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The Effects of Changes in Property Tax Rates and School Spending on Residential and Business Property Value Growth

Sung Kang
Laura Reese
Mark Skidmore

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Abstract

In this paper, we examine the effects of changes in property tax rates and school spending on residential and business property value growth in southeast Michigan. We use panel data for 152 communities in the five counties surrounding Detroit between the years 1983 and 2002, a period during which state government mandated major changes to school finance. Using the mandated changes to identify causality, we find that: 1) residential property values are more responsive to school spending changes than property tax rate changes; 2) business property values are more responsive to tax rate changes than school spending changes, and 3) business property values are more sensitive to changes in tax rates as compared to residential property. We also examine tax competition effects on property value growth, showing that tax competition plays an important role in property value growth in the southeast Michigan region.

JEL-Code: R100, R500.

Keywords: local public finance, property tax, property value growth.

Sung Kang
Michigan State University
East Lansing / Michigan / USA
kangsun6@msu.edu

Laura Reese
Michigan State University
East Lansing / Michigan / USA
reesela@msu.edu

Mark Skidmore
Michigan State University
East Lansing / Michigan / USA
mskidmor@msu.edu

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1. Introduction

Optimal provision of public goods has been discussed and debated in the literature for decades. In early work, Samuelson (1954) formally derived the necessary conditions, but pointed out that there is no decentralized pricing mechanism for the optimal provision of public goods because of the so-called free rider problem. That is, there is no incentive for residents to reveal true preferences if tax liabilities are based on stated preferences. However, Tiebout (1956) argued that in the case of local public goods, residents reveal their preferences for public goods by choosing to live in communities that have the most desirable tax-service packages. In this case, taxes for local public goods are in some ways analogous to prices of goods allocated through private markets. Oates (1969) conducted the first empirical test of Tiebout's hypothesis. Using data from a cross-section of communities in northeastern New Jersey, Oates (1969) found the that the net effect of tax reductions and education expenditure increases on property values is close to zero. This result was used to argue that the local public service (education) is provided at close to the optimal level. Since Oates' study, a large body of literature has been devoted to examining the effects of tax rates and local public spending on property values[1](see for example, Bradbury, *et al.,* 2001; Brueckner, 1979, 1982; Guilfoyle, 1998; Haughwout, *et al.*, 2004; Lang and Jian, 2004; Oates, 1973; Palmon and Smith, 1998; Pollakowski, 1973). Despite this now substantial body of research, little consideration has been given to the effects of tax rates and local public spending on different classes of property. Oates (1969) argued that if residents are mobile and shop around for communities that provide preferable levels of local public services at

[1] For comprehensive literature reviews on the subject of capitalization, see Yinger, *et al.* (1988) and Ross and Yinger (1999).

the lowest property tax liability, property taxes and the quality of local public services are capitalized into property values. However, residential property owners may prefer quite a different tax/service package than commercial or industrial interests. Further, businesses and their investments are also mobile. It is therefore likely that changes in taxes and public service spending have varying impacts on different classes of property, yet to our knowledge, such an examination has not been the focus of existing research. The purpose of this paper is to fill this gap in the literature by examining the responsiveness of property values of different classes of property to changing tax and spending regimes in a regional competition framework.

To address this question we use panel data from 152 communities in five counties surrounding Detroit, in southeast Michigan between 1983 and 2002. In Michigan, public schools are primarily financed by a property tax, which is levied at different rates on different classes of property. In this analysis, we focus on the two primary property classifications: Residential and business (commercial/industrial) property.[2] As we discuss in greater detail later, mobile agents with different sets of preferences make locational decisions based on their tax/service needs/preferences such that the property values of various property classes likely respond differently to changes in taxes and school spending.

To estimate the effects of changing tax rates and school spending on property value growth, we must take into account the endogeneity of property tax rates and school spending decisions. Following Skidmore, *et al.* (2012), our instruments are based on the exogenous policy shift brought on by the statewide imposition of Proposal A in 1994. Proposal A, which was chosen among two education finance options via statewide referenda, was implemented to reduce property tax burdens and improve funding equity in public schools through voter

[2] Agriculture, forest, and swampland property classifications are omitted.

approval.[3] Proposal A resulted in significant tax rate reductions across communities because funding sources for public schools were shifted to state government revenues generated from new sales and cigarette taxes, and a new statewide property value-based six mill state education tax. Also, since this reform was designed to reduce the gap in school spending between poor and wealthy communities, poor communities received relatively more funding from the state. As discussed in detail later, these exogenous changes in the tax rates and school spending across communities enable us to identify causal relationships between policy changes and property value growth of different property classes.

Our analysis also takes into account tax competition. Specifically, if policy changes in competitor communities affect one's own property value growth, then a failure to account for these leads to biased and inconsistent estimates. Thus, to avoid potential omitted variable bias resulting from spillovers, we estimate the property value effects of tax rates and school spending in the context of tax competition.

The analysis offered here reveals the following: 1) residential property values are more responsive to school spending changes than property tax rate changes; 2) business property values are more responsive to tax rate changes than school spending changes; 3) business property values are more sensitive to changes in property taxes relative to residential property values; and 4) there are significant fiscal externalities; that is, tax competition plays an important role in property value growth in the region.

2. Theoretical Considerations

2-1. Property Taxation

[3] The legislature abolished the old system of school finance and then offered two proposals to be considered by voters via statewide referenda. Proposal A was the successful proposal.

For decades, the property tax and the optimal provision of public goods has been the subject of an ongoing discussions and debate which can be summarized with the following question: Is the property tax distortionary in nature or is it primarily a benefit tax?[4] Hamilton (1975) argued that property taxation is an efficient tax if new residents pay property tax rates equal to the marginal costs for local public services they receive. If zoning requirements, which set minimum house values in a community, are strictly binding[5], then no one has an incentive to own homes with higher than the minimum required value because the owner would then be required to pay higher property tax payments. Therefore, in equilibrium all residents in a homogenous community pay the same property tax, serving as an efficient "head tax", and receive the same level of public services. In this case, the property tax is efficient. Hamilton (1976) further argued that under certain conditions the property tax serves as a pricing mechanism for local public services even when property values are different across taxing jurisdictions. Specifically, property taxes serve as a pricing mechanism when variation in property values exactly equal the fiscal differences emerging from different tax/service packages (perfect capitalization). This view is supported by Fischel (1987, 1995), Yinger, *et al.* (1988), Palmon and Smith (1998), and others.

On the other hand, Mieszkowski (1972) and Zodrow and Mieszkowski (1983, 1986) suggest that the property tax distorts the allocation of capital: If one community levies higher taxes on mobile factors such as capital, then the tax base moves to other communities with a more attractive tax environment, thereby resulting in inefficiently low tax rates (and local public services). In this case, the property tax is considered a tax on capital and results in "fiscal externalities" (Wildasin, 1986, 1989). In this so-called capital tax view, tax competition is

[4] For a comprehensive review, see Zodrow (2000).

