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Political Economy of Parcel Tax in California School Districts

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Abstract

This paper examines determinants of parcel tax adoption in California school districts as a means to supplement local public school funding. A parcel tax is a regressive tax imposed on a unit of property that requires a two-thirds supermajority vote to adopt. Despite its increasing role as a local funding source, the school parcel tax has not been well understood, particularly how this regressive form of property tax is adopted in different local conditions. Unlike previous research that emphasizes income differences across school districts, I predict that the distribution of home prices within a district is an important determinant in parcel tax adoption. Using Heckman selection models and California school district level data, I find that a larger distribution of home values reduces the likelihood of parcel tax adoption.

Keywords: parcel tax; school finance; local revenue for public schools; property tax; California; Proposition 13

JEL Codes: H71, H75, K00.

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I. Parcel Tax for Public Schools in California

My paper examines political economic conditions of parcel tax adoption through local referenda to fund public schools in California. Parcel tax is a tax per unit of property, specifically "a non-ad valorem tax imposed as an incident of property ownership" (California State Controller's Office).[1] Because it is a unique tax that exists only in California, it requires a historical background of school finance equalization and the constitutional amendment, Proposition 13 in the 1970s.

A series of school finance equalization litigations in the 1970s (*Serrano v. Priest* 1971, 1976, 1977) transferred local control over school finance to the state. It resulted in reallocating resources from affluent to low-income school districts (Baicker and Gordon 2006). School districts with a higher demand for public schooling tried to find ways to fulfill their unmet demand by encouraging donations through Parent Teacher Associations and/or by adopting compulsory measures such as taxes (Hill et al. 2014).

Nonetheless, raising taxes is constrained by an amendment of the state constitution. In 1978, California voters approved Proposition 13 to cap the ad-valorem property tax at 1% and its annual growth rate at 2%. Its passage was consequential. Before the passage of Prop 13, California's property tax rate was approximately 3% of assessed market value and different local governments set different property tax rates. After the passage, it plummeted to the same uniform 1% property tax rate, which resulted in severe revenue constraints in school districts (Brunner and Rueben 2001).

[1] Generally, a parcel tax is a fixed amount in most special districts, but some districts charge on a parcel based on the size and/or number of units on the parcel. See State Controller's Office's document on parcel tax. Note that a California appellate court ruled in 2014 that commercial and residential properties must be taxed equally (*Borikas vs. Alameda Unified School District*).

Despite the property tax cap, the State Constitution Article 13A Section 4 allows localities to impose special taxes by a two-thirds supermajority, except in the cases of an ad valorem tax, transaction tax or sales tax on the sale of real property. Parcel tax is one way to impose property tax without violating the constitution when two-thirds of voters agree. As a way to raise local funds few California school districts have turned to parcel taxes "to circumvent the limitations of Proposition 13 to extract revenue from real estate (Foldvary 2006)." The first school parcel tax was adopted in 1983. Between 1983 and 2013, 222 out of 958 California school districts have held at least one parcel tax election and 124 of those districts have passed at least one parcel tax measure (Ed Source 2013). During the 2014-5 fiscal year, school districts raised a total of $399.2 million, $3.9 million per school district (California Department of Education 2013).

My paper made three contributions. First, despite its increasing significance as a source of supplemental school funding in practice, parcel taxes have not been well explored in literature. The State had no comprehensive information about parcel tax use in localities until 2014. Realizing the growing importance of parcel taxes, the state mandated localities report detailed information about parcel taxes to the state controller in 2015.[2] This paper provides not only descriptive information about school parcel taxes but also helps us understand political economic dynamics of parcel tax elections that can apply to parcel taxes for other special purposes.

Second, little is known about district characteristics that make them amiable to the regressive parcel tax and how the regressivity affects political processes of local referenda on a parcel tax election. Unlike previous papers that focus the median housing price as a main determinant of parcel tax adoption, my paper emphasizes the distribution of home values within school district. I argue that a larger gap in property values makes it difficult to adopt a parcel tax

[2] AB 2109, Chapter 781, Statutes of 2014.

because the regressive parcel tax imposes a disproportionally heavier tax rate on properties of lower value. I support my argument with statistical analysis and supplemental anecdotes described in local newspapers.

Third, my empirical test accounts for the two-step process of the election: a decision to hold an election by school boards and a decision to approve a proposal by voters. This two-step process leads to a selection bias where school districts that held an election share certain characteristics. Previous studies ignore this two-step process and this paper improves empirical estimates by using the Heckman selection model.

The paper is organized as follows. In Section II, I review previous studies on this topic by providing discussions on their findings, contributions, and limitations. In Section III, I illustrate the two-step electoral processes including a mechanism through which distribution of home values affects parcel tax adoption. Section IV describes data and an empirical framework. In Section V, I report empirical results and robustness checks. Section VI concludes this paper.

II. Literature Review

Studies on parcel tax are rare. Brunner (2001) pioneered California school parcel taxes in 2001. He examines why the school parcel tax is not widespread when it provides additional local resources for public schools, many of which struggle with insufficient funding. He concludes that for homeowners, the marginal cost of schooling is greater under parcel tax than under ad-valorem property tax because the same amount of parcel tax is uniformly imposed on residential and commercial properties. Because property values of residential properties are lower than property values of commercial ones, homeowners bear higher tax rates than commercial property

owners.[3] Brunner explains that this tax rate differential discourages residential property owners to vote for a parcel tax.

Fifteen years later, two studies on parcel tax adoption have emerged (Lang and Sonstelie 2015; Kiewiet and Hill 2015). They examine cross-district differences that determine the likelihood of parcel tax adoption. Lang and Sonstelie (2015) use 2009-2010 cross-sectional data and find that a parcel tax is more likely to exist in school districts in the San Francisco Bay Area, with a higher average household income (consistent with Brunner 2001), a lower tax price of spending per pupil, and smaller state aid.[4]

Unlike the two studies discussed above, a paper by Kiewiet and Hill (2015) emphasizes political ideology and strategies of school boards to increase the chance of approval. Their pooled regression analysis using California school districts from 2001 to 2013 indicates wealthy and ideologically liberal school districts are more likely to adopt a parcel tax. They also find that a history of parcel tax adoption and having strategies to make the tax measures appealing to the voters—exemptions, sunset clause, and independent audit—increase the likelihood of adoption.

