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Examining the Effect of Parcel Taxes on School Achievement, Family Demographics, and Property Values

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Abstract

Examining differences between school districts that have passed and school districts that have failed to pass a parcel tax provides a unique opportunity to study how implementing a parcel tax may affect different outcomes. This paper examines the effect of implementing parcel taxes on school achievement, family income, the percentage of students participating in free/reduced price lunch programs, family size, and property values in the state of California. I estimate the effect of parcel taxes using a difference-in-difference model over a panel of 147 school districts. I find that compared to districts that voted but did not implement a parcel tax, districts that implemented parcel taxes see (1) no effect on family size, (2) a reduction in the percentage of students participating in free/reduced price lunch programs, (3) a decrease in improvement in school achievement, and (4) reduced improvement in property values. In addition, the effect on school achievement depends on the initial state of the school district prior to implementing the parcel tax.

Introduction

Since 1971, residents in California have seen funding for public education shift from mainly local financing to largely a state-controlled affair. Considerable decreases in the revenue raised by school districts have accompanied these changes in funding. In response to reductions in revenue, school districts are turning to the parcel tax, one of the final methods of augmenting locally-raised revenue. This parcel tax, generally a flat amount per parcel of land, can only be implemented in a school district with the approval of at least two-thirds of voters in that district.

Many papers have examined different aspects of the parcel tax, from determining which districts are most likely to implement the tax, to exploring different uses of the parcel tax. While many facets of the tax have been analyzed, no research has examined whether districts that implement parcel taxes are seeing accrued benefits as a result of the tax. This paper explores the impact of implementing parcel taxes within a school district on five different outcomes: school achievement, family income, the percentage of students participating in school free/reduced price lunch programs, family size, and property values.

To do this, I utilize a difference-in-difference model to identify how implementing a tax has impacted changes in those outcomes between the years of 2000 and 2010. This approach compares these outcomes from school districts that have voted and failed to implement a parcel tax with districts that have voted and approved a parcel tax. Using this approach reveals that implementing a parcel tax has no effect on how family size within a school district changes over the years. The approach also shows that implementing a parcel tax has no effect on family income within a school district over the years, but does tend to decrease the percentage of students who participate in free/reduced price lunch programs. Additionally, I find that districts that implement a parcel tax see a reduction in the increase in property values of approximately

$5,000 for each year a district has had a parcel tax. These results are consistent with previous findings that increasing local taxes are accompanied by reduced property values.

I also find that implementing a parcel tax results in higher improvements in school achievement for districts with lower initial school achievement, but reduced improvements in school achievement for districts with high initial school achievement. One possible reason for this is that because the measure of school achievement used has a cap on achievement that school districts cannot exceed, districts that implement a parcel tax while already near this cap are unable to see improvements resulting from the tax. Under this view, while bringing in additional local revenue may help districts with lower initial school achievement, it should have no effect on school districts that already have higher achievement. That would explain why school districts with low initial school achievement see benefits from parcel taxes, but it does not explain why school districts with high initial school achievement see reduced improvements in their achievement. There is nothing to suggest that implementing a parcel tax should negatively affect improvement instead of having an effect of zero.

A Brief History of California's School Finance System

Prior to 1978, funding for education in California came mainly from four places: local property taxes, aid for equalizing disparity between district revenues, state aid, and federal categorical aid (T. A. Downes 1992). Districts were assured a base level of per pupil state aid, and further equalizing aid augmented districts that were unable to reach a foundation level of spending through taxes. During this time, the property tax rate in California averaged 3% of the assessed value of houses (California Tax Data n.d.), and California received 47.1% of its funding for public schools from these local property tax revenues (California Budget Project 2013).

While some funding for California schools did come from other places, school district revenues at the time largely rested on property tax revenues. As such, large disparities in revenue for schools arose between very wealthy districts with high property values and less wealthy districts with low property values (Fischel 1989).

Eventually, this disparity in school district wealth and revenue was reflected in the Supreme Court decision Serrano v. Priest (1971), which ruled that large disparities in funding for public schools was unconstitutional (Serrano v. Priest 1971). The Court found that inequalities in school district revenue caused by large differences in property values violated the equal protection clause of the California and U.S. Constitutions. *Serrano II* solidified this outcome, stating that state plus local spending per student could not vary by more than $100 per student across districts (Fischel 1989).

In response to these rulings, California legislature implemented revenue limits for each school district. These limits restricted the amount of revenue a district could receive from property tax and state aid, and they effectively curbed the property tax rate that could be levied in each school district to a point that would not exceed that limit. Districts could still implement a higher property tax rate that would exceed this revenue limit, however, with a majority vote of district residents (Brunner and Sonstelie 2006). This essentially rendered the revenue limit meaningless, and the large disparities in per-pupil revenue between school districts persisted.

