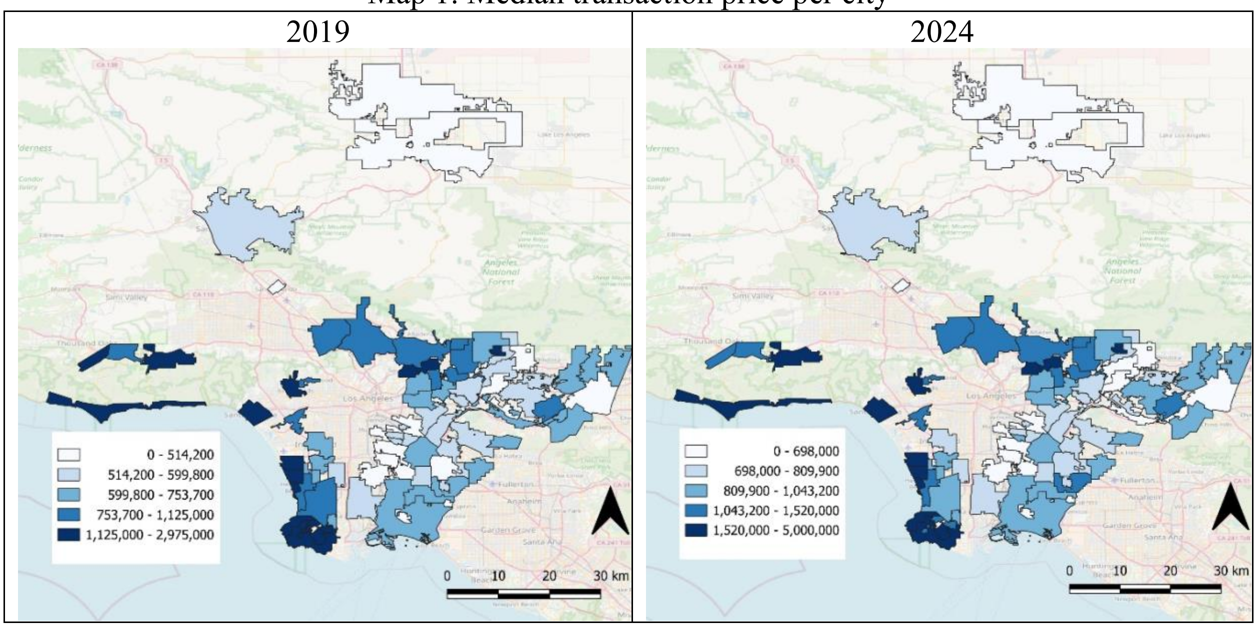
We must add that in addition to its general unaffordability effect, Proposition 13 has also affected inequality. The reason is that the reduced housing supply and higher prices are transferred, via residual land rent, into higher residential land values. Therefore, Proposition 13 has favored households that already owned housing in the 1970s, while making it harder for newly formed households. Since the 1970s, and more strongly since the 1990s, these newly formed households have mostly comprised large cohorts of Latin American immigrants. This inequality effect explains why, even when representing the majority of Los Angeles MSA residents, the Latin American population lack access to homeownership, 51.1.% when compared to 72.1% for white households. This issue adds to the effects of exclusionary zoning in the region, dating back to the incorporation of most cities around the 1950s-1960s (McConnell, 2012; De la Huesca, et al., 2016).

We must add that regardless of the abundant academic literature on the negative effects of Proposition 13, it has survived continuous legal and political challenges and has a high degree of voter approval. The visual aspect of offering relief to households, older households in particular, adds a level of complexity to any modification proposal (Danforth, 2021; Citri, 2009). In Section 5 we offer an alternative policy proposal of our own, based upon the results of this research.

### 3.2 Data sources and procedures

Our source of housing transaction prices and quantities per city is Corelogic. We have access to corresponding total values per housing unit, but not to their sizes or the size of their parcels. This limitation does not allow us to operate on a basis of prices per square foot. However, our total transaction and cadastral values will be controlled by housing conditions characteristics in the regressions of Section 4. Map 1 shows the median Corelogic transaction price in the initial and final years of our analysis: 2019 and 2024. The basemap includes highway and street network to facilitate visual inspection in reference to the built environment.

