Inertia and neighboring effects in local tax policy:
Illinois' experience with a local option tax on telecommunications

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Abstract

Illinois radically reconfigured the legal basis and constraints for municipal telecommunications taxes in 2003. The state assigned initial tax rates to many municipalities based on a formula without the direct input of municipal officials and effectively dictated initial (2003) tax rates. After 2003, local officials determined their own tax rate between zero and six percent. We use data on municipalities' initial (assigned) tax rate, fiscal condition, population and neighboring municipalities' initial (assigned) tax rates to explain changes in telecommunications tax rates between 2003 and 2008. We find clear evidence of an important and statistically significant inertia effect—municipalities initially assigned low rates continued to have low rates—and an important and statistically significant neighbor effect—municipalities whose neighbors were assigned relatively high initial rates increased their own rates faster, as well as a number of other statistical regularities that are inconsistent with a simple decisive voter model.

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1. Introduction

In recent years, state and local governments have begun modest efforts to modernize their tax systems to cope with structural economic and technological changes. Business taxation has been reformed and simplified, and the service sector is included increasingly in the sales tax base. The sales of professional services are generally exempted from the base of state and local general sales tax. As an exception to this observation, telecommunication services have long been taxed by state and local governments under a complex system that includes multiple taxes and fees on different components of the sector.

Recently a number of states have modernized and simplified their telecommunication tax systems (Wu and Pagano, 2008). In 2003 Illinois eliminated a complex bundle of local telecommunication taxes and replaced them with a uniform alternative. Municipal governments were given the option of levying a state-administered tax at a rate from zero to six percent on the new tax base. This sequence of events provides an unusual opportunity to observe a kind of "natural experiment" in tax rate policy and to learn about fiscal decision making in municipalities. Which municipalities adopt the tax immediately and at what rate? Do municipalities that initially forego the tax later adopt it? Do tax rates increase more quickly in municipalities that initially adopt the tax than in those that do not? Does competition with neighboring jurisdictions constrain the change of municipal tax rates?

We examine annual data on the tax rate selected by about 1,300 Illinois municipalities from the tax's inception in 2003 through 2008. We hypothesize that the change of the tax rate is affected by the municipality's initial (2003) tax rate, population size, revenue structure, fiscal stress, and the initial tax rates of neighboring municipalities. Consistent with some economic theory and previous empirical literature we postulate an "inertia effect" and a "neighboring effect". The inertia effect comes about because municipalities initially assigned a zero tax rate tend to keep rates at zero as time passes even when given the option to freely choose their rate. The neighboring effect is that municipalities tend to emulate the tax rates of geographical neighbors. Our results provide evidence that both effects are major determinants of telecommunications tax rates in Illinois. Most of the municipalities without the tax stayed tax free, whereas municipalities that were initially assigned a non-zero tax rate were likely to increase rates unless the legal cap was reached. We find that tax rates are spatially correlated which is consistent with the hypothesis that there is tax competition among neighboring jurisdictions.

When confronted with a newly restructured revenue source, municipal authorities may act like the Leviathan in a Buchanan-style public choice model (Buchanan, 1957) or the meeker median voter representatives of Black (1948) and Downs (1957). The presence of the inertia and neighboring effects indicates that some mixture of the Leviathan model and the median voter model explains changes in municipal telecommunications tax rate policy.

2. Simplified Municipal Telecommunications Tax in Illinois

After legal challenges to its earlier telecommunications tax system, Illinois enacted the *Simplified Municipal Telecommunications Tax Act* which took effect on January 1st, 2003. Under the new system, a state tax rate of seven percent is applied to the privilege of originating or receiving telecommunications.[1] In addition to a state excise tax, the act replaced three municipal-level taxes and fees on telecommunication services with a single municipal-option tax called the simplified municipal telecommunications tax.[2] This legislative effort substantially simplified the tax structure on telecommunications as well as the collection process. The new telecommunication taxes are collected by the Illinois Department of Revenue and then remitted to municipalities based on the service address, the service charge, and the tax rate set by the municipality.