[5] Each (homogenous) community in the region precludes movers who want to receive public services at relatively low costs, which are less than their share of the costs through fiscal zoning.

potentially harmful, in contrast to the positive view presented by Tiebout (1956). In summary, local governments are more likely to set tax rates at inefficiently low levels in order to gain locational advantages, thereby resulting in a lower level of provision of local public services (Oates, 1972; Hoyt, 1991; Krelove, 1993).

Fiscal zoning and capitalization play crucial roles in the degree to which the provision of local public services is optimally provided. The body of research suggests that the property tax is more like a distortionary capital tax when: 1) Fiscal zoning is not strictly binding; and/or 2) perfect capitalization does not occur (Mieszkowski and Zodrow, 1989). Because both homeowners and capital are mobile, differences in property taxes and the quantity/quality of public services can be reflected in property values. Further, the property tax is likely to distort the allocation of people and capital across communities because the assumptions of binding zoning and/or perfect capitalization are often rejected (Mieszkowski and Zodrow, 1989; Wildasin, 1989). In the context of the present study, our regional dynamic spatial analysis offers new evidence of fiscal externalities, and indirect evidence that the property tax is a capital tax, at least in the context of southeast Michigan.

2-2. Residential and Business Property

The property tax is an important source of local revenues, but it is useful to note that property tax revenues are generated from different classes of property. Further, owners of different property classes sometimes require different types of local public services. Thus, changes in property taxes and public services may result in different levels of capitalization across property classifications. In this paper, we seek to measure the degree to which policy

changes result in different rates of capitalization across residential and business (commercial and/industrial) property classes.

According the Tiebout hypothesis, mobile residents sort themselves across local communities in accordance with their policy preferences. This hypothesis implies that taxes function as a pricing mechanism for local public services as residents are willing to pay their share of the costs for these services in the communities they choose. This notion can also be applied to mobile firms. Fischel (1975), White (1975), and Wellisch (2000) argue that if firms are perfectly mobile and shop around among communities that offer different policy packages in a way that is analogous to mobile residents, local government competition results in the efficient provision of public goods. Thus, values of business property also reveal the policy preferences of firms through their locational decisions. If agents make locational decisions based on policy preferences and have different policy needs/preferences, then property value responses to policy changes will differ across classes of property. This argument leads to a question: How do fiscal policy preferences differ among agents? In a Cost Of Community Services (COCS) study[6] in Scio Township, southeast Michigan, Crane, *et al.* (1996) show that residents pay less than their share of costs of providing local public services, especially school services, whereas commercial/industrial firms contribute more revenue than the costs of local services they receive.[7] Ladd (1975) also argues that the higher fraction of non-residential property lowers the property tax burden on residents for service and consequently they demand relatively high levels of school services. Thus, residents may be more concerned about school spending than the

[6] COCS studies provide insights on the impact of different land uses on revenues and expenditures of local governments. For more details, see Freedgood (2004).

[7] The findings of COCS studies are consistent with those above showing high community costs associated with residential land use and lower costs associated with commercial and industrial land use. For more examples, see Freedgood (2004).

property tax when commercial/industrial properties contribute to school services fiscal capacity. Also, in this case commercial/industrial firms are more likely to respond to tax policy because they receive less in public services than the tax revenues they generate. Furthermore, Bartik (1991) argues that if the cost function of firms is similar across communities within the region, then property tax differentials could be an important location determinant for businesses, which are assumed to be motivated by profit maximization[8]. Luce (1994) examines the effects of fiscal policy on the location of employment and households simultaneously in the Philadelphia area, using a multiple-equation cross-section model. He finds empirical evidence that school spending is only a significant determinant of household location choices. He also shows that property taxes and local public services affect the location decision of firms, but the effect of the property tax is larger than public services. However, he fails to find an impact of school spending on firm behavior.

Based on this discussion and the previous research presented above, we pose two hypotheses:

H 1: Residential property values are more responsive to changes in school spending than changes in property taxes.

H 2: Business property values are more responsive to changes in property taxes than changes in school spending.

As we describe more fully below, our findings confirm that while residential property values are more responsive to school spending changes than property tax policy changes, business property values are more responsive to changes in property taxes. This study provides new evidence that property values across property classes respond differently to changes in local government policies.

[8] For empirical examples, see Wasylenko, 1980; Charney, 1983; Mcguire, 1985; Bartik, 1989; Papke, 1991.

2-3. Tax Competition – Fiscal Externalities

In the tax competition literature, inefficient location decisions may arise from spillover effects, or "fiscal externalities". To take into account fiscal externalities, we must consider regional competition in our analysis. Spatial econometric approaches have been increasingly applied in the context of local public finance[9], and we draw on this literature to account for the effects of policy changes in competitor (or neighbor) communities on one's own tax base. Several papers use spatial econometric methods to examine the tax base effects of tax rates in the context of tax competition. Defining competitor communities based on geographic proximity such as distance and population size, Brett and Pinkse (2000) failed to find significant effects of tax competition on the tax base. However, Buettner (2003) found that average tax rates in neighboring communities are a significant determinant of the local tax base, but only for small jurisdictions. More recently, Skidmore, *et al.* (2012) use migration patterns to determine regional competitors, finding strong tax competition effects on property value growth. That is, change in both the own and competitor tax rates are significant determinants of own property value growth, holding other factors constant. These findings demonstrate that regional competition may play a vital role for property value growth and a failure to account for competitor community activities could result in biased estimates and misleading inferences. We therefore examine property value responses by property class to changes in tax rates and school spending in the context of regional competition.

3. Data and Descriptive Statistics

To examine the effects of policy changes in property taxes and school spending on the value growth of classes of property, we use data from a panel of 152 communities in the five county

[9] For comprehensive overviews of spatial analysis, see LeSage and Pace (2009) and Brueckner (2003).

region surrounding Detroit over the 1983-2002 period. All variables in the data set are available from United State Census, Michigan Department of Treasury, Michigan Department of Education, and the Federal Bureau of Investigation (Appendix A).

The dependent variables are the values of three different property classifications: residential, commercial, and industrial property, where state equalized valuations (SEV) are used as a proxy for property values.[10] To control for community size, we use population to calculate per capita property values. Across the jurisdictions, residential property accounts for 68 percent of total aggregate SEV on average, whereas business property, (which is composed of both commercial and industrial property) accounts for 18 percent. Two communities, Lake Angelus City and Novi Township, reported business SEV as zero. These communities are very small, each with populations of less than 300. Because these communities are so small and contain no commercial or industrial activity, they are excluded from our sample.[11] We match current year of reported property values with lagged values of the other variables of interest because SEV reflects market values in the previous year. In addition, to account for the full impact of the changes in tax rates and school spending brought on by Proposal A, we define the transition period from 1993 to 1995 because Proposal A was partially implemented in 1994, but did not fully take effect until 1995.

In Michigan, the overall property tax rate[12] consists of three primary components: The county tax rate, the city or township tax rate, and the school tax rate. The same county tax rate is levied on all property within a given county, but other tax rates are determined by cities,

[10] In Michigan, SEV is defined as 50 percent of the estimated market value.