Map 1: Median transaction price per city



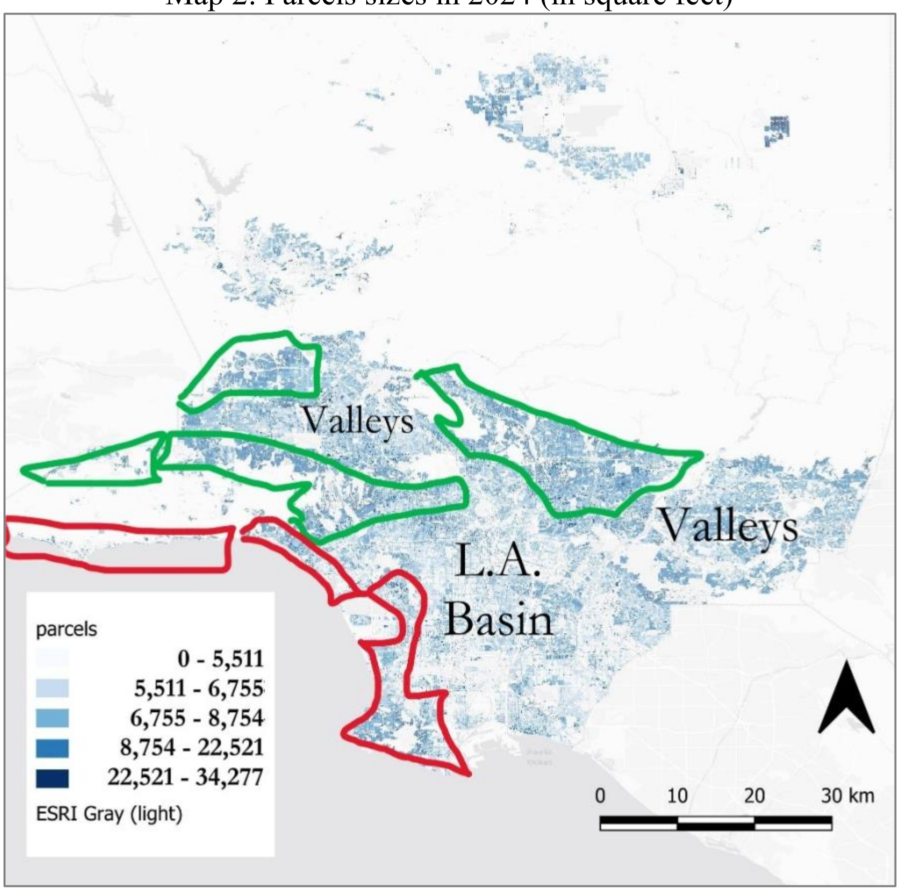

Map 1 shows that the most expensive housing units are in the coastal and mountain areas, while cities on the main basin of Los Angeles and its valleys tend to have lower prices. The prices, number of sales, and growth, highlighting the coastal and mountain cities performance are represented in Table 1, where we can appreciate that coastal cities tend to have higher prices, although not necessarily the highest price growth. We can also see the steady decrease in sales, a troublesome post-pandemic pattern observed elsewhere (Spader, 2022; Semuels, 2023).

Table 1: Transaction prices and sales per year

| | Average Price (medians per city) | | | | | | Yearly Growth |
|---|---|---|---|---|---|---|---|
| | 2019 | 2020 | 2021 | 2022 | 2023 | 2024 | |
| Total (88 cities) (weighted by sales) | 763,337 | 898,704 | 1,512,303 | 984,090 | 1,007,878 | 1,020,723 | 5.98% |
| Coastal (12 cities) | 1,632,320 | 1,921,720 | 3,084,018 | 2,109,378 | 2,224,718 | 2,172,721 | 5.89% |
| Mountain (10 cities | 1,329,628 | 1,484,196 | 1,637,622 | 1,713,915 | 1,716,001 | 1,724,521 | 5.34% |

| | Total Sales | | | | | | Yearly Growth |
|---|---|---|---|---|---|---|---|
| | 2019 | 2020 | 2021 | 2022 | 2023 | 2024 | |
| Total (88 cities) | 59,362 | 78,237 | 67,239 | 44,996 | 41,771 | 46,478 | -4.8% |
| Coastal (12 cities) | 6,037 | 8,294 | 6,675 | 4,535 | 4,110 | 4,567 | -5.4% |
| Mountain (10 cities | 5,968 | 8,461 | 7,301 | 4,788 | 4,286 | 4,869 | -4.0% |

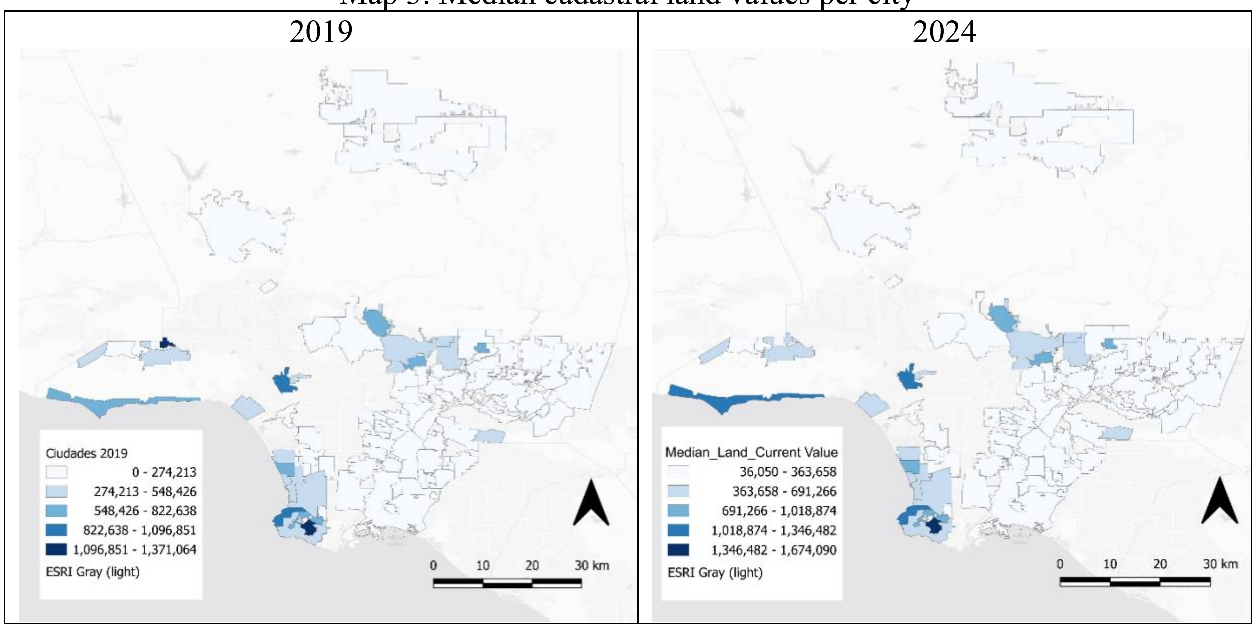
Map 2: Parcels sizes in 2024 (in square feet)