In 1978, following those decisions, California approved by a large majority the largest property tax reduction in the history of any U.S. state: Proposition 13 (Fischel 1995; Hirsch 1981). Proposition 13 both limited the property tax rate at 1% and restricted the growth of assessed value to 2% per year, with an exception for properties that were sold (Fischel 1989; Sonstelie 2015). In addition, Proposition 13 restricted state and local governments from

introducing any new ad valorem taxes and from implementing any taxes without the approval of two-thirds of either the legislature or the local residents.

The California legislature then determined a formula for allocating the revenue collected from the 1% tax rate to the local governments, and set a per-pupil target revenue. Under this formula, each local district received the same proportion of the property tax revenue that it had received before Proposition 13. Prior to the passage of Proposition 13, property tax revenues were 69% higher in California than in the rest of the country (Sonstelie 2015). Immediately following Proposition 13, however, the per capita property tax revenue fell to levels approximately equal to that of other states. The property tax revenue that had once brought in almost half of all funding for public schools now only brought in approximately one quarter of all per-pupil spending.

School districts met their per-pupil target revenue through a combination of both local property taxes and state aid. Only school districts that did not reach this revenue target with the 1% property tax revenue received state aid. Additionally, school districts that exceeded this target with the 1% property tax rate were allowed to keep excess funds as additional revenue.

Proposition 13 severely restricted local districts' ability to raise revenue, and districts found themselves facing large cuts (McGhee and Weston 2013). In order to augment school funds, some school districts are turning to the parcel tax. The parcel tax, a special tax earmarked for a specific purpose, can only be implemented following the approval of two-thirds of voters. This tax is a flat tax on a parcel of land, and does not vary with the size, characteristics, or value of the land. Just as Proposition 13 and the legislative allocation of property taxes to school districts puts control of education financing in the hands of the central government, the parcel tax returns some of that control to local school districts. As local districts know more about the

needs of their districts than the central government does, the revenue brought in from the parcel tax can conceivably be used to improve school districts in their respective areas of need.

In addition to school finance, there is a general public perception that houses are more expensive in better school districts, measured by school achievement. This can partially be attributed to the fact that homeowners notice and care about things such as school performance when selecting a school (Downes and Zabel 2002). Due to this perception, good school districts are correlated with a higher proportion of wealthier families in the district, as homeowners are willing to pay more for a home closer to a school with higher test scores. High-performing school districts, as measured by test scores and achievement exams, attract richer families, which in turn increases housing values (Dhar and Ross 2012). The higher property values bring in more revenue for school districts, which can, potentially due to the perception that wealthier schools will perform better academically, attract more families.

When the property tax was the primary source of income for school districts, districts saw a cycle where higher performing school districts brought in wealthier families, which had a positive effect on housing values. Previous research suggests that school performance is positively related to the percent of revenue raised locally (Mensah, Schoderbek and Sahay 2013), so the question remains of whether the parcel tax has this same effect on school performance and property values. To answer the question of this effect of the parcel tax on school districts, I will look at school achievement, average family incomes, the percentage of students participating in free/reduced price lunch programs, average family size, and property values within school districts. In addition to seeing the actual impact of parcel taxes on these variables, those results also serve to illustrate how people view the parcel tax and what effects they think the tax has.

Characteristics of the Parcel Tax

While parcel taxes are one of the few ways that school districts can raise local revenue, they make up a small share of total revenue. Additionally, many districts that implement parcel taxes are geographically close. Most districts that pass parcel taxes are located in the San Francisco Bay Area, although there are several inland counties as well as Southern California counties that have also implemented parcel taxes (McGhee and Weston 2013). In addition to the variation in location, the amount of per-pupil revenue that parcel taxes provide also varies, from less than $100 to over $1000.

There are many characteristics about specific parcel taxes that vary among school districts, but there are also some common trends. Many times, districts implement parcel taxes because the revenue allocated by the state does not meet the demands of local residents (Lang and Sonstelie 2014). Often there is higher support for parcel taxes in wealthier districts, where there is more disposable income (McGhee and Weston 2013). Additionally, districts that have passed parcel taxes have fewer low-income students, English Learners, and students of color, and are more likely to be smaller and have fewer school-age children per household.

Does the parcel tax have any effect on family demographics, property values, or school achievement? To target this question, I use a difference-in-difference model to analyze the change in those key variables due to implementing or not implementing a parcel tax. The difference model employed helps to control for any district-specific fixed-effects over the course of the sample period while allowing me to compare the change over time in important outcome variables.

I compare the change over time in five unique dependent outcomes: academic achievement as measured by the Academic Performance Index (API), median family income, the

percentage of students that participate in the free/reduced price lunch program, average household size, and average property values. As previous research has found a positive relationship between student test scores and local revenue, I hypothesize that districts that implement parcel taxes will see greater improvements in school achievement than districts that do not implement parcel taxes. This result might be affected by the cap on school achievement though, which could skew the results for districts already towards the upper limit of school achievement. Controlling for that cap I anticipate that overall, districts will see improvement in academic achievement, but that districts with lower initial API scores will see more improvement than districts with higher initial API scores.