[11] Empirical estimates are similar when we include these communities in the analysis.

[12] This tax rate is the statutory property tax millage rate. One mill is defined as $1 per $1,000 of taxable value. Because statutory property tax rates are twice effective property tax rates for 50 percent of the estimated market value, we use 1/2 of statutory property tax rates as effective property tax rates in our paper.

townships, and school districts.[13] There is substantial variation in property tax rates before and after Proposal A. Prior to Proposal A, the average millage across the region was 29.45 mills. After Proposal A was passed, the average millage decreased by more than 9 mills, but the reductions varied substantially across jurisdictions. Generally, low tax base/high tax rate jurisdictions received a larger tax rate reduction than high tax base/low tax rate jurisdictions. In addition, as a result of Proposal A, principal residence properties are not subject to local school taxes. Thus, residential property tax rates were reduced more than those for commercial or industrial property. Finally, after Proposal A all properties were subject to a new 6 mill statewide education tax. Regardless, all property classifications in all communities experienced a substantial reduction in property tax rates as a result of Proposal A.

Proposal A also resulted in a shift of education finance responsibilities from the local level to state government, and statewide education spending increased (Feldman, *et al.*, 2003). In this new system of school finance, poorer communities experienced significant increases in school funding, whereas wealthy communities were allowed to impose property tax millage rates to maintain their original spending levels. The end result was that the gap in school spending between low and high spending communities was reduced, but the overall level of school spending in the region increased. We use changes in school spending per pupil resulting from Proposal A as a measure of exogenous changes in local public services.

Finally, with regard to the control variables we use the number of crimes per 1,000 to capture temporal unobservable shocks to the quality of living in communities, which may be correlated with tax base. The studies, which examine tax base effects of the (business) property tax, often include the unemployment rate to control for temporal changes to the local economy.

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[13] After 1994, a 6 mill statewide education tax was also imposed.

Unfortunately, this variable is not available for every community for each year we consider in our analysis. In addition, to avoid omitted variable bias we include community fixed effects and community specific time trends. This inclusion controls for unobserved community fixed factors and community specific time varying factors in our empirical specifications.

4. Empirical Model

We estimate the effects of changes in property tax rates and school spending on property value growth for each property class using several specifications. The basic logarithmic specifications are based on a following equation[14]:

$$(1)\ PV_{it}^{j} = X_{it}\beta + [X_{it} - \sum_{j=1}^{N} w_{ij}X_{jt}]\delta + m_i + \theta_i t + t_i + e_{it}, \quad \text{j=1, 2}$$

where PV_{it}^{j} represents the natural logarithm of the per capita property value j (j =1, 2 for residential and business property, respectively) for community i in period t, X_{it} is a vector of variables for community i in period t that includes: the natural logarithm of aggregate effective tax rates of all overlying taxing authorities (municipality or township, school district[15], and county) that apply within the community, the natural logarithm of school spending per pupil, and the natural logarithm of crime rate per 1,000 people, $\sum_{j=1}^{N} \omega_{ij}X_{jt}$ represents the analogous set of variables for competitor communities where competitors are defined by the spatial weighting matrix, described below in equations 5-7 ($w_{ij} = W^{d}[i,j], W^{p}[i,j], or\ W_{t}^{m}[i,j]$), m is a vector of jurisdiction fixed effects, and $\theta_i t$ represents the community-specific time trends for

[14] This is the so-called "Spatially Lagged X Model (SLX)", which is a sub-category of the Spatial Durbin Model (SDM).

[15] School taxes include a six mill State Education Tax following the 1994 reforms and are exempted for residential property.

community i, which account for unobserved community characteristics that may affect property value per capita, and t is a vector of time effects.

In some specifications, we include contemporaneous and (one-, two-, and three-year) lagged values of all policy variables to examine the length of time it takes for the policy changes be fully reflected in property values. It allows us to indicate how long it takes for policy changes to be fully capitalized in the property values. To eliminate unobserved individual effects, we estimate equation (1) using a first-difference (FD) procedure.[16] Also, we employ a cluster approach in which standard errors are clustered at the community level to address temporal autocorrelation.

Simultaneity between tax base and tax rates arises, for example, when a significant decline in the tax base leads to increases in tax rates and/or decreases in school spending. In Michigan, central cities such as Detroit have faced chronic financial challenges because of ongoing population decline. Accordingly, struggling cities must either increase property tax rates in order to maintain previous spending levels or cut spending on schools. In Michigan, the endogeneity problem is exacerbated by another property tax policy, the so-called "Headlee Amendment", which was imposed in 1978.[17] Prior to the imposition of Proposal A in 1994, the Headlee Amendment put a direct limitation on property tax revenue growth. Specifically, the Headlee Amendment restricted property tax revenue growth, adjusted for new construction, to the rate of inflation. Any community with potential revenue increases exceeding the Headlee limit was (and still is) required to reduce property tax rates in order to bring revenues into line with the revenue growth restriction. Feldman, *et al.* (2003) provide the following example to explain how the Headlee Amendment works:

[16] We find positive autocorrelation of error terms.
[17] The Headlee Amendment is named for its author, Richard H. Headlee.

> For example, given an inflation rate in consumer prices of 2.5%, if the tax base increased from $1,000,000 to $1,100,000 (excluding new construction), and if the tax rate were one mill, the millage would have to be reduced to 0.932 so that the yield would be the same as that generated by the one mill on the original tax base adjusted for inflation - $1,025." This automatic tax reduction is referred to as "Headlee Rollback.[18]

Importantly, rapidly rising property values during the period of analysis resulted in numerous Headlee rollbacks. Also, the Headlee Amendment allows property tax rates to increase to match the rate of inflation (without voter approval) when the total tax base growth (excluding new construction) fails to keep up with the rate of inflation (Feldman, *et al.*, 2003). This example clearly illustrates the serious endogeneity problem between the tax base and property tax rates. Note that after the imposition of Proposal A[19], Headlee rollbacks were greatly reduced in both number and magnitude, but he Headlee Amendment still poses an empirical challenge for our analysis. For these reasons, failing to address endogeneity will result in misleading estimates of the effects of property taxes and school spending on property value growth.

To overcome the endogeneity of property taxes and school spending, following Skidmore, *et al.* (2012) we exploit the imposition of Proposal A, which resulted in differential changes in property taxes and school spending across communities in Michigan. Proposal A, authorized by voters in the state in 1994 resulted in: 1) prior to its imposition, local governments relied heavily on property tax revenues to fund k-12 education. As previously discussed, Proposal A resulted in significant changes in property taxes and school spending. Specifically, Proposal A shifted school funding to state government, which was paid for with revenues from sales taxes, cigarette taxes, and a new statewide property value-based six mill state education tax; 2) tax rates were reduced because of the reduction in local school operating millage rates; 3) for

[18] Local residents can choose to exceed the Headlee limitation by referendum, but this has occurred only rarely.