We built our database of 2.63 million parcels cadastral values using Los Angeles County Assessments at the level of parcel for January 2019 – 2024. The source contains data on land value, improvements value, and parcel size, which we represent in map 2. The map shows the spatial distribution of parcel sizes in 2024, where mountain (green) and coastal (red) plots of land tend to be larger than on the main Los Angeles and Valleys' basins. Plots of land in peripheral locations also tend to have larger sizes.

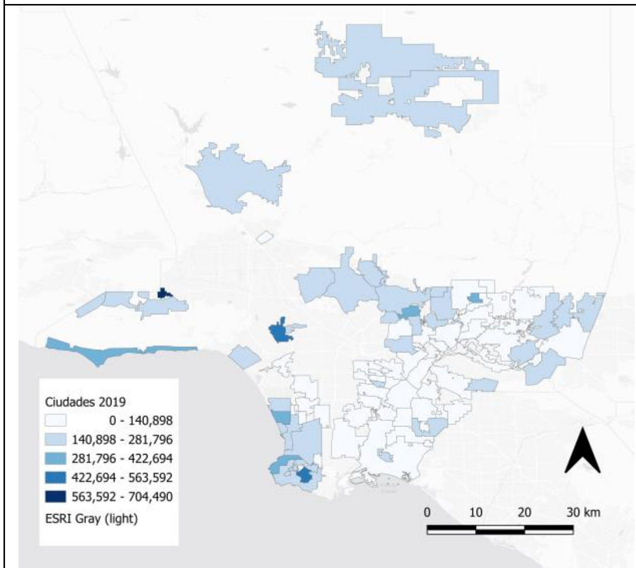
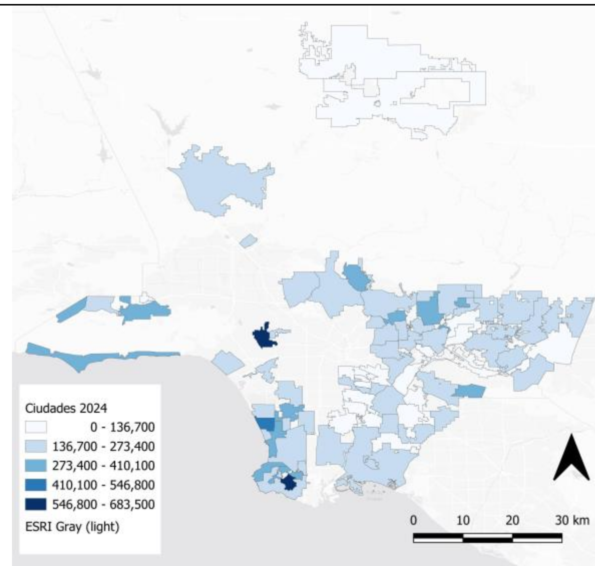
From Map 2 we extracted the information corresponding to the residential land use: 2.35 million parcels, and obtained corresponding medians per city, reported in Map 3, for 2019 and 2024. Map 3 shows that there is correlation between cadastral land values and parcels' sizes per city.

Map 3: Median cadastral land values per city




The improvements' values in contrast are more evenly distributed in map 4. Some highly valued improvements per housing unit occur in cities located in the main Los Angeles basin and further to the east of the city of Los Angeles. The temporal evolution and relationship between cadastral land and improvement values are reported in Table 2, offering a comparison for Coastal and Mountain cities. Table 2 shows that the cadastral values are very low in relation to the Corelogic transaction prices, a feature expected from Proposition 13 as discussed in section 2. Table 2 includes parcel sizes, which are also correspondingly higher, although decreasing, in coastal and mountain cities.

Map 4: Median cadastral improvement values per city

| 2019 | 2024 |
| --- | --- |
|  |  |





Another expected feature of Proposition 13 is that the land values are higher than the improvements, and their corresponding ratio has increased during the period, as shown in Table 3. We can see that coastal and mountain cities have higher ratios, corresponding to their more exclusive market orientation. However, these cities have lower ratio growth when compared to all the cities in the county, in coincidence with the decreasing parcel sizes of Table 2.

