REGIONAL COMPETITION IN PROPERTY TAXES, SCHOOL SPENDING, AND TAX ABATEMENTS

By

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ABSTRACT

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In this dissertation, I examine the effects of changes in property tax rates, school spending, and tax abatements on residential, commercial, and industrial property value growth in Southeast Michigan using data for all 152 communities in the five counties surrounding Detroit over the years 1983 through 2002. This is a period during which state government mandated major changes to school finance. The major contribution of this research is to provide new insights about the differential effects of policy changes on property classes. A key challenge in this work is to properly address the potential endogenous relationship between policy changes and property value growth. In this regard, my strategy is to consider the time period immediately before and after the imposition of Proposal A, which resulted in significant differential changes to both property tax rates and school spending for all communities in the state. In addition, I use spatial econometric techniques to account for potential fiscal spillover effects of competitor policy changes on one's own property value growth. In this analysis, I find that: 1) residential property values are more responsive to school spending changes than property tax rate changes; 2) commercial and industrial property values are more responsive to tax rate changes than school spending changes; 3) commercial and industrial property values are more responsive to changes in tax rates than are residential properties; and 4) regional competition plays an important role in property value growth in the Southeast Michigan region.

I also examine the degree to which the use of industrial property tax abatements spurs property value growth in the same region surrounding Detroit. My findings show that: 1)

localities that offer tax abatements yield statistically significant positive impacts on industrial property value growth; 2) the impacts are larger in high tax than in low tax communities; 3) there are positive spillover effects of tax abatements on residential and commercial property value growth; 4) the fiscal benefits to local government of tax abatements are much smaller than the cost of offering tax abatements; 5) this conclusion is remains intact even when I consider spillover benefits of the tax abatements; and 6) tax abatements offered in competitor communities do not appear to influence own industrial or other property value growth.

To my wife and son,

Shinhye Choi and Joshua Jiho Kang,

and my parents,

Sangwon Kang and Sunja Kim

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CHAPTER 1

Introduction

In 1994, Michigan voters approved Proposal A, which resulted in major changes in education finance. This reform reduced property tax rates for K-12 education and shifted funding sources to state government revenues from sales taxes, cigarette taxes, and a new statewide property value-based six mill state education tax. Also, under this reform, tax rate reductions and school spending increases were most dramatic in communities with the lowest tax bases, whereas the changes were much more modest for wealthier communities. Proposal A was designed to reduce the gap in school spending between poor and wealthy communities while reducing reliance on local property taxes to fund K-12 education. As I discuss in detail later, the exogenous changes in tax rates and school spending, resulting from the imposition of Proposal A, play an important role to identify causal relationships between policy changes and property value growth. In addition, I consider tax competition because if policy changes in competitor communities affect one's own property value growth, then a failure to account for competitor activities results in biased estimates and potentially misleading inference.

My primary interest in this dissertation is to measure the effects of property taxes, school spending, and tax abatements on residential, commercial, and industrial property value growth, using data from a panel of 152 communities in the five counties (Macomb, Monroe, Oakland, Washtenaw, and Wayne County) surrounding Detroit, Michigan between 1983 and 2002. To accomplish this, it is important to address two empirical challenges. First, I must appropriately address endogeneity of property taxes and school spending because simultaneity may lead to bias. To address endogeneity, I follow Skidmore, *et al.* (2012) and use exogenous changes in property tax rates and school spending imposed by Proposal A. The statewide imposition of Proposal A allows me to use an instrumental variable approach while at the same time take into consideration dynamic and spatial elements to explore relationships between the policy changes and property value growth. In addition, the granting of industrial tax abatements is also potentially endogenously determined. To explore the possibility of the endogeniety of tax abatements, I use as an instrument a variable that measures the city mayor and township supervisor election cycles. However, I find no evidence of endogeneity and thus treat tax abatement variables as exogenous. To account for community specific time varying unobserved fixed factors that could affect policy changes and property value growth, I include community-specific time trends in the empirical specifications.

Given that the region I examine contains many communities that compete with each other, it is important to consider appropriate ways to define and control for competitor/neighbor communities in my evaluation. In traditional studies, contiguity and population are often used to define *neighbors or competitors*. However, as noted by Case, *et al.* (1993), geographic proximity may not reflect economic closeness. Brett and Pinkse (2000) define *population neighbors* to characterize economic closeness. However, in the context of regional competition, actual *competitor* communities may differ from *neighbors* as defined by contiguity or population in that potential movers care about the tax-service packages offered in potential new communities, as described by Tiebout (1956). That is, competitor communities can potentially be revealed by the migration patterns of movers within the region (Skidmore, *et al.*, 2012). Following Skidmore, *et al.* (2012), I use a measure of "competitor communities" based on regional migration flow data. As discussed in detail later, I consider three types of competitors (*distance, population, and* *migration competitors*) where each type of competitor is defined using distance, population, and migration flow information, respectively.

Using the regional competition framework, I find the following: 1) Residential property values are more responsive to school spending changes than property tax rate changes; 2) commercial and industrial property values are more responsive to tax rate changes than school spending changes; 3) commercial and industrial property values are more sensitive to changes in tax rates than are residential properties; 4) tax abatements have statistically significant effects on industrial property value growth and their effects are larger in the high than the low tax communities; 5) there are positive spillover effects of industrial tax abatements on residential and commercial property value growth; 6) the local government fiscal benefits of tax abatements are quite small as compared with the costs of offering tax abatements even when I include the spillover benefits to residential and commercial properties; and 7) regional competition plays an important role for property value growth; that is, changes in property tax rates/school spending relative to competitor communities within the same region have significant impacts on one's own property value growth.

The remaining portions of this dissertation are organized as follows. The next chapter provides a brief literature review of the most relevant research. In chapter 3, I provide context by discussing the most relevant portions of the somewhat convoluted Michigan property tax history, highlighting major changes in property tax policy. In addition, Industrial Facilities Tax (IFT) abatement program in Michigan is described in detail in this chapter. Chapter 4 provides estimates of the effects of property tax rates, school spending, and tax abatements on the value growth of different types of property: Residential, commercial, and industrial property. Finally, chapter 5 concludes with a summary of my main findings and policy implications.

CHAPTER 2

Property Tax and Tax Abatement: A Review of Theory and Empirical Studies

2.1 Property Taxation

For decades, the property tax and the optimal provision of public goods have been the subjects of 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?[1] 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,[2] 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 variations 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.

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

[2] 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.

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). As I will discuss in detail in the next section, in this so-called capital tax view, tax competition is 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 to gain locational advantages, thereby resulting in a lower level of provision of local public services (Oates, 1972; Hoyt, 1991a; 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.

2.2.1 Tax Competition – Fiscal Externality

A wide variety of public finance studies analyze provision of public goods. Samuelson (1954) formally showed that public goods are optimally provided when the sum of marginal benefits ($MB = \sum_{i=1}^{N} MB_i$) to individuals from public goods equal marginal costs (MC) of providing public goods. This condition came to be called the Samuelson condition (or the Samuelson rule). However, he pointed out that no price mechanism exists to optimally provide public goods because individuals can consume them at no costs. This is often referred to as "free-rider" problem.

A prospective about the optimal provision of public goods came from Tiebout (1956). He argued that if a resident is mobile, he reveals his preferences about policy packages by choosing a community in which to live and local governments compete with one another for mobile residents through their own policy packages. He argued that this competition among local governments overcomes the free rider problem. However, according to Wilson's (1999) review article, a tax increase in one region creates a positive externality for other regions under the assumption of a fixed supply total capital stock because capital tends to flow to regions that have relatively lower tax rates. In this case, an efficient outcome cannot be achieved because local governments do not take account of this externality when they set property tax rates. This type of externality is often referred to as "fiscal externalities" (Wildasin, 1986, 1989). In a general model, tax competition can lead to lower tax rates and under-provision of public goods. In other words, the tax and spending policies that each local government chooses can affect the allocation of a mobile tax base among communities. This implies that government officials develop their own jurisdiction through inducing residents, firms, and capital to move in by manipulating strategic variables such as taxes and/or spending on public services. This framework also suggests that changes in tax and spending policies are to some degree influenced by competitor communities, and thus policy changes in competitor communities are not necessarily exogenous to own community policy changes. Oates (1972) supported this argument that tax competition results in providing public goods at a level below the optimal level. Hoyt (1991b) also showed that 1) changes in the tax rates distort the flow of capital among the jurisdictions and therefore the tax rates and public services are set at levels below the optimal level; and 2) this wasteful tax competition is aggravated as the number of jurisdictions, involved in tax competition, increases. This framework suggests that policy changes in competitor communities are not necessarily exogenous to one's own community policy changes.

In recent years, researchers have increasingly recognized that taking into account neighboring competitor activities is important to identify and to measure strategic interactions among communities in policy implementation.[3] In much of this work, rather than attempt to explicitly identify and account for neighbor activities, researchers make assumptions on which neighbors are potentially most important (contiguous neighbors for example) and develop a spatial weighting matrix to address spatial dependence via spatial autoregressive models. Anselin (1988), LeSage and Pace (2009) and Brueckner (2003) provide a comprehensive overview of the models and empirical studies that examine the strategic interactions between local governments using explicit spatial econometric techniques.

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) fail to find significant effects of tax competition on the tax base. Buettner (2003) finds that average tax rates in

[3] See Besley and Case (1995), Brett and Pinkse (2000), Buettner (2003), and Gérard et al., (2010) as examples.

neighboring communities are a significant determinant of the local tax base, but only for small jurisdictions. However, using a new approach that exploits migration patterns to determine regional competitors, Skidmore, *et al.* (2012) find strong tax competition effects on property value growth. That is, change in both the own and competitor tax rates are substantial determinants of own property value growth, holding other factors constant. In this dissertation, to examine regional competition effects, following Skidmore, *et al.* (2012), I define three types of competitors: *distance, population, and migration competitors*. My findings in this analysis are consistent of Skidmore, *et al.* (2012): 1) Migration appears to be better to explain regional competiton effects; and 2) using migration patterns to account for competitor activities, I find strong fiscal externalities indicating that regional competition plays a vital role for property value growth.

2.2 Tax Abatements

In reviewing the literature on tax abatements, it is clear that there is an ongoing debate over the effectiveness of (temporal) tax incentives for local development. Proponents of tax incentives argue that property taxes (or business taxes) have a negative influence on firm location decisions and employment (Bartik, 1989; Charney, 1983; Mcguire, 1985; Papke, 1991; Wasylenko, 1980). These studies suggest that tax abatements may attract new firms and/or to retain existing firms. In addition, some studies suggest that tax abatements are relatively more effective in struggling cities such as Detroit. Bartik (1991, 1994) argues that since the benefits of additional job growth may be much greater in high than low unemployment communities, redistributing jobs from low unemployment communities to high unemployment communities is not a zero-sum game for the region as a whole. This conjecture is empirically tested by Goss and

Phillips (1999). Using detailed data on Nebraska's tax incentive program, Goss and Phillips (1999) find evidence that business tax incentives are important determinants for economic growth, but this evidence is true only for low-unemployment counties. Although Goss and Phillips (1999) fail to find support the argument put forth by Bartik (1991, 1994), they show business incentives can have a positive influence on economic growth.

Opponents of tax abatement policies contend that taxes have a relatively small marginal (or no significant) impact on firm location decisions and thus on economic activity in a state and metropolitan region (Stephen, *et al.*, 1994; Wolkoff, 1985). Wassmer (2007) argues that although taxes could have a negative impact on firms, the response to tax abatements could be different than the response to a tax. In the context of tax competition, Bartik (1992) points out that if tax incentives in a given community tend to be matched by other communities within a given metropolitan region, then the benefits from tax incentives are more likely to be reduced. Further, Wassmer (2009) argues that due to the relatively low appeal of high tax communities, tax incentives could be more effective when used there, but this is likely to be true only if neighbor communities do not offer abatements.

The existing empirical literature offers somewhat mixed results, but most research focusing on Southeast Michigan, finds tax incentives to be generally ineffective. Wassmer (1994) fails to find evidence that property tax abatements stimulate economic development in the region. Wassmer and Anderson (2001) also find that manufacturing property tax abatements had a positive effect on property values, but only for the first three years following the adoption of the abatement legislation in 1974; manufacturing tax abatements have significant negative effects on economic activities after 1987. Based on these findings, they argue that industrial tax abatements are effective only for a short-time period because copycat behaviors among communities are more likely to happen in later periods. Using the duration model, Anderson and Wassmer (1995) also offer evidence of competition phenomena among communities; the rate of tax abatement adoption rises over time. These empirical findings suggest three important implications: 1) If one community in a metropolitan area offers tax abatements and others do not, I can expect significant effects of tax abatements on business activity, 2) there is evidence of mimicking behavior in the offering of tax abatements, and 3) mimicking behaviors of local governments for tax abatement policy reduce tax abatement effectiveness.

While these studies discuss the role of competition, they do not empirically account for the effects of competitor policy changes on a given community's economic development. To isolate the effects of own tax abatements on industrial property value growth, it is important to account for other influences, including the fiscal activities of competitor governments. Failing to account for competitor fiscal activities could lead to biased and misleading results.

With regard to the effects of tax abatements on industrial property value growth, in this study, I address the following questions in the context of Southeast Michigan:

- Do tax abatements promote industrial property value growth?
- Do tax abatements in competitor communities affect own industrial property value growth? That is, is there a fiscal externality caused by tax abatements?
- Are property tax rates a significant determinant for industrial property value growth?
- Does tax competition play an important role for own industrial property value growth?

In the next section, I provide a theoretical overview of how fiscal activities of local governments influence firm location decisions and discuss why officials might choose to use tax abatements to promote economic development.

2.2.1 Firm Location

The Tiebout model has been modified and reapplied in various studies in the tax competition literature. In the context of the present study, one important modification is an extension of the model from mobile households to mobile firms. In particular, Fischel (1975), White (1975), and Wellisch (2000) explored the linkages between firm location decisions and the optimal provision of local public services. They argue that local services are optimally provided if firms pay property tax rates equal to the marginal costs of the local services they receive and physical externalities, such as pollution, caused by firms. This argument implies that, similar to the original Tiebout hypothesis, competition among local governments for mobile firms results in an optimal level of public goods with no added costs associated with firm location behavior.

Others have noted the potential for harm associated with competition spillover effects, which are often referred to as fiscal externalities (Wildasin, 1989; Hoyt, 1991a; Wilson and Wildasin, 2004). For example, suppose property tax rates in a community are cut such that they are below average among communities. In this case, the reduction results in an inflow of capital from higher tax communities. This capital inflow is the fiscal externality, implying that local governments may have an incentive to offer too many tax abatements, which can result in inefficiently low property tax rates driven by a desire to attract and/or retain business. Unless local governments internalize this fiscal externality, local government competition leads to an under provision of local public goods. Of course, the degree of inefficiency depends on degree of firm mobility; higher mobility leads to greater fiscal externalities.

If mobile firms respond to changes in property taxation, tax abatements could play a significant role in attracting new firms, retaining existing firms and encouraging them to reinvestment in a given community. With the aim of promoting local economic growth in Michigan, hundreds of millions of dollars in property tax revenues are forgone through the offering of tax abatements each year. While tax abatements have been used extensively, they can only be justified if firms generate fiscal benefits that outweigh the forgone revenues from tax abatements.[4] Also, in the context of competition, tax abatements are inefficient if they distort capital flows—this is the result if local governments fail to take into account the fiscal externalities associated with use of tax abatements.

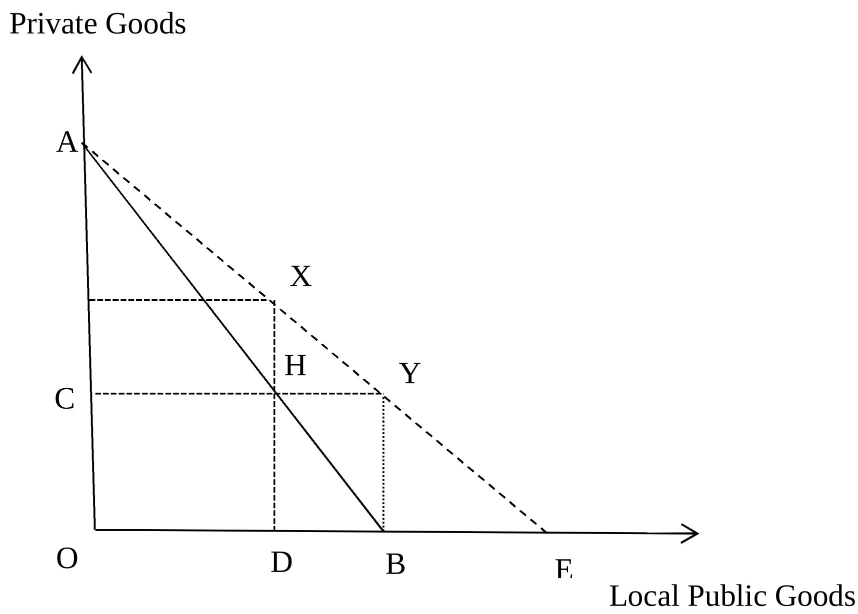
To assess the effectiveness of tax abatements, the core questions are: 1) do industrial firms generate significant fiscal benefits; and 2) do tax abatements result in fiscal externalities? With regard to fiscal benefits, Fischel (1987) offers a clear explanation of how they could be generated by a new plant or the rehabilitation of an old plant. Consider Figure 2.1, which is taken from Fischel (1987, pp.307). Initially, I consider a case with no tax abatement and no physical externality such as pollution. In Figure 2.1, a representative voter perceives the budget line AB between private goods (assumed to be "before-tax" income) and local public goods, where the initial equilibrium point is H. A representative voter pays AC in (property) taxes to receive OD in local public goods. Suppose that industrial property is rehabilitated or improved by new construction and the assessed value of property increases, which in turn results in additional property tax revenues. In this scenario, the voter faces the new budget line AE; as compared to point H, any point between X and Y makes the voter better off because the voter receives a *fiscal benefit* via a reduction in property tax rates, an increase in local public services, or both.

[4] In this case, fiscal benefits can be considered as local revenues, generated by firms, in excess of the costs of local public services they consume.

In this context, consider tax abatements like the IFT abatement program where property tax rates are cut in half for new industrial facilities and the assessed value is frozen on qualifying property. Also, assume the tax abatement is in effect for the specified time period. If firms make investments in industrial property in response to the tax abatement, the available local revenues are reduced as compared with the case where firms do the same without tax abatements. However, after tax abatements expire, if firms remain in a community, then the assessed values are reset based on *true market value* and therefore fiscal benefits in the later periods are significant. However, there are several scenarios where firms will generate lower or no fiscal benefits in the tax abatement program scenario: 1) New development or the rehabilitation of an existing site may require additional local public services such as road maintenance and police/fire protection; 2) firms may leave the community or go bankrupt prior to the expiration date of the abatement; or 3) tax abatements result in inefficient regional competition. In these scenarios, use of tax abatements could be ineffective and inefficient.

In the next chapter, I offer a detailed description of important features of property tax system, which will help to lay out the empirical challenges, and the IFT abatement program in Michigan.

Figure 2.1 Fiscal Benefits from Industrial Property



CHAPTER 3

Property Tax and the IFT Abatement Program in Michigan

3.1 A History of the Property Tax in Michigan

To fully inform my empirical strategy and analysis, it is important to understand the recent history of the property tax in Michigan. In particular, I discuss two key policy changes: the Headlee Amendment and Proposal A. Prior to the implementation of Proposal A, property tax revenues were limited by the "Headlee Amendment," which was passed in 1978.[5] That is, the Headlee Amendment restricts property tax revenue growth to the rate of inflation (with an adjustment for new construction). Any jurisdiction with potential revenue increases exceeding the Headlee limit is required to reduce property tax rates to bring revenues into line with the revenue growth restriction. This type of tax rate reduction is known as a "Headlee rollback." [6] Feldman, *et al.* (2003) provide the following example to explain how the Headlee Amendment works:

> "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."

Before the introduction of the taxable value cap, rapidly rising property values resulted in numerous Headlee rollbacks. After Proposal A, however, rollbacks were greatly reduced in both number and magnitude. Thus, after 1978 and before 1994 (Proposal A), the Headlee Amendment

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[5] The Headlee Amendment is named for its author, Richard H. Headlee.

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

provided a mechanism for limiting property tax rates in a uniform manner across all properties in a jurisdiction. Proposal A effectively instituted a new system for limiting effective property tax rates, but the mechanism did not treat all properties in a jurisdiction uniformly.

I would like to emphasize several features of Proposal A: 1) A residential property (and a qualified agricultural property) was entitled to exemptions from local school operating taxes[7]; 2) the sales tax and cigarette tax were increased and a new statewide property value-based six mill state education tax was imposed; and 3) unlike the Headlee Amendment, a cap on property value assessment growth was imposed.[8] These features imply the following:

- While overall property tax rates were reduced, the homestead exemption meant that the residential property tax rate was reduced more so than the commercial/industrial property tax rate.
- After the imposition of Proposal A, the funding for public schools shifted from local governments to the state. Further, local governments' control over property taxes was reduced.
- Poorer communities received relatively larger tax reductions and greater funding for local school operating costs from the state as compared to wealthy communities.
- During periods of rapidly rising home values, the assessment cap creates the gap between state equalized valuation (SEV), which is the 50% of the estimated market value, and taxable valuation (TV). Under the assessment growth cap, assessments are readjusted

[7] This is commonly known as the "Homestead Exemption."

[8] As long on as a homeowner does not sell his/her home the assessed value is only allowed to growth at the rate of inflation or 5%, whichever is lower. The taxable value cap is often referred to as an assessment growth limit.

based on the market value (that is, SEV equals TV) only when properties are sold. This implies that there are significant differentials in property taxes between old residents and new residents (Skidmore, *et al*., 2010). Under the assessment growth cap, the gap between SEV and TV for commercial and industrial property is smaller than that for residential property (Feldman, *et al.*, 2002).

- Both the number and size of Headlee Rollbacks were reduced because of the imposition of Proposal A, but rollbacks still occurred during the periods of rising property values.

With this overview of the Michigan property tax I highlight two important issues. First, 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 to maintain previous spending levels or cut spending on schools. In Michigan, the endogeneity problem is exacerbated by the Headlee Amendment. Thus, in my study, endogeneity is of a paramount concern. Second, as in Skidmore, *et al.* (2012), changes ushered in by Proposal A enable me to identify the causal effects of changing tax rates and school spending on residential and business property value growth. Importantly, these changes were exogenous for all communities because a statewide referenda process was forced on voters by the legislature.

3.2 Michigan's IFT Abatement Program

During the 20th century, Michigan's economy was driven largely by manufacturing, and in particular the auto industry was a dominant factor. Despite the relative prosperity associated with the strong manufacturing base, there were also disadvantages associated with a heavy reliance on manufacturing that emerged as manufacturing became a globally competitive industry (Bartik, *et al.*, 2003; Reese and Sands, 2012). First, central cities in Michigan suffered an ongoing population loss, resulting in a declining property tax base. As the property tax base eroded, local government officials increased property tax rates and/or decreased local public services. State and local officials understood that the relatively high and growing property tax rates in some cities could serve as an impediment to industrial development. In addition, wages of manufacturing workers were much higher than those in nearby states and states in the south. In addition, national economic recessions affected Michigan more than other states less dependent on manufacturing. For example, during the double dip recession in the 1980s, many older manufacturing facilities were closed and unemployment increased significantly (Block and Belman, 2003).

In an effort to improve the business environment, state and local governments in Michigan adopted various types of tax abatements and incentives: Industrial Property Tax Abatements, Renaissance Zones, Neighbor Enterprise Zones, and the Michigan Economic Growth Authority (Reese and Sands, 2012). One of the more popular tax incentive programs has been the *Industrial Facilities Tax* (IFT) abatement program, often referred to as Public Act 198 (PA 198). The IFT abatement program was designed to encourage industrial firms to make investments resulting in job creation and retention. For example, in 1973 the Chrysler Corporation wanted to rehabilitate the dilapidated Mack Street Stamping Plant.[9] However, Chrysler officers argued that the company would not be able to rehabilitate the plant without tax abatements, emphasizing that there were 5,000 jobs at stake. As a response to the request, local officials in Detroit lobbied state officials for introduction of the industrial property tax abatement

[9] This example is taken from Anderson and Wassmer (2000).

law, *Public Act 198*. This proposal was authorized by state authorities to begin in 1974 and Detroit city government was able to grant the tax abatement to the Chrysler Corporation. Since the IFT abatement program was adopted, many other local governments in Michigan have also used the IFT program to reduce property taxes for eligible manufacturing firms in an effort to promote economic development. According to Bartik, *et al.* (2003), this program represents the largest single use of incentives to promote economic development in Michigan.

To grant an IFT abatement, a local government must first establish a plant rehabilitation district, an industrial development district, or both. However, to qualify for establishing a district, property taxes levied should be at least 30 mills. Once a district is established, an eligible industrial firm can request tax abatements. To obtain tax abatements, the firm promises to make the investment, creates new jobs and/or retains existing jobs in the community. After a request is made by a firm, local government officials must decide whether or not to approve an application within sixty days. Finally, once local leaders approve the application, state government must approve the application prior to construction or installation of equipment.

An IFT abatement can apply to real and industrial/non-industrial personal property of manufacturing firms such as buildings, building improvements, machinery and equipment. The length of each tax abatement certificate is a maximum of twelve years from the completion date of the facility. Once the tax abatement expires, any buildings, improvements, or machinery/equipment become fully taxable. Thus, after tax abatement expiration, local governments can begin collecting more tax revenues as a result of new investments, but in reality, this does not always occur.

Figure 3.1 shows the number of tax abatements granted in Southeast Michigan over the period 1974 through 2010. In the 1980s, the use of tax abatements increased, peaking in 1986.

Since then, there has been a general decline in the use of tax abatements. Despite the recent decline, more than fifty tax abatement certificates have been granted every year since 1978 in this region. With regard to the decline in the use of abatements, Reese, *et al.* (2009) conducted a survey of city officials, finding that the main reason for the decline was that requests from firms dropped over the period. In particular, during an economic downturn, firms are not able to invest in new development/redevelopment, and this reality in turn leads to a reduction in abatement requests. This implies that the decision to offer tax abatements is not the result of the policy per se; rather, market conditions are crucial for demand on the part of firms for tax abatements.

As shown in Figure 3.1, the use of tax abatements tends to decrease during periods of recession. On the other hand, it may be that local policy makers decide not to offer tax abatements because they think that the abatement program is both costly and ineffective. However, this is in generally not the case at least in Michigan (Reese, *et al.*, 2009).

As shown in Figure 3.2, most communities issued less than twenty five IFT certificates in total over the period of analysis. In general, communities were cautious with extending IFT abatements. However, as shown in Figure 3.2, the following communities issued a high number of abatements: Clinton Township, Detroit, Fraser, Sterling Heights, and Chesterfield Township. In addition, as shown in Table 3.1, the number of communities that had never granted tax abatements decreased over time.

Figure 3.1 Number of Tax Abatements Granted. For interpretation of the references to color in this and all other figures, the reader is referred to the electronic version of this dissertation.