[19] Unlike the Headlee Amendment, Proposal A limits statutory millage rates and imposes a limit on the growth in taxable values.

homeowners, for schools only the six mills state education tax is levied, thereby reducing tax rates even further; and 4) poorer communities received relatively larger tax rate reductions and greater funding for school spending relative to wealthier communities. These exogenous changes in the taxes and school spending resulting from Proposal A enable us to identify causal relationships between policy changes and property value growth.

In this context, we use the change in the natural logarithm of the tax rate and the change in the natural logarithm of per pupil spending resulting from the imposition of Proposal A as the two key identifying instruments. To explore lagged effects of property taxes and school spending, we included one-, two- and three-year lagged of the logarithms of tax rates and spending in equation (1). Since we also treat both logarithms of tax rates lagged one-, two-, and three-year (τ_{t-1}, τ_{t-2}, and τ_{t-3}) and the logarithms of per pupil spending lagged one-, two-, and three-year (S_{t-1}, S_{t-2}, and S_{t-3}) as potentially endogenous, we use one-, two-, and three-year lagged *changes* in the logarithms of tax rates and per pupil spending resulting from Proposal A as additional instruments, respectively.[20] In the tax competition estimates, we transform these instruments in a way that is analogous to the method we used to transform the other explanatory variables.

To address regional competition, we considered three approaches for determining competitors. Traditional methods for defining competitor communities are based on information on distance and population. In addition to these traditional approaches, like Skidmore, *et al.* (2012), we use another approach that is based on intra-regional migration patterns. We therefore consider three definitions of competitors: Distance, population, and migration:

[20] To further improve the efficiency of the instrumental variables technique, we added property tax and school spending 5-years lagged to the set of instrumental variables for the current property tax and school spending, respectively.

(2) Distance (four nearest) competitors: community j is a competitor of i if it is one of the four closest jurisdictions to community i.

(3) Population competitors: community j is a competitor of i if it is one of the four closest in population size to community i.

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(4) Migration competitors: community j is a competitor of i if many who had previously lived in a community i migrated to community j.

To calculate average competitor variables, we need to use an appropriate weighting matrix. Each weighting matrix, corresponding to the three competitor definitions as described above, is based on the following:

(5) $W^d[i,j] = I^d[i,j]\frac{1}{\sum_j I^d[i,j]}$

(6) $W^p[i,j] = I^p[i,j]\frac{1}{\sum_j I^p[i,j]}$

(7) $W_t^m[i,j] = Out-migrants_t\ [i,j]\frac{1}{\sum_j Out-migrants_t\ [i,j]}$

where $I^d[i,j]$is an indicator variable, which takes the value of 1 if a community j is a "distance competitor" of i and 0 otherwise, $I^p[i,j]$is an indicator variable, which takes the value of 1 if a community j is a "population competitor" of i and 0 otherwise, and $Out-migrants_t\ [i,j]$ is out-migrants per capita from a community i to a community j, which is a "migration competitor".

To determine competitor communities based on intra-regional migration patterns, we need data on out-migrants at the community level, including information on where out-migrants moved. If such data were available, then we could calculate "competitor" variables as weighted averages using the ratio of out-migrants to total out-migrants who moved to a community in all "competitor" communities. These data are not available, however, and hence must be estimated. Following the procedure of Skidmore, *et al*. (2012), this estimation was achieved by multiplying

out-migrants at the county level by the ratio of in-migrants to total in-migrants at the community level[21]:

(8) $Out - Migrants_{ij} = (Out - Migrants_j) \times (In - MigrantsRatio_{ij})$

where each i, and j represents community and county, respectively.

To illustrate more concretely, assume that 1,000 people move from Wayne to Macomb County. Let us further suppose that there are a total of 2,000 in-migrants to Macomb County from elsewhere in the United States. If there were 100 in-migrants to Clinton Township (Clinton Township is located in Macomb County), the ratio of in-migrants to total in-migrants would be 0.05 (=100/2,000). To estimate out-migrants at the community level, we multiplied total out-migrants by the ratio of in-migrants to total in-migrants for all communities. To obtain the estimated number of out-migrants from Wayne County to the Township of Clinton, we multiplied 1,000 by 0.05 for an estimate of 50 out-migrants. We used this method to calculate the out-migrants to other counties in the region for each community in our sample. We then transformed all our variables using the ratio between the estimated number of out-migrants at the community level and total out-migrants summed over all "competitor" communities. From this ratio, we generated weighted averages for "competitor" variables. A more detailed explanation of the methods used to determine the competitors weighted average is provided in Appendix B[22]. We acknowledge that because of data limitations on migration activity, we can only generate an

[21] Data on in-migration is accessible at the subdivision level, but unfortunately these data do not indicate specifically from where the in-migrants came. However, we have data on out-migration at the county level that includes information on where out-migrants moved. Given these data limitations, we assume that cities and townships within a given county have the same out-migration as the county as a whole. Also, since Census data sources do not provide data on out-migrants who moved within the same county, to overcome this limitation, we further assume that in our sample, 24.9 percent of county population moved from one community to another within the same county, based on national Census data on out-migration (Schachter, *et al.*, 2003). To control for community size, population inflow and outflow are divided by community population to calculate the per capita inflows and outflows. For more details, see Skidmore, *et al*. (2012).

[22] This is taken from the explanation of the weighting scheme based on "migration patterns" in Skidmore, *et al.* (2012).

approximation of competitor communities. However, as we demonstrate in our analysis, our approach seems to perform better than the approaches typically used in the literature, at least in the context of Southeast Michigan.

Though Proposal A changed property taxes and school spending across all communities, the magnitudes of changes were different. Thus, a community's ***relative*** fiscal position is very important when estimating the effects of policy changes on property value growth. For example, if the property tax reductions in competitor communities are larger than the reduction in the own property tax rate, then the effect of the own tax reduction may not be significant. Therefore, following Skidmore, *et al* (2012), in order to examine regional competition effects, we use the ***relative changes*** in property taxes and school spending between one's own community and competitor communities, illustrated as follows:

(9) $NPT = log(Own\ Property\ Tax) - log(Competitor\ Property\ Taxes)$

(10) $NS = log(School\ Spending) - log(Competitor\ School\ Spending)$

(11) $NC = log(Crime\ Rates) - log(Competitor\ Crime\ Rates)$

Equations (9), (10), and (11) indicate that changes in property taxes, school spending, and crime rates ***relative to*** competitors, respectively.[23] If competition is important for property value growth, then the sign of coefficients on *NPT, NS,* and *NC* can be expected to be positive, negative and positive, respectively.

5. Empirical Results

To examine the property value effects of changes in property tax rates and school spending, we estimate equation (1) using a first-difference approach for each of the three classes of property.

[23] As noted in our discussion of equation 1, all variables including those illustrated by equations 2-a, 2-b, and 2-c are first-differenced.