Table 2: Cadastral values and parcel sizes per year

| | Average Land Value (medians per city) | | | | | | Yearly Growth |
|---|---|---|---|---|---|---|---|
| | 2019 | 2020 | 2021 | 2022 | 2023 | 2024 | |
| Total (88 cities) (weighted by acres) | 224,056 | 235,226 | 246,402 | 261,141 | 276,127 | 280,145 | 4.57% |
| Coastal (12 cities) | 582,500 | 610,200 | 639,117 | 674,635 | 713,624 | 741,825 | 4.95% |
| Mountain (10 cities) | 412,329 | 434,504 | 453,514 | 480,492 | 507,312 | 517,802 | 4.66% |

| | Average Improvements Value (medians per city) | | | | | | Yearly Growth |
|---|---|---|---|---|---|---|---|
| | 2019 | 2020 | 2021 | 2022 | 2023 | 2024 | |
| Total (88 cities) (weighted by acres) | 152,515 | 158,300 | 163,474 | 170,204 | 177,592 | 170,844 | 2.30% |
| Coastal (12 cities) | 256,966 | 263,009 | 274,171 | 288,524 | 306,426 | 326,039 | 4.88% |
| Mountain (10 cities) | 227,985 | 237,089 | 244,568 | 254,314 | 265,832 | 276,676 | 3.95% |

| | Average Parcel Size in Sq Ft (medians per city) | | | | | | Yearly Growth |
|---|---|---|---|---|---|---|---|
| | 2019 | 2020 | 2021 | 2022 | 2023 | 2024 | |
| Total (88 cities) (weighted by acres) | 1,757 | 1,758 | 1,763 | 1,765 | 1,767 | 1,758 | 0.01% |
| Coastal (12 cities) | 2,025 | 2,022 | 2,029 | 2,035 | 2,040 | 2,017 | -0.07% |
| Mountain (10 cities) | 1,979 | 1,980 | 1,987 | 1,988 | 1,990 | 1,933 | -0.47% |

Table 3: Ratio Cadastral Land/Improvements value per year

| | Ratio Land/Improvements (medians per city) | | | | | | Yearly Growth |
|---|---|---|---|---|---|---|---|
| | 2019 | 2020 | 2021 | 2022 | 2023 | 2024 | |
| Total (88 cities) (weighted by acres) | 1.47 | 1.49 | 1.51 | 1.53 | 1.55 | 1.64 | 2.22% |
| Coastal (12 cities) | 2.27 | 2.32 | 2.33 | 2.34 | 2.33 | 2.28 | 0.07% |
| Mountain (10 cities) | 1.81 | 1.83 | 1.85 | 1.89 | 1.91 | 1.87 | 0.69% |

## 4. Empirical Strategy and Regression Results

### 4.1 Testing Framework

Our theoretical framework states that due to distortions in the land market introduced by Proposition 13, housing prices, and their corresponding land values are disproportionately high in Los Angeles County. The analysis of figures 1 and 2 distills into two hypotheses to be tested. First, the $HousingPrice$ must have an increasing effect on the $CadastralRatio$, between cadastral land and improvement values. To verify that such relationship is connected to a property tax issue, the $CadastralRatio$ must be, in turn, determined by the Property $TaxRate$ per city as explained in Figure 2. In the context of our collected data this empirical strategy limits our panel regression setup, because $TaxRate$ is a pure cross-section variable which rules out the use of panel fixed effects. Also, it is a variable collected at the level of cities, the spatial unit level we use in this paper.

The second hypothesis is that the $CadastralRatio$ has an increasing effect on the $Ratio$ between $HousingPrice$ and Total Cadastral Value, this is our proxy of implicit subsidy, the degree of distortion caused by Proposition 13. The higher the $Ratio$, the higher the unaffordability effect of proposition 13 in the corresponding city. According to Figures 1 and 2, if a higher $CadastralRatio$ is caused by the distortionary effect of Proposition 13, these higher residual land rents transfer into the market $HousingPrice$, increasing the corresponding $Ratio$ against its total cadastral value,

We propose two sets of panel tests, controlled by other relevant cross-section and temporal variables, in addition to corresponding panel effects per city. These control variables are going to be selected using stepwise procedures, such that the regressions offer a rigorous *ex-ante* testing framework for our hypotheses. The total database variables used in our stepwise exercises and test regressions can be consulted in Appendix A, and the stepwise results can be consulted in Appendix B. The first set of tests is represented by the system of equations (1):

$$\begin{gathered} CadastralRatio_{i,t} = \widehat{HousingPrice}_{i,t} - TaxRate_i + ControlVariables_{i,t} + \gamma_i + \epsilon_t + \mu_{i,t} \\ HousingPrice_{i,t} = ControlVariables_{i,t} + \gamma_i + \epsilon_t + \mu_{i,t} \end{gathered} \tag{1}$$

The system of equations (1) is estimated using linear regression (OLS), instrumental variables (IV) and System estimation. The linear regression simply uses all the variables as presented in the first line of (1), we expect the $HousingPrice$ to have a positive, and $TaxRate$ a negative, effect on the $CadastralRatio$, as explained above. Notice that some variables have panel structure per city $i$, and year $t$; however, the $TaxRate$ is cross-sectional, only per city $i$. The stepwise-selected $ControlVariables$ might include panel, cross-section and temporal variables, which are listed and described in Appendix A. As explained above, these features will limit our selection of potential panel effects: $\gamma_i$ per city, and $\epsilon_t$ per year. $\mu_{i,t}$ are corresponding unstructured panel errors. All the regressions also include a $Dummy\_Covid$ controlling the pandemic shock in 2020, and all the numerical variables are introduced as logs (percents, ratios, or dummy variables, are not transformed). When using IV regression, the stepwise selected controls are used as instruments in the regression, such that they determine the variables $HousingPrice_{i,t}$ and $CadastralRatio_{i,t}$ (below in equation 2).