In 2003 the Illinois Department of Revenue assigned a tax rate to each municipality that had enacted an ordinance imposing any taxes or fees on telecommunications before January 2003 using a formula based on the three municipal taxes that were nullified.[3] The formula was apparently intended to keep revenue from the new tax roughly equivalent to revenue from the old taxes, on average. However, for any specific municipality old and new revenues might differ. This method of assigning January 2003 tax rates introduced an element of exogeneity in the setting of the initial rate. Beginning July 2003, the new system allowed municipalities to choose a tax rate of up to six percent on the gross charge for telecommunications purchased at retail.[4]

Municipalities that wish to levy the new tax must approve an ordinance that must then be certified by the Illinois Department of Revenue. The municipality must request certification several months before changes in the tax rate take effect. According to the state law, a municipal government can change the tax rate in either January or July of each year. To have the new rate take effect in January, the municipality must file a certified copy of the ordinance before September 21st of the prior year. Once that deadline has passed, the municipality can file a certified copy of the ordinance before March 21st to have the new rate effective starting from July of the same year.[5]

Table 1 describes the distribution of the simplified municipal telecommunications tax rate in Illinois from 2003 through 2008. When the law took effect in 2003, slightly more than half of the municipalities levied the tax. As time went on, more and more municipalities started taping this revenue source, and an increasing number taxed at higher rates. By July of 2008, the number of municipalities without such a tax dropped from 621 to 556. In the meantime, many municipalities moved from a low to a higher rate. There has been a substantial increase in the number of municipalities taxing at the maximum rate (six percent) – from 224 in July of 2003 to 327 in July of 2008. The substantial cross-year change in the tax rate provides an opportunity to investigate the factors affecting local decisions to impose a tax on telecommunication services and the setting of tax rates.

(Insert Table 1 about here)

Illinois municipalities have collected a substantial amount of revenue from simplified municipal telecommunications tax since 2003: $243 million in 2003-2004, $272 million in 2004-2005, $279 million in 2005-2006, $272 million in 2006-2007, and $289 million in 2007-2008.[6] The tax has become a significant part of revenue for Illinois municipal governments. On average, municipalities obtained about 5.5 percent of their own source revenues from telecommunications tax (about 11 percent of their own source taxes) in 2004-2008. For municipalities that have tapped this revenue source, the mean reliance on this tax was about 10 percent of own source revenues, or 20 percent of their own source taxes in this period.

3. Conceptual Framework and Literature Review

3.1: Conceptual Framework

State and local tax structure has been a favorite topic in the field of public finance. While the literature differs in the approach to understanding the formation and evolution of tax structure, the scholars generally agree that the tax structure is determined by political, economic, and administrative factors of the jurisdictions (Inman, 1987; Hettich and Winer, 1999). The Leviathan model assumes that the government has unlimited power to tax private activity, and that the only constraint is the adverse effects of taxation on the level of taxable activity (Brennan and Buchanan, 1980). On the other hand, the median voter model suggests that the choice of tax rate selected by a majority vote is the median of the desired levels. Under certain conditions, the median voter becomes decisive because her preference will prevail in a direct democracy.

In this section we provide a simplified framework to understand how municipalities pick their telecommunications tax rate. This framework underpins our econometric analyses and helps us select the appropriate variables, functional form and econometric technique to explore changes in the tax rate over time.

Figure 1 depicts a standard trade-off between the tax rate and tax revenue. The vertical axis measures 100 minus the tax rate and thus has a Y-intercept of 100 (when the tax rate is zero). We call this curve a “rate-revenue frontier” although it is depicted in the

100 minus rate/revenue space. As the tax rate increases we move down the Y axis and revenue increases. If the tax base is not perfectly inelastic the slope of this rate-revenue curve will become steeper as we move out the X axis (i.e. incremental revenue falls with increases in the tax rate because the tax base declines). As drawn, the curve reaches a revenue peak when crossing the X axis.

According to the Leviathan model, the government prefers a tax rate that maximizes revenue. However, in most cases the Leviathan's choice is constrained by constitutional rules and political factors, and the ultimate tax rate may not be revenue-maximizing. The tax rate also might be selected to achieve the maximum utility of the decisive voter as in the median voter model. Figure 2 depicts the indifference map of a decisive voter in the same "100-minus-rate"/revenue space shown in Figure 1[7]. We assume that the decisive voter dislikes higher tax rates since she has to pay them but likes higher (aggregate) revenues since these pay for public services. In this case, it is reasonable to assume that the voter will have a standard downward sloping concave indifference curve as depicted in Figure 2.

For the municipal telecommunications tax in Illinois, the state limits the choice of tax rates to between zero and six percent so that the solution is limited to the region of the rate-revenue frontier between 100 and 94 percent (the solid section of the rate-revenue frontier curves in Figure 3). Figure 3 depicts three possible optimal rate/revenue combinations. In Figure 3a the decisive voter chooses an interior solution where her indifference curve is just tangent to the rate-revenue frontier. In Figure 3b, the decisive voter chooses a corner solution with a tax rate of six percent where the indifference curve is steeper than the rate-revenue frontier while in Figure 3c the decisive voter chooses a corner solution with a tax rate of zero since her indifference curve is always flatter than the rate-revenue frontier.