Because of possible endogeneity, we use an instrumental variable technique using the instrumental variables discussed above. Appendices C and D display the first stage regression results, showing that instrumental variables are strong predictors of endogenous variables. Also, the Sargon-Hansen test for Overidentifying Restrictions shows that the instrumental variables are valid for all sets of regressions. Also, we employ a cluster approach in which standard errors are clustered at the community level to address temporal autocorrelation. Before turning to a discussion of the results, one final estimation issue requires attention. One may think that residential and business property values are related and therefore should be estimated as a system of equations. For example, it is reasonable to consider the use of a simultaneous equation model (SEM) to estimate key parameters in our two equations. However, as discussed in Wooldridge (2010, pp. 239-241), because each equation contains identical explanatory variables joint estimation as a system does not provide efficiency gains. For this reason, we estimate the two regressions separately.

Regression results are presented in Tables 3 and 4. In each table, the first two columns present results from specifications that ignore competitor community activities for the purpose of comparison. Columns 3-5 of each table present regression results in which competitor policy variables are included. In addition, columns 6-8 display regressions that allow lagged effects of the policy variables.

In all tables, regional competition is best explained when "competitors" are based on migration flow information: 1) The degree of the impacts of property taxes are larger; and 2) the results show much clearer effects of school spending and school spending *relative to* competitors on one's own property value growth. These findings show that how competitors are defined is

important, and is consistent with the finding of Skidmore, *et al.* (2012) that intra-regional migration patterns are an effective approach for identifying competitors.

Consider first the residential property estimates presented in Table 3. In columns 1-2, property taxes have significant effects on residential property value growth. In column 2, we also find evidence that the initial impact of changes in property taxes on residential property values is negative and statistically significant, but the impacts dissipate after about two years. However, in these regressions school spending changes are not a significant determinant of residential property value growth. In columns 3-8, we present the estimates that take into account regional competition. Because the results improve considerably when migration flow information is used to determine competitors, we focus on columns 3 and 6. In column 3, the coefficient on the property tax variable is much larger as compared to that displayed in columns 1 and 2. In addition, unlike columns 1-2, school spending now shows a significant effect on residential property value growth. The coefficient on the school spending variable is also larger than the coefficient for property tax. This initial set of estimates suggest that: 1) Failing to account for competition effects biases the estimates toward zero; and that 2) the elasticity of property values with respect to property taxes is much smaller than school spending. In other words, resident property values are more responsive to changes in school spending than changes in property tax rates.

The regression presented in column 6 includes current and lagged own and competitor policy variables. Here, the initial impact of tax policy changes is significant, but this impact dissipates over time, though the sign of the coefficients on three-year lagged property taxes is unexpectedly positive. We also find school spending to be a significant factor for residential property value growth. Similar to the tax rate effects on property value growth, the initial impact

of school spending changes tends to diminish over time. For the long run effects, holding other factors constant, a 10 percent tax reduction and a 10 percent school spending increase will increase property values by 4.1 and 14.0 percent, respectively. These results suggest that it takes about three years for the policy changes to fully generate residential tax base responses. These estimates also show that school spending is a much more important than tax rate changes to residential property value growth. Further, when we take into account regional tax competition, the net effects of tax policy changes depend on one's standing relative to competitors. For example, holding competitor tax rates constant, a tax reduction improves one's own community's relative tax position as compared to competitor communities, thereby further increasing tax base growth; our estimates suggest that a 10 percent tax reduction further increases property value growth by 3.3 percent when we consider tax competition effects. However, in this case, if competitor communities reduce tax rates, then the own community's relative tax position worsens, thus the net effects of a tax reduction in the own community become smaller. In all specifications, competitor crime rates have no significant effect on residential property value growth.

Turning to Table 4, consider the results for business property. Columns 1-2 show no statistically significant relationship between property tax rates and commercial property value growth. Also, school spending is not a significant factor. However, these estimates may be biased because specifications do not account for competitor community activities. In column 3, even though we account for regional competition, property tax is still not a significant factor in business property value growth. School spending shows a positive but insignificant effect. In addition, competitor tax has only marginally significant effects on one's own business property value growth and competitor school spending does not have a significant effect. However, once

we take into account both competitor activities as well as lagged effects of the policy variables, we find property tax rates to be a significant factor for business property value growth, though the initial impact of tax policy changes is only marginally significant. In the long run, the effects of tax changes reach a peak two years after policy changes and then dissipate in subsequent years. The long run tax elasticity of business property is -1.64. Moreover, this long run property tax elasticity is much larger than that of residential property. Interestingly, we do not find statistically significant business property value effects of school spending. In summary, business property values are more sensitive to changes in tax policy than residential property values, and property tax rates are much more important than school spending for business property value growth. We also find strong regional competition effects for business property value growth.

6. Conclusion and Policy Implications

We estimate the effects of changes in tax rates and school spending on the value growth of different types of property. Although it is true that changes in tax rates and school spending are capitalized into property values, we show that the degree of capitalization differs across property classes. Based on this analysis, we conclude the following:

- Property taxation shows significant effects on property value growth for both residential and business property.
- Residential property values are more sensitive to school spending changes than tax policy changes.
- Business property values are more sensitive to tax policy changes than school spending changes.
- Business property values are more sensitive to changes in property taxes relative to residential property values.

- Changes in competitor community property taxes and school spending play an important role in one's own property value growth. That is, we present new evidence of fiscal externalities.

The degree of this fiscal externality is much larger for business property value growth indicating that business property is more responsive to competitor tax policy changes than residential property. Our findings confirm the two hypotheses we propose regarding property value effects of property tax rates and school spending. With regard to regional competition, we find strong significant effects of competitor property tax rates (and/or school spending) on own property value growth. Specifically, our findings show that policy changes in neighboring communities (the competition) cause fiscal externalities to one's own community. Therefore, consideration of one's relative fiscal position vis-à-vis competitors within the region is a key issue.

Our paper contributes to the extensive literature on the property value effects of fiscal policy changes. The large body of empirical literature on the effects of fiscal policy changes on property values focuses primarily on residential property rather than business property. However, it is important to consider the effects of local policies on different property classes. We show that residents and businesses have different policy needs/preferences and thus there are tradeoffs between property taxes and school spending for each class of property: 1) property taxes and school spending are important factors for residential property value growth; the long run elasticity of residential property values with respect to property taxes and school spending is -0.41 and 1.40, respectively; and 2) the long run property tax elasticity of business property values is -1.64. These results imply that if a community raises property tax rates to increase school spending, then business property value growth is likely to be slowed. On the other hand, this policy is more likely to benefit current and potential new residents because of increased

school spending. If a community lowers property tax rates in order to increase business property value growth, then school spending could be curtailed[24], thereby inhibiting residential property value growth. More generally, these estimates can be used to guide local policy makers to meet their economic development objectives, whether it be greater residential property value growth or further business development. Communities with differing proportions of residential versus business tax bases may well come to different conclusions about their taxing and spending balances.