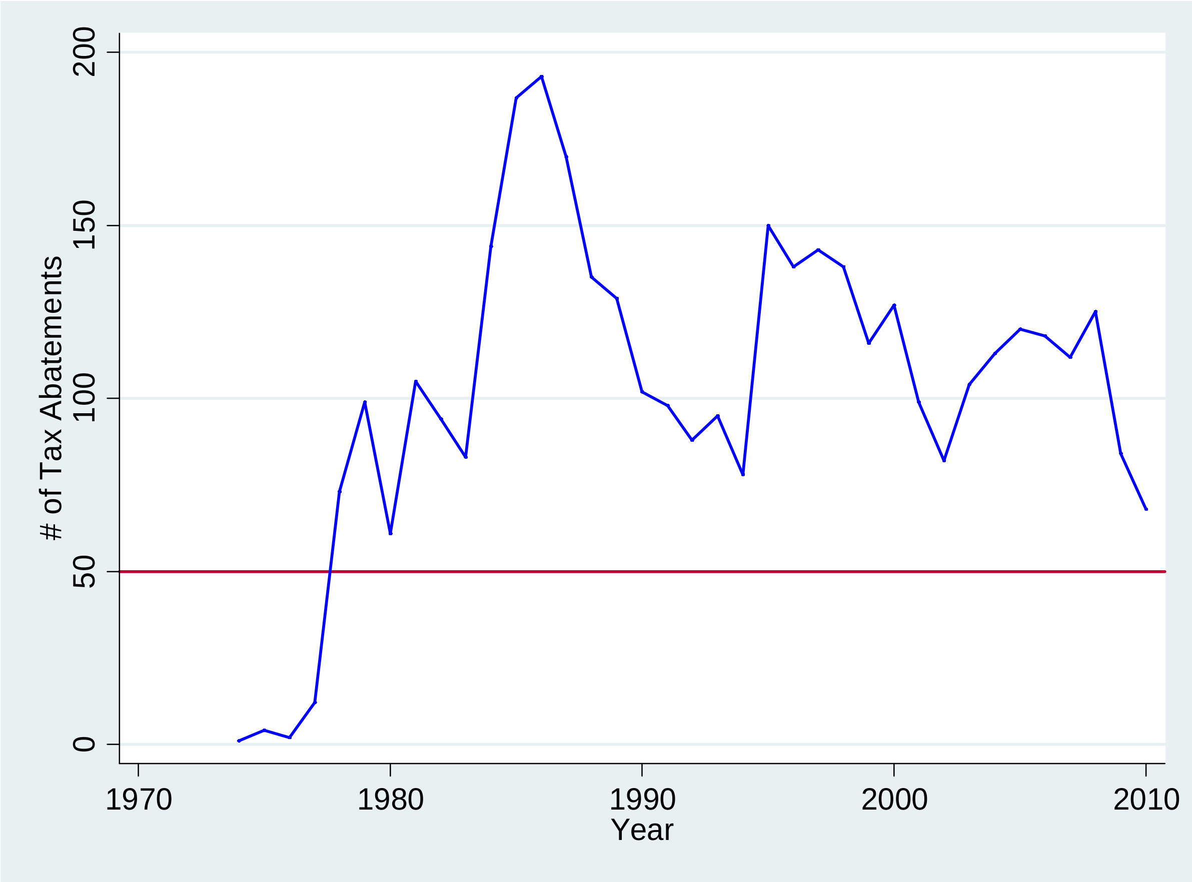

Figure 3.2 Total Number of Tax Abatements Granted: 1983-2002. Each dot represents a community.

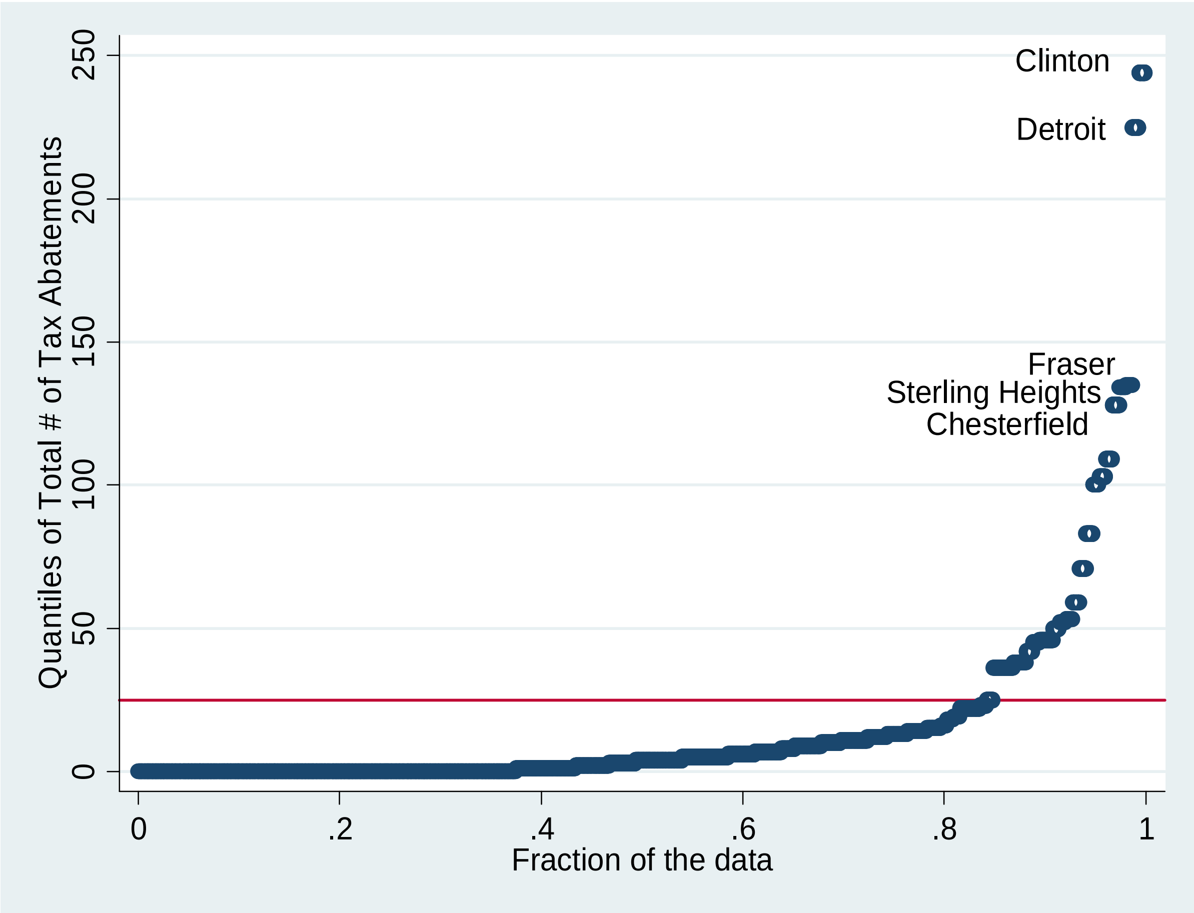

Table 3.1 The Percentage of Communities Never Giving A Tax Abatement

Year	Community (%)
1983	58
1987	43
1991	41
1998	35
2002	34

CHAPTER 4

The Effects of Changes in Property Tax Rates, School Spending, and Tax Abatements on Residential, Commercial, and Industrial Property Value growth

4.1 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 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) was being 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[10] (see for example, Bradbury et al., 2001; Brueckner, 1982, 1979; 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

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

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 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 my knowledge, such an examination has not been the focus of existing research. The main purpose of this chapter 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 I 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, I focus on the three primary property classifications: Residential, commercial and industrial.[11] As I 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. The work in this chapter extends Skidmore, *et al.* (2012) that examine how changing taxes and school spending affects overall property value growth in Southeast Michigan. The focus of the present work is to determine the degree to which residential, commercial, and

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

industrial property values respond differently to changes in property tax rates and school spending.

To estimate the effects of changing tax rates and school spending on property value growth, I must take into account the endogeneity of property tax rates and school spending decisions. Following Skidmore, *et al.* (2012), the 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 approval.[12] 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, the former received relatively more funding from the state. As discussed in detail later, these exogenous changes in tax rates and per pupil school spending for public schools across communities enable me to identify causal relationships between policy changes and property value growth of different property classes.

In the analysis, I also take 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, I estimate the property value effects of tax rates and school spending in the context of tax competition.

[12] 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.

The analysis offered here reveals the following: 1) Residential property values are more responsive to school spending changes than property tax rate changes; 2) commercial and industrial property values are more responsive to tax rate changes than school spending changes; 3) commercial and industrial 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.

Another interest of this chapter is to examine the effectiveness of tax abatements in Michigan. To do so, there are several issues that must be discussed. First, as I mentioned in chapter 3, industrial facilities tax (IFT) abatements are mainly targeted at industrial facilities. This suggests that that IFT abatements benefit only industrial firms. From the perspective of local government, to justify IFT abatement program, the fiscal benefits of tax abatements must offset their costs, which are the foregone tax revenues. Thus, to examine whether tax abatements are effective, I should compare net present value of the stream of property tax revenue of firms who receive tax abatements with foregone tax revenues resulting from granting abatements. Further, if the fiscal benefits are substantial and local governments can lower the tax rates and/or improve local public services to create favorable tax/spending environment for residents/commercial firms, then it is possible for tax abatements to create spillover effects on residential/commercial property values. Thus, in this chapter, I also examine the effects of tax abatements on residential and commercial property value growth. This study reveals several findings: 1) Localities that offer tax abatements yield statistically significant positive impacts on industrial property value growth; 2) these impacts are larger in high tax than in low tax communities; 3) the benefits of tax abatements are much smaller than the cost of offering tax abatements; that is, tax abatements are cost-ineffective; 4) there are positive spillover effects of tax abatements on residential and commercial property value growth, but tax abatements are still cost-ineffective even when the spillover benefits are considered; and 5) tax abatements offered in competitor communities do not appear to affect the own industrial property value growth.

4.2 Residential, Commercial and Industrial 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 chapter, I seek to measure the degree to which policy changes result in different rates of capitalization across residential, commercial and industrial property classes.

According to 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 (commercial and industrial 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[13] 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.[14] 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 property tax when commercial/industrial properties contribute to school service 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.[15] 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-sectional 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

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

[14] 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).

[15] For empirical examples, see Wasylenko (1980), Charney (1983), Mcguire (1985), Bartik (1989), Papke (1991).

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, I pose two hypotheses:

H1: Residential property values are more responsive to changes in school spending than changes in property taxes.

H2: Commercial and Industrial property values are more responsive to changes in property taxes than changes in school spending.

As I describe more fully below, the 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.

4.3 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, I use data from a panel of 152 communities in the five county region surrounding Detroit over the 1983-2002 period. All variables in the data set are available from United State Census Bureau, Michigan Department of Treasury, Michigan Department of Education, and the Federal Bureau of Investigation (Table 4.A.1 in APPENDIX 4.A).

The dependent variables are the values of three different property classifications: residential, commercial, and industrial property, where state equalized valuations (SEV) [16] are

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

used as a proxy for property values.[17] 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. With regard to industrial property, nine percent of the observations for industrial property values are truncated at zero. To account for the corner solution nature of industrial property values, in the framework of fixed effects and endogenous effects of fiscal policy, I might have used a Tobit model to estimate the effects of tax abatements on industrial property value growth. However, the Tobit specification does not provide qualitatively similar results in comparison with those from the core specifications. It may be that decisions regarding whether to permit industrial firms at all verses how much industrial activity is allowed are not the same. For example, industrial firms often generate negative externalities for residents such as pollution and congestion. This externality can inhibit industrial firms from moving into a community. In such a case, the Tobit model generates biased estimates and thus is not appropriate (Cragg, 1971).

Following Skidmore, *et al.* (2012), I 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, I define the transition period from 1993 to 1995 because Proposal A was partially implemented in 1994, but did not fully take effect until 1995.

The control variables I use are property tax rates, school spending, tax abatements and crime rates in Michigan. Summary statistics are reported in Tables 4.1 and 4.2.

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[17] I note that SEV captures both price responses (capitalization) and quantity responses (the number of houses/businesses) to the impacts of changes in fiscal policies. The focus of this chapter is to examine differential responses of residential, commercial and industrial property value growth to fiscal policy changes, so it does not consider the quantity and price responses separately. However, I note that this is an important topic for future research.

Table 4.1 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 Property Values	2,888	2,869	3,406	1/2 of Estimated Commercial Market Value per Capita
Industrial Property Values	2,888	1,838	4,474	1/2 of Estimated Industrial Market Value per Capita
Own Policy Variables				
G_IFT	2,888	0.474	1.098	The Number of Granted Tax Abatements Per 1,000 Population
E_IFT	2,888	0.167	0.597	The Number of Expired Tax Abatements Per 1,000 Population
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				
CG_IFT	2,888	0.291	0.156	The Number of Granted Tax Abatements Per 1,000 Population
CE_IFT	2,888	0.827	0.090	The Number of Expired Tax Abatements Per 1,000 Population
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

Table 4.1 (cont'd)

Variables	Obs.	Mean	Std. Dev.	Definition
Distance Competitor Variables				
CG_IFT	2,888	0.498	0.689	The Number of Granted Tax Abatements Per 1,000 Population
CE_IFT	2,888	0.177	0.392	The Number of Expired Tax Abatements Per 1,000 Population
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				
CG_IFT	2,888	0.481	0.564	The Number of Granted Tax Abatements Per 1,000 Population
CE_IFT	2,888	0.173	0.334	The Number of Expired Tax Abatements Per 1,000 Population
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 4.2 Summary Statistics Pre- and Post-Proposal A for Key Variables

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	26,527	20,920
Commercial Property Values	1,672	2,157	2,402	1,216	3,847	4,240
Industrial Property Values	1,672	1,531	4,288	1,216	2,260	4,687
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 Variables						
Migration Comp.						
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 Comp.						
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 Comp.						
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

With regard to property tax rates, in Michigan, the overall property tax rate[18] 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, townships, and school districts.[19] As discussed in earlier, 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 nine 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 six 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

[18] 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, I use 1/2 of statutory property tax rates as effective property tax rates in this chapter.

[19] After 1994, a six mill statewide education tax was also imposed.

between low and high spending communities was reduced, but the overall level of school spending in the region increased. I use changes in school spending per pupil resulting from Proposal A as a measure of exogenous changes in local public services.

The next key control variable is the number of tax abatements offered in each year (the number of IFT certificates) over the period 1983 through 2002. There are four issues that warrant discussion here. First, to control for community size, tax abatements are standardized by population size. Standardization is important because the number of tax abatements is likely to be greater in communities with larger populations. For example, as shown in Figure 4.1, the total number of tax abatements for the period 1983 to 2002 is greater in Detroit, which is the most populated city in the region. However, as shown in Figure 4.2, once I standardize by population, I see that Detroit offers relatively few tax abatements. Second, I use the first differenced cumulative number of tax abatements to capture effects over time. Next, whereas tax abatements benefits are targeted at industrial firms, it is possible for such abatements to create spillover effects on residential/commercial property values if a development project receiving tax abatements generates enough fiscal benefits to attract new residents/commercial firms and/or increase the value of existing firms. Thus, I also measure the effects of abatements on residential and commercial property values. Finally, I must also take into account the (cumulative) effects of *expired tax abatements* because: 1) tax abatements may have an impact on industrial property value growth after they expire; and 2) a new tax abatement is sometimes granted immediately following the expiration of an existing abatement such that the granting and expiration of abatements may be correlated. This means that a failure to control for expirations may result in omitted variable bias. To fully assess the effectiveness of tax abatements and to avoid the omitted variable bias, I, therefore, include a variable for the cumulative number of expired tax abatements in all specifications.

Figure 4.1 Total Number of Tax Abatements Granted: 1983-2002

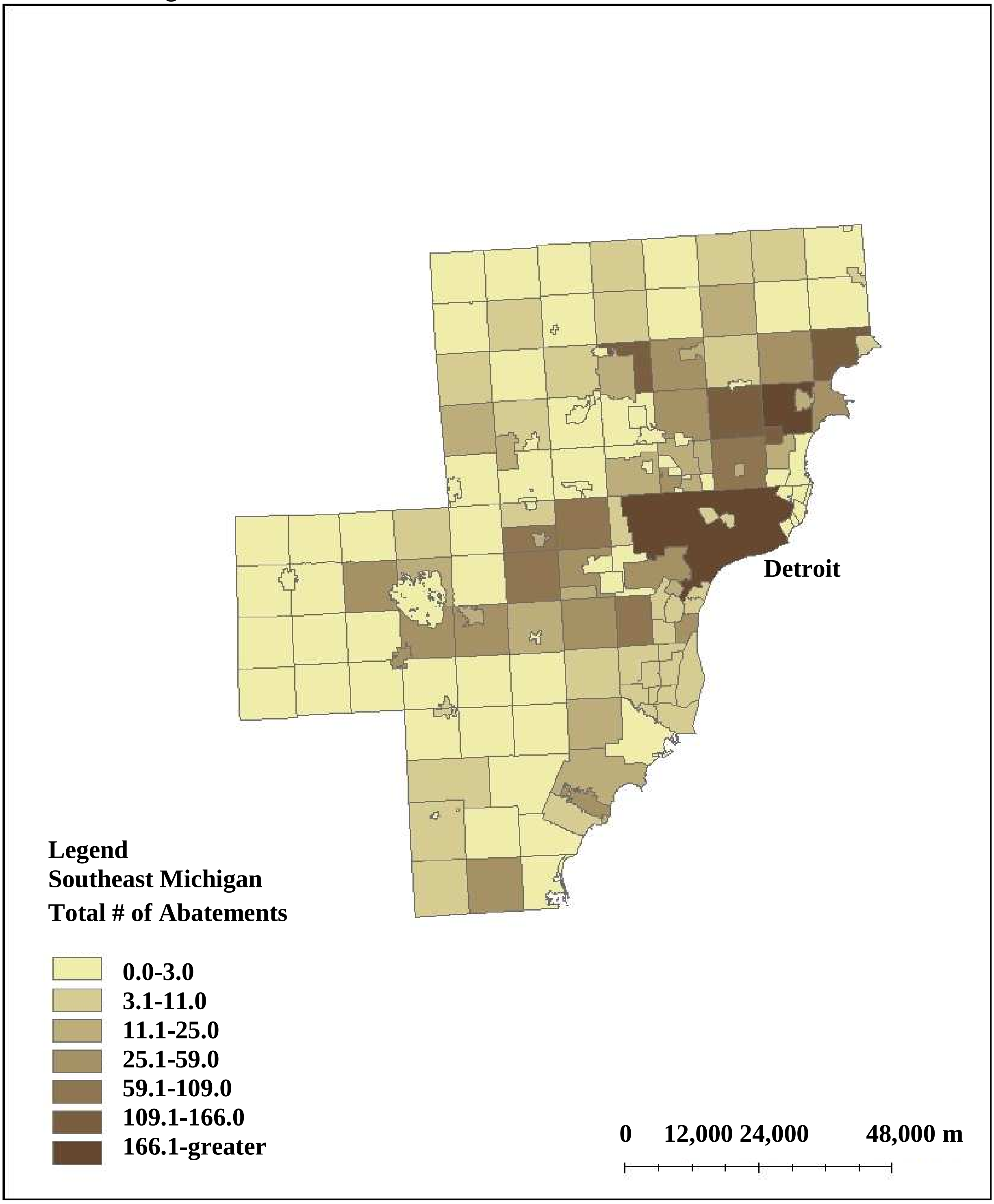
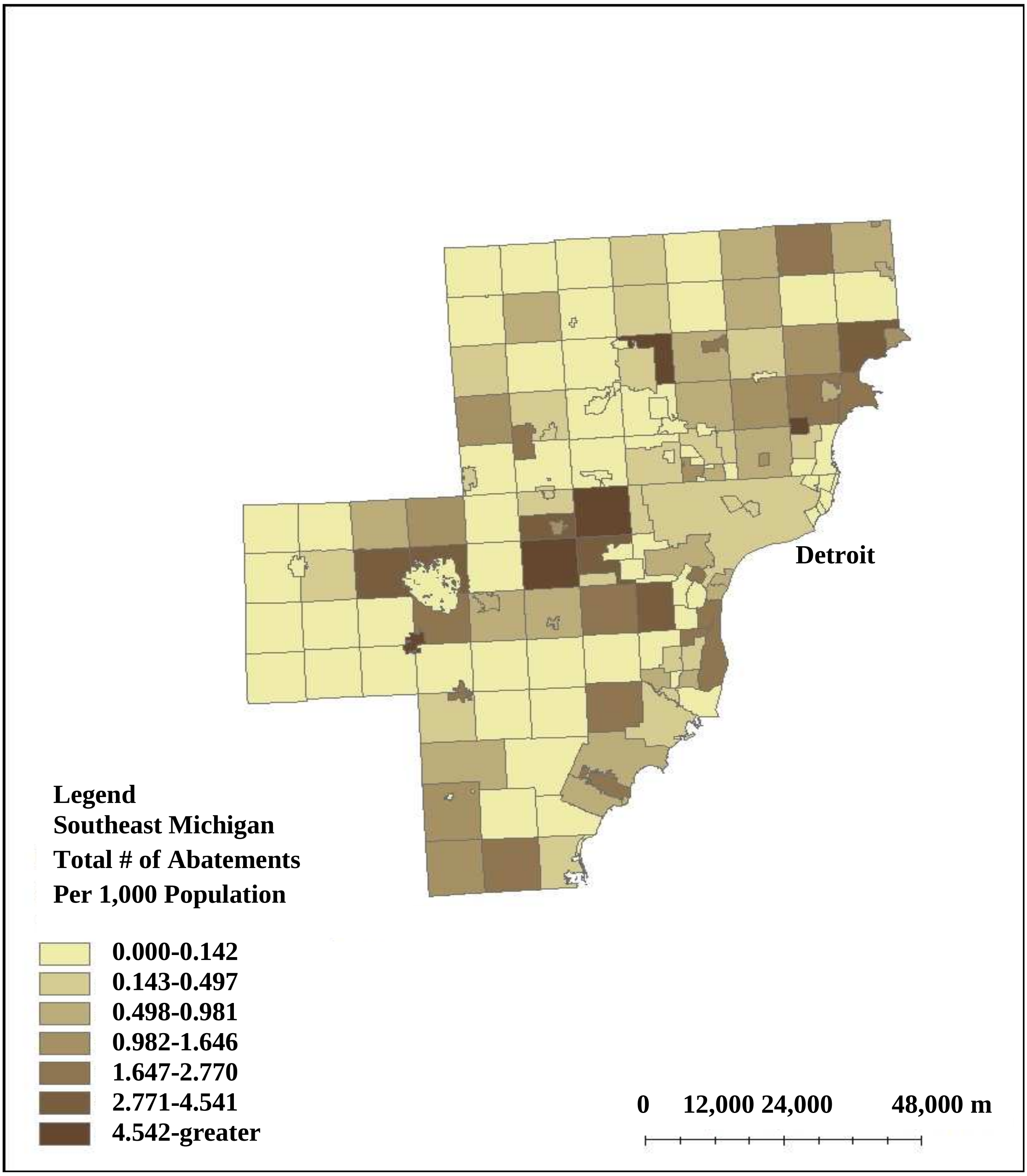


Figure 4.2 Total Number of Tax Abatements Granted Per 1,000 Population: 1983-2002



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

4.4 Empirical Model

I estimate the effects of changes in property tax rates, school spending, and tax abatements on property value growth for each property class using a first difference specification:[20]

$$PV_{it}^{j} = IFT_{it}\beta + X_{it}\gamma + \sum_{j=1}^{N} W_{ij} IFT_{jt}\delta + \left[X_{it} - \sum_{j=1}^{N} W_{ij} X_{jt}\right]\theta$$
$$+m_i + \mu_i t + t_t + e_{it}, \quad \text{j=1,2,3} \qquad (4.1)$$

where PV_{it}^{j} represents the natural logarithm of the property value j (j =1, 2, 3 for residential, commercial, and industrial property, respectively) for community i in period t, IFT_{it} is a vector of variables that include the number of granted tax abatements (G_IFT) and expired tax abatements (E_IFT) for community i in period t, X_{it} is a vector of variables for community i in

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

period t that includes the natural logarithm of aggregate effective tax rates of all overlying taxing authorities that apply within the community, the natural logarithm of school spending per pupil, and the natural logarithm of crime rate per 1,000 population, $\sum_{j=1}^{N} W_{ij} IFT_{jt}$ and $\sum_{j=1}^{N} \omega_{ij} X_{jt}$ represent the analogous set of variables for competitor communities where competitors are defined by the spatial weighting matrix, described in equations (4.6)-(4.8) below, ($W_{ij} = W^{d}[i,j], W^{p}[i,j], or\ W_{t}^{m}[i,j]$), m_i is jurisdiction fixed effects, $\theta_i t$ represents the community-specific time trends for community i[21] and t_t represents the time indicator variables to capture time effects.[22]

To eliminate unobserved community effects, I estimate equation (4.1) using a first-difference (FD) procedure and the specifications, thus, are based on the following:

$$\Delta PV_{it}^{j} = \Delta IFT_{it}\beta + \Delta X_{it}\gamma + \Delta \sum_{j=1}^{N} W_{ij} IFT_{jt}\delta + \Delta \left[X_{it} - \sum_{j=1}^{N} W_{ij} X_{jt} \right] \theta + \mu_i + \Delta t_t + \Delta e_{it}, \quad j=1,2,3 \quad (4.2)$$

Also, I employ a cluster approach in which standard errors are clustered at the community level to address temporal autocorrelation. Cluster-standard errors perform well when the number of clusters is reasonably large (Bertrand, *et al.*, 2000; Kezdi, 2004). Further, I take into account spatial autocorrelation. If there is spatial autocorrelation, the last error term in the equation (4.2)

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[21] This accounts for unobserved community factors changing over time that may affect property value growth. For example, community-specific time trends can proxy for the impacts of changes in quality of life or environment that may affect property values. I also note that the main results remain unchanged if I omit the community-specific time trends in the specifications.

[22] The first difference specification also addresses the positive autocorrelation of error terms I find in the data.

can be expressed as: $\Delta e_{it} = \Delta \sum_{j=1}^{N} W_{ij}\, e_{it}\varphi + \Delta v_{it}$. Thus, in this case, I can rewrite the specification as:

$$\Delta PV_{it}^{j} = \Delta IFT_{it}\beta + \Delta X_{it}\gamma + \Delta \sum_{j=1}^{N} W_{ij} IFT_{jt}\delta + \Delta \left[X_{it} - \sum_{j=1}^{N} W_{ij} X_{jt} \right] \theta$$

$$+\mu_i + \Delta t_t + \Delta \sum_{j=1}^{N} W_{ij}\, e_{it}\varphi + \Delta v_{it}, \quad \text{j=1,2,3} \quad (4.3)$$

To test for spatial autocorrelation, I use a regression-based test using the null hypothesis of no spatial autocorrelation, $\varphi = 0$:

Procedure 4.1

(1) Obtain the residuals ($\Delta\hat{e}_{it}$) for all (*i*, *t*) pairs by estimating equation (4.2).

(2) Estimate $\Delta \sum_{j=1}^{N} W_{ij}\widehat{e_{it}}$ using the residuals ($\Delta\hat{e}_{it}$) and replace the Δe_{it} in equation (4.2) with $[\Delta \sum_{j=1}^{N} W_{ij}\widehat{e_{it}}]\varphi + \Delta v_{it}$. The specifications for the test are based on equation (4.3).

(3) Use pooled OLS to estimate parameters (β, γ, δ, θ, and φ) in equation (4.3) and perform a t test on $\hat{\varphi}$.[23]

As a result of the test for spatial autocorrelation, I detect significant spatial autocorrelation for some specifications. In these specifications, I estimate the effects of policy changes on residential, commercial, and industrial property value growth taking into account spatial autocorrelation. In some specifications, I include contemporaneous and (one-, two-, and three-

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[23] Another version of this test is proposed by Born and Breitung (2011): 1) Estimate the following equation: $\Delta\hat{e}_{it} = \Delta \sum_{j=1}^{N} W_{ij}\, \hat{e}_{it}\varphi + \Delta v_{it}$; and then 2) perform a *t* test on $\hat{\varphi}$. Born and Breitung (2011) show that a regression-based test for spatial autocorrelation is asymptotically equivalent to the traditional test such as the Moran's *I* and LM tests. These methods are very similar to test for serial correlation (Wooldridge, 2010, pp198-199).

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.