These studies have helped us better understand school parcel taxes in California. Yet, it is hardly surprising that voters demand more public school spending as their incomes rise because education a normal good. And this is not unique for parcel tax. For any tax measures (including school facility bond measures), it seems evident that voters in a higher income school districts are more likely to support school tax measures. Yet not all wealthy districts presented with the opportunity have adopted parcel tax for schools and not all middle-income school districts have

[3] The marginal cost of parcel tax for a homeowner = (1/ number of parcels) × number of students; the marginal cost of *ad-valorem* property tax for a homeowner = (own home value/total home value in the district) × number of students (Brunner 2001).

[4] In their paper, the San Francisco Bay Area includes Alameda, Contra Costa, Marin, San Francisco, San Mateo, and Santa Clara Counties. The Association of Bay Area Governments includes three more counties: Napa, Sonoma, and Solano Counties. This paper follows the Association of Bay Area Governments.

failed to adopt one. Current literature also acknowledges that "many comparably wealthy districts in Southern California have not" adopted parcel tax measures (Lang and Sonstelie 2015). What is interesting is the regressivity of parcel tax. It has not been well investigated in current literature whether and how this regressivity affects voting behavior. Brunner's study (2001) on different tax price for residential and commercial properties accounts for this regressivity and implicitly leaves us how property values can affect electoral results.

III. Political Economy of Parcel Tax Referenda

Assume that when voters face a parcel tax proposal, their utility depends on a bundle of private goods (X) and the quality of public schools within their school district (Q). Public school quality depends on current operation expenditure (E), local price (P), and the number of students (N). As the number of students increases the quality of school also increases, but it decreases after a certain number.

The proposed parcel tax (T^p) is a lump-sum tax on a parcel proposed to voters j, j=1, …, J. Voters differ in their willingness to pay (T^*) for public schooling that depends on j's income (Y_j) and the marginal tax rate (t_j) from the new parcel tax T^p. Unlike a school bond measure that imposes the same tax rate for all property owners, a regressive parcel tax imposes marginal tax rates (t_j) that vary across properties because t_j is determined by the value of j's property (V_j). Thus, the total parcel tax revenue is $\sum t_j V_j$.[5]

Because a parcel tax is the same amount imposed regardless of property values, it is often described as an unfair tax.[6] According to survey research by school boards that proposed a parcel

[5] Bond measures impose a flat tax rate t for all property owners.
[6] Also this type of lump-sum tax has been historically unpopular due to its regressivity. James (2012) provides a detailed account about the poll tax proposed in the UK during the Thatcher administration. He

tax election, about 5% to 6% more voters responded that they would approve a parcel tax measure for a per-square-feet tax than for a lump-sum tax (the Mountain View Whisman Unified School District). In the Berkeley Unified School District, 89% of respondents said they would support the parcel tax proposal that would raise 20% of their budget.[7]

Thus, a voter's preferred uniform parcel tax is determined by income, property value, and school quality, $T^* = T_j^*(Y_j, V_j, E, P, N)$. When their willingness to pay (T_j^*) is equal to or greater than the proposed parcel tax T^p, voters get utility surplus $s_j \geq 0$ and they will vote yes only when $s_j \geq 0$.

$$\phi_j(T^p) = \begin{cases} yes\ (1) & if\ \ s_j \geq 0, (T^p \leq T_j^*), \\ no\ (0) & if\ \ s_j < 0, (T^p > T_j^*). \end{cases} \qquad (1)$$

Proposal Stage. It is important that a parcel tax adoption takes two electoral stages. School boards must put a parcel tax measure on the ballot. Previous studies assume that having an election is a random process, but it is unlikely the case. If school districts have any form of control over whether to hold an election, then the election may be correlated with traits that affect the decision to call it. For instance, there could be unobservable characteristics including existence of active organizations in favor of parcel tax, a trustful relationship between voters and a school board, cooperative local political culture, and ideology for or against taxes.

Most importantly, local ballot measures incur significant monetary and political costs. School districts that have held a parcel tax election may have financial resources and political

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points out that there were widespread refusals to pay the tax and it led to a major riot in London at that time, because the tax liability fell heavily on those with the lowest incomes.

[7] The information is provided by Steve Miller, a former school board member in Mountain View Whisman School District.

capacity to fund an election. Once a parcel tax is proposed, school boards heavily invest monetary resources in the election. Various local newspapers and school board meeting minutes show that the cost of an election is a major part of the conversation when localities ponder a parcel tax proposal.

Election costs consist of two parts: election administrative costs and campaign costs. By law, school districts absorb the cost of printing and distributing the text of the measure. It includes payment to the Registrar of Voters for locating and staffing polling places, verifying signatures on Vote by Mail ballots, providing a canvassing board to open and inspect Vote by Mail ballots, and inspecting them in precincts. For instance, Santa Monica-Malibu Unified School District paid $360,000 administration costs for a special parcel tax election in 2010, Santa Cruz Unified School District $250,000 in 2015, Alameda Unified School District over $200,000 in 2010, and Pasadena Unified School District $295,000 in 2009, just to name a few. This can be a significant amount of monetary resources for school districts. One personnel in the Long Beach Unified School District commented that "In the scheme of things, I suppose you can say that (the election cost) is not that much, but every $200,000, or every $100,000, means a program, a teacher or something like that" (Press Telegram, August 2016).

Although school districts must pay for election administrative costs, by law they cannot fund an election campaign. That means school districts need a group of volunteers who are committed to fundraising and campaigning for a parcel tax measure. The campaign funding is raised by campaign committees. The costs include hiring a professional campaign consultant and a polling/survey firm, which can substantially vary from $50,000 to $100,000 from one district to another.

In addition to the substantial monetary costs, there can be considerable political costs. For instance, after Menlo Park School District failed two parcel tax renewal elections in 2016, the superintendent of the district announced to step down at the end of the school year after five years in office. Two incumbent board members also announced not to seek re-election. A local newspaper reported that the two defeats "resulted in widespread finger-pointing and hand-wringing over what cuts will be necessary" (Mercury News September 2016) because the failure of parcel tax renewals created a $5.8 million budget shortfall over the following five years. Losing an election is especially critical for school districts that already rely on parcel tax revenues. As a superintendent candidate in Davis Joint School District put it, "a parcel tax is not the icing on the cake. It is a part of the cake" (Daily Journal October 2016).