This simple framework has some important implications. First, it predicts that municipalities that have selected an interior solution will alter their chosen tax rate when either the rate-revenue frontier or the decisive voter's indifference curve shifts. A variety of factors could cause either of these curves to shift. The rate-revenue frontier may shift for example, if neighboring (and competing) municipalities alter the tax rates that they charge. This frontier would be expected to shift to the right as new businesses enter the municipality. The decisive voter's indifference curve may shift as population rises and demographic characteristics change. Also, the appeal of new revenue will change as economic and fiscal conditions change. We expect that government officials and the decisive voter will find additional revenue more appealing when the municipality faces fiscal stress (e.g. a budget shortfall) than in times of fiscal surplus.

A second implication of this framework is that relatively small shifts in the rate-revenue frontier and/or the decisive voter's indifference map probably will not cause the municipality to select a new tax rate when they have previously selected a corner solution. This implication follows from the observation that, at a corner solution, the marginal benefit of decreasing (when the tax rate is six percent) or increasing (when the tax rate is zero) the tax rate may be much less than the cost as shown in Figures 3b and 3c. Thus, we expect relatively stable tax rate choices at the corner solutions but much more fluidity for interior choices. This is the inertia effect in the departure from the corner solution with a tax rate of zero or six percent. The framework also suggests that municipalities that have chosen an interior solution should be about as likely to decrease their tax rate as increase it in subsequent years. As we shall see, this implication is not borne out by the data. We return to this point in the conclusion.

3.2: Literature Review

There are few empirical studies of local revenue choices. One major part of the empirical literature is based on the median voter model (Sjoquist, 1981; Chicoine and Walzer, 1986; Blackley and DeBoer, 1987; Biegeleisen and Sjoquist, 1988), whereas a limited number of empirical studies are based on the Leviathan model (Nelson, 1986). In addition, some scholars understand the choices of tax from the perspective of minimizing the political cost of raising revenues (Hettich and Winer, 1984, 1988; Gill and Haurin, 2001).

One significant factor in the determination of local tax structure is interjurisdictional tax competition (Hettich and Winer, 1999). The recent growth of empirical studies on strategic interaction among local governments recognizes that the fiscal policies of one government are inevitably affected by and also affect other governments that are related to it either geographically or in other ways. Most of the empirical research in the U.S. that examines tax competition for different types of taxes focuses on state governments (Case, 1993; Besley and Case, 1995; Hettich and Winer, 1999; Hernandez-Murillo, 2003; and Rork, 2003). The few empirical studies of tax competition at the local level in the U.S. include Ladd (1992), Brueckner and Saavedra (2001) and Hendrick, Wu and Jacob. (2007). Ladd's research (1992) provides strong evidence that counties mimic the property tax burden of their neighbors. Using data of 70 cities in the Boston metropolitan area, Brueckner and Saavedra (2001) confirm that strategic tax competition existed in the

Boston metropolitan area in the pre-tax-limitation era and also after the Proposition $2^1/_2$, but in a less pervasive manner. Hendrick, Wu and Jacob (2007) also find that tax competition exists for property taxes among municipal governments in the Chicago metropolitan area.

A very recent study by Sjoquist and his colleagues (2007) examines the timing of the decision of county governments to adopt a local sales tax in the state of Georgia over the period 1975-2001. Using a time-to-failure model, the authors report that the adoption decision is affected by factors such as the ratio of sales tax base over property tax base, per capita income, and fiscal stress. In particular, the spatial aspect of neighbors' adoption of the sales tax is an important indicator of the likelihood and timing of adoption in any given county.

The brief review of empirical literature presents several caveats in the study of tax policy. First, too little attention has been devoted to understanding the inertia effect in local tax policy-making regarding whether to initiate a tax, and whether to change its rate after it is enacted. Second, while the neighboring effect is well recognized in the empirical literature, the specification of the spatial factor is too simplistic to disclose how interjurisdictional interaction works in setting tax policies. Our study extends the existing literature by providing empirical evidence that explores the inertia and neighbors' effect in the newly restructured telecommunications tax levied by Illinois municipalities.

4. Data and Empirical Model

We obtained data about Illinois municipalities' fiscal condition from annual financial reports that municipalities are required to file with the state comptroller's office. We obtained data about telecommunications tax rates from the Illinois Department of Revenue and additional data from the U.S Census Bureau. Table 2 summarizes the definition and data source of each of the variables in our econometric model.