4.4.1 Endogeneity

In the analysis, simultaneity between tax base and the policy variables (the tax/spending policy and tax abatement variables) is a primary concern.

4.4.1.1 Property Taxes and School Spending

The endogeneity problem occurs when a significant decline in the tax base leads to increases in tax rates and/or decreases in school spending. Also, as I discussed earlier, this problem is exacerbated by the Headlee Amendment. To overcome the endogeneity of property taxes and school spending, following Skidmore, *et al.* (2012), I exploit the imposition of Proposal A, which resulted in differential changes in property tax rates and school spending across communities in Michigan. Recall that Proposal A, authorized by voters in the state in 1994, had the following characteristics: 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 total funding per pupil for public schools. Specifically, Proposal A shifted school funding responsibilities 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) local property tax rates were reduced because of the reduction in local school operating millage rates; 3) for 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 the per pupil school spending for public schools resulting from Proposal A enable me to identify causal relationships between policy changes and property value growth. In this context, I use change in the natural logarithm of the tax rate and change in the natural logarithm of the per pupil school spending resulting from the imposition of Proposal A as the two key identifying instruments. To explore lagged effects of property taxes and school spending, I included one-, two- and three-year lags of the logarithms of tax rates and school spending in equations (4.1), which are potentially endogenous. Since I also treat both logarithms of tax rates lagged one-, two-, and three-years (τ_{t-1}, τ_{t-2}, and τ_{t-3}) and the logarithms of per pupil spending lagged one-, two-, and three-years (S_{t-1}, S_{t-2}, and S_{t-3}) as potentially endogenous, I use one-, two-, and three-year lagged *changes* in the logarithms of tax rates and per pupil school spending resulting from Proposal A as additional instruments, respectively.[24]

4.4.1.2 Tax Abatements

To determine whether tax abatements are endogenous, the key questions are: Is the tax abatement decision of local policy makers in a community driven by the demand of firms or the supply of local governments (local policy)? If local governments are willing to offer tax abatements, but they cannot grant them because firms do not request them, then local offers of tax abatements are a function of requests by firms. This case is more likely when firms do not consider building new plants, rehabilitation of old plants, or installation of machinery/equipment because of a difficult economic climate. However, there is also the possibility that local

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

governments decide to stop offering tax abatements because officials think that tax abatements are costly and ineffective in terms of spurring economic development. As reported earlier, Reese, *et al.* (2009) argue that the use of tax abatements is more likely to be driven by firm demand. In such a case, controlling for community fixed effects and community-specific year trends may enable me to identify the causal linkage between tax abatements and industrial property value growth. Nevertheless, as discussed next, I offer a formal test of exogeneity.

I examine whether the tax abatement variable is exogenous using the Hausman Test, which requires me to identify at least one valid instrument that is correlated with tax abatement use but not directly with industrial property value growth. The instrument I use is the city mayor and township supervisor election cycle.[25] Depending on how voters interpret tax abatement policies, the political costs and benefits of offering tax abatements may vary over the election cycle. For example, if voters believe that tax abatements are beneficial (harmful) in a community, elected local officials may be more (less) likely to offer tax abatements in the year prior to the election. Thus, the instrument for tax abatements is the political variable, which is a dummy variable that equals 1 in one year prior to mayoral or township supervisor elections and 0 otherwise.[26] As shown in Table 4.B.3-4.B.6, APPENDIX B, as compared with other years, tax abatements are more likely to be granted the year before the election and this estimated effect is statistically significant. Thus, the election cycle variable is a good predictor of tax abatements.

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[25] The election data are from several sources: City/Township Charter, County election official homepages, city official homepages, and Michigan Townships Association homepages. In general, each city has its own two or four-year election cycles for mayor, but all townships have four-year election cycles for supervisors (as well as clerks, treasures and trustees).

[26] I also tried to use the dummy variables for election year and/or one year after election as instruments. However, since these dummy variables do not have any predictive power, I excluded them in the list of instruments.

To test whether I have the weak instruments problem, I conduct F-tests for the excluded instruments for the first-stage regressions, which are statistically significant with the exception of one regression (column1 in Tables 4.B.3-4.B.6, APPENDIX B). To further examine the weak instrument problem in the presence of non-iid errors, as Baum, *et al.* (2007) suggested, I use a Kleibergen-Paap (KP) Wald *rk* F statistic for the weak identification (ID) test. The KP Wald *rk* statistics from all first-stage regressions are less than two. The critical values for Stock-Yogo weak ID test provided by Stock and Yogo (2005) are not available because I have five endogenous and nine instrumental variables (they provide critical values for up to three endogenous variables). Thus, I use the informal threshold of 10, the "Staiger and Stock rule of thumb", as a critical value to test the null hypothesis that the instruments are weak (Staiger and Stock, 1997). Using the KP Wald *rk* F statistics, for all first stage regressions, I fail to reject the null hypothesis, indicating that the joint strength of the excluded instruments is weak even though the election cycle variable is a statistically significant predictor of tax abatements. Nevertheless, I conduct the Hausman test to determine whether endogeneity is present. In the test, I fail to find evidence of endogeneity, and therefore prefer the specification treating the tax abatement variable as exogenous. However, as a robustness check, I also present instrumental variable specifications in which the tax abatement variable is treated as endogenous.

4.4.2 Regional Competition

To address regional competition, I 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, as in Skidmore, *et al.*

(2012), I use another approach that is based on intra-regional migration patterns. I therefore consider three definitions of competitors: distance, population, and migration:

- Distance (four nearest) competitors: community *j* is a competitor of *i* if it is one of the four closest jurisdictions to community *i*.
- Population competitors: community *j* is a competitor of *i* if it is one of the four closest in population size to community *i*.
- Migration competitors: community *j* is a competitor of *i* if many who had previously lived in community *i* migrated to community *j*.[27]

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

$$W^d[i,j] = I^d[i,j] \times \left(\frac{1}{\sum_j I^d[i,j]}\right) \tag{4.4}$$

$$W^p[i,j] = I^p[i,j] \times \left(\frac{1}{\sum_j I^p[i,j]}\right) \tag{4.5}$$

$$W_t^m[i,j] = \text{Out-migrants}_t^m[i,j] \left(\frac{1}{\sum_j \text{Out-migrants}_t^m[i,j]}\right) \tag{4.6}$$

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

[27] The findings remain consistent if I use "migration competitors" based on the following definition: community *j* is a competitor of *i* if it is one of the four closest in the number of out-migrants to community *i*. This definition is consistent with other competitor definitions.

community j is a "population competitor" of i and 0 otherwise, and $\text{Out-migrants}_t^m[i, j]$ 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, I need data on out-migrants at the community level. These data should include information on where out-migrants moved. If such data were available, then I can 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. Unfortunately, these data are not available and hence must be estimated.

Following the procedure of Skidmore, *et al*. (2012), this estimation was achieved. First, I have data on in-migration *at the subdivision level*, but these data do not indicate specifically from where the in-migrants came. Second, to estimate origin, I use data on out-migration *at the county level* that includes information on where out-migrants moved. However, I need to make several assumptions to calculate out-migration:

- Assumption 1: Cities and townships within a given county have the same out-migration as the county as a whole.
- Assumption 2: Since Census sources do not provide data on out-migrants who moved from one community to another *within the same county*, I follow Schachter et al. (2003) and further assume that in the sample 24.9 percent of county population moved from one community to another within the same county.

Next, with these two assumptions, I calculate out-migrants from one community to another by multiplying out-migrants at the county level by the ratio of in-migrants to total in-migrants at the community level: [28]

$$\text{Out-migrants}_t^m = (\text{Out-Migrants}_j) \times (\text{In-Migrants Ratio}_{ij}) \tag{4.7}$$

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.[29] Recall that my goal is that I use information on out-migrants at the county level and in-migrants at the community level to estimate the number of out-migrants who move *from one community to another*. Let me 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, I multiplied total out-migrants (1,000) at the county level 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, I multiplied 1,000 by 0.05 for an estimate of 50 out-migrants. I used this method to calculate the out-migrants to other counties in the region for each community in the sample. I then transformed all the 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, I generated weighted averages for "competitor" variables. A more detailed explanation of the methods used to determine the competitors

[28] To control for community size, population inflow and outflow are divided by community population to calculate the per capita inflows and outflows.

[29] This illustration is taken from Skidmore, *et al.* (2012).

weighted average is provided in APPENDIX 4.C. I acknowledge that because of data limitations on migration activity, I can only generate an approximation of competitor communities. However, as I demonstrate in the analysis, this approach seems to perform better than the approaches typically used in the literature, at least in the context of Southeast Michigan.

Once I obtain competitor variables as weighted averages, I include them in my specifications to investigate the effects of regional competition. There are several items worth noting before I turn to a discussion of the empirical analysis: 1) To examine the effects of the changes in competitor tax/spending policies on residential and business property value growth, I use *the relative changes* in property tax rates and school spending between one's own community and competitor communities; and 2) in the estimates that take into account competitor activity, I transform the instruments in a way that is analogous to the method I used to transform the other explanatory variables. As Skidmore, *et al*. (2012) mentioned, in this study, using the relative fiscal position of a community is important because the instruments, used to identify exogenous variation in changes in the tax/spending policies, are based on the imposition of Proposal A. Proposal A led to changes in property taxes and school spending across all communities, but the magnitudes of changes varied. These magnitudes reflecting the relative fiscal position of a community could play an important role for the own industrial property value growth. That is, depending on the relative magnitudes of tax reductions between the own community and competitor communities, the effect of the own tax reduction on property value growth could be significant or not. For example, if the property tax reductions in competitor communities are larger than the reduction in the own property tax rates, then the effect of the own tax reduction may not be significant. Therefore, following Skidmore, *et al*. (2012), to examine regional competition effects, I use the *relative changes* in property taxes and school spending between one's own community and competitor communities, illustrated as follows:

$$CPT = ln(Own\ Property\ Tax) - ln(Competitor\ Property\ Taxes) \quad (4.8)$$

$$CS = ln(School\ Spending) - ln(Competitor\ School\ Spending) \quad (4.9)$$

$$CC = ln(Crime\ Rates) - ln(Competitor\ Crime\ Rates) \quad (4.10)$$

Equations (4.8), (4.9), and (4.10) imply that changes in property tax rates, school spending, and crime rates relative to competitors are important to own property value growth.[30] If competition is important for property value growth, then the sign of coefficients on *CPT, CS,* and *CC* can be expected to be positive, negative and positive, respectively.

4.5 Empirical Results

To examine the property value effects of changes in property tax rates and school spending, I estimate equation (4.2) for each of the three classes of property. Because of possible endogeneity, I use an instrumental variable technique using the instrumental variables discussed above. Tables 4.B.1 and 4.B.2 in APPENDIX B display the first stage regression results, showing that instrumental variables are strong predictors of endogenous variables. The F-statistics for excluded instruments for all endogenous variables from the residential and business (commercial/industrial) property value equations are between 1,013 and 8,314, indicating that I do not have the weak instruments problem. Also, the Sargan-Hansen test for Overidentifying Restrictions shows that the instrumental variables are valid for all sets of regressions.

Core regression results are shown in Tables 4.3- 4.8. I present four regression specifications in all tables. The first specification (column 1, Tables 4.3, 4.5, and 4.7) only

[30] As noted in the discussion of equation (4.1), all variables including those illustrated by equations (4.8), (4.9), and (4.10) are first-differenced.

includes current values of one's own explanatory variables. In the second specification, I control for competitor activities by including competitor explanatory variables (columns 2-4, Tables 4.3, 4.5, and 4.7). In this specification, I define competitor communities based on distance, population size, and intra-migration flows. In the third specification, I include one-year, two-year, and three-year lagged values of the own policy variables in the first specification (column1, Tables 4.4, 4.6, and 4.8). In addition to the lags of the own policy variables, in the last specification I include one-year, two-year, and three-year lagged values of competitor policy variables (columns 2-4, Tables 4.4, 4.6, and 4.8). The inclusion of these lags allows me to examine residual effects of changes in the own and competitor policy on property value growth, showing the length of time it takes for policy changes to be fully reflected in industrial property values.

In all tables, regional competition appears to be better explained when "competitors" are based on migration flow information: 1) The degree of the impacts of property taxes on one's own residential, commercial, and industrial property value growth are larger; and 2) the results show much clearer effects of school spending and school spending *relative to* competitors on the own residential 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 a better approach for identifying competitors. Thus, because the results improve considerably when migration flow information is used to determine competitors, I focus on columns 2 to discuss about regional competition effects.

Finally, as mentioned earlier, I prefer regression specifications that treat tax abatements as exogenous. However, I also present the regression results from specifications with the tax abatement variable treated as endogenous in Tables 4.16-4.21 and discuss these estimates in the robustness section. With regard to tax abatements, I take into account the cumulative number of *granted* tax abatements (G_IFT) and the cumulative number of *expired* tax abatements (E_IFT). The coefficients on G_IFT and E_IFT provide estimates of the effects of another granted and expired IFT certificate on industrial property value growth, holding other factors constant, respectively.

4.5.1 Residential Property

4.5.1.1 Property Taxes and School Spending

Consider first the residential property estimates presented in Table 4.3. In columns 1, property taxes have significant effects on residential property value growth. In columns 2-4, I present the estimates that take into account regional competition. In column 2, the coefficient on the property tax variable is much larger as compared to that displayed in columns 1. In addition, unlike columns 1, 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.

Turning to Table 4.4 that present regression results in which the lagged policy variables are included, in column 1, I 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 substantial determinant of residential property value growth. The regression presented in column

2 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. I 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 3.8 and 18.0 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 I 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; the estimates suggest that a 10 percent tax reduction further increases property value growth by 3.2 percent when I 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, crime rates have no significant effect on residential property value growth.

4.5.1.2 Tax Abatements

Consider first the estimates of the coefficients on the number of *granted* tax abatements (ΔG_IFT) and the number of *expired* tax abatements (ΔE_IFT), presented in Table 4.3. In Table

4.3, regardless of specifications, I find positive and statistically significant coefficients on ΔG_IFT and ΔE_IFT. Focusing on column 2, [31] the result shows that 1) on average, an increase of one IFT certificate (per 1,000 population) will increase residential property values by 0.08 percent; and 2) the expiration of a tax abatement (per 1,000 population) is associated with a 0.05 percent increase in residential property values. It implies that tax abatements create positive spillover effects on residential property value growth. In addition, I also find statistically significant coefficients on the number of granted and expired *competitor* tax abatements (ΔCG_IFT and ΔCG_IFT), but the signs of these coefficients are unexpectedly positive. There are two possible explanations for this finding. First, competitor tax abatement variables may be highly correlated with another unobservable variable, which is not included in this analysis and this excluded variable could cause the unexpected sign. Second, the unexpected sign on competitor tax abatement variables may be because of a high positive correlation between the use of tax abatements in the own and competitor communities. For example, APPENDIX 4.E shows the estimated time trend slopes in the number of granted tax abatements (G_IFT) and of granted *competitor* tax abatements (CG_IFT). For each community, G_IFT and CG_IFT have a similar positive time trend. Also, the estimated correlation between the two variables is 0.57. This high correlation may cause this unexpected result.

The findings remain consistent when I account for competitor policy effects as well as the lagged effects of policy variables although there are no residual effects of tax abatements (columns 2-4, Table 4.4).

[31] This column 2 presents the regression results from the specification using migration patterns to account for competitor activities.

Table 4.3 First Difference Results I-1
Dependent Variable: Δ Ln Residential Property Values Per Capita

Specification	(1) FDIV	(2) FDIV	(3) FDIV‡	(4) FDIV
Include Comp. Variables	No	Yes	Yes	Yes
The Types of Competitors	–	Migration	Distance	Population
The Own Variables				
Δ G_IFT	0.073*** (0.025)	0.076*** (0.025)	0.067** (0.028)	0.070*** (0.025)
Δ E_IFT	0.043*** (0.015)	0.045*** (0.015)	0.043*** (0.013)	0.040*** (0.015)
Δ Ln Property Tax	-0.081*** (0.020)	-0.270*** (0.040)	-0.123*** (0.021)	-0.062* (0.036)
Δ Ln School Spending	-0.009 (0.078)	0.973*** (0.184)	-0.015 (0.100)	0.021 (0.140)
Δ Ln Crime rate	0.001 (0.002)	0.004 (0.007)	0.001 (0.002)	0.0002 (0.002)
The Competitor Variables				
Δ CG_IFT		0.169*** (0.051)	0.054* (0.032)	-0.032 (0.037)
Δ CE_IFT		0.379*** (0.136)	-0.033 (0.035)	-0.081** (0.033)
Δ Ln Property Tax		0.233*** (0.046)	0.097*** (0.030)	-0.017 (0.038)
Δ Ln School Spending		-0.995*** (0.191)	0.037 (0.127)	-0.034 (0.120)
Δ Ln Crime rate		-0.003 (0.006)	0.0004 (0.001)	0.001 (0.001)
N	1,976	1,976	1,976	1,976

Notes:
1. All regressions include a series of time indicator and community-specific time trend variables.
2. Robust cluster standard errors in parentheses
3. "Property Tax" indicates the residential property tax.
4. Spatial autocorrelation is taken into consideration in the specifications with the symbol (‡) in the first row.
5. * significant at 10%; ** significant at 5%; *** significant at 1%

Table 4.4 First Difference Results I-2
Dependent Variable: Δ Ln Residential Property Values Per Capita

Specification	(1) FDIV	**(2) FDIV**	(3) FDIV‡	(4) FDIV
Include Comp. Variables	No	**Yes**	Yes	Yes
The Types of Competitors	–	**Migration**	Distance	Population
The Own Variables				
Δ G_IFT	0.074** (0.032)	**0.082***** **(0.030)**	0.062* (0.033)	0.072** (0.030)
Δ G_IFT t-1	0.024 (0.021)	**0.036** **(0.022)**	0.025 (0.020)	0.021 (0.021)
Δ G_IFT t-2	-0.008 (0.017)	**-0.010** **(0.018)**	-0.005 (0.016)	-0.014 (0.016)
Δ G_IFT t-3	-0.006 (0.020)	**-0.007** **(0.019)**	-0.008 (0.020)	-0.009 (0.020)
Δ E_IFT	0.044*** (0.017)	**0.048***** **(0.017)**	0.046*** (0.016)	0.040*** (0.015)
Δ E_IFT t-1	-0.008 (0.017)	**-0.017** **(0.019)**	-0.015 (0.018)	-0.010 (0.016)
Δ E_IFT t-2	-0.003 (0.012)	**-0.012** **(0.012)**	-0.007 (0.012)	-0.007 (0.012)
Δ E_IFT t-3	0.024 (0.015)	**0.027*** **(0.015)**	0.017 (0.013)	0.026* (0.015)
Δ Ln Property Tax	-0.090*** (0.021)	**-0.251***** **(0.056)**	-0.133*** (0.024)	-0.078* (0.040)
Δ Ln Property Tax t-1	-0.042*** (0.012)	**-0.147***** **(0.046)**	-0.067*** (0.014)	-0.050* (0.026)
Δ Ln Property Tax t-2	-0.024* (0.013)	**-0.130***** **(0.049)**	-0.056*** (0.017)	-0.038 (0.026)
Δ Ln Property Tax t-3	-0.001 (0.013)	**0.149***** **(0.049)**	-0.006 (0.016)	-0.048** (0.021)
Δ Ln School Spending	-0.044 (0.095)	**1.156***** **(0.248)**	-0.143 (0.129)	-0.078 (0.160)
Δ Ln School Spending t-1	0.052 (0.069)	**0.657***** **(0.245)**	0.074 (0.081)	0.013 (0.131)
Δ Ln School Spending t-2	0.022 (0.049)	**0.318** **(0.273)**	-0.007 (0.074)	0.043 (0.136)
Δ Ln School Spending t-3	0.101* (0.057)	**0.382** **(0.250)**	0.203*** (0.070)	0.028 (0.111)
Δ Ln Crime rate	0.002 (0.002)	**0.009** **(0.008)**	0.002 (0.002)	0.001 (0.002)

Table 4.4 (cont'd)

Specification	(1) FDIV	**(2) FDIV**	(3) FDIV‡	(4) FDIV
The Competitor Variables				
Δ CG_IFT		**0.176***** **(0.053)**	0.039 (0.041)	-0.014 (0.044)
Δ CG_IFT t-1		**0.155***** **(0.046)**	-0.002 (0.038)	0.079 (0.059)
Δ CG_IFT t-2		**0.009** **(0.053)**	-0.033 (0.033)	-0.022 (0.038)
Δ CG_IFT t-3		**0.027** **(0.051)**	0.038 (0.039)	0.001 (0.049)
Δ CE_IFT		**0.414***** **(0.156)**	-0.039 (0.042)	-0.076** (0.038)
Δ CE_IFT t-1		**0.231** **(0.188)**	-0.021 (0.035)	-0.086*** (0.032)
Δ CE_IFT t-2		**-0.236** **(0.198)**	-0.053* (0.030)	-0.063* (0.036)
Δ CE_IFT t-3		**0.291** **(0.205)**	0.050 (0.033)	0.008 (0.036)
Δ Ln Property Tax		**0.211***** **(0.063)**	0.111*** (0.031)	-0.008 (0.041)
Δ Ln Property Tax t-1		**0.134***** **(0.048)**	0.064*** (0.022)	0.014 (0.024)
Δ Ln Property Tax t-2		**0.118**** **(0.049)**	0.058*** (0.022)	0.023 (0.023)
Δ Ln Property Tax t-3		**-0.143***** **(0.053)**	0.010 (0.026)	0.055*** (0.022)
Δ Ln School Spending		**-1.240***** **(0.234)**	0.144 (0.137)	0.036 (0.137)
Δ Ln School Spending t-1		**-0.635***** **(0.230)**	0.007 (0.098)	0.031 (0.108)
Δ Ln School Spending t-2		**-0.300** **(0.266)**	0.081 (0.098)	-0.032 (0.121)
Δ Ln School Spending t-3		**-0.277** **(0.253)**	-0.197** (0.086)	0.060 (0.092)
Δ Ln Crime rate		**-0.007** **(0.008)**	0.001 (0.001)	0.002 (0.001)
N	1,520	**1,520**	1,520	1,520

Notes:
1. All regressions include a series of time indicator and community-specific time trend variables.
2. Robust cluster standard errors in parentheses
3. "Property Tax" indicates the residential property tax.
4. Spatial autocorrelation is taken into consideration in the specifications with the symbol (‡) in the first row.
5. * significant at 10%; ** significant at 5%; *** significant at 1%

4.5.2 Commercial Property

4.5.2.1 Property Taxes and School Spending

The core results for commercial property are presented in Tables 4.5 and 4.6. Consider first Table 4.5. Column 1 shows no statistically significant relationship between property tax rates and commercial property value growth. Also, school spending is not a significant factor for commercial property value growth. However, these estimates may be biased because specifications do not account for competitor community activities. In column 2, when I account for regional competition, property tax is a marginally 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, turning to Table 4.6, once I take into account both competitor activities as well as lagged effects of the policy variables, I find property tax rates to be a significant factor for commercial property value growth. 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 commercial property is –1.77. Moreover, this long run property tax elasticity is much larger than that of residential property. Also, school spending is found to be marginally significant and its coefficient is 0.783, which is much smaller than that of property tax rates. For all specifications, I fail to find coefficients on crime rates to be statistically significant at the five percent level. In summary, commercial 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 commercial property value growth. I also find strong tax competition effects for commercial property value growth. This implies that it is important to keep tax rates competitive for local commercial businesses.

4.5.2.2 Tax Abatements

Consider first Table 4.5. In Table 4.5, for all specifications, I find positive and statistically significant coefficients on ΔG_IFT, but I fail to find a statistically significant coefficient on ΔE_IFT. As shown in column 2, the result shows that on average, an increase of one IFT certificate (per 1,000 population) will increase commercial property values by 0.07 percent. This result indicates that tax abatements may also create positive spillover effects on commercial property value growth.

Turning to Table 4.6, for all specifications, I find a positive spillover effect of tax abatements and the range of coefficients on ΔG_IFT is from 0.64 to 0.07. However, there are no residual effects of tax abatements. Also, for all specification I find statistically significant coefficient on the number of expired tax abatements (ΔE_IFT), but the signs of these coefficients are unexpectedly negative. As shown in column 2, the negative coefficient on ΔE_IFT is -0.04, indicating that the long run (net) spillover effect of tax abatements is smaller in column 2, Table 4.5 than that in column 2, Table 4.6. Finally, I fail to find evidence that competitor tax abatements are a substantial determinant for the own commercial property value growth.