Further, research suggests that the success or failure of a local election depends on the degree of uncertainty and the uncertainty results from community heterogeneity (Romer et al. 1992; Balsdon et al. 2003). Balsdon et al. (2003) predict that homogeneous communities will have a distribution of a preferred level of parcel tax (T*) with a high density in the range around the 33rd percentile than communities with heterogeneous preferences. As a result, yes votes decline with the level of community homogeneity. Following BBR, school boards set the parcel tax $T^p = T^*_{33} + u$, where u is setter errors. and they propose a parcel tax measure when the likelihood of approval is sufficiently large to cover cost of election, C. Since it is a property tax, only property owners will receive the tax bill visible to them. The property tax incidence for renters depends on the price elasticity of property rental market, but for the sake of simplicity, it is assumed to be zero in this model. The fraction of property owners among the residents is ω.

Since it is a lump-sum tax for property owners, marginal tax price[8] is the same for all property owners ($(T \times \omega J)/N$) and the marginal tax price is zero for all renters.

$$(1-\psi)\sum_{j=1}^{J}\phi_j \cdot s_j(T_{33}^{*}+u) > C,$$

where $\psi \in (0,1)$ represents the degree of free-riding. If ψ or C is sufficiently large then holding an election would not be economically justified or politically feasible.

IV. Empirical Test

This section provides an empirical framework to estimate the effect of the distribution of home price on parcel tax adoption given the level of a school district's income.

4.1. Empirical model

The two-stage local referendum process raises a sample selection and therefore an identification issue because parcel tax elections are not randomly held.[9] Since the election is costly and school boards have a control over an election proposal, only highly motivated school districts with a realistic winning prospect are likely to hold an election. It is even more so when the election calls for a tax increase by a supermajority.

In their analysis, Lang and Sonstelie (2015) treat the election process as random. They assume that an election will be held once demand for public schooling reaches a certain threshold and voters will approve a parcel tax measure once the demand reaches even higher. The assumption does not answer questions as to why then school boards propose a parcel tax that

[8] Marginal tax price refers to the amount of money to increase $1 per pupil (Bergstrom et al. 1982).
[9] In analyzing school bond elections, Balsdon et al. (2003) recognize that the selection condition for holding an election is unlikely to be random.

would fail and whether the increase in demand itself is a random process. In addition, a parcel tax is not the only way to meet the demand because there are other ways to raise revenue, including fund raising.

The non-random self-selection cannot be ignored since we are interested in all school districts in California. We have missing outcome variables for all school districts that have never held an election during the sample time period between 2009 and 2014. We do not observe school districts' decision on parcel tax measures if they have never held an election. This is incidental truncation because whether a school district adopts a parcel tax is missing information because of the outcome of another variable, "having held an election." The missing variable is endogenous, which leads to a serious bias in estimation (Wooldridge 2002, 552).

To address potential self-selection bias, I use the Heckman selection model (Heckman 1979). The main objective is to estimate the effect of distribution of home price on parcel tax adoption. The outcome and selection equations on log linear are as follows:

$$\text{Outcome equation: } Y_{1i} = b_0 + b_1 lnY_{33} + b_2 V_i + b_3 Q_i + u + \varepsilon_1$$

Y_{1i} is parcel tax use for the *i*th school district. It is observed for only those school districts that have held an election. Variables on the right-hand side are observed for the entire sample. Y_{33} is the household income of the 33rd percentile. V refers to the distribution of housing values within district, which determine the distribution of the marginal property tax rates imposed by T^p. R is current spending per pupil. u indicates setter error and ε statistical error term.

$$\text{Selection equation: } Y_{2i} = a_0 + a_1 lnY_{33} + a_2 V_i + a_3 C_i + a_4 H_i + a_5 R_i + u + \varepsilon_2$$

The selection equation is log-linear. Y_{2i} is an indicator variable whether a school district has held a parcel tax election, and is observable for all school districts. School boards' decision to propose a parcel tax election depends on district characteristics related to demand for public schooling

(e.g. income, educational attainment), political ideology (preference for tax and spending), cost of election (C), and uncertainty.

We observe the presence of parcel tax revenues (Y_{1i}) only when school boards propose an election (Y_{2i}=1). Then we estimate $E(Y_{1i} \mid X, Y_{2i} = 1)$. Note the standard assumptions of the Heckman's selection model are: (1) X and Y_{2i} are observed for all units, but Y_{1i} is observed only when Y_{2i} =1. (2) $\varepsilon 1$ and $\varepsilon 2$ are independent of X with zero mean. (3) $\varepsilon 2$ follows the standard normal distribution. (4) $E(\varepsilon 1 \mid \varepsilon 2) = \gamma\, \varepsilon 2$ and $Cov(\varepsilon 1, \varepsilon 2) = 0$.

4.2. Data

I use cross-sectional data of 762 California K12 school districts with more than 200 average daily attendances in 2014.[10] In this dataset, I examine school parcel tax elections held between 2008 and 2014. During this time, 131 school districts (17.2% of the sample) have held at least one parcel tax election. Of those, 75.6% of those have passed at least one parcel tax measure with the average approval rate of 73.6%. The failed measures received a 54.5% approval rate on average, but did not reach the 66.7% supermajority vote requirement.

This six-year span covers most school districts with parcel tax although three school districts (Las Lomitas Elementary, Rincon Valley Union Elementary, and Live Oak Unified School Districts) did not hold an election during the six years, but raised parcel tax revenue from the previously adopted parcel tax measures. From 2008 to 2014, three-quarters of parcel tax referenda have been approved in California school districts, despite this high threshold. Even the remaining 25% of districts that rejected a measure gained 54.53% of support on average.

[10] The total number of K12 school districts in 2014 California is 947 (Department of Education of California).

The reason for using cross sectional data is that the nature of parcel tax elections makes it difficult to use panel data. Parcel tax elections can be held in any year. There could be multiple elections within a year in a school district. But usually an election is held only occasionally. Once voters approve a parcel tax measure it is effective for several years. In the sample, 80% of school districts with a parcel tax have five to ten effective years. Seven school districts have no sunset clause. Thus, no variation in parcel tax use within a school district makes it impossible to use a panel data. Furthermore, the goal of this paper is to see between-district differences instead of within-district changes.

The dataset is compiled by using data from the California Department of Education, the U.S. Census Bureau, and Ed-Data (www.ed-data.k12.ca.us). The election data is crosschecked with an online database of local ballot measure elections on www.ballotpedia.org and with individual school district websites.

4.3. Variables

4.3.1. Dependent variables

(1) Y_{1i} is the dependent variable of the outcome equation, the existence of parcel tax revenue. The variable is dichotomous that takes value one if the school district raises revenues from a parcel tax and zero if there is no parcel tax revenue. But this variable is observable only when a district held an election. School districts that passed a parcel tax measure are coded one and those that attempted but failed are coded zero. School districts that never held an election are coded as missing and these school districts consist of 82.8% of the sample.