(Insert Table 2 about here)

We use two fiscal variables to explain the change in municipal telecommunications tax rates. One is own-source revenue as a percent of the total revenues garnered by the general, special, and debt service funds.[8] This variable measures reliance on own-source revenues to finance general government operations. We hypothesize that a higher reliance on own-source revenues may increase the likelihood that municipal governments levy or increase the tax on telecommunications. The other fiscal variable is the ending balance of general, special, and debt service funds in the prior fiscal year (which equals the beginning balance in the current year) as a percent of total revenues in the current year. For municipal governments, a positive beginning fund balance is equivalent to another source of revenue. We hypothesize that municipalities with a relatively large fund balance at the beginning of a fiscal year have less need to levy or increase a tax on telecommunications. On the contrary, a municipal government that has little money in hand or that is in debt at the start of a fiscal year is likely to face high fiscal stress and likely to search for additional revenues from sources such as the telecommunications tax.

In addition to the two fiscal variables measured in percentages, municipal population also may be relevant. Large municipalities generally have larger staffs to study and implement revenue-raising tools including telecommunications tax. Moreover, a high telecommunications tax rate is less likely to drive business or residents away from larger municipalities because they may be able to offer more desirable amenities. Therefore, large cities are more likely to levy a telecommunications tax or increase their rate if they decide to tap this source of revenue.

If municipal governments compete for mobile taxable resources or use neighboring governments' tax rates as a baseline to judge their own fiscal competence, the change in their telecommunications tax rate is likely to be related to the average tax rate of the neighboring municipal governments. Because telecommunication services are an important input for some industries, municipal governments may fear relocation of businesses if their tax rate is higher than their neighbors'.

Our simple econometric model can be expressed as follows,

$$DRT_{i,t} = \beta_1 RT_{i,0} + \beta_2 OR_{i,0} + \beta_3 FB_{i,0} + \beta_4 POP_{i,0} + \beta_5 SLRT_{i,0} + \varepsilon_{i,t}$$

In this model, the dependent variable DRT_t refers to the *change of simplified municipal telecommunications tax rate* from the inception to year *t*. The telecommunications tax rate in the inception year RT_0 is included on the right-hand side to represent the initial tax rate. The explanatory variables *OR* and *FB* refer to the *percentage of own-source revenues in total revenues* and the *percentage of ending fund balance in total revenues*, respectively.[9] Other explanatory variables include *POP* as the measure of municipal population (in logarithm), and *SLRT* as spatial lag operator representing the average telecommunications tax rates of the neighboring municipalities. The explanatory variables are all measured in the inception year 2003.

We use telecommunications tax rate that took effect in July as the rate of the year. As described in the prior section, municipalities have two opportunities to change their tax rate – file the certified ordinance before March 21st or September 21st. About eighty five percent of municipal governments end their fiscal year on April 30th. They can change their tax rate on January 1st or July 1st of the following year if they file the ordinance before September 21st of the current year, or before March 21st of the next year. For the remaining fifteen percent of municipalities with different ending dates of fiscal year, they can still make tax rate changes that take effect in the following year.[10] Therefore, the tax rate in July reflects the tax rate in a specific year as a result of municipalities' decisions on either of the two dates.

We include the initial telecommunications tax rate as one independent variable because it may have an impact on the change in the tax rate over time. We hypothesize that inertia has a strong impact on decision-making about local tax policy. For instance, if a municipal government initially did not levy a tax, it would tend to stay that way unless some strong external forces intervened. On the other hand, if the government had the tax in place, it is more likely to increase the rate. In our data, a large number of municipalities did not levy telecommunications tax when it was first authorized by state law. This provides an opportunity empirically to examine the inertia effect.

We expect that the governments that began the study period with a zero rate will have smaller tax rate changes than municipalities that had a telecommunications tax in place at the start of the study period. The municipalities that were assigned the maximum rate of six percent at the inception of the tax cannot increase the rate. We introduce seven dummy variables with each representing one of the following levels of tax rate in 2003:

- Tax rate at zero percent (rate = 0)
- Tax rate from 0 through 1 percent (0 < rate <= 1%)
- Tax rate from 1 through 2 percent (1% < rate <= 2%)
- Tax rate from 2 through 3 percent (2% < rate <= 3%)

- Tax rate from 3 through 4 percent (3% < rate <= 4%)
- Tax rate from 4 through 5 percent (4% < rate <= 5%)
- Tax rate from 5 through 6 percent (5% < rate <= 6%)

We also introduce a spatial lag operator to measure the effect of neighbors' tax rates on the change of own tax rate. Although the effects of neighbors are well recognized, the concept of "neighborliness" is hard to define in empirical studies. The key question is how to determine "neighbors" relevant to the decision-making at local level, especially when the number of neighboring municipalities is very large. Prior studies of tax competition introduce a spatial lag operator that is the average tax rate of all neighboring jurisdictions in the region based on their spatial proximity to each other. Spatial proximity is usually measured as distance or contiguity. In this study, the spatial weight equals the reciprocal of the Euclidean distance between municipalities *i* and *j*, which is measured by longitude and latitude from the city's geographic center. The spatial weights matrix calculated as the reciprocal distance assumes that the impact of neighboring municipalities declines as distance increases.