There are two potential results that could affect property values, and each effect pulls property value in a different direction. If the cycle between high performing schools and property value still exists with the parcel tax, then districts that implement parcel taxes should see improvements in property values due to the parcel tax. Additionally, if this theory holds, it suggests that districts that implement parcel taxes will also see increases in family size and family income, as wealthier families with more children move to those school districts. Alternate theories suggest that increases in tax prices correspond to decreases in property values (Oates 1969). This assumption suggests that districts that implement parcel taxes will actually see a decrease in property values due to the parcel tax. Better schools tends to improve property values, but higher taxes lower property values, so comparing the change in property values over time shows which effect dominates.

To examine these changes, I compare districts that implemented parcel taxes against a control group. School districts in California comprise a generally heterogeneous group, and as mentioned earlier, there are distinct differences in districts that choose to implement a parcel tax.

As school districts that propose and implement parcel taxes have so many distinct features, comparing districts with parcel taxes against all California school districts without parcel taxes may not provide accurate results due to too much variation in the control and treatment groups.

To avoid this problem, I compare districts that proposed and passed a parcel tax against districts that proposed but failed to pass a parcel tax. Unlike districts that have never proposed a parcel tax measure at all, districts that have proposed but failed to pass a parcel tax may be more similar in terms of unobservable characteristics to districts that proposed and did pass a parcel tax. If we assume that there are some unmeasurable and unobservable differences in districts that pass parcel taxes, districts that propose but fail to pass parcel taxes should provide a similar comparison measure for those unobservable characteristics. There may be some unknown reason that these districts brought the parcel tax to a vote, and districts that fail to pass a parcel tax are conceivably similar in these measures. While it is impossible to measure unobservable characteristics, Table 1 presents summary statistics for certain observable characteristics prior to implementing parcel taxes. Table 1, below, first compares both the treatment and the control group against all other districts in California, and then compares the control group against the treatment group.

As seen in Table 1, there are significant differences between districts used in my analysis (column (2)) and all other districts in California (column (1)). Average parent education, the percentage of students using the free/reduced price lunch program, the percentage of Asian students in the district, and the average class size for 4^{th} to 6^{th} grade are all characteristics that, in the initial states of the districts, show a significant difference at the 0.1% level between districts in the sample and those not in the sample. Average class size for kindergarten through 3^{rd} grade

is one additional variable between the districts included in the sample (column (2)) and districts not included in the sample (column (1)) that is significantly different at the 1% level.

Table 1 – 2003 District Control Characteristics

	(1)		(2)		(3)		(4)	
	Not in Sample		Sample Set		Control		Treatment	
VARIABLES	Mean	SD	Mean	SD	Mean	SD	Mean	SD
Average Parent Education	2.787***	0.621	3.084	0.681	2.990*	0.614	3.251	0.765
% English Learners	16.04	18.06	16.33	17.17	17.20	17.54	14.80	16.57
% Free/Reduced Price Lunches	45.76***	26.75	33.39	25.17	36.21	23.82	28.44	26.90
% Asian	3.828***	7.470	6.567	9.365	5.621	7.822	8.233	11.49
% Hispanic	53.78	27.75	51.92	27.50	51.29*	26.97	53.03	28.65
% White	32.37	27.22	28.87	23.89	32.23	24.50	22.95	21.77
Average Class Size - K-3	18.26**	2.604	18.87	1.591	18.96	1.231	18.72	2.093
Average Class Size - 4-6	25.48***	4.866	27.03	3.642	27.72**	3.239	25.82	4.021
N	864		147		96		51	

Notes: Columns (1) and (2) show the comparison between districts not included in the sample and those included in the sample. Districts not in the sample include districts that have never voted on a parcel tax as well as those districts which have both passed and failed to pass parcel tax measures at different times. Districts in the sample set are all districts that have only ever passed a parcel tax measure and those that have only ever failed to pass a parcel tax measure. Columns (3) and (4) break down the statistics for districts in the sample set even further, by the control group and the treatment group. The control group is districts that have voted but only ever failed to pass a parcel tax, while the treatment group is districts that have voted and only ever passed parcel tax measures.
Numbers with asterisks in columns (1) and (3) represent a significant difference from the numbers in columns (2) and (4), respectively. * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Three variables that do not show a significant difference between districts in the sample and districts not in the sample are the percentage of students that are English learners, the percentage of students that are Hispanic, and the percentage of students that are White. While I cannot measure those previously mentioned unobservable district characteristics, having so many demographic characteristics that are initially different between districts in the sample group (both control and treatment groups) and districts not in the sample suggests that there are inherent differences between those two subsets of school districts.

When comparing the treatment group (column (4)) to the control group (column (3)), there are no variables that are significantly different between the two groups at the .1% level.

Three variables are significant at the 1% and 5% levels, which are average parent education level, the percentage of students that are Hispanic, and the average class size for 4th to 6th grade. Having relatively few significant differences in demographic characteristics between the control and treatment groups at the beginning of the sample period suggests that the two groups do share some amount of similarity. The lack of differences suggests that districts that proposed and failed to pass a parcel tax may be similar in terms of those unobservable characteristics to districts that proposed and passed a parcel tax, and allows them to be compared to each other.