(2) Y_{2i} is the dependent variable of the selection equation, whether a school district held a school parcel tax election between 2008 and 2014. It is a binary variable where it takes one if a school district held an election and zero if not. I recode the latest election information if there were more than one election.

During the sample period between 2008 and 2014, 131 school districts have held a parcel tax election, which consists of 17.2% of the 762 school districts in the sample. Of those 131 school districts, 75.6% of them approved parcel tax measures while 24.4% rejected. The school districts that approved a measure have 73.6% approval rating on average, with the range from 66.8 to 85%. Those that failed have 54.5% vote, which exceeds a simple majority but failed to reach the two-thirds supermajority requirement in the State Constitution.

(3) Independent variables: outcome equation

Home price gap. The Census Bureau publishes the mean value of owner-occupied houses for each quartile for all school districts. The key explanatory variable, distribution of home values within district, is measured by taking the ratio between the average hosing value in the lower quartile and the average housing value in the upper quartile.

The Census capped the maximum housing value at $1,000,000. So in some school districts, the lower 25% and the upper 25% are the same value of $1,000,000. In this case, although there is a difference between the two, the ratio will be one. In the sample, there are only 11 such districts, but 9 of them have parcel tax revenue for their school district.

Size of district: I include population in logs as a proxy for the size of school districts because a large district in population will increase campaign costs. A large population implies dispersed

interests, heterogeneous preferences for public schooling (Balsdon et al. 2003), and more potential free riding behavior (Olson 1965). Previous studies include average daily attendance or enrollment as a proxy for school district size. Whichever used, the main findings remain the same. In this paper, population size is preferred because it is the voters who approve or reject parcel tax measures, not school-aged children.

Proposed tax amount. A district that proposes a lower parcel tax has a higher probability of winning than one that proposes a larger amount. However, school boards determine the parcel tax amount with considerations of the 33rd percentile household income, school district's per pupil expenditure, supply cost, and the size of school district. Since the amount is set at the level enough to gain a two-thirds supermajority, the amount would have no statistically significant effect in passing a parcel tax proposal. The variable is measured in dollar and is obtained from Ed-data.com and Ballotpedia.com.

Renters. Urban economics literature suggests that renters demand a higher level of local public goods than property owners because they underestimate their property tax burden (Bergstrom and Goodman 1973; Oates 2005; Brunner et al. 2015). Thus, the demand for local public goods is expected to increase as the fraction of renters becomes larger. Anecdotally, an opinion poll in the Davis Joint Unified School District shows that renters support the parcel tax election more than home owners by 13 to 25 percentage points, depending on the amount of parcel tax (Davis Vanguard 2016). Percentage of renters in the outcome equation controls for the degree of free ride within a school district. A larger renter population is expected to increase the likelihood of passing a parcel tax measure. The data are obtained from the U.S. Census.

(4) Independent variables: selection equation

Income bracket of the decisive voter. In school bond research, higher socio-economic status (education and income) increases the likelihood of voting and voting yes. Also previous studies (Lang and Sonstelie 2015; Kiewiet and Hill 2015) find higher income increases the likelihood of parcel tax passage. In this study, the effects of home price gap also should be estimated given the same level of income.

Since parcel tax measures require a two thirds supermajority to approve, it is ideal to include the bottom 33rd household income. Lang and Sonstelie (2015) use the 33rd individual income earner's income to estimate the effect of the decisive voter on the parcel tax adoption. The bottom 33rd household's income, however, is difficult to measure from the reported data from the U.S. Census. It reports income brackets (less than 15k, 15k-25k, 25=35k, 35-50k, 50-75k, 75-100k, 100-150k, 150-200k, and more than 200k) and the percentage of households that fall in each bracket. Using that information, I created a cumulative density function and find the income bracket that the bottom 33rd household's income falls into. Then to make the intervals in equal width, the brackets are reorganized to less than $25,000, $25,000 to $50,000, $50,000 to $75,000, and $75,000 and more. For robustness check, log of median household income is used alternative to the 33rd household income bracket. This does not change the baseline results.

Per pupil current operating spending. Parcel taxes are usually are set aside for specific purposes. Usually it is raised to provide additional education on science, mathematics, art, and music as well as to retain highly qualified teachers. Parcel taxes are raised to increase current operating spending. If current spending is too low school boards may want to raise additional revenue

through parcel taxes to increase the spending; if current spending is already high because of parcel tax revenues that school districts have raised, school boards may want to continue parcel taxes. Given that most parcel tax elections are for renewal, it may be that school districts with a higher current spending are more likely to have a parcel tax election. The data are obtained from the California Department of Education.

Cost of providing schooling. The cost of providing schooling differs throughout the state. An increase in cost will increase expenditures. Lang and Sonstelie (2015) note that in 2009-2010, 85.5% of current operating expenditures of California public schools were spent on salaries and benefits of school employees. And these costs reflect local conditions. Following Lang and Sonstelie (2015), I use the Comparable Wage Index from the National Center of Education Statistics (Taylor et al. 2006). The index is "a measure of the systematic, regional variations in the salaries of college graduates who are not educators. It can be used by researchers to adjust district-level finance data at different levels in order to make better comparisons across geographic areas." (Taylor et al. 2006, 1). A higher value indicates a higher labor cost.

Cost of election. School districts are concerned about the cost of election. Even in one of the most affluent districts, Los Altos School District, a local newspaper reported that "elections aren't cheap, even in Los Altos." Unfortunately, comprehensive information about cost of election is unavailable. As a proxy, factors that can raise or reduce cost of election can be considered.

By law, school districts must pay for the administrative cost of a parcel tax election (but they are legally not allowed to pay for campaign costs). When school districts are incongruent

with city boundaries, the electoral cost can be higher (Fischel 2010). According to election officials in the Menlo Park and Atherton School District (Almanac News 2016), because election costs are pro-rated among participating jurisdictions, holding a parcel tax election as part of a general election can save money.[11] Furthermore, even if school districts do not pay for campaign costs (it is illegal), a larger district with multiple city jurisdictions increases a campaign cost. Thus, the cost of election including administrative and campaign costs will increase as school districts overlap a greater number of cities.