Table 4.5 First Difference Results II-1
Dependent Variable: Δ Ln Commercial Property Values Per Capita

Specification	(1) FDIV	(2) FDIV	(3) FDIV‡	(4) FDIV
Include Comp. Variables	No	Yes	Yes	Yes
The Types of Competitors	–	Migration	Distance	Population
The Own Variables				
Δ CG_IFT	0.066**	0.071***	0.061**	0.066***
	(0.026)	(0.025)	(0.027)	(0.024)
Δ CE_IFT	0.016	0.015	0.015	0.017
	(0.023)	(0.023)	(0.023)	(0.023)
Δ Ln Property Tax	-0.021	-0.274*	-0.087	0.059
	(0.053)	(0.160)	(0.083)	(0.109)
Δ Ln School Spending	0.077	0.375	-0.015	-0.046
	(0.112)	(0.399)	(0.163)	(0.283)
Δ Ln Crime rate	0.006*	0.021	0.003	-0.001
	(0.003)	(0.015)	(0.004)	(0.004)
The Competitor Variables				
Δ CG_IFT		0.170	0.083	-0.010
		(0.115)	(0.067)	(0.079)
Δ CE_IFT		-0.022	-0.012	-0.007
		(0.179)	(0.046)	(0.060)
Δ Ln Property Tax		0.287*	0.120	-0.085
		(0.155)	(0.088)	(0.096)
Δ Ln School Spending		-0.268	0.145	0.104
		(0.372)	(0.195)	(0.263)
Δ Ln Crime rate		-0.015	0.002	0.007**
		(0.014)	(0.002)	(0.003)
N	1,976	1,976	1,976	1,976

Notes:
1. All regressions include a series of time indicator and community-specific time trend variables.
2. Robust cluster standard errors in parentheses
3. "Property Tax" indicates the non-residential property tax.
4. Spatial autocorrelation is taken into consideration in the specifications with the symbol (‡) in the first row.
5. * significant at 10%; ** significant at 5%; *** significant at 1%

Table 4.6 First Difference Results II-2
Dependent Variable: Δ Ln Commercial Property Values Per Capita

Specification	(1) FDIV	**(2) FDIV**	(3) FDIV‡	(4) FDIV
Include Comp. Variables	No	**Yes**	Yes	Yes
The Types of Competitors	–	**Migration**	Distance	Population
The Own Variables				
Δ G_IFT	0.067** (0.032)	**0.074** (0.031)**	0.064* (0.034)	0.068** (0.028)
Δ G_IFT t-1	0.009 (0.029)	**0.020 (0.031)**	0.003 (0.029)	0.010 (0.031)
Δ G_IFT t-2	-0.003 (0.036)	**-0.013 (0.039)**	0.005 (0.034)	-0.002 (0.036)
Δ G_IFT t-3	-0.022 (0.028)	**-0.037 (0.029)**	-0.020 (0.027)	-0.019 (0.028)
Δ E_IFT	0.027 (0.031)	**0.015 (0.032)**	0.023 (0.031)	0.022 (0.030)
Δ E_IFT t-1	0.024 (0.026)	**0.025 (0.029)**	0.014 (0.027)	0.022 (0.026)
Δ E_IFT t-2	-0.027* (0.014)	**-0.036** (0.016)**	-0.029* (0.016)	-0.035** (0.016)
Δ E_IFT t-3	0.040 (0.034)	**0.022 (0.039)**	0.040 (0.034)	0.041 (0.034)
Δ Ln Property Tax	0.003 (0.051)	**-0.431*** (0.158)**	-0.052 (0.089)	0.075 (0.107)
Δ Ln Property Tax t-1	0.011 (0.039)	**-0.572** (0.223)**	-0.006 (0.061)	0.051 (0.075)
Δ Ln Property Tax t-2	0.028 (0.047)	**-0.762*** (0.222)**	0.099 (0.078)	0.003 (0.075)
Δ Ln Property Tax t-3	0.033 (0.053)	**-0.093 (0.224)**	0.077 (0.079)	0.105 (0.095)
Δ Ln School Spending	0.086 (0.115)	**0.783* (0.449)**	-0.052 (0.181)	-0.124 (0.287)
Δ Ln School Spending t-1	0.032 (0.099)	**0.468 (0.423)**	0.022 (0.144)	0.093 (0.273)
Δ Ln School Spending t-2	-0.037 (0.111)	**0.620 (0.395)**	0.130 (0.152)	-0.289 (0.255)
Δ Ln School Spending t-3	0.061 (0.099)	**-0.430 (0.339)**	0.115 (0.149)	-0.221 (0.232)
Δ Ln Crime rate	0.007* (0.004)	**0.017 (0.017)**	0.004 (0.005)	-0.001 (0.004)

Table 4.6 (cont'd)

Specification	(1) FDIV	**(2) FDIV**	(3) FDIV‡	(4) FDIV
The Competitor Variables				
Δ CG_IFT		**0.194**	0.062	0.057
		(0.129)	(0.084)	(0.088)
Δ CG_IFT t-1		**-0.041**	-0.040	0.042
		(0.091)	(0.084)	(0.078)
Δ CG_IFT t-2		**-0.026**	0.007	-0.182**
		(0.099)	(0.069)	(0.087)
Δ CG_IFT t-3		**-0.139**	-0.068	0.083
		(0.113)	(0.075)	(0.080)
Δ CE_IFT		**-0.378**	0.026	0.006
		(0.282)	(0.057)	(0.068)
Δ CE_IFT t-1		**0.586***	-0.060	-0.054
		(0.314)	(0.067)	(0.065)
Δ CE_IFT t-2		**0.136**	0.085	-0.093
		(0.307)	(0.064)	(0.072)
Δ CE_IFT t-3		**-0.407**	0.107	0.026
		(0.410)	(0.103)	(0.066)
Δ Ln Property Tax		**0.472*****	0.114	-0.068
		(0.152)	(0.093)	(0.093)
Δ Ln Property Tax t-1		**0.580*****	0.043	-0.033
		(0.216)	(0.069)	(0.074)
Δ Ln Property Tax t-2		**0.805*****	-0.110	0.027
		(0.220)	(0.075)	(0.071)
Δ Ln Property Tax t-3		**0.136**	-0.066	-0.079
		(0.222)	(0.090)	(0.072)
Δ Ln School Spending		**-0.625**	0.215	0.213
		(0.445)	(0.221)	(0.264)
Δ Ln School Spending t-1		**-0.436**	0.086	-0.016
		(0.428)	(0.194)	(0.239)
Δ Ln School Spending t-2		**-0.582**	-0.208	0.250
		(0.386)	(0.199)	(0.205)
Δ Ln School Spending t-3		**0.532**	-0.107	0.267
		(0.338)	(0.235)	(0.197)
Δ Ln Crime rate		**-0.009**	0.002	0.009***
		(0.017)	(0.003)	(0.003)
N	1,520	**1,520**	1,520	1,520

Notes:
1. All regressions include a series of time indicator and community-specific time trend variables.
2. Robust cluster standard errors in parentheses
3. "Property Tax" indicates the non-residential property tax.
4. Spatial autocorrelation is taken into consideration in the specifications with the symbol (‡) in the first row.
5. * significant at 10%; ** significant at 5%; *** significant at 1%

4.5.3. Industrial Property

4.5.3.1 Property Taxes and School Spending

The regression results for tax policy and school spending are robust and consistent with the findings of the previous section (4.5.2): 1) The results show a significant negative relationship between property taxes and industrial property value growth in the context of regional competition; 2) competitor community property taxes play an important role for the own industrial property; 3) school spending and school spending relative to competitors are not important determinants of industrial property value growth; and 4) crime rates are not a significant factor for industrial property value growth. These findings suggest that the own community's relative tax position plays a crucial role for industrial property value growth. That is, if the own community reduces its tax rates more than competitor communities such that its relative tax position is improved, then in addition to the effects of the own tax reduction, industrial property values are further increased by competition effects. The estimates suggest that a 10 percent tax reduction increases industrial property values by 17.3 percent in the long run. However, in the case where the own community's relative tax position is worsened by tax reductions in competitor communities, industrial property value growth in the own community is hurt. Finally, industrial property values are more responsive to tax changes than school spending changes. Thus, the property tax is a more important factor than school spending for industrial property value growth.

4.5.3.2 Tax Abatements

The cumulative effects of the abatement program on industrial property value growth can be significant if the abatements affect the manufacturing firms' decision to relocate, expand, or rehabilitate plants. While tax abatements attract attention as a critical economic development policy tool, most studies on Michigan tax abatements conclude that they are inefficient and largely ineffective. The rationale in many of these studies is that tax abatements result in inefficient intra-community competition. While these studies recognize that regional competition can potentially be important assessing the effectiveness of tax abatements, they do not directly test the hypothesis that use of tax abatements in competitor communities influences the own industrial property value growth. A primary motivation of this section is to examine the effectiveness of the IFT abatement program in the context of regional competition.

The core regression results are presented in Tables 4.7 and 4.8. Consider first Table 4.7. In column 1, I find a positive and statistically significant coefficient on ΔG_IFT. This result indicates that on average, an increase of one IFT certificate (per 1,000 population) will increase industrial property values by 0.16 percent[32]. I also find marginally significant positive effects upon the expiration of a tax abatement. The coefficient on ΔE_IFT is 0.110, indicating that the expiration of a tax abatement (per 1,000 population) is associated with a 0.11 percent increase in industrial property values. Thus, these findings suggest that communities benefit from tax abatements when they are offered (partial increase in tax base due to new facility) and then again when they expire (tax base increases by full amount of the project). The findings remain consistent when I control for competitor policy effects, but I do not find any evidence that competitor tax abatements are important factors for the own industrial property value growth. Further, the results are not sensitive to the way in which competitor communities are defined, although the coefficient on ΔG_IFT is slightly larger in column 2.

[32] To better understand this result, suppose there is community A with 1,000 people. In this community A, one IFT certificate is associated with a 0.16 percent increase in industrial property values.

In Table 4.8, the regression results are based on the specifications that include lags. In column 1, there are no significant initial or residual effects of changes in tax abatements on industrial property value growth. In columns 2-4, I present the results from specifications that take into account both the lagged effects of policy changes and competitor activities. Columns 2-4 show regression results that incorporate migration, distance, and population competitors, respectively. In columns 2-4, the coefficients on ΔG_IFT are positive and significant, and their magnitudes are similar across columns. I find a negative coefficient on the second year lagged tax abatement variable (ΔG_IFT_{t-2}) that are marginally significant in column 4, indicating that the long run (net) effects of tax abatements are larger in column 2 than those in column 4. I also find evidence that both the own and competitor property taxes play important roles for the own industrial property value growth, but only in column 2. These findings suggest that the regression results are sensitive to the definition of competitor communities; economic closeness appears to be better measured by migration flow information, thus affecting the results of industrial property value effects for the own and competitor tax abatements. I therefore focus on the regression results for the specification that includes the migration competitor variables (column 2).

In column 2, the coefficient on ΔG_IFT is 0.160 and marginally significant. Its magnitude is slightly larger than that displayed in column 1 in Table 4.7 and very close to that in column 2 in Table 4.7. However, I fail to find residual effects of tax abatements on industrial property value growth as well as effects of the expired tax abatements. For ΔE_IFT, I find a positive coefficient, but it is not statistically significant. Further, I fail to find coefficients on ΔCG_IFT and ΔCE_IFT to be different from zero: that is, I find no evidence of fiscal externalities resulting from tax abatements.

Table 4.7 First Difference Results III-1
Dependent Variable: Δ Ln Industrial Property Values Per Capita

Specification	(1) FDIV	(2) FDIV	(3) FDIV‡	(4) FDIV
Include Comp. Variables	No	Yes	Yes	Yes
The Types of Competitors	–	Migration	Distance	Population
The Own Variables				
Δ G_IFT	0.158** (0.071)	0.168** (0.071)	0.162** (0.070)	0.152** (0.068)
Δ E_IFT	0.110* (0.062)	0.111* (0.062)	0.109* (0.062)	0.119* (0.062)
Δ Ln Property Tax	-0.017 (0.106)	-0.315 (0.341)	0.015 (0.170)	-0.315 (0.261)
Δ Ln School Spending	0.264 (0.477)	1.138* (0.655)	0.258 (0.488)	-0.872 (0.814)
Δ Ln Crime rate	0.004 (0.005)	0.010 (0.023)	0.003 (0.006)	-0.005 (0.007)
The Competitor Variables				
Δ CG_IFT		0.105 (0.158)	0.005 (0.209)	0.120 (0.138)
Δ CE_IFT		-0.401 (0.282)	-0.061 (0.084)	-0.106 (0.143)
Δ Ln Property Tax		0.297 (0.297)	-0.048 (0.150)	0.317 (0.216)
Δ Ln School Spending		-0.932 (0.893)	0.041 (0.306)	1.074* (0.609)
Δ Ln Crime rate		-0.007 (0.022)	0.001 (0.005)	0.010 (0.007)
N	1,976	1,976	1,976	1,976

Notes:
1. All regressions include a series of time indicator and community-specific time trend variables.
2. Robust cluster standard errors in parentheses
3. “Property Tax” indicates the non-residential property tax.
4. Spatial autocorrelation is taken into consideration in the specifications with the symbol (‡) in the first row.
5. * significant at 10%; ** significant at 5%; *** significant at 1%

Table 4.8 First Difference Results III-2
Dependent Variable: Δ Ln Industrial Property Values Per Capita

Specification	(1) FDIV	**(2) FDIV**	(3) FDIV‡	(4) FDIV
Include Comp. Variables	No	**Yes**	Yes	Yes
The Types of Competitors	–	**Migration**	Distance	Population
The Own Variables				
Δ G_IFT	0.140 (0.087)	**0.160*** **(0.086)**	0.155* (0.088)	0.158* (0.089)
Δ G_IFT t-1	-0.074 (0.056)	**-0.058** **(0.056)**	-0.063 (0.053)	-0.081 (0.061)
Δ G_IFT t-2	-0.089 (0.058)	**-0.093** **(0.063)**	-0.088 (0.064)	-0.107* (0.063)
Δ G_IFT t-3	-0.046 (0.055)	**-0.053** **(0.053)**	-0.026 (0.061)	-0.010 (0.064)
Δ E_IFT	0.079 (0.077)	**0.081** **(0.078)**	0.079 (0.076)	0.074 (0.078)
Δ E_IFT t-1	0.005 (0.043)	**0.006** **(0.042)**	-0.006 (0.047)	0.023 (0.049)
Δ E_IFT t-2	-0.052 (0.050)	**-0.063** **(0.053)**	-0.047 (0.052)	-0.055 (0.054)
Δ E_IFT t-3	0.021 (0.040)	**-0.0001** **(0.039)**	0.030 (0.044)	0.030 (0.046)
Δ Ln Property Tax	0.030 (0.114)	**-0.612** **(0.394)**	0.053 (0.178)	-0.136 (0.251)
Δ Ln Property Tax t-1	0.212 (0.188)	**-0.903**** **(0.428)**	0.429 (0.437)	0.079 (0.289)
Δ Ln Property Tax t-2	-0.008 (0.160)	**-0.554** **(0.522)**	0.0001 (0.137)	0.175 (0.221)
Δ Ln Property Tax t-3	0.040 (0.069)	**-0.041** **(0.493)**	0.167 (0.140)	0.147 (0.163)
Δ Ln School Spending	0.240 (0.510)	**0.853** **(0.856)**	0.160 (0.546)	-0.997 (0.884)
Δ Ln School Spending t-1	-0.851 (0.648)	**0.873** **(1.017)**	-1.047 (0.760)	-1.535 (1.411)
Δ Ln School Spending t-2	-0.212 (0.173)	**0.328** **(0.662)**	-0.137 (0.248)	0.678 (0.995)
Δ Ln School Spending t-3	0.0780 (0.283)	**0.061** **(0.553)**	0.099 (0.358)	1.300** (0.580)
Δ Ln Crime rate	0.004 (0.006)	**0.010** **(0.028)**	0.007 (0.007)	-0.004 (0.007)

Table 4.8 (cont'd)

Specification	(1) FDIV	**(2) FDIV**	(3) FDIV‡	(4) FDIV
The Competitor Variables				
Δ CG_IFT		**0.152**	-0.063	0.262
		(0.218)	(0.265)	(0.170)
Δ CG_IFT t-1		**-0.058**	0.052	0.077
		(0.152)	(0.174)	(0.240)
Δ CG_IFT t-2		**0.251**	-0.121	0.115
		(0.315)	(0.119)	(0.166)
Δ CG_IFT t-3		**0.050**	0.001	0.305**
		(0.169)	(0.190)	(0.152)
Δ CE_IFT		**-0.384**	0.019	-0.067
		(0.547)	(0.102)	(0.152)
Δ CE_IFT t-1		**0.538**	-0.253	-0.213
		(0.644)	(0.156)	(0.165)
Δ CE_IFT t-2		**-0.116**	0.029	-0.141
		(0.564)	(0.111)	(0.183)
Δ CE_IFT t-3		**-0.492**	0.124	0.436
		(0.803)	(0.140)	(0.269)
Δ Ln Property Tax		**0.661***	-0.071	0.197
		(0.364)	(0.156)	(0.205)
Δ Ln Property Tax t-1		**1.069****	-0.335	0.099
		(0.461)	(0.413)	(0.169)
Δ Ln Property Tax t-2		**0.562**	-0.048	-0.214
		(0.525)	(0.142)	(0.263)
Δ Ln Property Tax t-3		**0.071**	-0.227	-0.138
		(0.482)	(0.158)	(0.154)
Δ Ln School Spending		**-0.628**	-0.094	1.206*
		(0.951)	(0.329)	(0.637)
Δ Ln School Spending t-1		**-1.824**	0.509	0.685
		(1.637)	(0.556)	(1.018)
Δ Ln School Spending t-2		**-0.551**	-0.162	-0.953
		(0.722)	(0.359)	(0.934)
Δ Ln School Spending t-3		**0.006**	-0.095	-1.126**
		(0.693)	(0.329)	(0.525)
Δ Ln Crime rate		**-0.005**	-0.002	0.013*
		(0.027)	(0.006)	(0.007)
N	1,520	**1,520**	1,520	1,520

Notes:
1. All regressions include a series of time indicator and community-specific time trend variables.
2. Robust cluster standard errors in parentheses
3. "Property Tax" indicates the non-residential property tax.
4. Spatial autocorrelation is taken into consideration in the specifications with the symbol (‡) in the first row.
5. * significant at 10%; ** significant at 5%; *** significant at 1%

Bartik (1991, 1994) and Wassmer (2007) argue that tax abatements may be more effective when they are used in high tax communities because industrial firms appear to avoid such communities. To directly test this hypothesis, I split the sample into two groups based on average property tax rates before the imposition of Proposal A: High tax communities and low tax communities. Based on these two groupings, I create indicator variables for the two groups and then interact the indicator variables with the tax abatement variables and include them in the specifications. The regression results are summarized in Table 4.9. This table only reports the regression coefficients with robust standard errors on tax abatement variables for the high tax community and low tax community, but note that all the other control variables are included in the specifications.[33] For the results in Table 4.9, let me focus on column 6 that provides the estimates from the specification that accounts for lagged effects and competition effects. With respect of the effects of tax abatements in high tax communities, the coefficient on ΔG_IFT is 0.133 and just marginally significant. Its magnitude is slightly smaller than that displayed in column 2 in Table 4.8. I also find a positive and statistically significant coefficient on ΔE_IFT, which is 0.186. However, I fail to find significant effects of tax abatements when they are offered and when they expire in the low tax community. I also find that the negative coefficient on the second year lagged tax abatement variable (ΔG_IFT_{t-2}) that is marginally significant. This result suggests that industrial property values in the high tax community are increased when tax abatements are offered and then again when they expire, but again this is not the case in the low property tax community. Also, I fail to find residual effects of tax abatements on industrial property value growth and evidence of fiscal externalities for both the high and low tax communities.

[33] The results for control variables are consistent with previous results.

Table 4.9 First Difference Results for High and Low Tax Communities
Dependent Variable: Δ Ln Industrial Property Values Per Values

Specification	(1) FDIV	(2) FDIV	(3) FDIV	(4) FDIV‡	(5) FDIV	**(6) FDIV**	(7) FDIV‡	(8) FDIV
Include Comp. Variables	No	No	Yes	Yes	Yes	**Yes**	Yes	Yes
The Types of Competitors	–	-	Migration	Distance	Pop.	**Migration**	Distance	Pop.
The Tax Abatement Variables in High Tax Communities								
Δ G_IFT	0.140* (0.075)	0.103 (0.076)	0.153** (0.075)	0.145* (0.075)	0.133* (0.077)	**0.133*** **(0.076)**	0.121 (0.075)	0.105 (0.080)
Δ G_IFT t-1		-0.029 (0.061)				**-0.003** **(0.062)**	-0.033 (0.063)	-0.021 (0.069)
Δ G_IFT t-2		-0.003 (0.063)				**-0.008** **(0.070)**	0.021 (0.062)	-0.037 (0.069)
Δ G_IFT t-3		-0.058 (0.071)				**-0.068** **(0.072)**	-0.048 (0.074)	-0.043 (0.080)
Δ E_IFT	0.176*** (0.065)	0.174** (0.076)	0.181*** (0.065)	0.178*** (0.066)	0.192*** (0.067)	**0.186**** **(0.074)**	0.198*** (0.075)	0.180** (0.079)
Δ E_IFT t-1		0.008 (0.054)				**-0.003** **(0.058)**	0.005 (0.056)	0.040 (0.059)
Δ E_IFT t-2		-0.056 (0.059)				**-0.079** **(0.070)**	-0.036 (0.060)	-0.081 (0.064)
Δ E_IFT t-3		0.056 (0.054)				**0.021** **(0.051)**	0.091 (0.062)	0.015 (0.060)

Table 4.9 (cont'd)

Specification	(1) FDIV	(2) FDIV	(3) FDIV	(4) FDIV‡	(5) FDIV	**(6) FDIV**	(7) FDIV‡	(8) FDIV
The Tax Abatement Variables in Low Tax Communities								
Δ G_IFT	0.185	0.178	0.192	0.187	0.180*	**0.192**	0.192	0.222
	(0.119)	(0.152)	(0.119)	(0.117)	(0.108)	**(0.151)**	(0.150)	(0.148)
Δ G_IFT_{t-1}		-0.124				**-0.113**	-0.104	-0.131
		(0.084)				**(0.086)**	(0.080)	(0.089)
Δ G_IFT_{t-2}		-0.179*				**-0.180***	-0.194*	-0.177*
		(0.094)				**(0.103)**	(0.101)	(0.102)
Δ G_IFT_{t-3}		-0.018				**-0.021**	0.022	0.032
		(0.092)				**(0.087)**	(0.104)	(0.093)
Δ E_IFT	0.039	-0.014	0.036	0.036	0.041	**-0.024**	-0.034	-0.036
	(0.106)	(0.139)	(0.107)	(0.105)	(0.106)	**(0.137)**	(0.138)	(0.139)
Δ E_IFT_{t-1}		0.029				**0.037**	0.016	0.022
		(0.062)				**(0.062)**	(0.071)	(0.070)
Δ E_IFT_{t-2}		-0.025				**-0.025**	-0.029	-0.007
		(0.086)				**(0.086)**	(0.091)	(0.091)
Δ E_IFT_{t-3}		-0.026				**-0.036**	-0.045	0.040
		(0.059)				**(0.059)**	(0.072)	(0.074)
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 non-residential property tax.
4. Spatial autocorrelation is taken into consideration in the specifications with the symbol (‡) in the first row.

* significant at 10%; ** significant at 5%; *** significant at 1%

I highlight two implications of these findings. First, the results indicate that for each additional IFT certificate (per 1,000 population), industrial property values increase by 0.16 percent, but there are no residual effects. Second, the effects of tax abatements are larger in the high tax communities than in low tax communities. Third, I find no evidence of tax abatement competition effects even though it may be true that local governments mimic the tax abatement policies of competitor communities within a regional competition framework.

4.5.3.3 IFT Benefit/Cost Analysis

To examine the effectiveness of tax abatements, I conduct a simple benefit/cost (BC) analysis. The purpose of the BC analysis is to determine whether the benefits to local governments of tax abatements exceed the costs. I focus the analysis on the costs to local governments in that tax abatements incur costs in the form of forgone tax revenues during the period of abatement. That is, the costs of providing tax abatements are the tax revenues that might have been collected had the abatements not been offered. Thus, to fully assess the efficacy of tax abatements, it is important to estimate and compare the benefits and costs. If the benefit-cost ratio for offering tax abatements is larger than 1, then tax abatements are effective and worthwhile from the perspective of local government finance. I recognize that there may other benefits (job creation for residents, etc.) and costs (increased congestion, etc.), but consideration of these is beyond the scope of the present analysis.

The calculations provide an estimate of what happens to industrial property values when officials increase the use of tax abatements. The empirical findings suggest that an additional abatement in an average community and a high tax community yields \$0.105 and \$0.115 increases in per capita industrial property value, respectively. The net present values of property value benefits of the abatement are presented in Table 4.11. To calculate the *annual* increase in industrial property value from the abatement, I assume that 1) the period of the abatement is 12 years; 2) a firm stays for 12 years after the abatement expires; and 3) the discount rate is 5%. In addition, because the costs of offering abatements are expressed as (forgone) revenues, to offer an appropriate comparison, using the sample average of non-homestead millage rates, I estimate revenues generated by the abatement for each year.[34] The estimated annual revenues from the abatement for an average community and a high tax community are \$0.0004 and \$0.0005, respectively (Table 4.11). For costs, I use data on abatements from the State of Michigan. In Michigan, as a result of the IFT program 14,434 projects were abated between the fiscal years 1984-2003 and over this period, \$6,746 in per capita taxable value were abated: that is, on average, annual taxable value of property abated for each project is \$0.467 per capita (Citizens Research Council of Michigan, 2007). Using the sample average non-homestead millage rate, I calculate average forgone revenues from the tax abatements as a measure of the costs of the abatements to local governments (Table 4.10). The forgone revenues depend on the type of project because industrial firms receive a tax abatement of 100% of the improvement of the property for a replacement facility and a tax abatement of 50% of the total mills levied on a property for a new facility. However, I do not have information on which of the projects are categorized as a replacement facility and which are categorized as a new facility. Thus, I perform simulations for the B/C analysis using the following scenarios:

[34] Tax abatements may indirectly result in other benefits such as job creations and retentions, thereby promoting local economic development. However, in the B/C analysis, I focus on the direct fiscal benefits and costs of the abatements for localities because they provide a clear picture of changes in the fiscal health of localities after the abatements are granted. Thus, to assess the efficacy of the tax abatements, I examine how much tax revenues would be raised and lost if another tax abatement is offered.

- Scenario 1: Projected taxable values of the property for a replacement facility are 100% of total abated taxable values
- Scenario 2: Projected taxable values of the properties for a replacement facility and for a new facility are 70% and 30% of total abated taxable values, respectively
- Scenario 3: Projected taxable values of the properties for a replacement facility and for a new facility are 50% and 50% of total abated taxable values, respectively
- Scenario 4: Projected taxable values of the properties for a replacement facility and for a new facility are 30% and 70% of total abated taxable values, respectively
- Scenario 5: Projected taxable values of the property for a new facility are 100% of total abated taxable values

For each scenario, the per capita forgone revenues for each project as a result of tax abatements are provided in Table 4.10. Using benefits and costs of tax abatements, I calculate the B/C ratios. As shown in Table 4.14, for all scenarios, B/C ratios are always less than one, which suggests that on average the benefits of another tax abatement is far less than the costs. Based on this evaluation, I conclude that tax abatements are not cost-effective from a local government finance perspective. Also, this conclusion is maintained even for the high tax communities where tax abatements have relatively larger effects on industrial property value growth. This B/C analysis shows that tax abatements cannot be substantiated based on an evaluation from a local government perspective.

Table 4.10 Estimated Annual Forgone Revenues Resulting from Tax Abatements: Fiscal Year 1984-2003

Scenarios	Estimated Annual Forgone Revenues Per Capita Per Project	
	Average Communities	High Tax Communities
Scenario 1	0.212	0.253
Scenario 2	0.180	0.215
Scenario 3	0.159	0.190
Scenario 4	0.138	0.165
Scenario 5	0.106	0.127

Note:

1. Annual average taxable value of property values abated per capita per project is $0.470 (=$4,497,855/9,561,519). Also, for average communities and high tax communities, the sample average of non-homestead millage rates is 50.88 and 60.77, respectively.
2. To calculate the forgone revenues resulting from tax abatements, I use information on the number of projects and the taxable values of property abated from Citizens Research Council of Michigan (2007)
3. I assume that the period of tax abatements is 12 years.

Table 4.11 Estimated Generated Revenues Resulting from Tax Abatements: Industrial Property

Comm.	Average Property Values per Capita	Average Pop.	Non-Homestead Millage Rates	The Number of Tax Abatements Granted per 1,000 Population[1]	Coefficients on Tax Abatements[2]	Property Value Benefits Per Capita Per Project[3]	*Annual* Industrial Property Value Benefits Per Capita Per Project[4]	Estimated Generated *Annual* Revenues Per Capita Per Project
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
				=1/[(2)/1,000]		(1)×(4)×(5) ×0.01	$(6)/\sum_{t=1}^{T}\frac{1}{(1.05)^t}$	[(7)×(3) /1,000]
Average Comm.	1,838	27,980	50.88	0.036	0.160	0.150	0.0076	0.0004
High Tax Comm.	588	16,353	60.77	0.061	0.319 =(0.133+0.186)	0.115	0.0083	0.0005

Note:
1. I assume that one additional tax abatement is granted in an average community and a high tax community.
2. I use the coefficients on tax abatement variables in column 2, Table 4.8 and in column 6, Table 4.9.
3. Net present value of industrial property value benefits per capita per project
4. I assume that the discount rate is 5%. Also, I consider the case that the period of tax abatements is 12 years and firms stay for 12 years after abatements expire (T=24). The formula of net present value in column (6) is: NPV (0.05, 24 years) = $\sum_{t=1}^{24}\frac{(7)}{(1.05)^t}$.

Table 4.12 Estimated Generated Revenues Resulting from Tax Abatements: Residential Property

Comm.	Average Property Values per Capita	Average Pop.	Homestead Millage Rates	The Number of Tax Abatements Granted per 1,000 Population[1]	Coefficients on Tax Abatements[2]	Property Value Benefits Per Capita Per Project[3]	*Annual* Residential Property Value Benefits Per Capita Per Project[4]	Estimated Generated *Annual* Revenues Per Capita Per Project
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
				=1/[(2)/1,000]		(1)×(4)×(5) ×0.01	$(6)/\sum_{t=1}^{T}\frac{1}{(1.05)^t}$	[(7)×(3) /1,000]
Average Comm.	17,944	27,980	43.92	0.036	0.130 =(0.082+0.048)	0.835	0.061	0.0027

Note:

1. I assume that one additional tax abatement is granted in an average community.
2. I use the coefficients on tax abatement variables in column 2, Table 4.4.
3. Net present value of residential property value benefits per capita per project
4. I assume that the discount rate is 5%. Also, I consider the case that the period of tax abatements is 12 years and firms stay for 12 years after abatements expire (T=24). The formula of net present value in column (6) is: NPV (0.05, 24 years) = $\sum_{t=1}^{24}\frac{(7)}{(1.05)^t}$.