Data

School Districts and Parcel Taxes

Data on parcel tax elections comes from the nonpartisan organization, EdSource. For each election, EdSource compiles information on the code and name of the district the election was held in, the county the district resides in, the proposed amount of the tax, the earmarked purpose of the tax, the date of the election, the percentage of the vote the parcel tax received, if the tax passed or failed, and some additional notes for specific elections. The initial dataset is made up of all special elections held in school districts between 1983 through 2014, where special elections are comprised of parcel tax, Mello-Roos, sales tax, GO Bonds, and other similar measures. For this paper, I only focus on parcel tax elections.

Between 1983, the date of the first parcel tax election, through 2014, new school districts were established and existing school districts merged to form different school districts. Despite changes in the composition of school districts, there have consistently been over 900 school districts in California. From 1983 through 2014, there have been 650 parcel tax elections in California, of which 368 have resulted in a passed parcel tax. Of those over 900 school districts, however, the 650 parcel tax elections only occurred in 224 California school districts.

The election history varies greatly even among the 224 school districts that held parcel tax elections between 1984 and 2014. Out of these school districts, 77 are districts that have, at separate times, both passed a parcel tax measure and failed to pass a parcel tax measure. It is difficult to determine the reason for why a district would switch from voting to implement a parcel to voting against a parcel tax, or vice versa. There is a possibility that districts that once had a parcel tax decided that it was not worth the tax dollars in a subsequent election, or the possibility that districts that had never had a parcel tax finally chose to implement one for reasons unknown. Because it is not possible to discern those reasons, I exclude these 77 districts from my analysis.

The remaining sample, excluding districts that have both passed and failed to pass parcel taxes, encompasses 147 school districts. These 147 districts are districts which, over the years, have only ever passed or only ever failed to pass a parcel tax measure. The consistent manner which these districts have acted over the years allows for comparison between the districts.

Within the sample of 147 districts, 51 are school districts that have only passed parcel tax measures, and 96 are districts that have only ever failed to pass parcel tax measures. The districts that have never passed a parcel tax will act as the control group for my analysis, and the districts that have passed a parcel tax will be the treatment group. This data on elections was then augmented with data for each district on family incomes, family size, the percentage of students using the free/reduced price lunch program, property values, and school achievement.

Academic Achievement

To assess school achievement I used Academic Performance Index (API) scores, obtained from the California Department of Education (CDE). API scores assign a number reflective of a school's performance level to each school in California. The index, which runs

from 200 - 1000, is created using several statewide assessments: the California Standards Tests (CSTs), the California Modified Assessment (CMA), the California Alternate Performance Assessment (CAPA), and the California High School Exit Exam (CAHSEE). These exams assess proficiency in English, mathematics, history and social sciences, and science.

To calculate the API, students' scores on those statewide assessments are converted into points on the API scale. These points are then averaged across all of the students in that district and all of the tests, and this final result is the school API score. Each school in California has a specific API score, and district API scores are the average of all the school-specific API scores within that district.

The method for how API scores were calculated and reported changed in the 2002-2003 year, so I use 2003 as the start of my sample for API scores. For many of the other variables I examine, I use 2010 as the end of my sample period. However, I use 2011 as the end of the sample period for academic achievement to allow for more than seven years within the sample period.

Family Income and the Reduced/Free Price Lunch Program

In addition to academic achievement, I am also looking at several family demographic characteristics. One main variable of interest is median family income. As mentioned earlier, using property taxes to fund school revenues often results in a cycle which either brought families with children to better school districts, or gave incentives for families with children to leave worse-off school districts. Analyzing demographic variables as well as property values gives insight into whether a similar cycle still exists with the parcel tax.

Data for median family income comes from both the Census and the American Community Survey (ACS), and is broken down by school district through the Education

Demographic and Geographic Estimates (EDGE) program, run by the National Center for Education Statistics (NCES).

For family income at the start of my sample, I used median family income from the 2000 Census. Median family income is not available for the 2010 Census because data on income was incorporated into the ACS. To account for this, I used median family income, reported in 2012 dollars, as recorded in the 2008-2012 ACS. The ACS provides the same data for a representative sample of the population, and as such works as a close substitute for Census data. I adjusted income in 2000 for inflation using 2012 dollars (at a price index of 1.3781), to be comparable to the end-sample median family income.

To assess income using a different measure, I also use the percentage of students who participate in the free/reduced price lunch program. This measure assesses income in an alternate manner, such that as median family income rises, the percentage of students who participate in the free/reduced price lunch program should fall, and vice versa. This data, available from the CDE, is one of many district level statistics that the CDE reports along with API scores. As the data for academic achievement comes from 2003 and 2011, as explained earlier, I also use data from 2003 and 2011 for this measure.