To gauge the congruence between school districts and cities, I obtained the number of cities that are overlapped to each school district. The data is obtained from the Missouri Census Data Center Geographic Correspondence Engine. The data include the number of cities and a fraction of population that reside in each city within a district. For instance, school district A can consist of two cities where the population of the school district is equally distributed; 50% reside in one city and 50% in another city. A school district B, however, may include two areas, one city where almost all school district population live, and an unincorporated area where there is almost no population. Then school district A will incur a higher election cost than school district B because it must reach out to constituents in two different areas while school district B can ignore half its geographic area. Another school district C may overlap three different areas, but the district population may live in one area. In this case, even if the number of areas that school district C overlaps is greater than school district A, the cost of election may not necessarily be higher. For this reason, I compute the Herfindahl Index ($score = 1 - \sum c_i^2$ where c is the fraction of school district population) to approximate the election cost. The score ranges from 0

[11] However, not all districts prefer saving money. Even if it costs more, some school districts (such as Santa Monica-Malibu Unified School Districts in 2010) want to have a special election rather than during other elections because they think that it is much easier to focus on one issue across the school district and the turnout is higher for special elections. How many districts think this way is unclear.

to 1. A higher value indicates a higher level of fractionalization within a school district, which in turn, indicates a high election cost.

(5) Control variables

Political ideology: The conventional wisdom is that politically more liberal individuals prefer high spending and high tax. Previous studies are consistent with this (Kiewiet and Hill 2015; Lang and Sonstelie 2015). It is difficult to find data for political ideology (e.g. conventional conservative-liberal spectrum) at the school district level. Following Lang and Sonstelie (2015), I use the percentage of vote for Barack Obama in the 2012 presidential election as a proxy. The data is from the California Secretary of State website.

Educational level of the population. We would expect that school districts with a higher percentage of college graduates are more likely to adopt the parcel tax. Educational attainment is measured as the percentage of residents who are at least 25 years and hold a bachelor's degree.

Population age 65 and older. I include the percentage of old age population in Model 6 to control for their low demand for public schooling (Poterba 1997). In the same opinion poll conducted by the Davis Joint Unified School District (The Davis Vanguard 2016), residents who are 65 years and older generally support the parcel tax less than other age groups. In theory, it is reasonable to believe that an older population is unlikely to support more taxes for schools, but almost all parcel tax measures warrant exemptions for senior citizens. If they can be exempted from paying parcel taxes the tax should be beneficial for them, since a better school district increases property

values. Thus, it is unclear whether the percentage of senior citizens directly affects parcel tax adoption.

Bay Area indicator: I also include an indicator whether a school district is located in the Bay Area, following extant research (Lang and Sonstelie 2016; Kiewiet and Hill 2015).[12] Bay Area includes Alameda, Contra Costa, Marin, San Francisco, San Mateo, and Santa Clara Counties. It is unclear why school districts in the Bay Area adopted parcel taxes more often than in other areas. About 13% of the school districts in the sample is in the Bay Area. Of 99 Bay Area school districts, 70 districts (70.7%) have parcel tax revenue. On the other hand, only 5.13% of school districts (34 out of 663) in the non-Bay Area have parcel tax revenue. Bay Area school districts are more likely to have held at least one parcel tax election for school funding. Only 8% of the non-Bay Area school districts have held an election between 2008 and 2014 whereas 76.76% districts of the Bay Area have.

V. Results

This section reports results of Heckman's selection models, results of extended models, and robustness of the results. The goal is to examine the effect of housing price gap on parcel tax adoption in California school districts. Table 3 shows baseline estimates of Heckman selection model. The Wald Test result at the bottom of the table shows there is a statistical correlation between the error terms of the selection and outcome equations (rho=0.628) at the 1% significance level. Thus, estimation should consider the selection bias.

[Table 1 about here]

[12] Detailed variable descriptions and summary statistics are presented in the Appendix.

The first two columns show outcome equation estimates and the last two columns selection equation estimates. In short, home price gap significantly decreases the likelihood of parcel tax adoption at the 1% significance level, holding other variables constant. The log likelihood of home price gap is -1.548 (odds ratio is 0.213), which supports the hypothesis that a larger distribution of home price decreases the likelihood of parcel tax adoption. The coefficient of population is negative and statistically significant. It indicates that a large population significantly decreases the likelihood of parcel tax adoption, holding other variables constant. As explained in the theory, a larger district is more likely to have heterogeneous preferences of demand for schooling and a greater level of heterogeneity incurs a higher campaign effort.

The amount of parcel tax and percentage of renters are not statistically significant. Theoretically, the amount of parcel tax is determined at the selection stage; the amount is set by risk-averse school districts who will set the level that is safe enough to get approved by two thirds of voters. The amount is usually small. Three quarters of proposed parcel taxes are for less than $200 and almost 90% are less than $350. Given that, it is not surprising that the proposed amount does not determine the likelihood of parcel tax adoption.

The coefficient of renters shows a positive sign that is theoretically consistent. As the percentage of renters increases, the likelihood of parcel tax adoption also increases, since for renters, property tax is less salient than for property owners. However, the coefficient is not statistically significant. A previous study also finds no renter effect (Lang and Sonstelie 2015).

In the selection equation, the likelihood for school boards to propose a parcel tax election increases as the 33rd percentile household income bracket increases. It is consistent with the theoretical expectation that schooling is a normal good. Current expenditure per pupil is positively and significantly correlated with the likelihood of a parcel tax election. Higher current

expenditure may motivate school board members to look for additional revenue sources, which leads to a proposal of parcel tax election. The cost index is statistically significant, and the effect is positive. School districts in areas of labor cost are more likely to propose a parcel tax election. The city-school district incongruence index shows a negative and statistically significant coefficient. As school districts are more incongruent with cities, they incur a higher election cost, and therefore they are less likely to propose an election. Lastly, population has a positive and statistically significant coefficient. School districts with a larger population size are more likely to propose an election, holding other variables constant. Nonetheless, a larger population size negatively affects once the proposal is voted on at the second stage.

5.2. Conditional marginal effect of home price gap

I estimate predicted probabilities of parcel tax adoption for a given the level of housing price gap. Figure 1 graphically illustrates this. The X axis indicates home price gap and Y axis indicates predicted probability of parcel tax adoption.

[Figure 1 about here]

The graph shows a downward slope. Holding other variables constant, the home price ratio between upper and lower quintiles significantly reduces the probability of parcel tax adoption, conditional on having an election. The conditional marginal effect of home price gap on the likelihood of parcel tax adoption is expressed as $Pr(Y_1=1|Y_2=1, X)$. It is -0.416(standard error=0.186, $p<0.05$). A 1% increase in home price gap will degrease the likelihood of parcel tax adoption by 34%.