Table 4.13 Estimated Generated Revenues Resulting from Tax Abatements: Commercial Property

Comm.	Average Property Values per Capita	Average Pop.	Non-Homestead Millage Rates	The Number of Tax Abatements Granted per 1,000 Population[1]	Coefficients on Tax Abatements[2]	Property Value Benefits Per Capita Per Project[3]	*Annual* Commercial Property Value Benefits Per Capita Per Project[4]	Estimated Generated *Annual* Revenues Per Capita Per Project
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
				=1/[(2)/1,000]		(1)×(4)×(5) ×0.01	$(6)/\sum_{t=1}^{T}\frac{1}{(1.05)^t}$	[(7)×(3) /1,000]
Average Comm.	2,869	27,980	60.77	0.036	0.039 =(0.074-0.036)	0.040	0.003	0.0002

Note:

1. I assume that one additional tax abatement is granted in an average community.
2. I use the coefficients on tax abatement variables in column 2, Table 4.6.
3. Net present value of commercial property value benefits per capita per project
4. I assume that the discount rate is 5%. Also, I consider the case that the period of tax abatements is 12 years and firms stay for 12 years after abatements expire (T=24). The formula of net present value in column (6) is: NPV (0.05, 24 years) = $\sum_{t=1}^{24}\frac{(7)}{(1.05)^t}$.

Table 4.14 B/C Ratios of Tax Abatements I

Scenarios	Average Community			High Tax Community		
	Costs[1]	Benefits[2]	B/C Ratio	Costs[1]	Benefits[2]	B/C Ratio
Scenario 1	0.212	0.0093	0.044	0.253	0.0121	0.048
Scenario 2	0.180	0.0093	0.052	0.215	0.0121	0.056
Scenario 3	0.159	0.0093	0.059	0.190	0.0121	0.064
Scenario 4	0.138	0.0093	0.068	0.165	0.0121	0.074
Scenario 5	0.106	0.0093	0.088	0.127	0.0121	0.096

Note:
1. The costs of tax abatements are taken from Table 4.10.
2. For benefits of tax abatements, I assume that the total length of tenure of firms after the tax abatement is granted is 24 years: that is, the estimated annual revenues from abatements per capita per project can be calculated by: [column (8), Table 4.11] × 24 years.

4.5.3.4 Spillover Effects of Tax Abatements

In previous sections (4.5.1) and (4.5.2), I find evidence that there are positive spillover effects of tax abatements on residential and commercial property value growth. Thus, I recalculate the B/C ratios considering positive spillover effects of tax abatements on residential and commercial property values[35]. As shown in Table 4.15, for all scenarios, B/C ratios are still less than one, suggesting that tax abatements are costly and inefficient at least in Southeast Michigan.

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[35] For residential and commercial property, the estimated generated revenues resulting from tax abatements are presented in Tables 4.12 and 4.13.

Table 4.15 B/C Ratios of Tax Abatements II

Scenarios	Average Community		
	Costs[1]	Benefits[2]	B/C Ratio
Scenario 1	0.212	0.077	0.364
Scenario 2	0.180	0.077	0.429
Scenario 3	0.159	0.077	0.486
Scenario 4	0.138	0.077	0.560
Scenario 5	0.106	0.077	0.729

Note:

1. The costs of tax abatements are taken from Table 4.10.
2. For benefits of tax abatements, I assume that the total length of tenure of firms after the tax abatement is granted is 24 years: that is, the estimated annual revenues from abatements per capita per project can be calculated by: [column (8), Tables 4.11] × 24 years + [column (8), Tables 4.12] × 24 years + [column (8), Tables 4.13] × 24 years. I note that in the benefits here, I include spillover benefits of the tax abatements to residential and commercial properties.

4.6. Robustness Evaluation

To conduct robustness checks, I first consider the case that tax abatements are endogenous. Tables 4.16-4.21 provide the regression results from specifications treating the tax abatement variable (Δ G_IFT) as endogenous. I use the city mayor and township supervisor election cycles as an instrument to address potential endogeneity. Tables 4.16-4.21 correspond to Tables 4.3-4.8 and present the results that treat tax abatements as endogenously determined. As shown in Tables 4.16-4.21, I find no evidence that the own tax abatement variable (Δ G_IFT) have significant positive impacts on residential, commercial, and industrial property value growth. The lack of statistical significance may be due to the fact that the instrument I use for tax abatements is weak. In the future study, it will be useful to consider adding other valid instruments to improve identification. For other tax abatement variables, the results are consistent. Finally as shown in column 2 of Tables 4.17, 4.19, and 4.21, I report consistent findings for property tax rates and school spending: 1) Property tax rates affect the own residential, commercial, and industrial property value growth; 2) school spending is a important factor only for residential property value growth and 3) in the regional competition context, it is important for local communities to maintain a competitive tax position for industrial property value growth.

Table 4.16 First Difference Results – Robust Check I-1
Dependent Variable: Δ Ln Residential Property Values Per Capita

Specification	(1) FDIV	(2) FDIV	(3) FDIV‡	(4) FDIV
Include Comp. Variables	No	Yes	Yes	Yes
The Types of Competitors	–	Migration	Distance	Population
The Own Variables				
Δ G_IFT	0.021	-0.193	-0.061	0.018
	(0.145)	(0.150)	(0.121)	(0.139)
Δ E_IFT	0.049**	0.073**	0.056***	0.045**
	(0.021)	(0.029)	(0.020)	(0.020)
Δ Ln Property Tax	-0.079***	-0.281***	-0.124***	-0.060*
	(0.020)	(0.043)	(0.021)	(0.035)
Δ Ln School Spending	-0.009	0.881***	-0.005	0.029
	(0.078)	(0.198)	(0.099)	(0.136)
Δ Ln Crime rate	0.002	0.005	0.001	0.0002
	(0.002)	(0.007)	(0.002)	(0.002)
The Competitor Variables				
Δ CG_IFT		0.140***	0.007	-0.030
		(0.054)	(0.033)	(0.037)
Δ CE_IFT		0.443***	-0.027	-0.086**
		(0.141)	(0.038)	(0.036)
Δ Ln Property Tax		0.257***	0.107***	-0.017
		(0.049)	(0.033)	(0.037)
Δ Ln School Spending		-0.882***	0.023	-0.043
		(0.206)	(0.125)	(0.114)
Δ Ln Crime rate		-0.004	0.001	0.002
		(0.006)	(0.001)	(0.001)
N	1,976	1,976	1,976	1,976

Notes:

1. All regressions include a series of time indicator and community-specific time trend variables.
2. Robust cluster standard errors in parentheses
3. “Property Tax” indicates the residential property tax.
4. Spatial autocorrelation is taken into consideration in the specifications with the symbol (‡) in the first row.
5. I treat the tax abatement variable (G_IFT) as endogenous.
6. * significant at 10%; ** significant at 5%; *** significant at 1%

Table 4.17 First Difference Results – Robust Check I-1
Dependent Variable: Δ Ln Residential Property Values Per Capita

Specification	(1) FDIV	**(2) FDIV**	(3) FDIV‡	(4) FDIV
Include Comp. Variables	No	**Yes**	Yes	Yes
The Types of Competitors	–	**Migration**	Distance	Population
The Own Variables				
Δ G_IFT	0.233 (0.209)	**0.090** **(0.134)**	0.046 (0.102)	-0.015 (0.244)
Δ G_IFT t-1	0.100 (0.201)	**-0.088** **(0.128)**	0.036 (0.149)	-0.534* (0.293)
Δ G_IFT t-2	0.193 (0.278)	**-0.295**** **(0.146)**	0.195 (0.184)	0.234 (0.296)
Δ G_IFT t-3	0.455* (0.265)	**-0.105** **(0.126)**	0.073 (0.131)	0.201 (0.315)
Δ E_IFT	-0.004 (0.050)	**0.060**** **(0.028)**	0.040 (0.026)	0.030 (0.053)
Δ E_IFT t-1	-0.035 (0.049)	**0.007** **(0.025)**	-0.022 (0.033)	0.098* (0.059)
Δ E_IFT t-2	-0.025 (0.055)	**0.024** **(0.034)**	-0.032 (0.035)	-0.055 (0.048)
Δ E_IFT t-3	-0.028 (0.050)	**0.047** **(0.036)**	0.004 (0.021)	0.022 (0.048)
Δ Ln Property Tax	-0.082*** (0.024)	**-0.296***** **(0.067)**	-0.129*** (0.024)	-0.025 (0.072)
Δ Ln Property Tax t-1	-0.042** (0.017)	**-0.164***** **(0.063)**	-0.070*** (0.016)	0.037 (0.072)
Δ Ln Property Tax t-2	-0.022 (0.015)	**-0.125**** **(0.060)**	-0.054*** (0.021)	0.010 (0.057)
Δ Ln Property Tax t-3	-0.018 (0.023)	**0.106*** **(0.062)**	0.0002 (0.016)	0.016 (0.066)
Δ Ln School Spending	-0.030 (0.093)	**1.165***** **(0.293)**	-0.137 (0.129)	-0.056 (0.302)
Δ Ln School Spending t-1	0.075 (0.068)	**0.644**** **(0.325)**	0.100 (0.082)	0.120 (0.333)
Δ Ln School Spending t-2	0.053 (0.056)	**0.274** **(0.339)**	0.013 (0.079)	-0.246 (0.282)
Δ Ln School Spending t-3	0.119 (0.080)	**0.189** **(0.304)**	0.228*** (0.069)	-0.583** (0.262)
Δ Ln Crime rate	0.002 (0.002)	**0.012** **(0.009)**	0.002 (0.003)	0.0004 (0.005)

Table 4.17 (cont'd)

Specification	(1) FDIV	**(2) FDIV**	(3) FDIV	(4) FDIV
The Competitor Variables				
Δ CG_IFT		**0.142****	0.056	0.054
		(0.071)	(0.047)	(0.108)
Δ CG_IFT t-1		**0.079**	-0.007	0.066
		(0.076)	(0.042)	(0.091)
Δ CG_IFT t-2		**-0.063**	0.016	-0.197**
		(0.073)	(0.035)	(0.100)
Δ CG_IFT t-3		**-0.006**	0.049	0.099
		(0.064)	(0.046)	(0.091)
Δ CE_IFT		**0.479****	-0.046	-0.012
		(0.194)	(0.048)	(0.080)
Δ CE_IFT t-1		**0.272**	-0.022	-0.114
		(0.217)	(0.035)	(0.099)
Δ CE_IFT t-2		**-0.257**	-0.056	0.022
		(0.236)	(0.035)	(0.105)
Δ CE_IFT t-3		**0.393***	0.040	0.038
		(0.212)	(0.034)	(0.086)
Δ Ln Property Tax		**0.251*****	0.107***	-0.037
		(0.074)	(0.034)	(0.064)
Δ Ln Property Tax t-1		**0.141****	0.072**	-0.039
		(0.064)	(0.033)	(0.063)
Δ Ln Property Tax t-2		**0.116***	0.049	-0.065
		(0.062)	(0.034)	(0.056)
Δ Ln Property Tax t-3		**-0.089**	-0.005	-0.025
		(0.069)	(0.034)	(0.058)
Δ Ln School Spending		**-1.231*****	0.147	0.158
		(0.279)	(0.138)	(0.286)
Δ Ln School Spending t-1		**-0.613****	-0.025	-0.024
		(0.309)	(0.105)	(0.306)
Δ Ln School Spending t-2		**-0.241**	0.052	0.248
		(0.329)	(0.119)	(0.246)
Δ Ln School Spending t-3		**-0.054**	-0.242**	0.524**
		(0.299)	(0.104)	(0.239)
Δ Ln Crime rate		**-0.010**	-0.0001	0.008**
		(0.008)	(0.002)	(0.004)
N	1,520	**1,520**	1,520	1,520

Notes:
1. All regressions include a series of time indicator and individual-specific time trend variables.
2. Robust cluster standard errors in parentheses
3. "Property Tax" indicates the residential property tax.
4. Spatial autocorrelation is taken into consideration in the specifications with the symbol (‡) in the first row.
5. I treat tax abatement variables (G_IFT, G_IFT t-1, G_IFT t-2, and G_IFT t-3) as endogenous.
6. * significant at 10%; ** significant at 5%; *** significant at 1%

Table 4.18 First Difference Results II-1
Dependent Variable: Δ Ln Commercial Property Values Per Capita

Specification	(1) FDIV	(2) FDIV‡	(3) FDIV‡	(4) FDIV
Include Comp. Variables	No	Yes	Yes	Yes
The Types of Competitors	–	Migration	Distance	Population
The Own Variables				
Δ G_IFT	-0.175	-0.079	-0.109	-0.066
	(0.238)	(0.231)	(0.232)	(0.229)
Δ E_IFT	0.042	0.029	0.032	0.030
	(0.040)	(0.036)	(0.037)	(0.036)
Δ Ln Property Tax	-0.016	-0.259	-0.102	0.050
	(0.052)	(0.160)	(0.087)	(0.106)
Δ Ln School Spending	0.100	0.334	0.008	-0.034
	(0.108)	(0.387)	(0.164)	(0.281)
Δ Ln Crime rate	0.006**	0.021	0.003	-0.001
	(0.003)	(0.015)	(0.004)	(0.004)
The Competitor Variables				
Δ CG_IFT		0.142	0.039	-0.005
		(0.111)	(0.069)	(0.081)
Δ CE_IFT		-0.032	-0.005	-0.020
		(0.185)	(0.047)	(0.067)
Δ Ln Property Tax		0.277*	0.148	-0.071
		(0.155)	(0.095)	(0.094)
Δ Ln School Spending		-0.193	0.129	0.106
		(0.356)	(0.198)	(0.255)
Δ Ln Crime rate		-0.015	0.003	0.008***
		(0.014)	(0.003)	(0.003)
N	1,976	1,976	1,976	1,976

Notes:
1. All regressions include a series of time indicator and community-specific time trend variables.
2. Robust cluster standard errors in parentheses
3. “Property Tax” indicates the non-residential property tax.
4. Spatial autocorrelation is taken into consideration in the specifications with the symbol (‡) in the first row.
5. I treat the tax abatement variable (G_IFT) as endogenous.
6. * significant at 10%; ** significant at 5%; *** significant at 1%

Table 4.19 First Difference Results II-2
Dependent Variable: Δ Ln Commercial Property Values Per Capita

Specification	(1) FDIV	**(2) FDIV**	(3) FDIV‡	(4) FDIV
Include Comp. Variables	No	**Yes**	Yes	Yes
The Types of Competitors	–	**Migration**	Distance	Population
The Own Variables				
Δ G_IFT	-0.194	**-0.002**	-0.027	-0.080
	(0.218)	**(0.177)**	(0.203)	(0.226)
Δ G_IFT t-1	-0.349	**-0.288**	-0.299	-0.416
	(0.268)	**(0.206)**	(0.212)	(0.255)
Δ G_IFT t-2	0.021	**-0.163**	0.112	0.110
	(0.372)	**(0.250)**	(0.302)	(0.305)
Δ G_IFT t-3	0.048	**0.055**	0.074	0.001
	(0.280)	**(0.247)**	(0.242)	(0.265)
Δ E_IFT	0.062	**0.027**	0.034	0.044
	(0.053)	**(0.042)**	(0.043)	(0.050)
Δ E_IFT t-1	0.079	**0.070**	0.056	0.086*
	(0.052)	**(0.052)**	(0.044)	(0.051)
Δ E_IFT t-2	-0.020	**-0.009**	-0.036	-0.042
	(0.055)	**(0.042)**	(0.046)	(0.046)
Δ E_IFT t-3	0.031	**0.018**	0.031	0.041
	(0.046)	**(0.044)**	(0.041)	(0.046)
Δ Ln Property Tax	0.003	**-0.506*** **	-0.039	0.039
	(0.052)	**(0.166)**	(0.095)	(0.123)
Δ Ln Property Tax t-1	0.008	**-0.544** **	-0.046	0.032
	(0.046)	**(0.238)**	(0.071)	(0.119)
Δ Ln Property Tax t-2	0.033	**-0.818*** **	0.086	0.016
	(0.052)	**(0.223)**	(0.083)	(0.084)
Δ Ln Property Tax t-3	0.049	**-0.128**	0.085	0.106
	(0.057)	**(0.243)**	(0.085)	(0.104)
Δ Ln School Spending	0.079	**0.720**	-0.036	-0.035
	(0.118)	**(0.458)**	(0.189)	(0.306)
Δ Ln School Spending t-1	0.031	**0.326**	0.080	0.134
	(0.107)	**(0.463)**	(0.162)	(0.334)
Δ Ln School Spending t-2	-0.029	**0.454**	0.089	-0.232
	(0.110)	**(0.438)**	(0.163)	(0.271)
Δ Ln School Spending t-3	-0.010	**-0.563**	0.129	-0.334
	(0.099)	**(0.366)**	(0.148)	(0.259)
Δ Ln Crime rate	0.008*	**0.020**	0.006	-0.001
	(0.004)	**(0.018)**	(0.005)	(0.004)

Table 4.19 (cont'd)

Specification	(1) FDIV	**(2) FDIV**	(3) FDIV	(4) FDIV
The Competitor Variables				
Δ CG_IFT		**0.136**	0.069	0.058
		(0.146)	(0.095)	(0.101)
Δ CG_IFT t-1		**-0.119**	-0.137	0.062
		(0.129)	(0.097)	(0.083)
Δ CG_IFT t-2		**-0.059**	0.030	-0.195**
		(0.120)	(0.082)	(0.095)
Δ CG_IFT t-3		**-0.123**	-0.082	0.099
		(0.123)	(0.081)	(0.086)
Δ CE_IFT		**-0.325**	0.034	-0.013
		(0.312)	(0.064)	(0.080)
Δ CE_IFT t-1		**0.643***	-0.041	-0.093
		(0.372)	(0.067)	(0.088)
Δ CE_IFT t-2		**0.162**	0.092	-0.026
		(0.337)	(0.071)	(0.091)
Δ CE_IFT t-3		**-0.493**	0.082	0.019
		(0.424)	(0.103)	(0.079)
Δ Ln Property Tax		**0.541*****	0.083	-0.034
		(0.158)	(0.109)	(0.114)
Δ Ln Property Tax t-1		**0.553****	0.109	-0.009
		(0.229)	(0.086)	(0.117)
Δ Ln Property Tax t-2		**0.875*****	-0.097	0.013
		(0.222)	(0.092)	(0.084)
Δ Ln Property Tax t-3		**0.181**	-0.069	-0.067
		(0.243)	(0.107)	(0.088)
Δ Ln School Spending		**-0.544**	0.089	0.110
		(0.456)	(0.239)	(0.281)
Δ Ln School Spending t-1		**-0.270**	0.012	-0.052
		(0.467)	(0.225)	(0.310)
Δ Ln School Spending t-2		**-0.353**	-0.104	0.214
		(0.433)	(0.224)	(0.222)
Δ Ln School Spending t-3		**0.633***	-0.267	0.314
		(0.384)	(0.268)	(0.233)
Δ Ln Crime rate		**-0.011**	0.002	0.010***
		(0.018)	(0.003)	(0.003)
N	1,520	**1,520**	1,520	1,520

Notes:
1. All regressions include a series of time indicator and community-specific time trend variables.
2. Robust cluster standard errors in parentheses
3. "Property Tax" indicates the non-residential property tax.
4. Spatial autocorrelation is taken into consideration in the specifications with the symbol (‡) in the first row.
5. I treat tax abatement variables (G_IFT, G_IFT t-1, G_IFT t-2, and G_IFT t-3) as endogenous.
6. * significant at 10%; ** significant at 5%; *** significant at 1%

Table 4.20 First Difference Results – Robust Check III-1
Dependent Variable: Δ Ln Industrial Property Values

Specification	(1) FDIV	(2) FDIV	(3) FDIV‡	(4) FDIV
Include Comp. Variables	No	Yes	Yes	Yes
The Types of Competitors	–	Migration	Distance	Population
The Own Variables				
Δ G_IFT	0.158 (0.557)	0.371 (0.561)	0.121 (0.529)	0.322 (0.583)
Δ E_IFT	0.110 (0.083)	0.090 (0.085)	0.114 (0.082)	0.101 (0.087)
Δ Ln Property Tax	-0.019 (0.108)	-0.340 (0.340)	0.012 (0.171)	-0.304 (0.254)
Δ Ln School Spending	0.255 (0.479)	1.213* (0.687)	0.255 (0.492)	-0.888 (0.805)
Δ Ln Crime rate	0.004 (0.005)	0.008 (0.024)	0.003 (0.006)	-0.005 (0.007)
The Competitor Variables				
Δ CG_IFT		0.129 (0.183)	0.010 (0.213)	0.113 (0.135)
Δ CE_IFT		-0.447 (0.322)	-0.061 (0.082)	-0.088 (0.134)
Δ Ln Property Tax		0.318 (0.295)	-0.044 (0.168)	0.299 (0.216)
Δ Ln School Spending		-1.025 (0.925)	0.037 (0.306)	1.069* (0.589)
Δ Ln Crime rate		-0.006 (0.023)	0.001 (0.005)	0.009 (0.006)
N	1,976	1,976	1,976	1,976

Notes:
1. All regressions include a series of time indicator and community-specific time trend variables.
2. Robust cluster standard errors in parentheses
3. “Property Tax” indicates the non-residential property tax.
4. Spatial autocorrelation is taken into consideration in the specifications with the symbol (‡) in the first row.
5. I treat the tax abatement variable (G_IFT) as endogenous.
6. * significant at 10%; ** significant at 5%; *** significant at 1%

Table 4.21 First Difference Results – Robust Check III-2
Dependent Variable: Δ Ln Industrial Property Values

Specification	(1) FDIV	**(2) FDIV**	(3) FDIV	(4) FDIV
Include Comp. Variables	No	**Yes**	Yes	Yes
The Types of Competitors	–	**Migration**	Distance	Population
The Own Variables				
Δ G_IFT	-0.028 (0.382)	**0.082** **(0.370)**	-0.167 (0.438)	-0.156 (0.460)
Δ G_IFT t-1	-0.106 (0.450)	**-0.699** **(0.558)**	-0.056 (0.500)	-0.474 (0.500)
Δ G_IFT t-2	-0.385 (0.601)	**-0.464** **(0.527)**	-0.914 (0.666)	-0.421 (0.533)
Δ G_IFT t-3	-0.037 (0.500)	**-0.458** **(0.563)**	-0.436 (0.603)	-0.336 (0.554)
Δ E_IFT	0.105 (0.087)	**0.120** **(0.112)**	0.158 (0.102)	0.140 (0.104)
Δ E_IFT t-1	0.019 (0.087)	**0.118** **(0.106)**	0.022 (0.105)	0.098 (0.094)
Δ E_IFT t-2	-0.008 (0.107)	**-0.007** **(0.107)**	0.060 (0.132)	-0.009 (0.104)
Δ E_IFT t-3	0.020 (0.071)	**0.057** **(0.095)**	0.077 (0.099)	0.070 (0.094)
Δ Ln Property Tax	0.039 (0.118)	**-0.666** **(0.414)**	0.019 (0.190)	-0.216 (0.260)
Δ Ln Property Taxt-1	0.200 (0.187)	**-0.903**** **(0.444)**	0.457 (0.428)	0.029 (0.287)
Δ Ln Property Taxt-2	0.003 (0.163)	**-0.762** **(0.607)**	-0.023 (0.152)	0.142 (0.238)
Δ Ln Property Taxt-3	0.050 (0.072)	**-0.349** **(0.643)**	0.121 (0.166)	0.136 (0.191)
Δ Ln School Spending	0.242 (0.511)	**0.530** **(1.029)**	0.127 (0.556)	-0.924 (0.922)
Δ Ln School Spending t-1	-0.899 (0.659)	**0.721** **(0.989)**	-1.285 (0.855)	-1.502 (1.421)
Δ Ln School Spending t-2	-0.227 (0.183)	**0.030** **(0.778)**	-0.175 (0.306)	0.702 (1.074)
Δ Ln School Spending t-3	0.093 (0.280)	**-0.019** **(0.640)**	-0.077 (0.425)	1.275** (0.566)
Δ Ln Crime rate	0.005 (0.007)	**0.009** **(0.032)**	0.006 (0.008)	-0.003 (0.007)

Table 4.21 (cont'd)

Specification	(1) FDIV	**(2) FDIV**	(3) FDIV	(4) FDIV
The Competitor Variables				
Δ CG_IFT		**-0.027**	-0.193	0.271
		(0.253)	(0.272)	(0.169)
Δ CG_IFT t-1		**-0.283**	0.108	0.077
		(0.295)	(0.172)	(0.234)
Δ CG_IFT t-2		**0.061**	-0.210	0.101
		(0.316)	(0.137)	(0.167)
Δ CG_IFT t-3		**-0.031**	0.044	0.313*
		(0.220)	(0.212)	(0.162)
Δ CE_IFT		**-0.415**	0.036	-0.094
		(0.564)	(0.131)	(0.149)
Δ CE_IFT t-1		**0.802**	-0.228	-0.251
		(0.708)	(0.161)	(0.222)
Δ CE_IFT t-2		**0.218**	-0.010	-0.140
		(0.707)	(0.133)	(0.221)
Δ CE_IFT t-3		**-0.756**	0.169	0.427*
		(0.908)	(0.144)	(0.249)
Δ Ln Property Tax		**0.716***	0.013	0.291
		(0.388)	(0.198)	(0.227)
Δ Ln Property Tax t-1		**1.047****	-0.405	0.146
		(0.482)	(0.405)	(0.188)
Δ Ln Property Tax t-2		**0.771**	0.052	-0.166
		(0.613)	(0.199)	(0.284)
Δ Ln Property Tax t-3		**0.411**	-0.119	-0.094
		(0.650)	(0.219)	(0.184)
Δ Ln School Spending		**-0.251**	0.123	1.128
		(1.132)	(0.381)	(0.691)
Δ Ln School Spending t-1		**-1.697**	0.738	0.604
		(1.533)	(0.641)	(1.035)
Δ Ln School Spending t-2		**-0.204**	-0.155	-0.999
		(0.845)	(0.495)	(1.002)
Δ Ln School Spending t-3		**0.179**	0.247	-1.127**
		(0.755)	(0.454)	(0.525)
Δ Ln Crime rate		**-0.004**	0.001	0.013*
		(0.030)	(0.007)	(0.007)
N	1,520	**1,520**	1,520	1,520

Notes:
1. All regressions include a series of time indicator and community-specific time trend variables.
2. Robust cluster standard errors in parentheses
3. "Property Tax" indicates the residential property tax.
4. I fail to find spatial autocorrelation for all specifications.
5. I treat tax abatement variables (G_IFT, G_IFT t-1, G_IFT t-2, and G_IFT t-3) as endogenous.
6. * significant at 10%; ** significant at 5%; *** significant at 1%

Further, in addition to treating tax abatements as endogenous, I explore several alternative approaches and specifications. First, migration and population competitor weights in the analysis are based on the data from the 2000 Census. Because the post-reform values may reflect migration flows in response to school finance reform, for robustness evaluation, I use the values before the imposition of Proposal A to define competitor communities; that is, I use the data on migration patterns that was obtained from the 1990 Census and an "average" population of each community over the years before the implementation of Proposal A (1983-1993). Second, to explore finding the appropriate definition of "true" competitors/neighbors, additionally, I employ information on the composition of race and income per capita (in 1985 dollars) to define competitors. Race and income competitors are defined as:

- Race competitors: community j is a competitor of i if it is one of the four closest in the ratio of black/African American to community i.
- Income competitors: community j is a competitor of i if it is one of the four closest in income per capita to community i.