There are caveats that should be noted. Specifically, this research has not considered spending for other public services beyond schools. Other work has indicated positive correlations between spending for local services such as parks and recreation and public safety and local economic health (Reese and Ye, 2011). Thus, reductions in property taxes may also limit the ability of local governments to provide a broader array of services important to both residential and commercial interests. In addition, changes in tax rates and school spending may have impacts beyond the property value effects we identify, including employment opportunities, standard of living, and quality of life.[25] All of these factors should be considered as policy makers ponder the tradeoffs between taxing and spending.

[24] In Michigan, although major funding sources for public schools are shifted to state revenues by Proposal A, the funding from the state is only for school operation, not for capital investments. Thus, property tax revenues are still an important source for public school.

[25] Some of these effects are arguably captured in changes in property values, however.

Table 1. Summary Statistics and Variable Definitions

Variables	Obs.	Mean	Std. Dev.	Definition
Dependent Variable				
Residential Property Values	2,888	17,944	1,7029	1/2 of Estimated Residential Market Value per Capita
Commercial/Industrial Property Values	2,850	4,770	5,902	1/2 of Estimated Commercial/Industrial Market Value per Capita
Own Policy Variables				
Residential Property Tax	2,888	21.96	10.13	1/2 of Residential Property Tax Rates Per $1,000 of Taxable Value
Non-Residential Property Tax	2,888	25.44	7.19	1/2 of Non-Residential Property Tax Rates Per $1,000 of Taxable Value
School Spending	2,888	5,340	1,867	General Fund School Expenditures per Pupil
Crime Rates	2,888	38.51	58.72	Uniform Crime Index per 1,000 Capita
Competitor Policy Variables				
Migration Competitor Variables				
Residential Property Tax	2,888	20.91	8.90	Competitor Residential Property Tax Rates
Non-Residential Property Tax	2,888	24.10	5.30	Competitor Non-Residential Property Tax Rates
School Spending	2,888	5,150	1,668	Competitor General Fund School Expenditures per Pupil
Crime Rates	2,888	26.28	8.30	Competitor Uniform Crime Index
Distance Competitor Variables				
Residential Property Tax	2,888	22.13	9.70	Competitor Residential Property Tax Rates
Non-Residential Property Tax	2,888	25.55	6.33	Competitor Non-Residential Property Tax Rates
School Spending	2,888	5,322	1,759	Competitor General Fund School Expenditures per Pupil
Crime Rates	2,888	36.48	28.62	Competitor Uniform Crime Index
Population Competitor Variables				
Residential Property Tax	2,888	21.89	9.28	Competitor Residential Property Tax Rates
Non-Residential Property Tax	2,888	25.34	5.69	Competitor Non-Residential Property Tax Rates
School Spending	2,888	5,316	1,707	Competitor General Fund School Expenditures per Pupil
Crime Rates	2,888	39.31	31.01	Competitor Uniform Crime Index

Table 2. Summary Statistics Pre- and Post-Proposal A

Variables	Obs.	Mean	Std. Dev.	Obs.	Mean	Std. Dev.
	Before Proposal A			**After Proposal A**		
Dependent Variable						
Residential Property Values	1,672	11,702	9,496	1,216	2,6527	20,920
Commercial/Industrial Property Values	1,650	3,738	5,057	1,200	6,188	6,643
Own Policy Variable						
Residential Property Tax	1,672	29.45	5.38	1,216	11.67	4.57
Non-Residential Property Tax	1,672	29.45	5.38	1,216	19.93	5.52
School Spending	1,672	4,099	1,163	1,216	7,047	1,177
Competitor Policy Variable						
Migration Competitor						
Residential Property Tax	1,672	28.32	1.96	1,216	10.71	1.81
Non-Residential Property Tax	1,672	28.32	1.96	1,216	18.29	1.75
School Spending	1,672	3,885	780	1,216	6,890	738
Distance Competitor						
Residential Property Tax	1,672	29.67	4.15	1,216	11.75	3.68
Non-Residential Property Tax	1,672	29.67	4.15	1,216	19.89	4.00
School Spending	1,672	4,094	1,025	1,216	7,012	986
Population Competitor						
Residential Property Tax	1,672	29.39	3.05	1,216	11.56	2.75
Non-Residential Property Tax	1,672	29.39	3.05	1,216	19.78	3.28
School Spending	1,672	4,088	957	1,216	7,003	863

Table 3. First Difference Results – Dependent Variable: Δ Log Residential Property Values

Specification	(1) FD 2SLS	(2) FD 2SLS	(3) FD 2SLS	(4) FD 2SLS	(5) FD 2SLS	**(6) FD 2SLS**	(7) FD 2SLS	(8) FD 2SLS
Include Competitor Variables	No	No	Yes	Yes	Yes	**Yes**	Yes	Yes
The Types of Competitors	–	–	Migration Comp.	Distance Comp.	Population Comp.	**Migration Comp.**	Distance Comp.	Population Comp.
Own Community Variables								
Δ Log Property Tax	-0.077***	-0.087***	-0.279***	-0.133***	-0.066*	**-0.298*** **	-0.143***	-0.090**
	(0.019)	(0.021)	(0.040)	(0.022)	(0.034)	**(0.042)**	(0.026)	(0.039)
Δ Log Property Tax_{t-1}		-0.041***				**-0.093** **	-0.069***	-0.064***
		(0.012)				**(0.041)**	(0.015)	(0.025)
Δ Log Property Tax_{t-2}		-0.024*				**-0.140*** **	-0.059***	-0.043
		(0.013)				**(0.044)**	(0.018)	(0.027)
Δ Log Property Tax_{t-3}		0.003				**0.113** **	-0.007	-0.042**
		(0.013)				**(0.044)**	(0.016)	(0.021)
Δ Log School Spending	-0.008	-0.048	0.764***	0.026	0.030	**0.803*** **	-0.101	-0.022
	(0.076)	(0.094)	(0.180)	(0.102)	(0.144)	**(0.204)**	(0.131)	(0.165)
Δ Log School Spending $_{t-1}$		0.048				**0.482*** **	0.073	0.068
		(0.070)				**(0.180)**	(0.086)	(0.139)
Δ Log School Spending $_{t-2}$		0.013				**-0.178**	-0.013	0.072
		(0.051)				**(0.193)**	(0.077)	(0.141)
Δ Log School Spending $_{t-3}$		0.087				**0.294** **	0.187***	0.013
		(0.057)				**(0.148)**	(0.068)	(0.102)
Δ Log Crime rates	0.002	0.003	0.004	0.001	0.0003	**0.009**	0.002	0.001
	(0.002)	(0.002)	(0.007)	(0.002)	(0.002)	**(0.008)**	(0.003)	(0.002)

(*continued*)