Figure 1 shows that once a school parcel tax referendum is called, those school districts with a narrow range of housing prices will be more likely to approve the proposal (i.e. gaining

more than 66.7% support). As the horizontal reference line indicates, the baseline model predicts that a parcel tax proposal is unlikely to gain the 66.7% necessary support when the housing price ratio exceeds 0.7. The 66.7% threshold will be outside of the confidence intervals when the housing price ratio within school district is great than 0.7. In sum, once a proposal is made, home price gap has a strong predictive power.

Is this effect of home price gap applicable to all income levels? Figure 2 illustrates that the answer is yes. The X axis indicates home price gap and Y axis the probability of parcel tax adoption. The graph shows the conditional marginal effect of parcel tax adoption at each level of housing price gap for the decisive voter's income brackets (the 33rd percentile household in a household income distribution): less than $25,000, between $25,000 and $50,000, between $50,000 and $75,000, and more than $75,000.

[Figure 2 about here]

The negative relationship between home price gap and the probability of parcel tax adoption holds for all income levels, once an election is proposed. The 95% confidence intervals become wider get the home price gap becomes larger. It is because there are fewer school districts as the home price gap increases. In addition, at the same home price gap, lower income districts are slightly more likely to adopt a parcel tax, although the results suggest that income levels are not statistically significant factor. In sum, regardless of school districts' 33rd percentile household income levels, districts with a larger home price gap are significantly less likely to approve a parcel tax measure.

3. Extended models and robustness checks

This section provides series of robustness checks for the effect of home price gap on the likelihood of parcel tax adoption once an election is called. For comparison purposes, I reproduce the baseline estimates in each table. In Table 2 model (1), home price gap is included in the selection equation as a control variable. If we assume that school boards know that the distribution of home price gap would affect the electoral outcome, they may take it into consideration when they propose a parcel tax election. However, the estimates with home price gap in the selection equation are similar to the baseline estimates. Importantly, although home price gap shows an expected negative sign, the coefficient is not statistically significant in the selection equation. The coefficient of home price gap in the outcome equation remains statistically significant and the magnitude is similar.

[Table 2 about here]

In model (2), the percentage of renters is controlled for in the selection equation. Again, the baseline estimates remain the same. Estimated coefficient of home price gap is statistically significant and the magnitude of the effect does not change much. The percentage of renters does not significantly affect the likelihood of proposing an election.

In model (3), the 33rd percentile household income bracket is included in the outcome equation. This does not change the baseline estimates. The income level does not significantly affect the likelihood of approving a parcel tax measure, once the proposal is made, although a higher income significantly increases the likelihood of having an election.

Next, I extend the baseline model by controlling for demographic, political, and geographic factors that previous studies have considered. In Table 3, again baseline estimates are reported for comparison purposes.

[Table 3 about here]

In column (1), percentage of Obama supporters in the 2012 presidential election, percentage of college graduates within district, percentage of old-age population, and the Bay Area indicator are controlled for in the selection equation. The estimates in outcome equation are similar to the baseline estimates. Home price gap and population are the statistically significant factors of parcel tax adoption. In the selection equation, however, the additional control variables are all statistically significant and show theoretically expected signs. School boards are more likely to propose a parcel tax election when districts have a higher percentage of Obama voters, higher percentage of college graduates, and smaller old-age population. Being located in the Bay Area increases the likelihood of having an election. Interestingly, when these factors are controlled for, the effects of income, cost of election, and population evaporate. In the selection process, political preference for fiscal policy (high tax vs. low tax) and demographic factors are strong predictors. Per pupil spending and cost of supply (cost index) remain statistically significant although the magnitudes become smaller.

The results in column (1) do not change much even when the control variables are also in the outcome equation in column (2). Again, the effect of home price gap in the outcome equation remains statistically significant and the magnitude of the coefficient also remains similar to the baseline estimate. None of the additional control variables in the outcome equation is statistically significant. Home price gap and population size consistently remain as significant predictors.

VI. Discussion and Conclusion

This paper finds that a larger difference in home prices within a school district lowers the likelihood of parcel tax adoption. California already has many layers of legal constraints on

levying local taxes to fund local public goods and services. In addition to extremely high marginal tax price for public schooling (Hoxby 2001) and rules on school bonds, the use of parcel tax for public schools raises concerns about horizontal equity in taxation.

People with low property value will bear a disproportionately larger tax burden in supporting local public schools through a parcel tax. Even if equity in taxation is not a concern, heterogeneous and large school districts, especially in large urban areas, will be unable to raise parcel taxes due to high transactions cost in a referendum process. It implies that more homogeneous communities are more likely to raise additional revenue for teacher retention, math and science education, art education, and small class size, while districts serving a wider range of incomes are less likely to adopt a parcel tax for additional resources. The difference in ability to raise parcel tax revenue undermines state requirements for equalized school funding.

Furthermore, it is unclear how the rising housing prices in major California metropolitan areas, rising income and wealth inequality, and Proposition 13 will influence various types of local funding sources (e.g. parcel tax, donation) for public schools in California. For policy makers, it should be clear that parcel tax adoption is not completely up to the will of people even if they approve or reject parcel tax measures. There are underlying political economic conditions under which their demand for public schooling is realized, especially for the regressive parcel tax that requires a supermajority.

References

Baicker, Katherine, and Nora Gordon. 2006. "The Effect of State Education Finance Reform on Total Local Resources." *Journal of Public Economics* 90: 1519-35.

Balsdon, Ed, Eric J. Brunner, and Kim Rueben. 2003. "Private Demands for Public Capital: Evidence from School Bond Referenda." *Journal of Urban Economics* 54: 610-38.

Bergstrom, Theodore C., and Robert P. Goodman. 1973. "Private Demands for Public Goods." *American Economic Review* 63: 280-96.

Bergstrom, Theodore, Daniel Rubinfeld, and Perry Shapiro. 1982. "Micro-Based Estimates of Demand Functions for Local School Expenditures." *Econometrica* 50: 1183-205.

Brunner J. Eric, and Kim Rueben. 2001. "Financing New School Construction and Modernization: Evidence from California." *National Tax Journal* 54(September): 527-39.

Brunner, Eric J. 2001. "The Parcel Tax." San Francisco, CA: Public Policy Institute of California.

Brunner, Eric J., and Jon Sonstelie. 2006. "California's School Finance Reform: An Experiment in Fiscal Federalism." Economics Working Papers 200509.