Next, the population and crime variables may be endogenous to the fiscal changes brought on by Proposal A, which is important for my identification strategy because potential movers may choose where to live based on physical amenities and fiscal amenities such as crime, pollution, and tax/spending. Furthermore, it is possible that population and crime are also highly correlated with residential and business property values (Brett and Pinkse, 2000). In the case, I need instruments to control for the potential endogeneity of the population and crime rate variables. Since I do not have appropriate instruments for population and crime, I use property values, which are not normalized by population, as the dependent variable and omit the crime rate variable as the independent variable in the specifications. Lastly, under Proposal A, poorer communities received greater funding for local operating costs from the state than wealthy communities. Proposal A was designed to reduce the gap between low and high spending communities and the overall level of school funding in the region increased. Thus, in an effort to find an appropriate instrument for school spending, I use changes in the per pupil school funding (the per pupil state aid and the per pupil local revenue) *resulting from Proposal A* as an alternative instrument. APPENDIX 4.D provides a more detailed description of how I generate the instrument for changes in school spending. For reference, I report, in Tables 4.B.5 and 4.B.6, APPENDIX 4.B, the first stage regressions, showing that the alternative instrument is a statistically significant predictor. However, the F-statistics for excluded instruments for two of the four endogenous variables, school spending and competitor school spending (CS), are between four and six (columns 3 and 5 on both Tables 4.B.5 and 4.B.6). To further examine the weak instrument problem in the presence of non-i.i.d errors, as Baum, et al. (2007) suggested, I use a Kleibergen-Paap (KP) Wald *rk* F statistic for the weak identification (ID) test.[36] The KP Wald *rk* F statistics from the first-stage regressions for the residential and business (commercial/industrial) property value equations are 1.07 and 1.4, respectively. The critical values for Stock-Yogo weak ID test provided by Stock and Yogo (2005) are not available because in these specifications because I have five endogenous and nine instrumental variables (they provide critical values for up to three endogenous variables). Thus, I use the informal threshold of 10, the “Staiger and Stock rule of thumb”, as a critical value to test the null hypothesis that the instruments are weak (Staiger and Stock, 1997). Using the KP Wald *rk* F statistics, I fail to reject the null hypothesis, indicating that the joint strength of the excluded

[36] The KP Wald *rk* F statistic is analogous to the Cragg-Donald (CD) F statistic, but unlike the CD F statistic, it accounts for heteroskedasticity, autocorrelation, or clustering (Baum, *et al.*, 2007).

instruments is weak. Therefore, the robust estimates may be biased by weak instruments. Regardless, I think that this robust evaluation advances understanding of regional competition.

As shown in Tables 4.5-4.8, the robustness check results are consistent with the traditional instrumental variable results presented in the core analysis, except for industrial property value effects of the tax rates,[37] though the magnitudes of the estimated effects are somewhat smaller.[38] Also, intra-regional migration patterns appear to be a better approach for identifying competitors, at least in the case of Southeast Michigan.

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[37] In this robustness check result, I fail to find a statistically significant effect of the tax rates on industrial property value growth.

[38] To calculate the long run effects of property taxes and school spending on residential property value growth in column 2, Table 4.23, I use the Stata LINCOM command computing the aggregate coefficients: 1) the aggregate coefficient on current-, one-, and two-year lagged property taxes is – 0.347, which is statistically significant although the coefficient on one year lagged property taxes is not significant and 2) the aggregate coefficient on one- and three-year lagged school spending is 0.683, which is statistically significant. For the long run effects of school spending, I do not include the coefficient on the two-year lagged school spending, which is marginally significant, because the aggregate coefficient on current-, one-, and two year lagged school spending is not different from zero. Also, using a same technique, I calculate the long run effects of property taxes on commercial property value growth in column 2, Tables 4.25: – 0.438.

Table 4.22 First Difference Results – Robust Check IV-1: Dependent Variable - Δ Log Residential Property Values

Specification	(1) FDIV	(2) FDIV	(3) FDIV‡	(4) FDIV	(5) FDIV	(6) FDIV‡
Include Competitor Variables	No	Yes	Yes	Yes	Yes	Yes
The Types of Competitors	–	Migration	Distance	Population	Income	Race
The Own Variables						
Δ G_IFT	-0.178	-0.191	-0.186	-0.257**	-0.175	-0.093
	(0.141)	(0.118)	(0.128)	(0.123)	(0.147)	(0.137)
Δ E_IFT	0.007	0.006	0.007	0.011	0.006	-0.007
	(0.022)	(0.020)	(0.021)	(0.021)	(0.022)	(0.022)
Δ Ln Property Tax	-0.105***	-0.274***	-0.174***	-0.091**	-0.111***	-0.167***
	(0.019)	(0.046)	(0.023)	(0.036)	(0.034)	(0.051)
Δ Ln School Spending	0.032	0.495	0.052	0.146	0.108	-0.575
	(0.164)	(0.302)	(0.133)	(0.299)	(0.409)	(0.384)
The Competitor Variables						
Δ CG_IFT		0.012	-0.011	-0.024	0.004	-0.022
		(0.045)	(0.024)	(0.041)	(0.038)	(0.040)
Δ CE_IFT		0.365***	0.008	-0.089**	-0.001	-0.002
		(0.110)	(0.024)	(0.038)	(0.002)	(0.002)
Δ Ln Property Tax		0.191***	0.129***	-0.008	0.007	0.058
		(0.050)	(0.033)	(0.035)	(0.033)	(0.050)
Δ Ln School Spending		-0.404	-0.315	-0.068	-0.073	0.588*
		(0.285)	(0.256)	(0.296)	(0.333)	(0.322)

Notes:
1. All regressions include a series of time indicator and community-specific time trend variables.
2. Robust cluster standard errors in parentheses
3. “Property Tax” indicates the residential property tax.
4. Spatial autocorrelation is taken into consideration in the specifications with the symbol (‡) in the first row.
5. I treat tax abatement variables (G_IFT) as endogenous.
6. * significant at 10%; ** significant at 5%; *** significant at 1%

Table 4.23 First Difference Results – Robust Check IV-2
Dependent Variable: Δ Ln Residential Property Values

Specification	(1) FDIV	**(2) FDIV**	(3) FDIV‡	(4) FDIV	(5) FDIV	(6) FDIV‡
Include Comp. Variables	No	**Yes**	Yes	Yes	Yes	Yes
The Types of Competitors	–	**Migr.**	Dist.	Pop.	Race	Income
The Own Variables						
Δ G_IFT	0.025	**-0.175***	-0.276***	0.210	-0.002	0.039
	(0.145)	**(0.092)**	(0.102)	(0.296)	(0.109)	(0.104)
Δ G_IFT t-1	-0.101	**-0.091**	-0.026	-0.540**	-0.018	-0.012
	(0.156)	**(0.084)**	(0.127)	(0.254)	(0.108)	(0.104)
Δ G_IFT t-2	0.060	**-0.072**	0.065	0.311	-0.004	0.030
	(0.229)	**(0.086)**	(0.190)	(0.272)	(0.151)	(0.127)
Δ G_IFT t-3	0.344	**0.086**	-0.020	0.307	0.194	0.284*
	(0.219)	**(0.078)**	(0.124)	(0.277)	(0.156)	(0.157)
Δ E_IFT	-0.035	**0.004**	0.013	-0.055	-0.023	-0.037
	(0.035)	**(0.019)**	(0.022)	(0.059)	(0.024)	(0.028)
Δ E_IFT t-1	-0.006	**0.004**	-0.004	0.078	-0.010	-0.012
	(0.034)	**(0.020)**	(0.030)	(0.059)	(0.028)	(0.027)
Δ E_IFT t-2	-0.005	**0.006**	-0.015	-0.061	-0.0003	-0.005
	(0.042)	**(0.018)**	(0.030)	(0.056)	(0.027)	(0.027)
Δ E_IFT t-3	-0.012	**0.003**	0.005	0.033	0.006	-0.005
	(0.038)	**(0.021)**	(0.019)	(0.048)	(0.026)	(0.028)
Δ Ln Property	-0.12***	**-0.235*****	-0.178***	-0.158*	-0.141***	-0.137**
Tax	(0.024)	**(0.050)**	(0.026)	(0.085)	(0.036)	(0.054)
Δ Ln Property	-0.027*	**-0.027**	-0.056***	0.061	-0.017	-0.069
Tax t-1	(0.015)	**(0.050)**	(0.016)	(0.080)	(0.030)	(0.046)
Δ Ln Property	-0.026**	**-0.085****	-0.069***	-0.003	-0.035	-0.027
Tax t-2	(0.013)	**(0.039)**	(0.019)	(0.064)	(0.028)	(0.037)
Δ Ln Property	-0.016	**0.002**	-0.026	-0.023	-0.035	0.005
Tax t-3	(0.019)	**(0.042)**	(0.018)	(0.073)	(0.032)	(0.057)
Δ Ln School	-0.024	**0.226**	-0.258*	-0.288	-0.083	-0.579
Spending	(0.185)	**(0.193)**	(0.154)	(0.801)	(0.367)	(0.381)
Δ Ln School	0.072	**0.274***	0.093	1.096*	0.279	-1.037***
Spending t-1	(0.133)	**(0.149)**	(0.117)	(0.656)	(0.202)	(0.399)
Δ Ln School	0.040	**-0.087**	-0.208	0.652	-0.011	-0.203
Spending t-2	(0.128)	**(0.167)**	(0.127)	(0.619)	(0.227)	(0.323)
Δ Ln School	-0.206	**0.410****	0.097	-1.097**	-0.288	-0.103
Spending t-3	(0.153)	**(0.206)**	(0.107)	(0.486)	(0.283)	(0.280)

Table 4.23 (cont'd)

Specification	(1) FDIV	**(2) FDIV**	(3) FDIV‡	(4) FDIV	(5) FDIV	(6) FDIV‡
The Competitor Variables						
Δ CG_IFT		**-0.001**	-0.0562	0.047	-0.060	0.0441
		(0.044)	(0.0367)	(0.121)	(0.038)	(0.0568)
Δ CG_IFT t-1		**0.051**	-0.0349	0.021	-0.009	-0.0195
		(0.038)	(0.0398)	(0.090)	(0.033)	(0.0486)
Δ CG_IFT t-2		**0.050**	-0.0217	-0.147	0.014	0.0226
		(0.041)	(0.0351)	(0.110)	(0.035)	(0.0517)
Δ CG_IFT t-3		**0.095****	-0.0063	0.124	-0.010	0.1391*
		(0.042)	(0.0360)	(0.121)	(0.040)	(0.0753)
Δ CE_IFT		**0.478*****	-0.0117	0.061	0.0004	-0.0007
		(0.173)	(0.0340)	(0.097)	(0.002)	(0.0026)
Δ CE_IFT t-1		**0.287***	0.0391	-0.187*	-0.003	-0.0023
		(0.159)	(0.0322)	(0.099)	(0.002)	(0.0021)
Δ CE_IFT t-2		**-0.155**	-0.0210	0.027	0.001	-0.0033
		(0.166)	(0.0270)	(0.108)	(0.002)	(0.0022)
Δ CE_IFT t-3		**-0.173**	0.0105	0.077	-0.002	-0.0019
		(0.185)	(0.0315)	(0.104)	(0.002)	(0.0029)
Δ Ln Property		**0.156*****	0.1507***	0.028	0.022	0.0154
Tax		**(0.057)**	(0.0372)	(0.074)	(0.036)	(0.0546)
Δ Ln Property		**0.001**	0.0653***	-0.043	-0.019	0.0294
Tax t-1		**(0.055)**	(0.0253)	(0.070)	(0.029)	(0.0462)
Δ Ln Property		**0.077***	0.0674**	-0.064	0.010	0.0017
Tax t-2		**(0.043)**	(0.0343)	(0.066)	(0.027)	(0.0339)
Δ Ln Property		**-0.003**	0.0447	-0.005	0.021	-0.0163
Tax t-3		**(0.050)**	(0.0379)	(0.065)	(0.030)	(0.0524)
Δ Ln School		**-0.282***	0.1868	0.521	-0.066	0.5187
Spending		**(0.158)**	(0.2064)	(0.727)	(0.321)	(0.3268)
Δ Ln School		**-0.354*****	-0.0956	-0.856	-0.257	1.0820***
Spending t-1		**(0.130)**	(0.2214)	(0.616)	(0.176)	(0.3635)
Δ Ln School		**-0.113**	0.0114	-0.225	0.017	0.1845
Spending t-2		**(0.147)**	(0.2123)	(0.525)	(0.159)	(0.3066)
Δ Ln School		**-0.394***	-0.1995	0.790*	0.177	0.0009
Spending t-3		**(0.206)**	(0.1818)	(0.433)	(0.220)	(0.2436)
N	1,520	**1,520**	1,520	1,520	1,520	1,520

Notes:

1. All regressions include a series of time indicator and community-specific time trend variables.
2. Robust cluster standard errors in parentheses
3. "Property Tax" indicates the residential property tax.
4. Spatial autocorrelation is taken into consideration in the specifications with the symbol (‡) in the first row.
5. I treat tax abatement variables (G_IFT, G_IFT t-1, G_IFT t-2, and G_IFT t-3) as endogenous.
6. * significant at 10%; ** significant at 5%; *** significant at 1%

Table 4.24 First Difference Results – Robust Check V-1: Dependent Variable - Δ Log Commercial Property Values

Specification	(1) FDIV	(2) FDIV	(3) FDIV	(4) FDIV	(5) FDIV	(6) FDIV
Include Competitor Variables	No	Yes	Yes	Yes	Yes	Yes
The Types of Competitors	–	Migr.	Dist.	Pop.	Income	Race
The Own Variables						
Δ G_IFT	-0.352	-0.171	-0.353	-0.180	-0.290	-0.236
	(0.312)	(0.228)	(0.308)	(0.274)	(0.292)	(0.303)
Δ E_IFT	-0.003	-0.024	-0.007	-0.010	-0.004	-0.011
	(0.050)	(0.035)	(0.048)	(0.045)	(0.045)	(0.045)
Δ Ln Property Tax	-0.023	-0.363**	-0.165	-0.174	-0.190**	-0.030
	(0.066)	(0.183)	(0.102)	(0.155)	(0.093)	(0.151)
Δ Ln School Spending	0.503	0.208	-0.166	-1.200	-0.112	-1.309
	(0.501)	(0.532)	(0.467)	(0.982)	(0.713)	(1.009)
The Competitor Variables						
Δ CG_IFT		-0.014	0.069	0.002	0.020	-0.036
		(0.089)	(0.063)	(0.077)	(0.078)	(0.102)
Δ CE_IFT		0.268	0.030	0.039	0.007**	0.0003
		(0.188)	(0.059)	(0.077)	(0.003)	(0.003)
Δ Ln Property Tax		0.333*	0.277**	0.128	0.185*	-0.034
		(0.196)	(0.120)	(0.139)	(0.110)	(0.134)
Δ Ln School Spending		0.081	1.256*	1.617*	0.564	1.725*
		(0.532)	(0.730)	(0.898)	(0.549)	(0.992)

Notes:

1. All regressions include a series of time indicator and community-specific time trend variables.
2. Robust cluster standard errors in parentheses
3. “Property Tax” indicates the non-residential property tax.
4. I fail to find spatial autocorrelation for all specifications.
5. I treat tax abatement variables (G_IFT) as endogenous.
6. * significant at 10%; ** significant at 5%; *** significant at 1%

Table 4.25 First Difference Results – Robust Check IV-2
Dependent Variable: Δ Ln Commercial Property Values

Specification	(1) FDIV	**(2) FDIV**	(3) FDIV‡	(4) FDIV	(5) FDIV	(6) FDIV
Include Comp. Variables	No	**Yes**	Yes	Yes	Yes	Yes
The Types of Competitors	–	**Migr.**	Dist.	Pop.	Race	Income
The Own Variables						
Δ G_IFT	0.304 (0.361)	**-0.076** **(0.224)**	0.661 (0.425)	0.229 (0.300)	0.002 (0.313)	-0.034 (0.297)
Δ G_IFT t-1	-0.144 (0.371)	**-0.175** **(0.207)**	0.016 (0.429)	-0.330 (0.249)	-0.130 (0.285)	-0.206 (0.252)
Δ G_IFT t-2	0.555 (0.529)	**0.036** **(0.263)**	0.631 (0.742)	0.344 (0.293)	0.227 (0.381)	0.391 (0.355)
Δ G_IFT t-3	0.537 (0.445)	**0.222** **(0.216)**	0.707 (0.519)	0.312 (0.249)	0.172 (0.277)	0.188 (0.260)
Δ E_IFT	-0.091 (0.077)	**-0.027** **(0.052)**	-0.146 (0.101)	-0.065 (0.059)	-0.030 (0.055)	-0.029 (0.059)
Δ E_IFT t-1	0.015 (0.075)	**0.048** **(0.040)**	-0.041 (0.097)	0.046 (0.051)	0.039 (0.048)	0.058 (0.048)
Δ E_IFT t-2	-0.087 (0.094)	**-0.035** **(0.044)**	-0.092 (0.129)	-0.069 (0.060)	-0.056 (0.059)	-0.065 (0.057)
Δ E_IFT t-3	-0.009 (0.079)	**0.008** **(0.047)**	-0.011 (0.099)	0.029 (0.049)	0.023 (0.046)	0.018 (0.047)
Δ Ln Property Tax	-0.025 (0.072)	**-0.438**** **(0.183)**	-0.039 (0.139)	-0.131 (0.147)	-0.132 (0.107)	0.235* (0.132)
Δ Ln Property Tax t-1	0.043 (0.053)	**-0.284** **(0.185)**	0.094 (0.103)	0.105 (0.132)	-0.037 (0.093)	0.118 (0.121)
Δ Ln Property Tax t-2	0.068 (0.059)	**-0.169** **(0.194)**	0.240 (0.151)	0.068 (0.114)	0.005 (0.101)	0.150 (0.150)
Δ Ln Property Tax t-3	0.011 (0.076)	**-0.102** **(0.166)**	0.153 (0.159)	0.063 (0.139)	0.057 (0.141)	0.162 (0.147)
Δ Ln School Spending	0.532 (0.609)	**0.758** **(0.576)**	0.801 (0.717)	-0.513 (0.876)	0.172 (0.826)	0.310 (0.730)
Δ Ln School Spending t-1	0.430 (0.366)	**0.378** **(0.338)**	0.412 (0.569)	1.131* (0.685)	-0.108 (0.657)	0.002 (0.762)
Δ Ln School Spending t-2	0.609 (0.437)	**0.547** **(0.431)**	1.477** (0.615)	0.709 (0.651)	-0.219 (0.487)	0.525 (0.806)
Δ Ln School Spending t-3	-0.194 (0.314)	**0.507** **(0.504)**	-0.180 (0.368)	-0.549 (0.489)	0.085 (0.589)	0.658 (0.630)

Table 4.25 (cont'd)

Specification	(1) FDIV	**(2) FDIV**	(3) FDIV‡	(4) FDIV	(5) FDIV	(6) FDIV
The Competitor Variables						
Δ CG_IFT		**-0.037**	0.336**	0.073	-0.164*	0.090
		(0.123)	(0.140)	(0.113)	(0.092)	(0.133)
Δ CG_IFT t-1		**-0.069**	-0.140	0.020	0.044	-0.062
		(0.096)	(0.129)	(0.082)	(0.091)	(0.109)
Δ CG_IFT t-2		**0.044**	0.142	-0.133	-0.039	0.150
		(0.126)	(0.110)	(0.106)	(0.107)	(0.133)
Δ CG_IFT t-3		**0.120**	0.171	0.145	0.002	0.199*
		(0.102)	(0.144)	(0.120)	(0.097)	(0.114)
Δ CE_IFT		**0.723****	0.045	0.068	0.010**	0.003
		(0.367)	(0.096)	(0.102)	(0.005)	(0.004)
Δ CE_IFT t-1		**1.038****	-0.125	-0.165*	-0.001	0.007
		(0.415)	(0.106)	(0.093)	(0.005)	(0.005)
Δ CE_IFT t-2		**-0.546**	0.207**	-0.020	0.001	0.003
		(0.355)	(0.096)	(0.096)	(0.004)	(0.006)
Δ CE_IFT t-3		**-0.088**	0.102	0.061	0.007	-0.001
		(0.600)	(0.114)	(0.100)	(0.004)	(0.006)
Δ Ln Property		**0.467*****	0.052	0.069	0.131	-0.277**
Tax		**(0.173)**	(0.145)	(0.138)	(0.105)	(0.117)
Δ Ln Property		**0.287**	0.001	-0.063	0.091	-0.090
Tax t-1		**(0.180)**	(0.113)	(0.127)	(0.092)	(0.110)
Δ Ln Property		**0.274**	-0.277	-0.025	0.040	-0.103
Tax t-2		**(0.188)**	(0.208)	(0.108)	(0.102)	(0.127)
Δ Ln Property		**0.151**	-0.225	-0.053	0.016	-0.113
Tax t-3		**(0.165)**	(0.230)	(0.125)	(0.112)	(0.117)
Δ Ln School		**-0.256**	-0.212	0.698	0.101	0.040
Spending		**(0.413)**	(0.644)	(0.775)	(0.621)	(0.771)
Δ Ln School		**-0.291**	0.438	-0.838	0.618	0.357
Spending t-1		**(0.292)**	(0.557)	(0.651)	(0.599)	(0.727)
Δ Ln School		**-0.229**	-0.861	-0.269	0.328	-0.400
Spending t-2		**(0.357)**	(0.704)	(0.518)	(0.374)	(0.679)
Δ Ln School		**-0.421**	-0.013	0.446	0.135	-0.624
Spending t-3		**(0.470)**	(0.528)	(0.452)	(0.491)	(0.607)
N	1,520	**1,520**	1,520	1,520	1,520	1,520

Notes:
1. All regressions include a series of time indicator and community-specific time trend variables.
2. Robust cluster standard errors in parentheses
3. "Property Tax" indicates the non-residential property tax.
4. Spatial autocorrelation is taken into consideration in the specifications with the symbol (‡) in the first row.
5. I treat tax abatement variables (G_IFT, G_IFT t-1, G_IFT t-2, and G_IFT t-3) as endogenous.
6. * significant at 10%; ** significant at 5%; *** significant at 1%

Table 4.26 First Difference Results – Robust Check VI-1: Dependent Variable - Δ Log Industrial Property Values

Specification	(1) FDIV	(2) FDIV	(3) FDIV	(4) FDIV	(5) FDIV	(6) FDIV
Include Competitor Variables	No	Yes	Yes	Yes	Yes	Yes
The Types of Competitors	–	Migr.	Dist.	Pop.	Income	Race
The Own Variables						
Δ G_IFT	0.726	1.296	0.349	1.330	1.076	1.653
	(0.840)	(0.943)	(0.693)	(1.029)	(0.952)	(1.239)
Δ E_IFT	-0.022	-0.078	0.019	-0.049	-0.039	-0.112
	(0.123)	(0.151)	(0.097)	(0.154)	(0.139)	(0.197)
Δ Ln Property Tax	-0.083	0.140	-0.031	-0.783*	-0.630**	-1.137**
	(0.158)	(0.604)	(0.215)	(0.406)	(0.304)	(0.544)
Δ Ln School Spending	1.094	1.251	2.064	-4.146*	-1.219	-5.849*
	(1.420)	(1.404)	(1.595)	(2.434)	(1.615)	(3.220)
The Competitor Variables						
Δ CG_IFT		0.096	-0.081	0.231	0.068	-0.148
		(0.210)	(0.215)	(0.264)	(0.235)	(0.283)
Δ CE_IFT		-0.703*	-0.019	0.049	0.026	0.013
		(0.375)	(0.106)	(0.196)	(0.021)	(0.012)
Δ Ln Property Tax		-0.279	-0.075	0.633*	0.579	0.966**
		(0.629)	(0.226)	(0.338)	(0.362)	(0.469)
Δ Ln School Spending		-0.724	-1.345	4.619**	1.839	6.327**
		(1.340)	(1.598)	(2.107)	(1.795)	(3.033)

Notes:
1. All regressions include a series of time indicator and community-specific time trend variables.
2. Robust cluster standard errors in parentheses
3. “Property Tax” indicates the non-residential property tax.
4. I fail to find spatial autocorrelation for all specifications.
5. I treat tax abatement variables (G_IFT) as endogenous.
6. * significant at 10%; ** significant at 5%; *** significant at 1%

Table 4.27 First Difference Results – Robust Check VI-2
Dependent Variable: Δ Ln Industrial Property Values

Specification	(1) FDIV	**(2) FDIV**	(3) FDIV	(4) FDIV	(5) FDIV	(6) FDIV
Include Comp. Variables	No	**Yes**	Yes	Yes	Yes	Yes
The Types of Competitors	–	**Migr.**	Dist.	Pop.	Race	Income
The Own Variables						
Δ G_IFT	-4.574 (3.205)	**-0.450** **(1.085)**	-1.049 (1.527)	-2.093 (1.796)	-3.744 (2.788)	-3.356* (1.923)
Δ G_IFT t-1	0.717 (2.007)	**-0.202** **(0.928)**	0.483 (1.639)	-0.742 (1.480)	0.998 (1.869)	-0.038 (1.397)
Δ G_IFT t-2	-0.198 (2.486)	**1.708** **(1.438)**	1.510 (2.896)	0.080 (1.098)	0.663 (2.237)	-1.353 (1.585)
Δ G_IFT t-3	-1.946 (3.182)	**1.156** **(1.266)**	1.220 (1.748)	-0.345 (1.307)	-1.994 (2.585)	-2.232 (2.188)
Δ E_IFT	0.430 (0.481)	**-0.092** **(0.182)**	-0.058 (0.293)	0.059 (0.281)	0.337 (0.385)	0.387 (0.347)
Δ E_IFT t-1	0.122 (0.366)	**0.036** **(0.223)**	-0.111 (0.368)	0.182 (0.238)	0.242 (0.391)	0.202 (0.296)
Δ E_IFT t-2	-0.028 (0.417)	**-0.300** **(0.246)**	-0.178 (0.462)	0.028 (0.203)	-0.293 (0.381)	0.092 (0.334)
Δ E_IFT t-3	-0.165 (0.465)	**-0.271** **(0.288)**	-0.295 (0.365)	-0.241 (0.277)	-0.096 (0.338)	-0.042 (0.366)
Δ Ln Property Tax	0.667 (0.552)	**1.259** **(1.166)**	0.362 (0.487)	1.192 (1.267)	0.239 (0.899)	0.346 (0.838)
Δ Ln Property Tax t-1	0.115 (0.507)	**-1.542** **(1.503)**	1.479 (1.367)	1.314 (1.701)	-0.064 (0.625)	-1.786 (1.239)
Δ Ln Property Tax t-2	-0.246 (0.388)	**-0.513** **(0.842)**	0.067 (0.395)	-0.548 (0.861)	0.320 (0.664)	-0.540 (0.876)
Δ Ln Property Tax t-3	0.540 (0.437)	**-0.210** **(0.830)**	0.556 (0.450)	0.998 (0.711)	0.243 (0.820)	1.040 (0.834)
Δ Ln School Spending	4.077 (3.551)	**0.721** **(2.031)**	5.750* (3.397)	7.205 (6.559)	12.628 (9.584)	1.019 (3.993)
Δ Ln School Spending t-1	-8.155 (6.645)	**-1.436** **(2.211)**	-5.112 (4.389)	-2.805 (4.578)	-9.685 (8.773)	-8.034 (9.041)
Δ Ln School Spending t-2	-7.032* (4.169)	**0.701** **(1.436)**	-0.921 (1.942)	-8.688 (6.846)	-2.447 (3.559)	-1.881 (4.102)
Δ Ln School Spending t-3	3.720 (2.328)	**3.388** **(2.625)**	-0.383 (1.467)	3.276 (2.513)	-2.849 (4.329)	5.935 (4.296)

Table 4.27 (cont'd)

Specification	(1) FDIV	**(2) FDIV**	(3) FDIV	(4) FDIV	(5) FDIV	(6) FDIV
The Competitor Variables						
Δ CG_IFT		**0.332**	-0.107	0.775	1.589	-0.341
		(0.441)	(0.410)	(0.618)	(1.056)	(0.676)
Δ CG_IFT t-1		**-0.259**	0.344	0.042	0.354	2.532
		(0.508)	(0.416)	(0.446)	(0.728)	(1.635)
Δ CG_IFT t-2		**0.566**	-0.666	0.288	0.256	0.740
		(0.539)	(0.492)	(0.382)	(0.740)	(0.618)
Δ CG_IFT t-3		**0.101**	0.204	0.180	0.854	0.704
		(0.498)	(0.405)	(0.527)	(0.747)	(0.950)
Δ CE_IFT		**1.111**	0.100	-1.257	0.007	0.017
		(1.738)	(0.295)	(0.922)	(0.037)	(0.029)
Δ CE_IFT t-1		**-0.980**	-0.503	0.198	-0.030	0.046
		(1.642)	(0.452)	(0.608)	(0.042)	(0.048)
Δ CE_IFT t-2		**-1.346**	0.100	0.474	0.042	-0.030
		(1.525)	(0.301)	(0.894)	(0.038)	(0.041)
Δ CE_IFT t-3		**-0.077**	0.010	-0.048	0.008	0.037
		(2.081)	(0.344)	(0.635)	(0.030)	(0.055)
Δ Ln Property Tax		**-0.898**	-0.144	-0.537	0.395	0.138
		(1.010)	(0.505)	(0.955)	(1.058)	(0.818)
Δ Ln Property Tax t-1		**1.730**	-1.624	-1.045	0.220	2.071
		(1.564)	(1.454)	(1.268)	(0.778)	(1.392)
Δ Ln Property Tax t-2		**0.175**	-0.350	0.320	-0.510	0.468
		(0.770)	(0.685)	(0.733)	(0.686)	(0.862)
Δ Ln Property Tax t-3		**0.252**	-0.654	-0.639	0.210	-0.602
		(0.837)	(0.759)	(0.559)	(0.782)	(0.735)
Δ Ln School Spending		**0.939**	-2.597	-2.358	-7.411	2.510
		(1.567)	(4.058)	(4.142)	(7.678)	(4.452)
Δ Ln School Spending t-1		**-4.701**	0.625	-4.829	1.941	0.108
		(2.974)	(2.640)	(4.878)	(5.582)	(7.746)
Δ Ln School Spending t-2		**-3.624***	-2.832	4.860	-2.495	-3.226
		(2.166)	(2.719)	(5.126)	(3.397)	(3.963)
Δ Ln School Spending t-3		**-1.742**	1.121	-1.480	5.241	-3.022
		(2.006)	(2.203)	(2.432)	(4.865)	(3.846)
N	1,520	**1,520**	1,520	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 non-residential property tax.
4. I fail to find spatial autocorrelation for all specifications.
5. I treat tax abatement variables (G_IFT, G_IFT t-1, G_IFT t-2, and G_IFT t-3) as endogenous.
6. * significant at 10%; ** significant at 5%; *** significant at 1%

4.7 Conclusion and Policy Implications

I 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, I show that the degree of capitalization differs across property classes. Based on this analysis, I 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.
- Commercial and industrial property values are more sensitive to tax policy changes than school spending changes.
- Commercial and industrial property values are more sensitive to changes in property taxes relative to residential property values.
- Tax abatements have a statistically significant positive effect on industrial property value growth and this effect is relatively larger in the high tax community than in the low tax community. However, its magnitude is relatively small as compared to the costs to local government of offering tax abatements; in other words, tax abatements are not cost-effective.
- Tax abatements create positive spillover effects on residential and commercial property value growth, but this result does not alter the argument that tax abatements are cost-ineffective.