Compeitor Community Variables								
Δ Log Property Tax			0.228***	0.109***	-0.012	**0.238*** **	0.122***	0.004
			(0.046)	(0.030)	(0.037)	**(0.048)**	(0.033)	(0.040)
Δ Log Property Tax$_{t-1}$						**0.064**	0.069***	0.028
						(0.043)	(0.021)	(0.024)
Δ Log Property Tax$_{t-2}$						**0.127*** **	0.060***	0.028
						(0.044)	(0.022)	(0.024)
Δ Log Property Tax$_{t-3}$						**-0.104** **	0.016	0.053**
						(0.049)	(0.025)	(0.021)
Δ Log School Spending			-0.781***	-0.038	-0.039	**-0.875*** **	0.055	-0.018
			(0.183)	(0.132)	(0.123)	**(0.187)**	(0.138)	(0.145)
Δ Log School Spending $_{t-1}$						**-0.437*** **	-0.009	-0.014
						(0.169)	(0.105)	(0.117)
Δ Log School Spending $_{t-2}$						**0.166**	0.073	-0.059
						(0.188)	(0.099)	(0.127)
Δ Log School Spending $_{t-3}$						**-0.216**	-0.218**	0.064
						(0.152)	(0.086)	(0.084)
Δ Log Crime rates			-0.003	0.001	0.002	**-0.007**	0.001	0.002
			(0.006)	(0.001)	(0.001)	**(0.008)**	(0.001)	(0.001)
N	1,976	1,520	1,976	1,976	1,976	**1,520**	1,520	1,520

Notes:
1. All regressions include a series of time indicator variables and individual-specific time trend variables.
2. Robust cluster standard errors in parentheses
3. Property Tax indicates the residential property tax.
4. * significant at 10%; ** significant at 5%; *** significant at 1%

Table 4. First Difference Results – Dependent Variable: Δ Log Commercial/Industrial Property Values

Specification	(1) FD 2SLS	(2) FD 2SLS	(3) FD 2SLS	(4) FD 2SLS	(5) FD 2SLS	**(6) FD 2SLS**	(7) FD 2SLS	(8) FD 2SLS
Include Competitor Variables	No	No	Yes	Yes	Yes	**Yes**	Yes	Yes
The Types of Competitors	–	–	Migration Comp.	Distance Comp.	Population Comp.	**Migration Comp.**	Distance Comp.	Population Comp.
Own Community Variables								
Δ Log Property Tax	0.020	0.052	-0.236	0.003	0.020	-0.356*	0.038	0.020
	(0.056)	(0.059)	(0.177)	(0.093)	(0.115)	(0.189)	(0.097)	(0.119)
Δ Log Property Tax_{t-1}		0.050				-0.529***	0.014	0.055
		(0.039)				(0.184)	(0.059)	(0.084)
Δ Log Property Tax_{t-2}		-0.005				-0.751***	0.064	0.039
		(0.087)				(0.188)	(0.090)	(0.077)
Δ Log Property Tax_{t-3}		0.055				0.036	0.126*	0.173**
		(0.051)				(0.216)	(0.072)	(0.087)
Δ Log School Spending	0.189	0.218	0.474	0.136	-0.163	0.636	0.123	-0.184
	(0.233)	(0.242)	(0.372)	(0.266)	(0.361)	(0.407)	(0.276)	(0.429)
Δ Log School Spending $_{t-1}$		0.026				0.458	-0.060	0.164
		(0.104)				(0.319)	(0.155)	(0.340)
Δ Log School Spending $_{t-2}$		-0.070				0.323	0.078	0.319
		(0.114)				(0.399)	(0.142)	(0.532)
Δ Log School Spending $_{t-3}$		0.154				-0.153	0.200	0.203
		(0.105)				(0.286)	(0.140)	(0.275)
Δ Log Crime rates	0.006*	0.006	0.015	0.003	-0.003	0.011	0.004	-0.004
	(0.003)	(0.004)	(0.013)	(0.004)	(0.003)	(0.016)	(0.005)	(0.004)

(*continued*)

Compeitor Community Variables								
Δ Log Property Tax			0.262*	0.039	-0.002	0.404**	0.042	0.028
			(0.158)	(0.091)	(0.093)	(0.179)	(0.097)	(0.100)
Δ Log Property Tax$_{t-1}$						0.582***	0.055	-0.010
						(0.182)	(0.065)	(0.074)
Δ Log Property Tax$_{t-2}$						0.759***	-0.121	-0.054
						(0.187)	(0.093)	(0.120)
Δ Log Property Tax$_{t-3}$						0.023	-0.120	-0.131*
						(0.222)	(0.086)	(0.075)
Δ Log School Spending			-0.316	0.117	0.326	-0.469	0.125	0.378
			(0.441)	(0.197)	(0.252)	(0.452)	(0.190)	(0.312)
Δ Log School Spending $_{t-1}$						-0.442	0.190	-0.124
						(0.324)	(0.199)	(0.302)
Δ Log School Spending $_{t-2}$						-0.347	-0.226	-0.413
						(0.457)	(0.220)	(0.491)
Δ Log School Spending $_{t-3}$						0.310	-0.117	-0.024
						(0.267)	(0.207)	(0.230)
Δ Log Crime rates			-0.010	0.003	0.010***	-0.005	0.002	0.012***
			(0.013)	(0.002)	(0.002)	(0.016)	(0.003)	(0.003)
N	1,950	1,500	1,950	1,950	1,950	1,500	1,500	1,500

Notes:
1. All regressions include a series of time indicator variables and individual-specific time trend variables.
2. Robust cluster standard errors in parentheses
3. Property Tax indicates the non-residential property tax.
4. * significant at 10%; ** significant at 5%; *** significant at 1%

Appendix A: Variable Sources

Variables	Sources	Links
Residential, Commercial, and Industrial State Equalized Valuation (SEV)	Michigan Department of Treasury	http://www.michigan.gov/treasury/0,1607,7-121-1751_2228_21957_45818---,00.html
Residential, Commercial, and Industrial Property Taxes	Michigan Department of Treasury	http://www.michigan.gov/taxes/0,1607,7-238-43535_43925-57815--,00.html
Uniform Crime Index (UCI)	Federal Bureau of Investigation U.S. Department of Justice	http://www.fbi.gov/ucr/ucr.htm http://magic.msu.edu/record=b4975507~S39a
General Fund Expenditure per pupil (GFEP)	Michigan Department of Education	http://www.michigan.gov/mde/0,1607,7-140-6530_6605-21514--,00.html
Population	U.S. Census Bureau Michigan Government	http://www.census.gov/popest/datasets.html http://www.michigan.gov/documents/MCD1960-1990C_33608_7.pdf

Appendix B: Determining the Weighted Average of "Competitor" Characteristics – Migration Competitors

(This appendix is reported here for the referees, but is not intended to be included in the final publication.)

To generate the "competitor" variables, there are five steps. In the following equations, each i, j, and t represents community, county and year, respectively[26].