Brunner, Eric, and Jon Sonstelie. 1997. "Coping with Serrano: Voluntary Contributions to California's Local Public Schools." Paper presented at the Annual Conference on Taxation.

Brunner, Eric, and Jon Sonstelie. 2003. "School Finance Reform and Voluntary Fiscal Federalism." *Journal of Public Economics* 87:2157-85.

California Department of Education, Annual Financial Data, www.cde.ca.gov/ds

California Secretary of State, Statement of Vote, November 6, 2012. President by County, http://elections.cdn.sos.ca.gov/sov/2012-general/10-president.pdf

Davis Vanguard, 2016. "Analysis: School Board to Hold Two Special Meetings This Week to Decide the Parcel Tax." (June 27, 2016)

Foldvary, Fred. 2006. "Circumventing California's Proposition 13 for the Public Collection of Rent." Presented at the Eastern Economic Association Conference.

George Borikas v. Alameda Unified School District (2013) 214 Cal. App. 4th 135, 154 Cal.

Heckman, James. "Sample Selection Bias as a Specification Error." *Econometrica* 47(1): 153-61.

Hill, Sarah A., D. Roderick Kiewiet, and Shelly Arsneault. 2014. "Filling the Gap: the Role of Voluntary Contributions and Parcel Taxes in Supplementing K-12 Spending in California." Presented at the Western Political Science Association Conference.

Hill, Sarah, and D. Roderick Kiewiet. 2015. "Parcel Tax Elections in California, 1983-2013." Paper presented at the Southern Political Science Association Conference.

Hoxby, Caroline M. 2001. 1997. "All School Finance Equalization Are Not Created Equal." *Quarterly Journal of Economics* 116 (November): 1189-231.

Lang, Bree J. and Jon Sonstelie. 2015. "The Parcel Tax as a Source of Local Revenue for California Public Schools." *National Tax Journal* 68:3: 545-72

Oates, Wallace E. 2005. "Property Taxation and Local Public Spending: The Renter Effect." *Journal of Urban Economics* 57: 419-31.

Olson, Mancur. 1965. *The Logic of Collective Action: Public Goods and the Theory of Groups*. Cambridge: Harvard University Press.

Poterba, James M. 1997. "Demographic Structure and the Political Economy of Public Education." *Journal of Policy Analysis and Management* 16: 48-66.

Wooldridge, Jeffrey M. 2002. *Econometric Analysis of Cross Section and Panel Data*. Cambridge: MIT Press.

Appendix

A. Data Sources

(1) Financial data: California Department of Education, Annual Financial Data (Unaudited year-end data). Available from 2003 to 2014. http://www.cde.ca.gov/ds/fd/fd/

(2) Parcel tax and school bond election data: Ed-Source and Ed-Data Partnership (cross-checked with Ballotpedia). Available from 1983 to 2014.
Ed-data: http://www.ed-data.org/
Ballotpedia: https://ballotpedia.org/Parcel_tax_elections_in_California

(3) Demographic data: US Census American Fact Finder. Available from 2005 to 2014.
2014 ACS 5-year estimates: 2010-2014.
http://factfinder.census.gov/faces/nav/jsf/pages/index.xhtml

B. Variable Description

Variable	Description
Existence of parcel tax	Existence of parcel tax revenue (1=Yes, 0=No)
Home price gap	Average value ratio between top and bottom quintile single family homes.
Election	Having had at least one parcel tax election between 2008 and 2014 (1=Yes, 0=No)
Income for decisive voter	33rd percentile household income bracket
Current expenditure per pupil	Current operating expenditure per pupil
City-School District Incongruence	City-School District Incongruence index
Population	Total population
Parcel tax amount	Parcel tax amount per parcel ($)
Age65	Population age 65 and older (%)
Cost Index	Local labor cost index
Renter	Renters in occupied housing units (%)
Education	People with BA degree and more (%)
Political preference	Obama vote in 2012 presidential election (%)
Bay Area	1=In Bay Area, 0=Not in Bay Area

C. Summary Statistics
(Mean and standard deviation in parenthesis; no missing values)

	All school districts		No election		Had an election	
Variable	N	Mean	N	Mean	N	Mean
Existence of parcel tax	133	.782 (.414)	2	1	131	.779 (.417)
Home price gap	762	2.159 (.909)	631	2.247 (.959)	131	1.736 (.399)
Parcel tax amount	128	184.762 (267.534)	.	.	128	184.762 (267.534)
Population	762	62806 (188195)	631	51148 (75879)	131	118959 (419033)
Renter	762	38.692 (12.885)	631	38.499 (12.603)	131	39.619 (14.181)
33^{rd} percentile income	762	2.207 (.700)	631	2.092 (.618)	131	2.763 (.802)
City-school district incongruence	752	.388 (.240)	623	.401 (.234)	129	.330 (.258)
Current expenditure per pupil	762	9124 (2111)	631	8982 (.2023)	131	9810 (2380)
Cost index	762	1.257 (.196)	631	1.217 (.178)	131	1.451 (.159)
Bay Area	762	.181 (.385)	631	.084 (.278)	131	.649 (.479)
Education	762	16.530 (9.211)	631	14.478 (7.876)	131	26.414 (8.785)
Age 65	762	13.717 (5.623)	631	13.597 (5.772)	131	14.292 (4.821)

Table 1.
Effects of home price gap on the likelihood of parcel tax election
(Heckman selection model estimate)

Outcome equation		Selection equation	
Dependent variable: Parcel tax adoption		Dependent variable: Having had a parcel tax election	
Home price gap (log)	-1.584*** (.726)	33rd percentile household income bracket	.424*** (.101)
Parcel tax amount (log)	-.048 (.205)	Operating expenditure per pupil (log)	1.739*** (.344)
Population (log)	-.370*** (.122)	Cost Index (log)	4.411*** (1.232)
% Renters (log)	.289 (.340)	City-School District Incongruence index (log)	-.109* (.049)
Constant	-5.018*** (1.928)	Population (log)	.128** (.044)
		Constant	-20.52*** (3.310)
N		706	
Censored observation		593	
Uncensored observations		113	
Rho		-.628	
Wald Test (rho=0)		12.36***	

Notes: Robust standard errors in parentheses.
* p<0.1, ** p<0.05, *** p<0.01.