Finally, the System regressions use the exact structure proposed in (1), with the $ControlVariables$ determining the estimated $\widehat{HousingPrice}$, which subsequently determines the $CadastralRatio$. The System will be estimated using Seemingly Unrelated Regression (SUR), which performs sequential iterations to simultaneously update the coefficients on both equations until the unstructured residuals are minimized (Greene, 2012).

The system of equations (2) represents the second hypothesis to be tested. In this case, the $Ratio$ between $HousingPrice$ and Total Cadastral Value is determined by $CadastralRatio$, which in turn dependends upon the $TaxRate$ and the set of stepwise preselected $ControlVariables$ for this system. Once again, in the OLS regression all the variables are used in the same equation, in the IV regression the $TaxRate$ and $ControlVariables$ are introduced as instruments, and the SUR regression looks exactly like the system (2).

$$\begin{aligned} Ratio_{i,t} &= \widehat{CadastralRatio}_{i,t} + ControlVariables_{i,t} + \gamma_i + \epsilon_t + \mu_{i,t} \\ CadastralRatio_{i,t} &= -\,TaxRate_i + ControlVariables_{i,t} + \gamma_i + \epsilon_t + \mu_{i,t} \end{aligned} \tag{2}$$

In this empirical design, the $Ratio$ proxies the net implicit subsidy of Proposition 13 on property values, because by having a low effective $TaxRate$, both the $CadastralRatio$ and its corresponding $Ratio$ are higher. We are in this sense building and improving upon the Proposition 13 subsidy estimations obtained by Wasi & White (2005), by using a panel approach with data collected at the level of parcel and operationalized at the level of cities for the period 2019-2024, while they had comparison of cross-sections at the level of counties in the L.A. MSA. Our period of analysis covers the current crisis of housing affordability in California and can be also operationalized at the level of census-tracks, although this approach will be limited by the availability of parcel-level tax rate data[3].

### 4.2 Regression Results

Regression results for equation (1) are presented in Table 4, where we test our first hypothesis: the dependent variable $CadastralRatio$ is positively determined by $HousingPrice$. The $HousingPrice$, is in turn determined by $Interest\ Rate$ and $Dummy\ Covid$, and by the stepwise selected variables as reported in Appendix B: Income per capita, Poverty, GDP National, Race Asian %, Sales, and Population. In addition, following the theoretical proposal in Figure 1, the $TaxRate$ must negatively determine the $CadastralRatio$.

Table 4: Panel Random Effects (dependent variable: $CadastralRatio$)

[3] We cannot use the tax collection data as a percentage of Total Cadastral Value as a proxy of the tax rate, because the amount collected is actually endogenous to Proposition 13, the Cadastral Ratio, and the Total Cadastral Value itself.

| Variable | OLS | IV | SUR System |
|---|---|---|---|
| Constant | 1.610 | 6.308 *** | -7.268 *** |
| Housing Price | 0.482 *** | 0.097 | 0.672 *** |
| Tax Rate | -0.639 * | -5.124 *** | -0.284 |
| dummy covid | -0.017 | -0.068 *** | -0.015 |
| *Interest Rate Lag* | -0.002 | | -0.021 *** |
| *Income per capita* | 0.115 | | 1.083 *** |
| *Poverty* | 0.000 | | 0.024 *** |
| *GDP National* | -0.414 *** | | 0.396 *** |
| *Race Asian* | 0.001 | | 0.003 *** |
| *Sales* | -0.076 *** | | -0.151 *** |
| *Population* | 0.035 | | 0.133 *** |
| R2 | 0.258 | | 0.335 |
| Breusch-Pagan Ommited Effects | 0.000 | 0.000 | |
| Hausmann Independence (p-value) | | | 0.806 |
| Sargan_Hansen (p-value) | 0.000 | 0.010 | |
| Instruments Endogeneity | | 0.037 | |

Table 4 shows that $CadastralRatio$ is correctly explained by $HousingPrice$ and $TaxRate$, everything else constant in the OLS estimation. Notice that cross-section Random Effects (RE) are required as per the Breusch-Pagan indicator in both, the OLS and IV models, and Fixed Effects (FE) cannot be implemented because the Tax Rate variables is a cross-section variable per city. The IV model portrays a non-significant parameter for $HousingPrice$, which corresponds to the fact that the instruments are stepwise selected to fully explain, and essentially replace, this variable. There is however no overidentification of instruments according to Sargan-Hansen, and they are not correlated to the errors (only 0.037 $R^2$). IV results also show a negative impact of $TaxRate$ on $CadastralRatio$, as theoretically expected. Finally, the SUR regression shows that all the stepwise-selected instruments correctly explain $HousingPrice$, which in turn, is positively related to $CadastralRatio$, also verifying our first hypothesis.