Family Size

I am also examining family size. Similar to family income, family size is an additional indicator of whether implementing a parcel tax is encouraging more families (and more families with children) to move into certain school districts. The variable median family size is available for the 2010 Census, but is not available for the 2000 Census. Because of this, I am instead using median household size for both 2000 and 2010 instead of median family size.

While median family size and median household size are both similar measures, there is one key difference. Family size measures the number of people within one family unit, and is defined as two or more people residing in the same housing unit who are related by adoption, marriage, or birth (United States Census Bureau 2011). A household, on the other hand, measures the number of people living within one housing unit, regardless of relationship. A household may be comprised of only one person or may be multiple unrelated individuals or families, so the household variable has much more noise than the family variable. Even with that noise, however, examining how the variable has changed over time still provides general insight into how household size has changed over time.

Property Values

Aside from demographic variables, I am also examining property values. Examining property values is one more way to show whether the aforementioned cycle with housing prices, property tax revenues, and wealthy families happens with the parcel tax. One reason this cycle existed is because the property tax is a value-added tax. Because of this value-added characteristic, the tax revenue, based on the value of someone's property, immediately affected the amount of revenue that schools receive from the tax. When property values rose, school districts saw higher revenues. However, this relationship no longer exists with the parcel tax.

The parcel tax is a flat-rate tax, so regardless of how property values change, the amount of revenue raised from a parcel tax remains constant. It is hard to predict how housing prices will respond to parcel taxes because that link between the tax, school revenue, and housing values no longer exists. Examining data on property values will hopefully show what effect, if any, implementing a parcel tax has on property values. Data for property values comes from the 2000 Census and the 2008-2012 ACS. Again, the property values are adjusted to correct for inflation.

Methodology

While I am examining five unique dependent variables, the equation used is roughly the same in each one, with only the dependent variable changing. I assume that each dependent variable is constructed from some base value, some effect of implementing a parcel tax, and some error term. In addition, there may be district-specific fixed effects that affect the outcome of the dependent variable. The equation constructing each dependent variable is shown below in equation (1).

(1) $$Y_{it} = \beta_{0t} + \alpha_i + \beta_1 T_{it} + \epsilon_i$$

In this equation, Y represents that specific dependent variable for district *i* in time *t*, and *T* represents how many years a district has had a parcel tax in place. For districts in the control group – that is, districts that have voted and never implemented a tax – *T* takes the value of 0 and drops out of the equation. α_i represents time invariant district fixed effects. β_{0t} is a constant term for each dependent variable, and also allows for a time trend when taking the difference between two time periods. To assess the change in the dependent variable for a district over the sample period, I took the difference between that variable at the end of the sample ($t = t^2$) and that variable at the beginning of the sample ($t = t^1$), as shown in equation (2).

(2) $$\Delta Y_i = Y_{it^2} - Y_{it^1} = (\beta_{0t^2} - \beta_{ot^1}) + \beta_1 (T_{it^2} - T_{it^1}) + \epsilon_i$$

Taking this difference allows for two things to happen: one, it shows how the dependent variable has changed over the sample period along with the tax-year variable, and two, it removes the district-specific fixed-effects from the equation. The variable *T* will only take a value for districts that have implemented parcel taxes, and the coefficient on that variable will provide the impact of implementing a parcel tax on family income. The change in β_0 will capture

broad time trends in the data and variables, and will prevent β_1 from picking up any of those general time trends.

Descriptive Statistics

Prior to any regressions, Table 2, below, shows the mean and standard deviation of the change over the sample period in the five dependent variables for the control group and the treatment group.

Table 2 – Difference in Outcome Variables

	(1) Control		(2) Treatment	
VARIABLES	Mean	SD	Mean	SD
API	72.11	40.25	59.43	45.14
Median Family Income	-$4,087	$8,351	-$3,417	$12,185
% Free/Reduced Lunch	10.34 %	11.72 %	6.988 %	10.51 %
Average Household Size	-0.0250	0.112	-0.0308	0.113
Average Property Value	$90,069***	$66,706	$23,381	$141,695
N	96		51	

Notes: this table shows the means and standard deviations of the change in each variable ($Y_{it^2} - Y_{it^1}$) over the course of the sample for the dependent variables being tested. Asterisks mark the variables that show a significant difference between the control group and the treatment group.
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

As you can see from Table 2, most of the variables show general time trends. API scores and average property values both increase over the sample period. While the differences in those two variables between the control and treatment group seem large, the standard deviations within each group are quite large as well. Property value is the only outcome variable that shows a significant difference between the control and treatment group, with the value of a house increasing much more for districts that did not implement a parcel tax than for districts that did.

Median family income decreases over the sample period, while the percentage of students participating in the free/reduced lunch program rises. As mentioned earlier, in addition to median family income I use the percentage of students participating in the free/reduced price lunch

program as a proxy for income. The change in this percentage between 2011 and 2003 approximates how the income distribution within a school district has evolved over the course of the sample period for families with school-aged children.