In the existing literature, the spatial weight matrix includes all jurisdictions but itself, implicitly presuming that all other municipalities are potential competitors. One major weakness of such a weighting matrix is that it gives remote neighbors some weight even though they are likely to have no impact. When a municipal government sets its tax rate, it may just look at a few communities that are close enough to be deemed relevant. In this study, we construct four alternate measures of the spatial lag operator using different spatial weight matrixes.

- *dwrtk5*: spatial lag operator based on a weight matrix that includes exactly five closest neighbors for every municipality.
- *dwrtk10*: spatial lag operator based on a weight matrix that includes exactly ten closest neighbors for every municipality.
- *dwrtk20*: spatial lag operator based on a weight matrix that includes exactly twenty closest neighbors for every municipality.
- *dwrtk50*: spatial lag operator based on a weight matrix that includes exactly fifty closest neighbors for every municipality.

Some descriptive statistics of the variables are presented in Table 3. The full sample includes 1,301 municipalities in 2003 and 2008.

(Insert Table 3 about here)

5. Result and Discussion

5.1: Descriptive Analysis

We hypothesize that municipalities tend to stay tax free if they did not levy the tax before due to the "inertia effect". Once the tax is enacted, it becomes relatively easy for municipalities to go from a low tax rate to higher ones until they reach the six percent cap. If an inertia effect exists, we should observe that municipalities initially assigned a zero tax rate are less likely to increase the tax rate than municipalities that initially had non-zero and below-maximum tax rates.

Table 4 presents a transition matrix of telecommunications tax rates[11]. Values above the main diagonal represent tax increases, those below the diagonal represent tax decreases and values on the diagonal did not change. The matrix shows that municipalities with an initial tax rate of zero or six percent rarely made changes. For 2,925 observations with a zero tax rate in the prior year, 97.7 percent (2,858) do not change this tax free policy. In contrast municipalities that already had a non-zero tax rate are more likely to increase the rate. About seven, twelve, twelve or seven percent of municipalities with a one, two, three or four percent tax rate in the prior year increased their tax rate. Once the prior year tax rate reached five percent or above, fewer municipalities take any action possibly because of the binding six-percent limit on the maximum tax rate.

The inertia effect is also reflected in the average change in the tax rate starting from different values. For municipalities with a zero rate in the prior year, the mean one-year change in the tax rate is 0.10 percentage point. With a rate at one, two or three percent in the prior year, the mean one-year change in the tax rate is larger (0.24, 0.36, and 0.24 percentage points, respectively). The change is reduced to 0.12 and 0.03 percentage points as the initial rate approaches five and six percent, respectively.

5.2: Regression Analysis

The regression analyses explore the inertia and neighboring effects on the total change in telecommunications tax rates in 2003-2008 period. The model is implemented using ordinary least squares (OLS) without a constant. We first run the regression on the dummy variables for different levels of the telecommunications tax rate in 2003. Then we add to the model the following variables in 2003: the percentage of own-source revenues in total revenues, percentage of ending fund balance in total revenues, and municipal population (in logarithm). Finally, each of the four alternative measures of the spatial lag operator is also added to the model. The full sample includes 1,301 municipalities, with very few observations missing in some specifications of the model due to unavailability of data. The statistical results are presented in Table 5.

(Insert Table 5 about here)

When only dummy variables measuring the initial tax rate are included, the estimates show the mean values of rate change in 2003-2008 as a result of different starting rates in 2003. As expected, municipalities with a zero rate in 2003 increase tax rate by a significantly smaller amount than those starting from a rate of one, two or three percent. The change of rate declines as municipalities approach the maximum rate of six percent. The relationship of the change in tax rate 2003-2008 and the initial tax rate in 2003 is depicted in Figure 4. The curve shows that municipalities with an initial rate from one to three percent increase their tax rate more than those at either end of the range from zero through six percent. There was virtually no change in rates for municipalities that started with the maximum rate of six percent. This supports our hypothesis that an initial corner solution (shown in Figure 3b) results in a reduced likelihood of a rate change. The empirical evidence also suggests that the inertia effect exists in an initial rate of zero (Figure 3c) because municipalities at a zero rate initially change their rates much less than those with an initial rate of one through three percent.