Table 5 presents regression results for our second hypothesis, expressed in equation (2): the $CadastralRatio$ positively determines the $Ratio$ between $HousingPrice$ and Total Cadastral Value. Building upon table 4 results, the models also include the $InterestRate$ and $DummyCovid$ as direct determinants of the $HousingPrice$, and therefore, of the $Ratio$. OLS results in Table 5 show that effectively, the $Ratio$ is positively determined by the $CadastralRatio$, everything else constant, and including a corresponding negative effect of the $InterestRate$.

Table 5: Regression results (dependent variable: $Ratio$)

| Variable | OLS | IV | SUR System |
|---|---|---|---|
| Constant | 5.210 *** | 12.301 *** | 1.882 *** |
| Cadastral Ratio | 0.422 *** | 0.385 *** | 0.346 *** |
| Interest Rate Lag | -0.024 ** | -2.095 *** | -0.044 ** |
| dummy Covid | -0.045 | -8.403 *** | -0.098 * |
| *Tax Rate* | 0.305 | | -0.792 *** |
| *Housing Vacancy Rate* | 1.645 * | | 5.338 *** |
| *Race Hispanic* | 0.001 | | -0.017 *** |
| *Parcel Square Feet* | -0.346 | | -0.786 *** |
| *Housing Units* | -0.998 *** | | -1.345 *** |
| *Population* | 0.755 *** | | 1.267 *** |
| *Housing Mobile Homes %* | 1.248 | | -3.070 *** |
| R2 | 0.261 | | 0.098 |
| Breusch-Pagan Ommited Effects | 0.000 | 0.000 | |
| Hausmann Independence (p-value) | | | 0.806 |
| Sargan-Hansen (p-value) | 0.003 | 0.034 | |
| Instruments Endogeneity | | 0.003 | |

The results confirm the second hypothesis, the $CadastralRatio$ positively impacts the $Ratio$, when using OLS, IV and SUR. In addition, the $TaxRate$ negatively impacts the $CadastralRatio$ as represented in Figures 1 and 2. Finally, notice that random effects are required according to Breusch-Pagan for both the OLS and IV regressions, there is no overidentification of instruments according to Sargan-Hansen, and the instruments are not correlated to the errors (only 0.003 $R^2$).

Our results confirm the two hypotheses stated in the conceptual section of this paper, highlighting the distortions to the land markets that Proposition 13 has had after almost 50 years. Essentially, by diminishing the effective property tax in the county, this policy has increased the participation of land in the total cadastral value and the market price of every housing unit. This process must be added to the already limiting effect of restrictive zoning in worsening housing affordability (Kok, et al., 2014).

In addition to contributing to land value inflation, Proposition 13 has had inequality effects. Our results confirm that a higher $CadastralRatio$ contributes to a higher $Ratio$ between $HousingPrice$ and Total Cadastral Value, as illustrated in Figure 2. In other words, the county-level land market bottlenecks are transferred via spatial general equilibrium feedback into higher asset inequality in the long-run, mimicking the long-run effects of red-lining on the differences in generational wealth per social groups (Hayashi, 2014; Ihlandfeldt, 2011).

## 5. Discussion

In performing this research, we have faced some data limitations. The most evident is that due to reluctance by the Southern California Association of Governments, we could not perform our analysis at the Metropolitan Statistical Area (MSA) level. We faced this limitation regardless of this institution having a signed cooperation agreement with our university. That is why we have focused on Los Angeles County, which in any case contains between 60% and 70% of the total population, housing stock, and real estate value of the MSA.

Another limitation is that due to having property tax rate data only at the level of cities, we could not perform our analysis at the level of Census Tracks. This limitation has also required us to eliminate the city of Los Angeles from the database. The reasons for this exclusion are: a) the city of Los Angeles is disproportionately large in relation to the rest of the county, and has a convoluted geographic shape that borders almost every other city, distorting feedback effects; and b) the city comprises the entire ethnic, income, property values and land uses diversity of the county, rendering less relevant (statistically) the variation between these variables per city. In the context of our analysis, the exclusion of the City of Los Angeles comprises simply one observation less in the database (6 observations in panel structure). However, we are planning on overcoming this limitation in future analyses with the same data, where all the geoprocessing will be performed at the level of census tracks.

Regarding our present results, we have verified the hypotheses stated in the conceptual section: after fifty years of Proposition 13 in Los Angeles County, the $CadastralRatio$ increases the $Ratio$ between 0.346 – 0.422, and in turn, the $TaxRate$ decreases the $CadastralRatio$ between 0.639-0.722. Using our data for 2024 (Tables 1, 2 and 3), a median value housing unit is worth $1,020,723 with a $Ratio$ = 2.26, of which the $CadastralRatio$ contributes (using its coefficient in the regression) $1.64 \cdot 0.346 = 0.567$. This is a considerable impact; if we subtract it, the median price housing unit would be worth only $764,638 with a $Ratio$ 1.69. Notice that these results are obtained after using IV and SUR System estimation, which add but do not disaggregate corresponding general equilibrium feedback effects. An analysis that disaggregates spatial feedback effects would require a different approach, operating at the level of census tracks. Our estimation methods have, however, allowed us to perform an analysis that builds and improves upon Wasi & White (2005) proposal to identify the implicit Proposition 13 subsidy on $HousingPrice$.