One caveat to this measure, however, is that the variable is measured slightly differently at the start and end dates to the sample. The variable for free/reduced price lunches in 2003 measures the percentage of students participating in the program, while the variable in 2011 measures the percentage of students eligible for the program. As not all students eligible for the program participate in the program, the values may be biased in one of two ways. One, the 2011 measure may be surprisingly high, or two, the 2003 measure may be surprisingly low. Regardless of which is true, the difference between the two years will account for this and most likely overestimate the true change, and so should be seen as an "upper bound."

The means in Table 2 show that on average, family income decreases over the sample period for both the control and the treatment group, and the percentage of students using the free/reduced price lunch program increases for both groups. The increase in the free/reduced price lunch variable is noticeably larger in districts that did not pass a parcel tax, both in the initial rates of students using this program and in the change over time. These results are consistent with family income results. If family income decreases over time, the percentage of students using free/reduced price lunches would naturally rise.

One thing to note about median family income is that, once corrected for inflation, both districts that passed a parcel tax and those that did not pass a parcel tax on average saw median family income decrease over the sample period. This could potentially be due to the Great Recession, which lasted from 2007 until 2009. While both incomes saw a decrease over this

period, the incomes for districts that did not pass a parcel tax saw, on average, a larger decrease than districts that did pass a parcel tax.

The descriptive statistics for family size are similar for both districts that passed a parcel tax as well as those that did not pass a parcel tax, and are also displayed in Table 2. While family size was on average slightly larger in districts that did not pass a parcel tax, both districts saw almost the same change in family size over the ten year period. Additionally, the change in family size is extremely insignificant, with very large standard deviations.

Results

The results from the regressions using those five dependent variables are presented in Table 3, below. Each column reports the results for a different dependent variable. The constant term captures any general time trends within a variable regardless of if a district approved a parcel tax or not. The Pass*Time coefficient is that β_1 that gives the effect of implementing a parcel tax on each of those dependent variables, and is measured as the effect of implementing a parcel tax times how many years a district has had a parcel tax.

Table 3 – Estimates Using the Difference Model

VARIABLES	(1) API Scores	(2) Property Values	(3) Median Family Income	(4) Free/Reduced Price Lunches	(5) Household Size
Pass*Time (β_1)	-1.113***	-5,412***	-0.905	-0.233***	0.000988
	(0.329)	(1,720)	(118.8)	(0.0849)	(0.00129)
Constant	72.67***	86,216***	-3,852***	10.67***	-0.0306***
	(3.504)	(7,050)	(811.6)	(1.026)	(0.0100)
Observations	147	141	147	138	147

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1
Notes: each dependent variable is measured by the change from the end of the sample to the beginning of the sample ($Y_{it^2} - Y_{it^1}$), and the coefficients reported are measuring the difference and change in each of the dependent variables.

As seen from Table 3 through the constant, API scores, property values, and the percentage of students participating in free/reduced price lunches have general positive time trends over the sample period. Median family income and household size show a negative time trend.

Regression 1, with API scores as the dependent variable, presents a coefficient on β_1 of -1.11. This suggests that implementing a parcel tax tends to decrease improvement in API scores over time, by just over one point for every year a district has a parcel tax. While one point alone does not result in a large change when compared to the control group, if a district has had a parcel tax for almost the whole sample period, their improvement in API would be closer to 60 points, whereas the change in API scores for the control group would be just over 70 points.

Seeing a negative impact of implementing a parcel tax on API scores goes against my hypothesis that implementing a parcel tax would improve API scores. Even if there was no improvement from implementing a parcel tax, the most that I expected to find was no effect at all. But this result suggests that implementing a parcel tax may actually hurt a school district's improvement in API scores. While this result is not intuitive, it is possible that the effect seen is simply a result of that cap on API scores of 1000. For districts that already have high API scores, they do not have upward mobility in the same way that districts with low initial API scores do. This potential cause of the negative result is discussed in further detail below.

The results of estimating the effect of implementing a parcel tax on property values suggest that property values decrease by approximately $5,000 for every year a district has a parcel tax in place. This significant result does not mean that passing a parcel tax decreases property value outright, but rather suggests that the increase in property values will be much less in districts that pass a parcel tax. For example, a district that has never passed a property tax can

expect to see property values rise by approximately $86,000 over that eight year period (seen in regression (2)). A district that has had a parcel tax for two years, however, can expect to see property values rise by approximately $75,000, and this gap only increases for each year that a district has had a parcel tax. The results imply that simply having a tax for two years reduces improvement in property values by over $10,000, which is not an insignificant sum. For districts that have had parcel taxes for five years, this reduction is over $25,000.

From the two theories for housing prices mentioned earlier, these results align more with the theory that increasing property taxes reduces the value of a home. The alternate theory posits that better schools (measured by academic achievement) result in higher property values. However, districts with parcel taxes do not see any added improvement in their academic achievement, and are additionally seeing lower increases in property value. Those two results are consistent with each other, and also suggest that the property value/academic achievement/tax revenue cycle seen before no longer occurs. In this scenario, it is also possible that the benefit of a parcel tax is less than the tax itself, so the tax is seen solely as a burden instead of an asset.