(Insert Figure 4 about here)

In other specifications when more independent variables are included, the estimates of the dummy variables change but the pattern is similar to that shown in Figure 4. Municipalities with a zero or very high initial tax rate increase their rates less than those with intermediate initial rates. In tests not reported here we found that there was no statistically significant difference between dummy variable coefficients for tax rates from zero through three percent. We therefore introduce a single dummy variable that equals 1 if the municipalities' initial tax rate was greater than zero but less than or equal to three percent to replace three of the dummy variables shown in Table 5. We run the same regressions on the new set of dummies, and the results are presented in Table 6.

(Insert Table 6 about here)

As expected, the results are fairly consistent in Tables 5 and 6. The estimated coefficient of the dummy for a zero rate is consistently lower than that of the dummy for a tax rate from zero through three percent. The difference between the two estimated coefficients is statistically significant at ten percent level.[12] At the other end, the estimated coefficient of the dummy for a six percent rate is the lowest among the four dummy variables, and the difference between this estimated coefficient and that of the adjacent dummy variable is significant.[13]

It is noteworthy that the estimates of other variables are also consistent across regressions. As expected, the estimated coefficients on the *percentage of ending fund balance in total revenues* are statistically significant and negative but the magnitude of this coefficient is virtually zero. It indicates that a municipal government tends to decrease its telecommunications tax rate if it has a relatively large amount of money at the start of the period, all else being equal. The very small magnitude of this coefficient may reflect the reluctance of municipalities to use reserved funds that are necessary to ensure a low cost for their future debt issuance. Large municipalities tend to increase the telecommunications tax rate more than small ones. The estimates indicate that each one percent increase in a municipality's population results in a 19 to 20 one-hundredths of a percentage point additional increase in the telecommunications tax rate. The coefficient estimates of the *percentage of own-source revenues in total revenues* are not statistically significant.

Our results also support the hypothesis that the tax rates of neighboring municipalities are an important factor determining the change of municipal telecommunications tax rate.[14] Furthermore, the results show that the neighboring effect increases and then levels off as more neighbors are considered. When the number of closest neighbors increases from five to fifty, the estimated effect is doubled. There is virtually no difference between the estimates of the spatial operator based on fifty neighbors and all neighbors so the regression with all neighbors is not shown. In general, local governments may consider only a few close communities relevant when they make fiscal decisions. The relevant neighbors are likely the jurisdictions contiguous to them, or close enough geographically because only the closest neighbors are likely to be the competitors for business activities and residents. Remote municipalities are not relevant at all, and need not be included in the spatial weight matrix.

6. Conclusion

Our empirical analyses find evidence of both inertia and neighboring effects on the setting of municipal telecommunications tax rates in Illinois during the 2003 to 2008 period. Both the Leviathan and median voter models of taxation predict most of the effects we have found. In the Leviathan model intergovernmental competition for fiscal resources may serve as a substitute for constitutional constraints and can limit tax rates of local governments (Nelson, 1986). On the other hand, the political pressure represented by the median (decisive) voter also may drive tax competition through the local political channels.

The inertia effect is also consistent with both kinds of model. The Leviathan model predicts inertia because the initial adoption of a tax is likely to be more visible than increasing the tax once it has been adopted. The decisive voter model analyzed in our discussion of the conceptual framework also predicts relatively stable tax rate choices at corner solutions because at a corner solution the marginal benefit of increasing (when the tax rate is zero) or decreasing (when the tax rate is six percent) the tax rate may be much less than the cost (See Figures 3b and 3c).

While the implications of these two widely used models do not differ with respect to two of our empirical findings other results cast some doubt on pure version of the decisive voter model. We find that tax rate increases are common while tax rate cuts are exceedingly rare—occurring only three times in more than 6,500 opportunities. Figure 3a suggests that municipalities with interior solutions ought to be equally likely to cut or increase tax rates. Secondly, we find very little evidence that tax rate increases are motivated by fiscal stress as we would expect in a decisive voter model. Finally, we find that large municipalities, which are likely to have sophisticated bureaucracies that can easily understand the complexities of a telecommunications taxes are more likely to raise tax rates than small municipalities. In summary, our empirical results suggest that simple models of municipal tax setting behavior explain only some of the observed behavior.

References

Besley, Timothy, and Anne C. Case. “Incumbent Behavior: Vote Seeking, Tax Setting, and Yardstick Competition.” *American Economic Review* 85 No. 1 (March, 1995): 25-45.

Biegeleisen, J. Alan, and David L. Sjoquist. “Rational Voting Applied to Choices of Taxes.” *Public Choice* 57 No. 1 (April, 1988): 39-47.

Black, Duncan. “On the Rationale of Group Decision-making.” *Journal of Political Economy* 56 No. 1 (February, 1948): 23–34.

Blackley, Paul R., and Larry DeBoer. “Tax Base Choice of Local Governments.” *Land Economics* 63 No. 3 (August, 1987): 227-236.