The difference we have found between the cadastral and market value of real estate and housing units should not be necessarily a problem. Different cities and countries face such a problem due to government inefficiencies and lack of transparency in real estate markets and cadastral registries (Contreras, et al., 2022; Echavarria & Monkkonen, 2025). However, the problem in the California case is that a) such differences are extremely large; and b) the differences are due to the long-term distortionary effect of Proposition 13, as our results show. The distortion is such in the long-run that we can detect the neutral (negative) effect of the tax on the value of land as portrayed in Figure 2, regardless of being a traditional, not land-based, property tax.

The abundant amount of academic research evidence against Proposition 13, to which we are here adding further results, should have already convinced the state and local governments to either repeal or drastically change it. This has not happened, and quite the opposite, initiatives to change Proposition 13 have been repeatedly repealed by voters and policy makers of all the ideological affiliations (Danforth, 2023; Fischel, 2015). We believe that a lack of understanding of urban economics and land rent theory, are part of the reason why Proposition 13 is still appealing to stakeholders (Brunori, 2004). That is, because the tax relief has so far disproportionately benefited long-standing homeowners located in high value cities, while charging the tax on potential homeowners and renters via higher prices.

Based upon our research, we propose some policy alternatives where Proposition 13 does not have to be changed as such (Stark, 2016). For example, a split-rate or land-based property tax, in the model of Pittsburgh (Oates & Schwab, 1997). Such policy can still offer a tax relief formula for California's homeowners, while subtracting a higher percentage of the residual land rent and therefore improving affordability. In our present research the median property tax rate is 1.15%. If we focus the tax only on land value, and with a $CadastralRatio$ of 1.64, we would need to charge 3.036% of the cadastral land value to maintain equal tax revenue in the short-run. This value, in turn, should be updated to a “corrected” market value of land $632,615 (out of a housing unit worth $1,020,723). In the long-run the land-based tax will contribute to: a) decelerate land inflation by directly discounting residual land rent from housing price offers; b) increase housing supply by incentivizing construction and not the mere retention of land; and c) still offer tax relief to middle and low-income households by incentivizing the improvements, not the land, in a context with increasing constructive and population densities (in the long-run). We would expect that a land-based property tax, while still offering tax relief via immediate discounts to the taxable value of improvements (which in any case fall due to depreciation in the long-run) would be less politically resisted than other proposals attempted to date.

## 6. Conclusions

We use a simplified urban land economics framework to analyze the effect of Proposition 13, a property tax relief measure implemented in California since 1978, on the housing markets of Los Angeles County during 2019-2024. Our conceptual framework is based upon a Rosen-Roback Urban Economics framework with capital shifts due to land tax differences per jurisdiction, allow us to propose an empirical test design focused on finding if Proposition 13 has increased the ratio between the market price of housing and its cadastral. In addition, and building upon the conceptual framework, we want to find if Proposition 13 has increased the land to improvements value due to lack of housing rotation and corresponding depreciation of the built environment. This particularity, in the logic of the Henry George theorem, increases the proportion of the property tax levied on land value and makes its effect more easily detectable.

We assembled a panel database for the 87 cities of Los Angeles County, including cross-section, panel and time-series variables describing housing, population, socio-economic and macroeconomic characteristics. Our main two sources of information are Corelogic for the housing transaction prices and number of sales, and Los Angeles County Assessment Office for the cadastral values and parcel characteristics.

Using a system of equations testing strategy that builds upon our applied conceptual framework, and implementing OLS, IV, and SUR estimation, we verified the two hypothesis: a) that he ratio between housing price and total cadastral value is positively determined by the ratio between cadastral land and improvements value; and b) that this cadastral ratio is in turn determined by the market price of housing. In addition, we also proved that both hypotheses include the corresponding negative (Georgian) effect of the property tax rate on the cadastral ratio. These results corroborate our conceptual framework where Proposition 13 has made housing less affordable and its stock stagnant, while worsening asset inequality by more strongly subsidizing the high value coastal and mountain cities of Los Angeles County.

Our results point to a policy proposal where Proposition 13 can be modified in the logic of a split rate or land-based property tax, while still offering tax relief on the improvements value. We consider that such a design might be less politically resisted than previous proposals, while contributing to alleviating the housing crisis in the county via its land-value lowering effect, a Henry George theorem feature.