The results from median family income as the dependent variable, regression (3), are extremely small in magnitude and extremely insignificant. Regression (3) says that for every year that a district has a parcel tax, the change in median family incomes over the sample period will decrease by less than a dollar, which is hardly any effect at all. The interesting element is that, while median family income sees a decrease due to implementing a parcel tax, so does the percentage of students participating in free/reduced price lunch programs. As median family income rises (falls), the percentage of student utilizing free/reduced price lunch programs should fall (rise); this is not what appears to be happening.

Median family income and the percentage of students participating in the free/reduced price lunch program do show the same direction of the effect of implementing a parcel tax, but the free/reduced price lunch measure presents a slightly more accurate look at the effect of parcel taxes for families with school-age children. While median family income represents how income in districts changes as a whole, this number includes all families who do not have school-aged children, have children in private school, or do not have children at all. The measure of the percentage of students using free/reduced price lunches, however, provides insight into how income is changing within families with students enrolled in public schools.

Based on this, while implementing parcel taxes does not seem to have an effect on family income as a whole at the district level, it does appear to have a positive effect on families with children in public education. That is, districts that implement a parcel tax are seeing slight reductions in the percentage of their students who participate in the free/reduced price lunch program. This would suggest that passing a parcel tax is bringing slightly wealthier families with school-aged children into those districts with the tax. As there does not appear to be a benefit from the tax for the schools themselves, in terms of academic achievement, this effect may be because families perceive the parcel tax as bringing benefits other than academic achievement, such as aesthetic improvements, elective classes, a wider variety of sports, or simply the perception that the school is better because it has more revenue.

Again, one thing to note is that the estimates for free/reduced price lunches should be seen as an upper bound, as the measure most likely overestimates the change in percentage of students utilizing the program. In reality, the estimated coefficients on Pass*Time for the percentage of students participating in the free/reduced price lunch program are most likely smaller, and less significant.

Finally, the results in looking at the effect of passing a parcel tax on family size do not show any effect at all. Interpreting the coefficient shows that implementing a parcel tax will increase family size by 0.00098 people for every year that the parcel tax is in place. This small effect is also very insignificant, which suggests that passing a parcel tax does not affect family size much, if at all.

Robustness Checks for Academic Achievement

The results shown in Table 3 suggest a slight negative effect of passing a parcel tax on academic achievement, but one thing that might be skewing results is the measurement of the API variable itself. As mentioned earlier, the API is an index from 200 - 1000, so it is possible that districts toward the top of this index would not see an improvement in academic achievement as much as districts lower down. The average 2003 API score for districts that did not pass a parcel tax is 732, and the average for districts that did pass a parcel tax is 780. The mean 2003 API score for the entire sample is 749.

To see whether this upper bound for API scores may affect how much a district will see improvement, I added a proportion variable into the equation. The model then becomes:

(3) $$\Delta Y_i = (\beta_{0t^2} - \beta_{0t^1}) + \beta_1 \frac{P_i}{API_{initial}} + \beta_2 P_i + \epsilon_i$$

With *P* taking the place of *T*. P_i is a dummy variable for whether a district passed a parcel tax or not. Adding the interaction between *P* and a district's initial API score allows β_1 to account for the difference in the effect of a parcel tax based on a district's initial API. The results from this are shown in Table 4. Column (1) shows the results from the regression described in equation (3).

Table 4 – Change in API scores

VARIABLES	(1)
Pass/2003API	167,301***
	(21,525)
Pass	-226.3***
	(27.43)
Constant	71.52***
	(3.708)
Observations	147

Notes: Regression (1) measures the effect of implementing a parcel tax on the change in API scores conditional on a district's API score at the start of the sample.

As seen in the results from including the proportion, a district's initial API score does seem to have an effect on whether passing a parcel tax helps or hurts that district. As the proportion variable ($\frac{Pass}{API_{2003}}$) is positive and the pass variable is negative, it is possible to find the breakeven point for when passing a parcel tax will help or hurt a district by setting the two variables equal to each other and solving for that initial API score. The positive proportion variable means that the larger a district's initial API score, the smaller the positive effect of implementing a parcel tax, and the greater the weight of the indicator variable for pass. Using that methodology, the breakeven point occurs at an initial API score of approximately 740, which sits just below the mean of API scores for the entire sample. The effects of passing a parcel tax for different initial API scores are shown below in Table 5.

As seen in Table 5, the calculated effects of implementing a parcel tax vary widely even when the difference in initial API scores is only 40 points. The point at which passing a parcel tax may help or hurt is at an initial score of just about 740. Table 5 reports how quickly the effect of the parcel tax changes from positive to negative and how quickly that effect accumulates.