Brennan, Geoffrey, and James M. Buchanan. *The power to tax: Analytical foundations of a fiscal constitution.* Cambridge: Cambridge University Press, 1980.

Brueckner, Jan K., and Luz A. Saavedra. “Do Local Governments Engage in Strategic Property Tax Competition?” *National Tax Journal* 54 No. 2 (June, 2001): 203-229.

Buchanan, James M. *The Limits of Liberty: Between Anarchy and Leviathan*. Indianapolis, IN: Liberty Fund, Inc., 1957.

Case, Anne C. “Interstate Tax Competition after TRA86.” *Journal of Policy Analysis and Management* 12 No. 1 (Winter, 1993): 136-148.

Chicone, David L., and Norman Walzer. “Factors Affecting Property Tax Reliance: Additional Evidence.” *Public Choice* 49 No. 1 (April, 1986): 17-27.

Downs, Anthony. *An Economic Theory of Democracy*. New York, NY: Harper Collins, 1957.

Gill, H. Leroy, and Donald R. Haurin. “The Choice of Tax Base by Local Authorities: Voter Preferences, Special Interest Groups, and Tax Base Diversification.” *Regional Science and Urban Economics* 31 No. 6 (November, 2001): 733-749.

Hendrick, Rebecca, Yonghong Wu, and Benoy Jacob. “Tax Competition Among Municipal Governments: Exit Versus Voice.” *Urban Affairs Review* 43 No. 2 (November, 2007): 221-255.

Hernandez-Murillo, Ruben. “Strategic Interaction in Tax Policies among States.” *Federal Reserve Bank of St. Louis Review* 85 No. 3 (May/June, 2003): 47-56.

Hettich, Walter, and Stanley L. Winer. “A Postive Model of Tax Structure.” *Journal of Public Economics* 24 No. 1 (June, 1984): 67-87.

—“Economic and Political Foundations of Tax Structure.” *American Economic Review* 78 No. 4 (September, 1988): 701-712.

—*Democratic Choice and Taxation: A Theoretical and Empirical Analysis*. Cambridge, U.K. and New York, NY: Cambridge University Press, 1999.

Inman, Robert P. “Market, Government and the “New” Political Economy.” In *Handbook of Public Economics*, edited by Alan J. Auerbach and Martin. S. Feldstein, 647-777. Amsterdam, Netherlands: Elsevier, 1987.

Ladd, Helen F. “Mimicking of Local Tax Burdens among Neighboring Counties.” *Public Finance Quarterly* 20 No. 4 (October, 1992): 450-467.

Nelson, Michael A. “An empirical analysis of state and local tax structure in the context of the Leviathan model of government.” *Public Choice* 49 No. 3 (June, 1986): 283-294.

Rork, Jonathan C. “Coveting Thy Neighbors' Taxation.” *National Tax Journal* 56 No. 4 (December, 2003): 775-787.

Sjoquist, David L. “A Median Voter Analysis of Variations in the Use of Property Taxes among Local Governments.” *Public Choice* 36 No. 2 (February, 1981): 273-285.

Sjoquist, David L., William J. Smith, Mary Beth Walker, and Sally Wallace. “An Analysis of the Time to Adoption of Local Sales Taxes: A Duration Model Approach.” *Public Budgeting & Finance* 27 No. 1 (Spring, 2007): 20-40.

U.S. Census Bureau. *2002 Census of Governments Volume 1, Number 1, Government Organization*. Washington, DC: U.S. Census Bureau, 2002.

Wu, Yonghong, and Michael A. Pagano. “Municipal communications tax revenue reliance and fiscal impact of possible federal preemption.” *Public Budgeting & Finance* 28 No. 1 (Spring, 2008): 82-100.

Table 1: Distribution of simplified municipal telecommunications tax rates 2003-2008

Rate Category	July, 2003	July, 2004	July, 2005	July, 2006	July, 2007	July, 2008
Rate = 0.00%	621	592	578	570	564	556
0.00% < Rate <= 1.00%	197	173	162	154	149	145
1.00% < Rate <= 2.00%	27	33	30	25	23	22
2.00% < Rate <= 3.00%	36	39	39	38	42	40
3.00% < Rate <= 4.00%	67	67	70	69	69	69
4.00% < Rate <= 5.00%	124	132	134	133	133	136
5.00% < Rate < 6.00%	5	5	6	6	6	6
Rate = 6.00%	224	260	282	306	315	327
Total	1,301	1,301	1,301	1,301	1,301	1,301

Source: Illinois Department of Revenue (n.d.)
Note: We have simplified municipal telecommunications tax rate data for 1,302 municipalities in Illinois. The distribution does not include Chicago having its telecommunications tax rate at 7% that is 1 percentage higher than the cap of simplified municipal telecommunications tax rate for other municipalities.