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

The degree of this fiscal externality is much larger for commercial and industrial property value growth, indicating that commercial and industrial property is more responsive to competitor tax policy changes than residential property. In this study, the findings confirm the two hypotheses I propose regarding property value effects of property tax rates and school spending. With regard to regional competition, I find strong significant effects of competitor property tax rates (and/or school spending) on own property value growth. Specifically, the 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.

This study 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 commercial/industrial property. However, it is important to consider the effects of local policies on different property classes. I show that residents and businesses (commercial/industrial firms) 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 - 0.38 and 1.80, respectively; and 2) the long run property tax elasticities of commercial and industrial property values are –1.77 and -1.73, respectively. These results imply that if a community raises property tax rates to increase school spending, then business (commercial/industrial) 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 to increase business property value growth, then school spending could be curtailed,[39] 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.

With regard to the IFT abatement program, I draw two policy implications from the analysis. First, the findings directly support the Bartik (1991, 1994) and Wassmer (2007) argument that tax abatements may be more effective when they are used in high property tax rate communities because industrial firms appear to avoid high tax communities. That is, in high tax communities, tax abatements could be a useful tool to create a competitive relative position that might generate industrial property value growth in the context of regional competition. Second, although tax abatements can boost industrial activity, the findings show that there are substantial costs as well, and that net tax abatements result in a net cost to the local government. This inefficiency may stem from the lack of targeting. Almost every manufacturing firm is eligible for property tax abatements in almost every community in Michigan and it is rare for localities to reject abatement requests (Reese and Sands, 2012). In this case, firms, more likely to stay in a community without tax abatements, can have an incentive to request tax abatements, thereby

[39] 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.

causing inefficiency. Thus, to enhance the efficiency of the property tax abatement program in Michigan, it is important to improve targeting to limit eligibility for abatements: for example, developing more effective strategies for targeting manufacturing firms that are less likely to stay without tax abatements, or limiting to high tax communities that pose potentially unfriendly business environments. These types of limitation on the use of tax abatements may reduce the forgone revenues of the abatements as well as help maximize their fiscal benefits.

There are caveats that should be noted. Specifically, this study 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 I identify, including employment opportunities, standard of living, and quality of life.[40] All of these factors should be considered as policy makers ponder the tradeoffs between taxing and spending.

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

CHAPTER 5

Conclusion

This dissertation examines the effects of property taxes, school spending, and tax abatements on residential, commercial, and industrial property value growth in Southeast Michigan. First, I examine the effects of changes in property tax rates and school spending on residential, commercial, and industrial property value growth in Southeast Michigan. I provide new insight about how the effects of policy changes vary by type of property. To address the potential endogenous relationship between policy changes and property value growth, I use the imposition of Proposal A, which resulted in significant changes to both property tax rates and school spending for all communities in the state. Using an instrumental variables technique, I find that: 1) residential property values are more sensitive to school spending changes than property tax rate changes; 2) commercial and industrial property values are more sensitive to tax rate changes than school spending changes; and 3) commercial and industrial property values are more sensitive to changes in tax rates than are residential properties. I also find evidence that tax competition plays an important role in property value growth within the region.

Second, I examine the effectiveness of tax abatements in this same region surrounding Detroit. In this analysis, I find evidence that tax abatements have a statistically significant positive effect on industrial property value growth and this effect is larger in high than in low tax communities. Also, my findings show that tax abatements create spillover effects on residential and commercial property value growth. However, the benefits of tax abatements are much smaller than the cost of offering tax abatements and this result is not changed even when I include the spillover benefits of tax abatements in this analysis. In addition, whereas property tax rates and competitor property tax rates are significant determinants of the own industrial property value growth, I do not find evidence that competitor tax abatements influence the own industrial property value growth.

There are several policy implications we can draw from these findings. First, my results suggest that tax competition plays a vital role in property value growth. In this context, it is important for a community to keep its tax-service package competitive within the region in order not to lose property value growth. Second, the findings in this study imply that residents and businesses have different policy preferences and thus there are tradeoffs between taxing and spending for each class of property. Finally, these results suggest that tax abatements are cost-ineffective in Southeast Michigan. To improve the efficiency of tax abatements, local policymakers could improve targeting of abatements to manufacturing firms that are truly less likely to come (or stay) without abatements. From a state perspective, it may be prudent to limit use of abatements to high tax communities. Local policymakers do well to understand 1) the effects of policy changes in the context of regional competition; 2) the tradeoffs in the effects of policy changes on the value growth of different property classifications; and 3) the effectiveness of tax abatements considering the cost of granting them.

In addition to these important policy implications, this dissertation offers three main contributions to the literature. First, I find *new* evidence of differential responsiveness of residential and business property value growth to changes in tax rates and school spending. Second, I find a consistent result that migration flow information appears to better explain regional competition, at least in the Southeast Michigan context. Lastly, using the spatial weighting scheme based on migration flow information, proposed by Skidmore, *et al.* (2012), I find robust evidence of significant *fiscal externalities* in the Southeast Michigan region.

APPENDICES

APPENDIX 4.A Variable Sources

Table 4.A.1 Variable Sources

Variables	Sources	Links
The Number of Tax Abatements (G_IFT and E_IFT)	Michigan Department of Treasury	http://www.michigan.gov/taxes/0,1607,7-238-43535_43925-164513--,00.html
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 4.B First Stages IV Results

Table 4.B.1 First Stage IV Results from Column 2 in Table 4.3

Specification	(1) FDIV	(2) FDIV	(3) FDIV	(4) FDIV
Dependent Variables	Δ Ln Property Tax	Δ Ln School Spending	Δ Ln Comp. Property Tax	Δ Ln Comp. School Spending
Own Community Variables				
Δ G_IFT	-0.020	-0.015	-0.024	-0.013
	(0.018)	(0.012)	(0.020)	(0.012)
Δ E_IFT	0.013	0.005	0.010	0.006
	(0.012)	(0.011)	(0.013)	(0.011)
Δ Ln Changes in Property Tax due to Proposal A	0.984***	0.009	-0.043**	0.004
	(0.011)	(0.009)	(0.017)	(0.009)
Δ Ln Property Tax t-5	0.047	0.067***	-0.007	0.048*
	(0.085)	(0.025)	(0.087)	(0.025)
Δ Ln Changes in School Spending due to Proposal A	-0.120**	1.049***	-0.113	0.043
	(0.053)	(0.036)	(0.073)	(0.033)
Δ Ln School Spending t-5	0.171**	-0.008	-0.012	-0.072
	(0.078)	(0.048)	(0.083)	(0.050)
Δ Ln Crime rate	0.008	-0.002	0.010	-0.0004
	(0.008)	(0.006)	(0.008)	(0.006)
Competitor Community Variable				
Δ CG_IFT	-0.077***	-0.051***	-0.100***	-0.005
	(0.027)	(0.015)	(0.032)	(0.015)
Δ CE_IFT	0.061	-0.051	-0.200	0.047
	(0.126)	(0.069)	(0.148)	(0.072)
Δ Ln Changes in Property Tax due to Proposal A	0.027**	-0.011	1.043***	-0.004
	(0.012)	(0.009)	(0.018)	(0.010)
Δ Ln Property Tax t-5	-0.032	-0.032	0.018	-0.019
	(0.080)	(0.036)	(0.080)	(0.036)
Δ Ln Changes in School Spending due to Proposal A	0.142***	-0.036	0.143**	0.970***
	(0.052)	(0.033)	(0.070)	(0.030)
Δ Ln School Spending t-5	-0.115*	0.043	0.060	0.097*
	(0.066)	(0.051)	(0.071)	(0.053)
Δ Ln Crime rate	-0.006	-0.001	-0.007	-0.003
	(0.007)	(0.006)	(0.008)	(0.006)
F-test for excluded instruments	7,637	1,163	2,360	1,485
	(*P=0.000*)	(*P=0.000*)	(*P=0.000*)	(*P=0.000*)
N	1,976	1,976	1,976	1,976

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

Table 4.B.2 First Stage IV Results from Column 2 in Tables 4.5 and 4.7

Specification	(1) FDIV	(2) FDIV	(3) FDIV	(4) FDIV
Dependent Variables	Δ Ln Property Tax	Δ Ln School Spending	Δ Ln Comp. Property Tax	Δ Ln Comp. School Spending
Own Community Variables				
Δ G_IFT	0.010	-0.015	0.003	-0.013
	(0.011)	(0.012)	(0.011)	(0.012)
Δ E_IFT	0.009	0.005	0.005	0.006
	(0.008)	(0.011)	(0.010)	(0.011)
Δ Ln Changes in Property Tax	1.012***	-0.024	-0.124***	-0.025
due to Proposal A	(0.025)	(0.024)	(0.030)	(0.024)
Δ Ln Property Tax t-5	-0.199***	0.206***	0.170**	0.162***
	(0.054)	(0.051)	(0.069)	(0.055)
Δ Ln Changes in School Spending	-0.036	1.073***	-0.015	0.062*
due to Proposal A	(0.036)	(0.039)	(0.049)	(0.035)
Δ Ln School Spending t-5	0.124**	0.009	-0.072	-0.059
	(0.049)	(0.048)	(0.056)	(0.050)
Δ Ln Crime rate	-0.004	-0.002	-0.003	-0.0003
	(0.005)	(0.006)	(0.006)	(0.006)
Competitor Community Variable				
Δ CG_IFT	-0.054	-0.045	-0.018	0.050
	(0.070)	(0.070)	(0.087)	(0.073)
Δ CE_IFT	-0.020	-0.058***	-0.069***	-0.011
	(0.015)	(0.016)	(0.018)	(0.015)
Δ Ln Changes in Property Tax	0.007	0.024	1.131***	0.027
due to Proposal A	(0.024)	(0.023)	(0.029)	(0.024)
Δ Ln Property Tax t-5	0.191***	-0.165***	-0.198***	-0.131**
	(0.057)	(0.058)	(0.072)	(0.061)
Δ Ln Changes in School Spending	0.045	-0.057	0.026	0.953***
due to Proposal A	(0.034)	(0.036)	(0.047)	(0.033)
Δ Ln School Spending t-5	-0.084*	0.028	0.100*	0.085
	(0.047)	(0.050)	(0.053)	(0.053)
Δ Ln Crime rate	0.005	-0.001	0.005	-0.003
	(0.005)	(0.006)	(0.006)	(0.006)
F-test	8,314	1,013	4,883	1,310
for excluded instruments	(*P*=0.000)	(*P*=0.000)	(*P*=0.000)	(*P*=0.000)
N	1,976	1,976	1,976	1,976

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

Table 4.B.3 First Stage IV Results from Column 2 in Table 4.16

Specification	(1) FDIV	(2) FDIV	(3) FDIV	(4) FDIV	(5) FDIV
Dependent Variables	Δ G_IFT	Δ Ln Property Tax	Δ Ln School Spending	Δ Ln Comp. Property Tax	Δ Ln Comp. School Spending
Own Community Variables					
Δ Election Year t-1	0.004**	-0.001	-0.002	0.001	-0.002
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
Δ E_IFT	0.107	0.011	0.003	0.007	0.005
	(0.079)	(0.012)	(0.011)	(0.013)	(0.011)
Δ Ln Changes in Property Tax due to Proposal A	-0.050	0.987***	0.014	-0.044**	0.008
	(0.096)	(0.012)	(0.009)	(0.018)	(0.009)
Δ Ln Property Tax t-5	-0.096	0.048	0.067***	-0.004	0.047*
	(0.068)	(0.086)	(0.025)	(0.087)	(0.025)
Δ Ln Changes in School Spending due to Proposal A	-0.480	-0.105*	1.068***	-0.109	0.061*
	(0.455)	(0.061)	(0.038)	(0.077)	(0.036)
Δ Ln School Spending t-5	0.143	0.171**	-0.005	-0.019	-0.069
	(0.106)	(0.079)	(0.047)	(0.083)	(0.050)
Δ Ln Crime rate	0.008	0.008	-0.002	0.010	-0.001
	(0.008)	(0.008)	(0.006)	(0.008)	(0.006)
Competitor Community Variable					
Δ CG_IFT	0.259*	0.059	-0.049	-0.210	0.050
	(0.140)	(0.127)	(0.070)	(0.149)	(0.073)
Δ CE_IFT	-0.118	-0.075***	-0.049***	-0.097***	-0.004
	(0.111)	(0.028)	(0.015)	(0.032)	(0.015)
Δ Ln Changes in Property Tax due to Proposal A	0.077	0.026**	-0.011	1.041***	-0.004
	(0.117)	(0.013)	(0.009)	(0.018)	(0.009)
Δ Ln Property Tax t-5	0.092	-0.032	-0.030	0.014	-0.017
	(0.078)	(0.080)	(0.036)	(0.081)	(0.036)
Δ Ln Changes in School Spending due to Proposal A	0.559	0.127**	-0.053	0.135*	0.954***
	(0.453)	(0.058)	(0.035)	(0.073)	(0.032)
Δ Ln School Spending t-5	-0.024	-0.117*	0.038	0.064	0.092*
	(0.099)	(0.067)	(0.050)	(0.071)	(0.053)
Δ Ln Crime rate	-0.005	-0.006	-0.001	-0.007	-0.002
	(0.008)	(0.007)	(0.006)	(0.008)	(0.006)
F-test for excluded instruments	1	7,379	975	2,495	1,266
	(*P=0.523*)	(*P=0.000*)	(*P=0.000*)	(*P=0.000*)	(*P=0.000*)
N	1,976	1,976	1,976	1,976	1,976

Notes:
1. All regressions include a series of time indicator and community-specific time trend variables.
2. Robust cluster standard errors in parentheses
3. The tax abatement variable (G_IFT) is treated as endogenous.
4. “Property Tax” indicates the residential property tax.
5. * significant at 10%; ** significant at 5%; *** significant at 1%

Table 4.B.4 First Stage IV Results from Column 2 in Tables 4.18 and 4.20

Specification	(1) FDIV	(2) FDIV	(3) FDIV	(4) FDIV	(5) FDIV
Dependent Variables	Δ G_IFT	Δ Ln Property Tax	Δ Ln School Spending	Δ Ln Comp. Property Tax	Δ Ln Comp. School Spending
Own Community Variables					
Δ Election Year t-1	0.005**	-0.001	-0.002	0.0002	-0.002
	(0.003)	(0.001)	(0.002)	(0.001)	(0.002)
Δ E_IFT	0.106	0.010	0.003	0.006	0.005
	(0.079)	(0.008)	(0.011)	(0.0098)	(0.011)
Δ Ln Changes in Property	-0.024	1.018***	-0.013	-0.125***	-0.014
Tax due to Proposal A	(0.218)	(0.025)	(0.026)	(0.032)	(0.026)
Δ Ln Property Tax t-5	-0.157	-0.199***	0.212***	0.169**	0.169***
	(0.124)	(0.054)	(0.051)	(0.068)	(0.055)
Δ Ln Changes in School	-0.490	-0.033	1.093***	-0.018	0.082**
Spending due to Proposal A	(0.458)	(0.038)	(0.041)	(0.050)	(0.038)
Δ Ln School Spending t-5	0.133	0.129***	0.013	-0.073	-0.054
	(0.107)	(0.049)	(0.047)	(0.056)	(0.050)
Δ Ln Crime rate	0.008	-0.004	-0.002	-0.003	-0.001
	(0.008)	(0.005)	(0.006)	(0.006)	(0.006)
Competitor Community Variable					
Δ CG_IFT	-0.123	-0.021	-0.057***	-0.069***	-0.010
	(0.123)	(0.015)	(0.015)	(0.017)	(0.015)
Δ CE_IFT	0.224*	-0.049	-0.043	-0.018	0.051
	(0.130)	(0.070)	(0.071)	(0.087)	(0.074)
Δ Ln Changes in Property	0.019	0.004	0.018	1.132***	0.021
Tax due to Proposal A	(0.221)	(0.024)	(0.024)	(0.030)	(0.024)
Δ Ln Property Tax t-5	0.158	0.190***	-0.170***	-0.197***	-0.137**
	(0.122)	(0.057)	(0.057)	(0.071)	(0.061)
Δ Ln Changes in School	0.545	0.046	-0.072*	0.029	0.939***
Spending due to Proposal A	(0.441)	(0.035)	(0.037)	(0.047)	(0.035)
Δ Ln School Spending t-5	-0.014	-0.087*	0.022	0.101*	0.078
	(0.104)	(0.047)	(0.050)	(0.053)	(0.053)
Δ Ln Crime rate	-0.005	0.005	-0.001	0.005	-0.002
	(0.008)	(0.005)	(0.006)	(0.006)	(0.006)
F-test	1.21	7,704	884	4,304	1,173
for excluded instruments	(*P=0.523*)	(*P=0.523*)	(*P=0.523*)	(*P=0.523*)	(*P=0.523*)
N	1,976	1,976	1,976	1,976	1,976

Notes:

1. All regressions include a series of time indicator and community-specific time trend variables.
2. Robust cluster standard errors in parentheses
3. The tax abatement variable (G_IFT) is treated as endogenous.
4. "Property Tax" indicates the non-residential property tax.
5. * significant at 10%; ** significant at 5%; *** significant at 1%

Table 4.B.5 First Stage IV Results from Column 2 in Table 4.22

Specification	(1) FDIV	(2) FDIV	(3) FDIV	(4) FDIV	(5) FDIV
Dependent Variables	Δ G_IFT	Δ Ln Property Tax	Δ Ln School Spending	Δ Ln Comp. Property Tax	Δ Ln Comp. School Spending
Own Community Variables					
Δ Election Year t-1	0.004**	-0.001	-0.001	-0.002	-0.001
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
Δ E_IFT	0.107	0.010	-0.001	0.016	-0.0001
	(0.078)	(0.012)	(0.011)	(0.011)	(0.011)
Δ Ln Changes in Property	0.257	1.021***	-0.102	0.045***	0.086
Tax due to Proposal A	(0.156)	(0.014)	(0.070)	(0.014)	(0.076)
Δ Ln Property Tax t-5	-0.142**	0.062	0.068**	0.078	0.043
	(0.062)	(0.083)	(0.026)	(0.083)	(0.029)
Δ Ln Changes in School	2.087*	0.194*	-0.807**	0.191*	0.430
Finding due to Proposal A	(1.184)	(0.105)	(0.313)	(0.105)	(0.364)
Δ Ln School Spending t-5	0.129*	0.146***	-0.005	-0.049	-0.030
	(0.076)	(0.047)	(0.028)	(0.047)	(0.030)
Competitor Community Variable					
Δ CG_IFT	0.422***	-0.055	-0.102	-0.026	0.002
	(0.152)	(0.111)	(0.071)	(0.112)	(0.075)
Δ CE_IFT	-0.337	-0.074***	0.066	-0.029	-0.035
	(0.221)	(0.023)	(0.053)	(0.023)	(0.053)
Δ Ln Changes in Property	-0.202	-0.004	0.117	0.972***	-0.080
Tax due to Proposal A	(0.161)	(0.016)	(0.078)	(0.016)	(0.081)
Δ Ln Property Tax t-5	0.143**	-0.045	-0.037	-0.062	-0.020
	(0.072)	(0.078)	(0.036)	(0.078)	(0.038)
Δ Ln Changes in School	-2.005*	-0.189*	1.010***	-0.186*	-0.201
Funding due to Proposal A	(1.176)	(0.105)	(0.314)	(0.106)	(0.364)
Δ Ln School Spending t-5	-0.013	-0.092**	0.038	0.102***	0.054*
	(0.057)	(0.036)	(0.029)	(0.036)	(0.031)
F-test	1	8,708	4	7,366	4
for excluded instruments	(*P=0.379*)	(*P=0.000*)	(*P=0.000*)	(*P=0.000*)	(*P=0.000*)
N	1,976	1,976	1,976	1,976	1,976

Notes:
1. All regressions include a series of time indicator and community-specific time trend variables.
2. Robust cluster standard errors in parentheses
3. The tax abatement variable (G_IFT) is treated as endogenous.
4. “Property Tax” indicates the residential property tax.
5. * significant at 10%; ** significant at 5%; *** significant at 1%

Table 4.B.6 First Stage IV Results from Column 2 in Tables 4.24 and 4.26

Specification	(1) FDIV	(2) FDIV	(3) FDIV	(4) FDIV	(5) FDIV
Dependent Variables	Δ G_IFT	Δ Ln Property Tax	Δ Ln School Spending	Δ Ln Comp. Property Tax	Δ Ln Comp. School Spending
Own Community Variables					
Δ Election Year t-1	0.005**	-0.001	-0.0004	-0.0002	-0.001
	(0.002)	(0.001)	(0.002)	(0.001)	(0.002)
Δ E_IFT	0.105	0.009	0.001	0.018**	0.001
	(0.078)	(0.008)	(0.011)	(0.009)	(0.011)
Δ Ln Changes in Property Tax due to Proposal A	0.245	1.029***	-0.180	0.052**	0.181
	(0.186)	(0.018)	(0.117)	(0.022)	(0.115)
Δ Ln Property Tax t-5	-0.192**	-0.081*	0.154***	-0.107*	0.133***
	(0.090)	(0.045)	(0.045)	(0.057)	(0.048)
Δ Ln Changes in School Funding due to Proposal A	1.403*	0.026	-0.651***	0.232***	0.225
	(0.829)	(0.052)	(0.224)	(0.065)	(0.222)
Δ Ln School Spending t-5	0.112	0.089***	0.007	-0.047	-0.015
	(0.076)	(0.032)	(0.028)	(0.032)	(0.030)
Competitor Community Variable					
Δ CG_IFT	0.330**	-0.029	-0.066	0.202***	0.007
	(0.137)	(0.064)	(0.065)	(0.068)	(0.066)
Δ CE_IFT	-0.251	-0.002	0.030	-0.019	-0.018
	(0.186)	(0.013)	(0.047)	(0.015)	(0.044)
Δ Ln Changes in Property Tax due to Proposal A	-0.211	-0.009	0.149	0.967***	-0.218*
	(0.186)	(0.018)	(0.117)	(0.022)	(0.116)
Δ Ln Property Tax t-5	0.191**	0.067	-0.117**	0.122**	-0.102**
	(0.086)	(0.048)	(0.046)	(0.061)	(0.050)
Δ Ln Changes in School Funding due to Proposal A	-1.321	-0.0284	0.827***	-0.233***	-0.030
	(0.8344)	(0.0523)	(0.221)	(0.065)	(0.217)
Δ Ln School Spending t-5	0.003	-0.0512*	0.029	0.089***	0.044
	(0.060)	(0.0301)	(0.029)	(0.030)	(0.031)
F-test for excluded instruments	2	8,719	5	7,208	6
	(*P*=0.047)	(*P*=0.000)	(*P*=0.000)	(*P*=0.000)	(*P*=0.000)
N	1,976	1,976	1,976	1,976	1,976

Notes:

1. All regressions include a series of time indicator and community-specific time trend variables.
2. Robust cluster standard errors in parentheses
3. The tax abatement variable (G_IFT) is treated as endogenous.
4. “Property Tax” indicates the non-residential property tax.
5. * significant at 10%; ** significant at 5%; *** significant at 1%

APPENDIX 4.C[41]
Determining the Weighted Average of "Competitor" Characteristics – Migration Competitors

To generate the "competitor" variables, there are five steps. In the following equations, each i, j, and t represents community, county and year, respectively[42].

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

$$\text{In-migrants}_{ij}^{t} = \frac{In - migrants_{ij}}{population_{ij}^{t}} \quad (4.H.1)$$

$$\text{Out-migrants}_{ij}^{t} = \frac{Out - migrants_{ij}}{population_{ij}^{t}} \quad (4.H.2)$$

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

$$\text{In-migrants Ratio}_{ij}^{t} = \frac{\text{In-migrants}_{ij}}{\sum_{i}(\text{In-migrants}_{ij}^{t})} \quad (4.H.3)$$

Step 3: Using out-migrants at the county level and in-migrants ratio (4.H.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 migrant population aged 5 years and older in 1995

[41] This appendix is taken from Skidmore, *et al.* (2012)

[42] The data is based on all 152 communities in the five county region surrounding Detroit (Macomb, Monroe, Oakland, Washtenaw, and Wayne counties) over the 1973-2007 period.