Table 2.
Robustness Checks
Effects of home price gap on the likelihood of parcel tax election
(Heckman selection model estimate)

Outcome Equation	Baseline	(1)	(2)	(3)
Home price gap (log)	-1.584***	-1.389**	-1.528**	-1.621**
	(.726)	(.684)	(.725)	(.773)
Parcel tax amount (log)	-.048	.053	.046	.049
	(.205)	(.201)	(.207)	(.203)
Population (log)	-.370***	-.363***	-.355***	-.368
	(.122)	(.121)	(.121)	(.123)
% Renters (log)	.289	.254	.167	.241
	(.340)	(.333)	(.341)	(.438)
33rd percentile household income bracket				-.048
				(.297)
Selection Equation				
33rd percentile household income bracket	.424***	.353***	.554***	.427***
	(.101)	(.120)	(.130)	(.103)
Operating expenditure per pupil (log)	1.739***	1.680***	1.651***	1.742***
	(.344)	(.354)	(.337)	(.344)
Cost Index (log)	4.411***	4.307***	4.216***	4.395***
	(1.232)	(1.240)	(1.219)	(1.230)
City-School District Incongruence index (log)	-.109*	-.099**	-.095*	-.109**
	(.049)	(.0497)	(.049)	(.049)
Population (log)	.128**	.116**	.094**	.127***
	(.044)	(.046)	(.047)	(.044)
Home price gap (log)		-.473		
		(.398)		
% Renters (log)			.421	
			(.271)	
N	*706*	*706*	*706*	*706*
Rho	*-.628*	*-.643*	*-.628*	*-.642*
Wald Test (rho=0)	*12.36****	*12.63****	*10.87****	*11.09****

Notes: Robust standard errors in parentheses.
* p<0.1, ** p<0.05, *** p<0.01.

Table 3.
Extended models (Heckman selection model estimate)

Outcome Equation (DV: existence of parcel tax)	Baseline	(1)	(2)
Home price gap (log)	-1.584***	-1.553**	-1.551**
	(.726)	(.624)	(.644)
Parcel tax amount (log)	-.048	-.005	-.013
	(.205)	(.215)	(.242)
Population (log)	-.370***	-.350***	-.364***
	(.122)	(.119)	(.117)
% Renters (log)	.289	.0745	.047
	(.340)	(.320)	(.392)
% Obama Vote in 2012 (log)			-.407
			(1.387)
% Population with college degree (log)			.289
			(.438)
% Population age 65 and older (log)			-.325
			(.538)
Bay Area (1=yes, 0=no)			.153
			(.320)
Selection Equation (DV: having had an election)			
33rd percentile household income bracket	.424***	-.121	-.120
	(.101)	(.135)	(.136)
Operating expenditure per pupil (log)	1.739***	1.224***	1.207***
	(.344)	(.391)	(.393)
Cost Index (log)	4.411***	2.563***	2.627***
	(1.232)	(.865)	(.884)
City-School District Incongruence index (log)	-.109*	-.071	-.0703
	(.049)	(.051)	(.051)
Population (log)	.128**	.062	.064
	(.044)	(.055)	(.056)
% Obama Vote in 2012 (log)		1.664***	1.741***
		(.508)	(.524)
% Population with college degree (log)		1.040***	1.014***
		(.287)	(.296)
% Population age 65 and older (log)		-0.476*	-.434
		(.280)	(.294)
Bay Area (1=yes, 0=no)		.431**	.402*
		(.198)	(.208)
N	*706*	*705*	*705*
Rho	*-.628*	*-.746*	*-.691*
Wald Test (rho=0)	*12.36****	*14.71****	*3.62**

Notes: Robust standard errors in parentheses. * p<0.1, ** p<0.05, *** p<0.01.

Figure 1.
Conditional Marginal Effect of Home Price Gap on Likelihood of Parcel Tax Adoption
(with 95% Confidence Intervals)

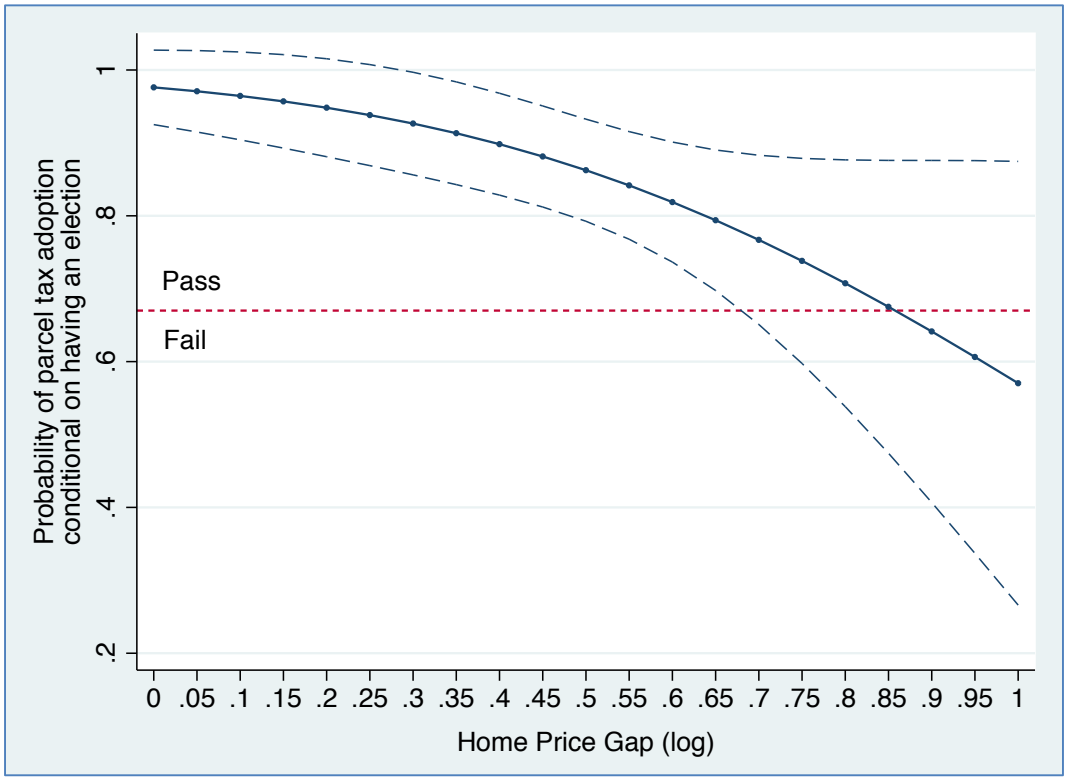

Figure 2.
Conditional Marginal Effect of Home Price Gap on Likelihood of Parcel Tax Adoption
By 33rd Percentile Household Income Levels