Table 5 – Effects of Parcel Tax on Different Initial API Scores

Initial API Score	Calculated Effect of Parcel Tax
660	27.2
700	12.714
740 (Breakeven Point)	-0.205
780	-11.8
820	-22.26

Notes: This table shows the different calculated effects of implementing a parcel tax for different initial API scores in increments of 40.

Finally, data on API scores is available for every year since 2003, which allowed me to examine the negative effect of parcel taxes on academic achievement using panel data for API scores. The equation for these regressions is similar to equation (1). Here, the dependent variable is simply the overall API score for a district, and the time variable begins counting when a district passes a parcel tax and then continues counting up. The results of the panel data are shown below in Table 6. Regression (1) includes year indicator variables, and the constant in this regression represents year 2004. Regression (2) does not include these year indicator variables.

As you can see from regression (1), the coefficient on Pass*Time is -2.142. This suggests that every year a district has a parcel tax reduces the overall API by just over two points. While the general trend in API scores is still positive as seen by the year indicator variables, the regression in column (1) shows that that increasing trend is less for districts with parcel taxes, depending on how many years a district has had a parcel tax. When year indicator variables are omitted from the regression, the coefficient on Pass*Time becomes positive and more significant, suggesting that the time variable may just be picking up some of that positive time trend that is left out when year indicator variables are omitted. Additionally, the coefficient for each year indicator increases with each year, again showing that increasing time trend in API scores.

Table 6 – Effect of Passing a Parcel Tax on API

VARIABLES	(1)	(2)
Pass*Time	-2.142*	7.093***
	(1.107)	(0.998)
2005	16.67***	
	(1.805)	
2006	27.18***	
	(2.173)	
2007	27.90***	
	(3.384)	
2008	36.43***	
	(2.775)	
2008	49.68***	
	(2.834)	
2010	57.19***	
	(3.257)	
2011	65.64***	
	(3.570)	
2012	75.72***	
	(3.768)	
Constant	755.1***	765.0***
	(3.535)	(3.363)
Observations	1,158	1,158
District Fixed-Effects	YES	YES
R-squared	0.596	0.095

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

Note: the dependent variable is the overall API score, not the change in API. Regression (1) includes year indicator variables; regression (2) does not include year indicator variables. Both regressions control for district fixed-effects. Standard errors are clustered by district.

Conclusion

From analyzing the parcel tax election data I come to two main conclusions. The first is that the cycle seen between property values and school revenue does not exist as a result of a parcel tax. Median family incomes as well as household size do not change much, if at all, as the result of implementing a parcel tax. The results for implementing a parcel tax on property values suggest that the increase in property values is approximately $5,000 less for every year a district

has had a parcel tax. This negative result could be due to the fact that residents in that district view the tax as simply a tax burden that does not produce measurable improvements to the district. The result also indicates that the dominant theory for implementing parcel taxes is that an increase in taxes leads to a decrease in property values.

The one result that does not uphold the broken cycle theory is the result for free/reduced price lunches. While passing a parcel tax does not seem to have an effect on median family income in the district as a whole, it does seem to have an effect on incomes for families with school-aged children. While overall, schools saw the percentage of students using free/reduced price lunches increase by approximately 10% over the period from 2003-2011, districts that implemented parcel taxes reduced this increase by 0.23% each year the tax was in place. Even though this change is small, it implies that parcel taxes may be attracting slightly wealthier families with school-aged children to districts. Future research could look at the impact of parcel taxes solely on the income of families with school-aged children to try to narrow down the effect of implementing a parcel tax.

The second conclusion is that parcel taxes can sometimes be beneficial for academic improvement, but it depends on district performance prior to implementing the tax. Because of the ceiling of 1000 that restricts how high a district may improve, districts only see improvement in their API scores as a result of a parcel tax if that district has an initial API score below 740. For districts with initial API scores above 740, there does not seem to be a benefit, and there may indeed be a negative effect. This negative effect may still be due to that API ceiling, and further re-specification of the empirical model used here may be able to separate the effect of parcel taxes depending on initial API score more thoroughly.

The model I use most likely excludes several important variables, which may explain more of the effect of the parcel tax. It is possible that there is some other variable which causes these variations that is significantly different between districts that passed parcel taxes and districts that failed to pass parcel taxes. Future research could include other variables and controls to try to find what this may be.

Other potential research on the effect of parcel taxes could use panel data for property values to truly examine the effect of the parcel tax on property values. Additionally, further research could include variables that look at the effect of the different specific earmarked purposes of the parcel tax, or could examine the effect of the parcel tax as a result of the amount of the tax.

While implementing a parcel tax may at times have benefits, those benefits are only seen under specific pre-existing conditions. Generally, the effect of parcel taxes is most extreme in the school districts which are also on the extreme ends of the school achievement index. For districts that perform well, the parcel tax may not provide any measurable benefits. However, districts that are below the average may indeed see improvement from this increased local revenue. As the parcel tax picks up popularity, districts should examine their current standing to see if implementing a parcel tax will potentially bring about real change, or whether it will solely be seen as a tax burden in that district.

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