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## APPENDIX A

Table A1: List of test and control variables

| Variable | Type of Variable | Explanation | Units of Measurement | Source |
|---|---|---|---|---|
| City | Cross-section | Cross-section unit | | |
| Year | Time Series | Period unit | | |
| Median Price | Panel | Total Price from Corelogic, median per city | Dollars | Corelogic |
| Sales | Panel | Total Corelogic registered sales in the city | Units | Corelogic |
| Median Land Value | Panel | Cadastral Land Value, median per city | Dollars | Los Angeles County Dept of Assessments |
| Median Improv Values | Panel | Cadastral Improvements Value, median per city | Dollars | Los Angeles County Dept of Assessments |
| Median SqFt | Panel | Cadastral Size of the Parcel, median per city | Square Feet | Los Angeles County Dept of Assessments |
| Median Value | Panel | Cadastral Total Value, median per city | Dollars | Los Angeles County Dept of Assessments |
| Cadastral Count | Panel | Total number of parcels per city | Units | Los Angeles County Dept of Assessments |
| Median Ratio | Panel | Median Corelogic Price / Median Cadastral Total Value, per city | Ratio | Los Angeles County Dept of Assessments |
| Median Total Cadastral Ratio | Panel | Median Cadastral Land Value / Median Cadastral Improvements Value, per city | Ratio | Los Angeles County Dept of Assessments |
| Housing Units | Cross-section | Total Housing Units, per city | Units | California DOF - Demographic Research Unit |
| Housing Single Detached % | Cross-section | Percent of Housing Single Detached type, per city | Percent | California DOF - Demographic Research Unit |
| Housing Single Attached % | Cross-section | Percent of Housing Single Attached type, per city | Percent | California DOF - Demographic Research Unit |
| Housing Two to Four % | Cross-section | Percent of Housing Two to Four type, per city | Percent | California DOF - Demographic Research Unit |
| Housing Five Plus % | Cross-section | Percent of Housing Five Plus type, per city | Percent | California DOF - Demographic Research Unit |
| Housing Mobile Homes % | Cross-section | Percent of Housing Mobile Homes type, per city | Percent | California DOF - Demographic Research Unit |
| Housing Vacancy Rate | Cross-section | Housing Vacancy Rate, per city | Percent | California DOF - Demographic Research Unit |
| Income Household | Panel | Income Household (2023 and 2018 all the other values are exponential interpolations), per city | Dollars | California DOF - Demographic Research Unit |
| Income per capita | Panel | Income per capita (2023 and 2018 all the other values are exponential interpolations), per city | Dollars | California DOF - Demographic Research Unit |
| Poverty | Panel | Percent of Households Below Poverty Line (2023 and 2018 all the other values are exponential interpolations), per city | Percent | California DOF - Demographic Research Unit |
| Unemployment | Panel | Unemployment Rate, per city | Percent | California DOF - Demographic Research Unit |
| Race Hispanic | Cross-section | Percent of Total Population, per city | Percent | California DOF - Demographic Research Unit |
| Race White | Cross-section | Percent of Total Population, per city | Percent | California DOF - Demographic Research Unit |
| Race Black | Cross-section | Percent of Total Population, per city | Percent | California DOF - Demographic Research Unit |
| Race Asian | Cross-section | Percent of Total Population, per city | Percent | California DOF - Demographic Research Unit |
| Population Median age | Cross-section | Median Age of the individuals per city | Years | California DOF - Demographic Research Unit |
| Population | Panel | Total Population (since 2020, 2019 is exponential interpolation), per city | Units | California DOF - Demographic Research Unit |
| Loc Mountain | Cross-section | Dummy; if Mountain = 1 | dummy | own elaboration |
| Loc Coastal | Cross-section | Dummy; if Coastal = 1 | dummy | own elaboration |
| Tax TRA | Cross-section | Total Property Tax Revenue Average, per city | Dollars | Los Angeles County Auditor-Comptroller |
| Tax Rate | Cross-section | Property Tax Rate, per city | Percent | Los Angeles County Auditor-Comptroller |
| Interest Rate | Time Series | Mortgages interest rate year deseasoned | Percent | FRED Economic Data - FED |
| GDP National | Time Series | Los Angeles Metropolitan Statistical Area Yearly Gross Domestic Product | Dollars | FRED Economic Data - FED |
| GDP MSA | Time Series | National Yearly Gross Domestic Product | Dollars | FRED Economic Data - FED |
| Dummy Covid | Time Series | Dummy; if 2020 = 1 | dummy | own elaboration |

# APPENDIX B

Table B1: stepwise selection model for the Median Housing Price

| | | |
|---|---|---|
| Constant | -8.291 | *** |
| dummy covid | 0.097 | *** |
| Interest Rate Lag | -0.025 | *** |
| Income per capita | 1.086 | *** |
| Poverty | 0.024 | *** |
| GDP National | 0.566 | *** |
| Race Asian | 0.003 | *** |
| Sales | -0.160 | *** |
| Population | 0.141 | *** |
| R2 | 0.870 | |

Table B2: stepwise selection model for the Median Cadastral Ratio

| | | |
|---|---|---|
| Constant | 8.227 | *** |
| Tax Rate | -0.795 | |
| dummy Covid | -0.039 | ** |
| Housing Vacancy Rate | 5.329 | *** |
| Race Hispanic | -0.017 | *** |
| Parcel Square Feet | -0.781 | *** |
| Housing Units | -1.337 | *** |
| Population | 1.260 | *** |
| Housing Mobile Homes % | -3.083 | *** |
| R2 | 0.493 | |