Step 1: For controlling community size, in-migrants and out-migrants per capita are calculated.

$$(1)\ \text{In}-\text{migrants}_{ij}^{t} = \frac{\text{In-migrants}_{ij}}{\text{Population}_{ij}^{t}}$$

$$(2)\ \text{Out}-\text{migrants}_{ij}^{t} = \frac{\text{Out-migrants}_{ij}}{\text{Population}_{ij}^{t}}$$

Step 2: Obtain the in-migrants ratio with county in-migrants data.

$$(3)\ \text{In}-\text{migrants Ratio}_{ij}^{t} = \frac{\text{In}-\text{migrants}_{ij}^{t}}{\sum_{i}(\text{In}-\text{migrants}_{ij}^{t})}$$

Step 3: Using out-migrants at the county level and in-migrants ratio (3), the out-migrants at the community level are calculated. Since data on out-migrants who moved from one community to another within the same county is not available from Census sources, I use a proxy for the number of out-migrants moving from one community to another within the same county. From national Census data, 24.9 percent of the population aged 5 years and older in 1995 moved to another community within same county. Following Schachter, et al (2003), I use the 24.9 percent figure as an estimate for within county migration activity.

[26] Our data is based on all 152 communities in the five county region surrounding Detroit (Macomb, Monroe, Oakland, Washtenaw, and Wayne counties) over the 1983-2002 period.

(4) $\text{Out}-\text{migrants}_{ij}^{t} = (\text{Out}-\text{migrants}_{j}^{t}) \times (\text{In}-\text{migrants Ratio}_{ij}^{t})$

Step 4: With out-migrants (4), calculate the ratio between out-migrants (4) and total-migrants in all "competitor" counties.

(5) $$\text{Out}-\text{migrants Ratio}_{i}^{t} = \frac{\text{Out}-\text{migrants}_{ij}^{t}}{\sum_{j}\sum_{i}(\text{Out}-\text{migrants}_{ij}^{t})}$$

Step 5: By multiplying the estimated out-migrants ratio by key values and then summing up weighted key values, the "competitor" variables are generated. (5)

(6) $$\textit{Competitor}\ \text{Property Taxes}^{t} = \sum_{j}\sum_{i}[(\text{Property Taxes}_{ij}^{t}) \times (\text{Out}-\text{migrants Ratio}_{ij}^{t})]$$

(7) $$\textit{Competitor}\ \text{School Spending}_{ij}^{t} = \sum_{j}\sum_{i}[(\text{School Spending}_{ij}^{t}) \times (\text{Out}-\text{migrants Ratio}_{ij}^{t})]$$

(8) $$\textit{Competitor}\ \text{Crime rates}_{ij}^{t} = \sum_{j}\sum_{i}[(\text{Crime rates}_{ij}^{t}) \times (\text{Out}-\text{migrants Ratio}_{ij}^{t})]$$

Appendix C. First Stage IV Results from Column 3 in Table 3

Specification	(2-1) FD 2SLS	(2-2) FD 2SLS	(2-3) FD 2SLS	(2-4) FD 2SLS
Dependent Variables	Δ Log Property Tax	Δ Log School Spending	Δ Log Comp. Property Tax	Δ Log Comp. School Spending
Include Competitor Variables	Yes	Yes	Yes	Yes
Own Community Variables				
Δ Log Changes in Property Tax due to Proposal A	0.994***	0.017**	-0.028**	0.004
	(0.010)	(0.007)	(0.011)	(0.007)
Δ Log Property Tax t-5	0.057	0.060**	-0.035	0.055**
	(0.077)	(0.024)	(0.079)	(0.024)
Δ Log Changes in School Spending due to Proposal A	-0.029	1.103***	-0.018	0.055*
	(0.041)	(0.029)	(0.044)	(0.030)
Δ Log School Spending t-5	0.152**	-0.032	-0.069	-0.071
	(0.067)	(0.044)	(0.069)	(0.046)
Δ Log Crime rates	0.008	-0.002	0.009	-0.001
	(0.007)	(0.006)	(0.008)	(0.006)
Competitor Community Variables				
Δ Log Changes in Property Tax due to Proposal A	0.023**	-0.014*	1.038***	-0.005
	(0.012)	(0.008)	(0.013)	(0.009)
Δ Log Property Tax t-5	-0.041	-0.025	0.044	-0.026
	(0.072)	(0.036)	(0.073)	(0.035)
Δ Log Changes in School Spending due to Proposal A	0.050	-0.090***	0.049	0.956***
	(0.041)	(0.028)	(0.042)	(0.028)
Δ Log School Spending t-5	-0.098*	0.064	0.111*	0.095*
	(0.058)	(0.047)	(0.061)	(0.049)
Δ Log Crime rates	-0.006	-0.001	-0.007	-0.003
	(0.007)	(0.005)	(0.008)	(0.005)
N	1,976	1,976	1,976	1,976

Notes:
1. All regressions include a series of time indicator variables and individual-specific time trend variables.
2. Robust cluster standard errors in parentheses
3. Property Tax indicates the residential property tax.
4. Competitor variables are based on "migration competitors".
5. * significant at 10%; ** significant at 5%; *** significant at 1%

Appendix D. First Stage IV Results from Column 3 in Table 4

Specification	(2-1) FD 2SLS	(2-2) FD 2SLS	(2-3) FD 2SLS	(2-4) FD 2SLS
Dependent Variables	Δ Log Property Tax	Δ Log School Spending	Δ Log Comp. Property Tax	Δ Log Comp. School Spending
Include Competitor Variables	Yes	Yes	Yes	Yes
Own Community Variables				
Δ Log Changes in Property Tax due to Proposal A	1.027***	0.018	-0.077***	-0.023
	(0.020)	(0.020)	(0.020)	(0.020)
Δ Log Property Tax t-5	-0.213***	0.186***	0.165***	0.165***
	(0.051)	(0.047)	(0.061)	(0.050)
Δ Log Changes in School Spending due to Proposal A	-0.029	1.124***	0.050	0.078**
	(0.031)	(0.031)	(0.033)	(0.031)
Δ Log School Spending t-5	0.118***	-0.025	-0.088*	-0.069
	(0.043)	(0.044)	(0.049)	(0.045)
Δ Log Crime rates	-0.002	-0.003	-0.001	-0.002
	(0.005)	(0.006)	(0.006)	(0.006)
Competitor Community Variables				
Δ Log Changes in Property Tax due to Proposal A	-0.006	-0.012	1.091***	0.026
	(0.020)	(0.019)	(0.020)	(0.020)
Δ Log Property Tax t-5	0.201***	-0.147**	-0.196***	-0.133**
	(0.053)	(0.057)	(0.063)	(0.059)
Δ Log Changes in School Spending due to Proposal A	0.037	-0.109***	-0.041	0.937***
	(0.029)	(0.030)	(0.032)	(0.030)
Δ Log School Spending t-5	-0.078*	0.060	0.117**	0.096**
	(0.043)	(0.047)	(0.048)	(0.048)
Δ Log Crime rates	0.004	-0.0004	0.004	-0.001
	(0.005)	(0.005)	(0.006)	(0.005)
N	1,950	1,950	1,950	1,950

Notes:
1. All regressions include a series of time indicator variables and individual-specific time trend variables.
2. Robust cluster standard errors in parentheses
3. Property Tax indicates the non-residential property tax.
4. Competitor variables are based on "migration competitors".
5. * significant at 10%; ** significant at 5%; *** significant at 1%

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