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.

$$\text{Out-migrants}_t^m = (\text{Out-Migrants}_j) \times (\text{In-Migrants Ratio}_{ij})$$

(H.4)

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

$$\text{Out-migrants Ratio}_{ij}^t = \frac{\text{Out-migrants}_{ij}}{\sum_j \sum_i (\text{Out-migrants}_{ij}^t)} \qquad (4.\text{H}.5)$$

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

$$\textit{Competitor}\ \text{Property Taxes}_{ij}^t = \sum_j \sum_i [(\text{Property Taxes}_{ij}^t) \times (\text{Out-migrants Ratio}_{ij}^t)] \qquad (4.\text{H}.6)$$

$$\textit{Competitor}\ \text{School Spending}_{ij}^t = \sum_j \sum_i [(\text{School Spending}_{ij}^t) \times (\text{Out-migrants Ratio}_{ij}^t)] \qquad (4.\text{H}.7)$$

$$\textit{Competitor}\ \text{Crime rates}_{ij}^t = \sum_j \sum_i [(\text{Crime rates}_{ij}^t) \times (\text{Out-migrants Ratio}_{ij}^t)] \qquad (4.\text{H}.8)$$

APPENDIX 4.D
Instrument for School Spending:
Changes in the Total Funding for Public Schools[43]

Prior to the implementation of Michigan's Proposal A, the per pupil total funding for public schools relied on three factors: the guaranteed tax base per pupil, local property values per pupil measured by State Equalized Valuation per pupil (SEV),[44] and district millage rates. The state determined the guaranteed tax base and allowed districts to set their own property tax rates. The pre-reform state aid formula per pupil is calculated as:

$$Aid_{it} = \begin{cases} G_t + (V_t^* - V_{it}) \times \tau_{it}) & if\ V_{it} \leq V_{it}^* \\ 0 & if\ V_{it} > V_{it}^* \end{cases} \tag{4.I.1}$$

where G represents the flat grant per pupil in year t, V_{it}^* represents the state-determined guaranteed tax base per pupil for a district i in year t, V_{it} represents local property values per pupil for a district i in year t, and τ_{it} is property tax millage rates for a district i in year t.

This pre-reform formula shows that districts with per pupil tax bases in excess of the guaranteed tax base per pupil were ineligible for state aid. In these districts, local property tax revenues were a primary public school funding source. In 1993, the year before the reform, the guaranteed tax base was $96,270 and about 50 percent of districts were off-formula in Southeast Michigan.

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[43] I use the pre- and post-reform state aid formula provided by the Michigan House and Senate Fiscal Agencies (1994)

[44] SEV is 50 percent of the estimated true market value.

Based on this pre-reform formula, the pre-reform per pupil total revenue for public schools is calculated as:

$$TR_{it} = \begin{cases} G_t + V_t^* \times \tau_{it} & if\ V_{it} \leq V_{it}^* \\ V_{it} \times \tau_{it} & if\ V_{it} > V_{it}^* \end{cases}$$

(4.I.2)

where TR_{it}represents the total revenue for a district i in year t.

After the imposition of Proposal A, the key component for public school funding is the so-called foundation allowance. The foundation allowance per pupil is the maximum revenue per pupil that a district can receive. The state determines the foundation allowance per pupil in year t based on the amount of the eligible revenue that a district received in year $t-1$. The post-reform state aid formula per pupil is calculated as:

$$Aid_{it} = \begin{cases} F_{it} - (U_{it} \times 0.018),\ if\ F_{it} \leq \overline{F_{it}} \\ \overline{F_{it}} - (U_{it} \times 0.018),\ if\ F_{it} > \overline{F_{it}} \end{cases} \tag{4.I.3}$$

where F_{it} represents the foundation allowance for a district i in year t, U_{it} represents nonhomestead property values per pupil for a district i in year t and $\overline{F_{it}}$ is the cap of the foundation allowance.[45]

This formula implies that a district with a foundation allowance above the cap will not receive the full amount of the state-determined foundation allowance. However, it is possible for these districts to levy an additional millage, which is referred to as a “hold harmless” millage, on homestead property as a complimentary revenue source.

[45] Nonhomestead property is considered to be business property, rental housing/house, and vacation homes.

Based on the post-reform formula, the post-reform per pupil total revenue for public schools is calculated as:[46]

$$TR_{it} = \begin{cases} F_{it} & if\ F_{it} \leq \overline{F_{it}} \\ \overline{F_{it}} & if\ \ F_{it} > \overline{F_{it}} \end{cases} \tag{4.I.4}$$

For the instrument for school spending, I focus on the small window before and after the implementation of Proposal A. Since Proposal A was partially adopted in 1994 but not fully implemented until 1995, the key instrumental variable for school spending is based on changes in the total funding (TR_{it}) between 1993 and 1995.[47]

Tables 4.I.1-4.I.3 provide an example of how I calculate the total revenues per pupil for a district i before and after the implementation of Proposal A and its changes as the key instrument for school spending.

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[46] In this calculation, since the local decision to impose a hold harmless millage on homestead property may be endogenous to tax base, I omit the per pupil local revenue that comes from hold harmless taxes on homestead property.

[47] Since the key policy variable is in the natural logarithm, I use the changes in the natural logarithm of per pupil total funding for education resulting from Proposal A as the key identifying instrument for school spending.

Table 4.D.1
The total revenue per pupil as funding for public schools : FY1992-1993

District	District Millage Rate	The Guaranteed Tax Base per pupil	Gross Allowance Per Pupil	Local SEV Per pupil	State Formula Aid Per Pupil	Local Revenue Per Pupil	Total Revenue Per Pupil
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
			(1)×0.001 ×(2)+342[1]		(3)-(6)	(1)×0.001×(4)	(5)+(6)
South Lake	30.03	$96,720	$3,233	$195,489	$0	$5,870	$5,870
Van Buren	45.25	$96,720	4,698	$80,627	$3,468	$1,050	$4,698
Total Sample Average	37.52	$96,720	$3,954	$117,546	$694	$4,181	$4,874

Note:

1. I assume that a district qualified for all of the incentive payments. Under this assumption, the maximum flat grant per pupil in 1993 was $342.

Table 4.D.2
The Total Revenue Per Pupil as Funding for Public Schools: FY1994-1995

District	Foundation Allowance Per Pupil	Nonhomstead SEV Per pupil[2]	State Formula Aid Per Pupil	Local Revenue on 18 Mills Per Pupil	Total Revenue Per Pupil
	(1)	(2)	(3)	(4)	(5)
			(1)-(4)	(2)×0.018	(3)+(4)
South Lake	$6,766	$82,649	$5,012	$1,488	$6,500
Van Buren	$5,717	$43,461	$4,935	$782	$5,717
Total Sample Average	$5,996	$45,718	$5,018	$1,119	$5,700

Note:

1. The cap of the foundation allowance is $6,500 in 1995 and the minimum of the foundation allowance is $4,200.
2. For this calculation, I use the estimated nonhomestead SEV per pupil in 1993 by multiplying the aggregate SEV per pupil in 1993 by the ratio of the nonhomstead SEV per pupil in 1995 to the aggregate SEV per pupil in 1995. This is useful to avoid the possibility that the instruments could include an endogenous response to the reform.

† In the case that a foundation allowance per pupil is larger than $6,500, because of the cap of foundation allowance, state formula aid per pupil is calculated as: $6,500-(4)

Table 4.D.3
Changes in the Total Revenue Per Pupil for Public Schools as the Key Instrument of School Spending

District	Total Revenue Per Pupil FY1992-1993	Total Revenue Per Pupil FY1994-1995	Changes in Total Revenue Per Pupil
	(1)	(2)	(3)
			(2)-(1)
South Lake	$5,870	$6,500	$630
Van Buren	$4,698	$5,717	$1,019
Total Sample Average	$4,874	$5,700	$826

APPENDIX 4.E Estimated Time Slopes

Table 4.E.1 The Number of Granted Tax Abatements (G_IFT) and of Granted Competitor Tax Abatements (CG_IFT)

Community	Estimated Time Trend Slopes in The Number of Granted Tax Abatements (G_IFT)	Estimated Time Trend Slopes in The Number of Granted Competitor Tax Abatements (CG_IFT)[1]
Fraser	-0.272***	0.032***
Memphis	0.084***	0.015***
Mt. Clemens	0.044***	0.029***
New Baltimore	0.044***	0.030***
Richmond	0.035***	0.030***
St. Clair Shores	0.031***	0.029***
Sterling Heights	0.033***	0.029***
Utica	0.031***	0.030***
Warren	0.038***	0.029***
Armada Township	0.105***	0.028***
Bruce Township	0.031***	0.030***
Chesterfield Township	0.081***	0.030***
Clinton Township	0.078***	0.029***
Harrison Township	0.033***	0.029***
Lake Township	0.031***	0.033***
Lenox Township	0.031***	0.029***
Macomb Township	0.017***	0.030***
Ray Township	0.031***	0.030***
Richmond Township	0.003***	0.031***
Shelby Township	0.037***	0.029***
Washington Township	0.028***	0.030***
Luna Pier	0.031***	0.031***
Monroe	0.039***	0.030***
Petersburg	0.031***	0.032***
Ash Township	0.068***	0.029***
Bedford Township	0.033***	0.030***
Berlin Township	0.037***	0.031***
Dundee Township	0.042***	0.030***
Erie Township	0.040***	0.030***
Exeter Township	0.031***	0.031***
Frenchtown Township	0.057***	0.030***
Ida Township	0.031***	0.031***
La Salle Township	0.031***	0.031***
London Township	0.031***	0.032***
Milan Township	0.058***	0.024***
Monroe Township	0.037***	0.030***

Table 4.E.1 (cont'd)

Community	Estimated Time Trend Slopes in The Number of Granted Tax Abatements (G_IFT)	Estimated Time Trend Slopes in The Number of Granted Competitor Tax Abatements (CG_IFT)[1]
Raisinville Township	0.031***	0.031***
Summerfield Township	0.049***	0.030***
Whiteford Township	0.035***	0.030***
Berkley	0.031***	0.012***
Birmingham	0.031***	0.012***
Bloomfield Hills	0.031***	0.012***
Clawson	0.031***	0.012***
Farmington	0.026***	0.012***
Farmington Hills	0.031***	0.012***
Ferndale	0.003***	0.012***
Hazel Park	0.027***	0.012***
Huntington Woods	0.031***	0.012***
Keego Harbor	0.031***	0.012***
Lathrup Village	0.031***	0.012***
Madison Heights	0.030***	0.012***
Novi	0.031***	0.012***
Oak Park	0.037***	0.012***
Orchard Lake Village	0.031***	0.012***
Pleasant Ridge	0.031***	0.012***
Pontiac	0.037***	0.012***
Rochester	-0.130***	0.018***
Royal Oak	0.033***	0.012***
South Lyon	0.016***	0.013***
Southfield	0.036***	0.012***
Sylvan Lake	0.031***	0.012***
Troy	0.027***	0.012***
Walled Lake	0.042***	0.012***
Wixom	0.006***	0.014***
Addison Township	0.031***	0.012***
Bloomfield Township	0.031***	0.012***
Brandon Township	0.031***	0.012***
Commerce Township	0.026***	0.012***
Groveland Township	0.031***	0.012***
Highland Township	0.034***	0.012***
Holly Township	0.028***	0.012***
Independence Township	0.031***	0.012***

Table 4.E.1 (cont'd)

Community	Estimated Time Trend Slopes in The Number of Granted Tax Abatements (G_IFT)	Estimated Time Trend Slopes in The Number of Granted Competitor Tax Abatements (CG_IFT)[1]
Lyon Township	0.031***	0.012***
Milford Township	0.008***	0.012***
Novi Township	0.031***	0.007***
Oakland Township	0.031***	0.012***
Orion Township	0.030***	0.012***
Oxford Township	0.010***	0.012***
Rose Township	0.031***	0.012***
Royal Oak Township	0.027***	0.011***
Southfield Township	0.031***	0.012***
Springfield Township	0.013***	0.012***
Waterford Township	0.027***	0.012***
West Bloomfield Township	0.031***	0.012***
White Lake Township	0.031***	0.012***
Ann Arbor	0.030***	0.016***
Milan	0.008***	0.016***
Saline	0.004***	0.016***
Ypsilanti	0.046***	0.016***
Ann Arbor Township	0.042***	0.016***
Augusta Township	0.031***	0.016***
Bridgewater Township	0.031***	0.015***
Dexter Township	0.031***	0.016***
Freedom Township	0.031***	0.016***
Lima Township	0.025***	0.016***
Lodi Township	0.031***	0.016***
Lyndon Township	0.031***	0.015***
Manchester Township	0.031***	0.016***
Northfield Township	0.043***	0.016***
Salem Township	0.031***	0.014***
Saline Township	-0.031***	0.019***
Scio Township	-0.204***	0.019***
Sharon Township	0.031***	0.016***
Superior Township	0.031***	0.016***
Sylvan Township	0.013***	0.016***
Webster Township	0.038***	0.015***
York Township	0.031***	0.016***
Ypsilanti Township	0.021***	0.016***

Table 4.E.1 (cont'd)

Community	Estimated Time Trend Slopes in The Number of Granted Tax Abatements (G_IFT)	Estimated Time Trend Slopes in The Number of Granted Competitor Tax Abatements (CG_IFT)[1]
Allen Park	0.037***	0.025***
Belleville	0.047***	0.023***
Dearborn	0.035***	0.025***
Dearborn Heights	0.031***	0.025***
Detroit	0.028***	0.025***
Ecorse	0.021***	0.025***
Flat Rock	0.045***	0.025***
Garden City	0.029***	0.025***
Gibraltar	0.046***	0.025***
Grosse Pointe	0.031***	0.025***
Grosse Pointe Farms	0.031***	0.025***
Grosse Point Park	0.031***	0.025***
Grosse Pointe Woods	0.031***	0.025***
Hamtramck	0.026***	0.025***
Harper Woods	0.031***	0.025***
Highland Park	0.034***	0.025***
Inkster	0.030***	0.025***
Lincoln Park	0.032***	0.025***
Livonia	0.045***	0.025***
Melvindale	0.007***	0.025***
Northville	0.031***	0.025***
Plymouth	0.071***	0.023***
River Rouge	0.031***	0.025***
Riverview	0.037***	0.025***
Rockwood	0.042***	0.025***
Romulus	0.060***	0.025***
Southgate	0.023***	0.025***
Taylor	0.056***	0.025***
Trenton	0.037***	0.025***
Wayne	0.052***	0.025***
Westland	0.029***	0.025***
Woodhaven	0.049***	0.025***
Wyandotte	0.042***	0.025***
Brownstown Township	0.043***	0.025***
Canton Township	0.036***	0.025***
Grosse Ile Township	0.036***	0.025***
Grosse Pointe Township	0.031***	0.026***
Huron Township	0.038***	0.025***

Table 4.E.1 (cont'd)

Community	Estimated Time Trend Slopes in The Number of Granted Tax Abatements (G_IFT)	Estimated Time Trend Slopes in The Number of Granted Competitor Tax Abatements (CG_IFT)[1]
Northville Township	0.029***	0.025***
Plymouth Township	0.092***	0.024***
Redford Township	0.037***	0.025***
Sumpter Township	0.033***	0.025***
Van Burden Township	0.031***	0.025***

Note:

1. Competitor tax abatement variable is based on "migration competitors"
2. * significant at 10%; ** significant at 5%; *** significant at 1%

REFERENCES

REFERENCES

Anderson, J.E., Wassmer, R.W., 1995. The decision to “bid for business”: municipal behavior in granting property tax abatements. Regional Science and Urban Economics 25, 739–757.

Anderson, J.E., Wassmer, R.W., 2000. Bidding for Business: The Efficacy of Local Economic Development Incentives in a Metropolitan Area. W.E. Upjohn Institute for Employment Research, Kalamazoo, Mich.

Anselin, L., 1988. Spatial econometrics: methods and models. Springer.

Bartik, T.J., 1989. Small business start-ups in the United States : estimates of the effects of characteristics of states. Southern Economic Journal 55, 1004–1018.

Bartik, T.J., 1991. Who benefits from state and local economic development policies? W.E. Upjohn Institute for Employment Research, Kalamazoo, Mich.

Bartik, T.J., 1992. The effects of state and local taxes on economic development: a review of recent research. Economic Development Quarterly 6, 102–111.

Bartik, T.J., 1994. Jobs, productivity and local economic development: what implications does economic research have for the role of government? National Tax Journal 47, 847–861.

Bartik, T.J., Eisinger, P., Erickcek, G., 2003. Economic Development Policy in Michigan, in: Ballard, C.L., Courant, P.N., Drake, D.C., Fisher, R.C. (Eds.), Michigan at the Millennium : A Benchmark and Analysis of Its Fiscal and Economic Structure. Michigan State University Press, East Lansing, Mich., pp. 279 – 297.

Baum, C.F., Schaffer, M.E., Stillman, S., 2007. Enhanced routines for instrumental variables/GMM estimation and testing. Stata Journal 7, 465–506.

Bertrand, M., Duflo, E., Mullainathan, S., 2000. How much should we trust differences-in-differences estimates? The Quarterly Journal of Economics 119, 249–275.

Besley, T., Case, A., 1995. Incumbent Behavior: Vote-Seeking, Tax-Setting, and Yardstick Competition. The American Economic Review 85, 25–45.

Block, R.N., Belman, D., 2003. Automotive and Other Manufacturing Industries in Michigan: Output, Employment, Earnings, and Collective Bargaining, 1980–2001, in: Ballard, C.L., Courant, P.N., Drake, D.C., Fisher, R.C. (Eds.), Michigan at the Millennium : A Benchmark and Analysis of Its Fiscal and Economic Structure. Michigan State University Press, East Lansing, Mich.

Bradbury, K.L., Mayer, C.J., Case, K.E., 2001. Property tax limits, local fiscal behavior, and property values: evidence from Massachusetts under Proposition. Journal of Public Economics 80, 287–311.

Brett, C., Pinkse, J., 2000. The determinants of municipal tax rates in British Columbia. Canadian Journal of Economics 33, 695–714.

Brueckner, J.K., 1979. Property values, local public expenditure and economic efficiency. Journal of Public Economics 11, 223–245.

Brueckner, J.K., 1982. A test for allocative efficiency in the local public sector. Journal of Public Economics 19, 311–331.

Brueckner, J.K., 2003. Strategic interaction among governments: an overview of empirical studies. International Regional Science Review 26, 175–188.

Buettner, T., 2003. Tax base effects and fiscal externalities of local capital taxation: evidence from a panel of German jurisdictions. Journal of Urban Economics 54, 110–128.

Case, A.C., Rosen, H.S., Hines Jr., J.R., 1993. Budget spillovers and fiscal policy interdependence: evidence from the states. Journal of Public Economics 52, 258–307.

Charney, A.H., 1983. Intraurban manufacturing location decisions and local tax differentials. Journal of Urban Economics 14, 184–205.

Citizens Research Council of Michigan, 2007. Survey of Economic Development Program in Michigan Report No. 347.

Cragg, J.G., 1971. Some statistical models for limited dependent variables with application to the demand for durable goods. Econometrica 39, 829–844.

Crane, L.P., Manion, M.M., Spiecker, K.F., 1996. A Cost of Community Services Study of Scio Township. Washtenaw Land Trust, Ann Arbor, Michigan.

Feldman, N.E., Courant, P.N., Drake, D.C., 2003. The Property Tax in Michigan, in: Ballard, C.L., Courant, P.N., Drake, D.C., Fisher, R.C. (Eds.), Michigan at the Millennium : A Benchmark and Analysis of Its Fiscal and Economic Structure. Michigan State University Press, East Lansing, Mich., pp. 577–602.

Fischel, W.A., 1975. Fiscal and Environmental Considerations in The Location of Firms in Suburban Communities, in: Mills, E.S., Oates, W.E. (Eds.), Fiscal Zoning and Land Use Controls : The Economic Issues. Lexington Books, Lexington, Mass.

Fischel, W.A., 1987. The Economics of Zoning Laws : A Property Rights Approach to American Land Use Controls. Johns Hopkins University Press, Baltimore.

Fischel, W.A., 1995. Regulatory Takings : Law, Economics, and Politics. Harvard University Press, Cambridge, Mass.

Freedgood, J., 2004. Cost of Community Services Studies: Making The Case for Conservation. Farmland Information Center, Washington, D.C.

Gérard, M., Jayet, H., Paty, S., 2010. Tax interactions among Belgian municipalities: Do interregional differences matter? Regional Science and Urban Economics 40, 336–342.

Goss, E.P., Phillips, J.M., 1999. Do business tax incentives contribute to a divergence in economic growth. Economic Development Quarterly 13, 217–228.

Guilfoyle, J.P., 1998. The effect of property taxes and school spending on house prices : evidence from Michigan's Proposal A. Michigan Dept. of Treasury, Office of Revenue and Tax Analysis, Lansing, Mich.

Hamilton, B., 1975. Zoning and property taxation in a system of local governments. Urban Studies 12, 205–211.

Hamilton, B.W., 1976. Capitalization of intrajurisdictional differences in local tax prices. The American Economic Review 66, 743–753.

Haughwout, A., Inman, R., Craig, S., Luce, T., 2004. Local revenue hills: evidence from four U.S. cities. The Review of Economics and Statistics 86, 570–585.

Hoyt, W.H., 1991a. Property taxation, Nash equilibrium, and market power. Journal of Urban Economics 30, 123–131.

Hoyt, W.H., 1991b. Competitive jurisdictions , congestion , the Henry George Theorem: When should property and. Regional Science and Urban Economics 21, 351–370.

Kezdi, G., 2004. Robust standard-error estimations in fixed-effect panel models. Hungarian Statistical Review 9, 95–116.

Krelove, R., 1993. The persistence and inefficiency of property tax finance of local public expenditures. Journal of Public Economics 51, 415–435.

Ladd, H.F., 1975. Local education expenditures, fiscal capacity, and the composition of the property tax base. National Tax Journal 28, 145–158.

Lang, K., Jian, T., 2004. Property taxes and property values: evidence from Proposition 21/2. Journal of Urban Economics 55, 439–457.

LeSage, J.P., Pace, R.K., 2009. Introduction to Spatial Econometrics. CRC Press, Boca Raton.

Luce, T.F., 1994. Local taxes, public services, and the intrametropolitan location of firms and households. Public Finance Review 22, 139–167.

Mcguire, T.J., 1985. Are local property taxes important in the intrametropolitan location decisions of firms? An empirical analysis of the Metropolitan area. Journal of Urban Economics 18, 226–234.

Michigan House and Senate Fiscal Agencies, 1994. Appendix A. The Michigan School Aid Act compiled and Appendices.

Mieszkowski, P., 1972. The property tax: an excise tax or a profits tax. Journal of Public Economics 1, 73–96.

Mieszkowski, P., Zodrow, G.R., 1989. Taxation and the Tiebout model: the differential effects of head taxes, taxes on land rents, and property taxes. Journal of Economic Literature 27, 1098–1146.

Oates, W.E., 1969. The effects of property taxes and local public spending on property values: an empirical study of tax capitalization and the Tiebout hypothesis. Journal of Political Economy 77, 957–971.

Oates, W.E., 1972. Fiscal Federalism. Harcourt Brace Jovanovich, New York.

Oates, W.E., 1973. The effects of property taxes and local public spending on property values : a reply and yet further results. Journal of Public Economics 81, 1004–1008.

Palmon, O., Smith, B.A., 1998. New evidence on property tax capitalization. Journal of Political Economy 106, 1099–1111.

Papke, L.E., 1991. Interstate business tax differentials and new firm location: Evidence from panel data. Journal of Public Economics 45, 47–68.

Pollakowski, H., 1973. The effects of property taxes and local public spending on property values : a comment and further results. Journal of Political Economy 81, 994–1003.

Reese, L.A., Larnell, T.B., Sands, G., 2009. Patterns of tax abatement policy: lessons from the outliers? The American Review of Public Administration 1, 1–23.

Reese, L.A., Sands, G., 2012. Money for nothing : industrial tax abatements and economic development. Lexington Books, Lanham, Md.

Reese, L.A., Ye, M., 2011. Policy versus place luck: Achieving local economic prosperity. Economic Development Quarterly 25, 221–236.

Ross, S., Yinger, J., 1999. Chapter 47 Sorting and voting: A review of the literature on urban public finance, in: Cheshire, P., Mills, E.S. (Eds.), Applied Urban Economics. Elsevier, pp. 2001–2060.

Samuelson, P.A., 1954. The pure theory of public expenditure. The Review of Economics and Statistics 36, 387–389.

Schachter, J.P., Franklin, R.S., Perry, M.J., 2003. Migration and Geographic Mobility in Metropolitan and Nonmetropolitan America: 1995 to 2000. Washington, D.C.

Skidmore, M., Reese, L., Kang, S.H., 2012. Regional analysis of property taxation, education finance reform, and property value growth. Regional Science and Urban Economics 42, 351–363.

Staiger, D., Stock, J.H., 1997. Instrumental Variables Regression with Weak Instruments. Econometrica 65, 557–586.

Stephen, M., Mcguire, T.J., Papke, L.E., 1994. The influence of tax on employment and population growth : evidence from the Washington, D. C. Metropolitan area. National Tax Journal 53, 105–123.

Tiebout, C.M., 1956. A pure theory of local expenditures. Journal of Political Economy 64, 416–424.

Wassmer, R., 1994. Can Local Incentives Alter a Metropolitan City's Economic Development. Urban Studies 31, 1251–1278.

Wassmer, R.W., 2007. The increasing use of property tax abatement as a means of promoting sub-national economic activity in the United States.

Wassmer, R.W., Anderson, J.E., 2001. Bidding for Business: New Evidence on the Effect of Locally Offered Economic Development Incentives in a Metropolitan Area. Economic Development Quarterly 15, 132–148.

Wasylenko, M.J., 1980. Evidence of fiscal differentials and intrametropolitan firm relocation. Land Economics 56, 339–349.

Wellisch, D., 2000. Theory of Public Finance in a Federal State. Cambridge University Press, Cambridge, U.K.

White, M.J., 1975. Firm Location in A Zoned Metropolitan Area, in: Mills, E.S., Oates, W.E. (Eds.), Fiscal Zoning and Land Use Controls : The Economic Issues. Lexington Books, Lexington, Mass.

Wildasin, D.E., 1986. Urban Public Finance. Harwood Academic Publishers, Chur, Switzerland.

Wildasin, D.E., 1989. Interjurisdictional capital mobility: Fiscal externality and a corrective subsidy. Journal of Urban Economics 25, 193–212.

Wilson, J.D., 1999. Theories of tax competition. National tax journal 52, 269–304.

Wilson, J.D., Wildasin, D.E., 2004. Capital tax competition: bane or boon. Journal of Public Economics 88, 1065–1091.

Wolkoff, M., 1985. Chasing a dream: the use of tax abatements to spur urban economic development. Urban Studies 22, 305–315.

Wooldridge, J.M., 2010. Econometric analysis of cross section and panel data. MIT Press, Cambridge, Mass.

Yinger, J., Bloom, H.S., Börsch-Supan, A., Ladd, H.F., 1988. Property Taxes and House Values : The Theory and Estimation of Intrajurisdictional Property Tax Capitalization. Academic Press, Boston.

Zodrow, G.R., 2000. The property tax as a capital tax : a room with three views. National Tax Journal 54, 139–156.

Zodrow, G.R., Mieszkowski, P., 1983. The Incidence of The Property Tax: The Benefit View Versus The New View, in: Local Provision of Public Services : The Tiebout Model After Twenty-Five Years. Academic Press, New York.

Zodrow, G.R., Mieszkowski, P., 1986. Pigou, Tiebout, property taxation, and the underprovision of local public goods. Journal of Urban Economics 19, 356–370.