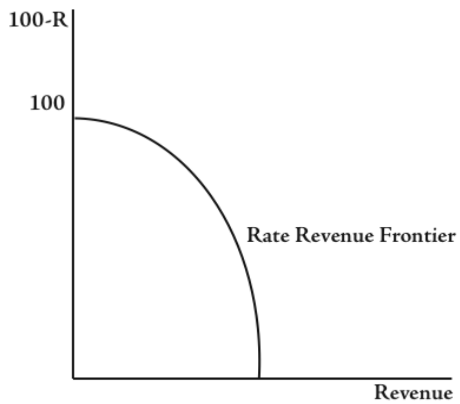

Figure 1: Tax rate/revenue frontier curve

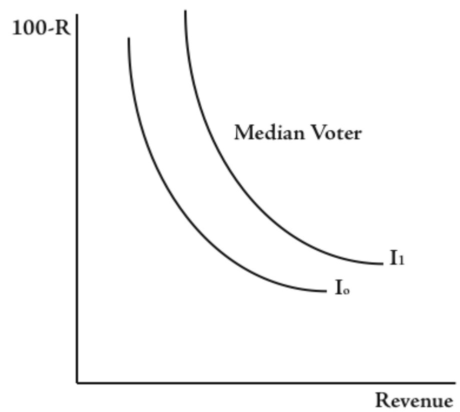

Figure 2: Indifference curves of a decisive voter

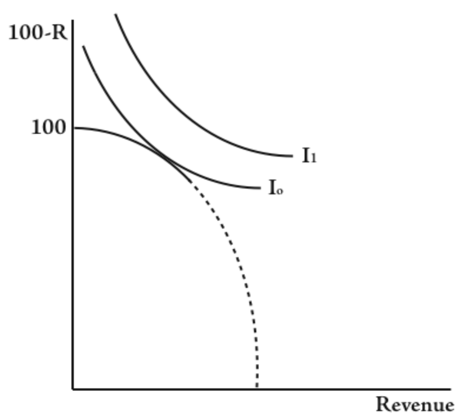

Figure 3a: Interior solution of tax rate choice

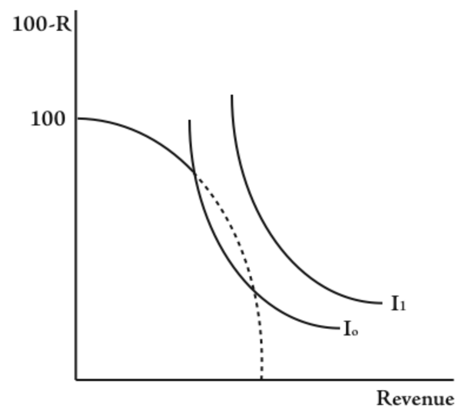

Figure 3b: Corner solution of tax rate choice (at 6%)

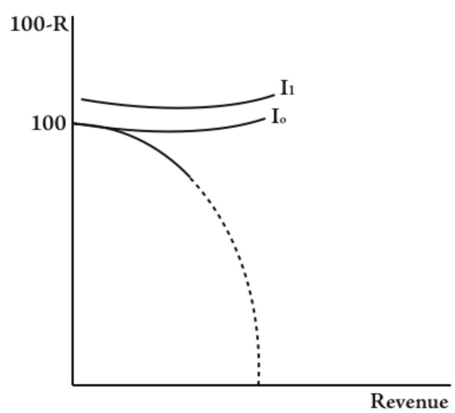

Figure 3c: Corner solution of tax rate choice (at 0%)

Table 2: Variable definition and data source

Variable	Definition	Data source
DRT_t	Change of simplified municipal telecommunications tax rate 2003-2008 (in %)	Illinois Department of Revenue (n.d.)
RT_0	Simplified municipal telecommunications tax rate in 2003(in %)	Illinois Department of Revenue (n.d.)
OR_0	Percent of GF, SR & DS own-source revenues in total revenues in 2003 (in %) [a]	Municipal revenues data from Illinois State Comptroller Office
FB_0	Percent of GF, SR & DS ending fund balance in total revenues in 2003 (in %)	Municipal fund balance data from Illinois State Comptroller Office
POP_0	Municipal population in 2003	Illinois State Comptroller Office
$dwrtk5_0$	Distance weighted municipal telecommunication tax rate of neighbors in 2003 – each municipality has 5 closest neighbors	Illinois Department of Revenue (n.d.) U.S. Census Bureau (2000)
$dwrtk10_0$	Distance weighted municipal telecommunication tax rate of neighbors in 2003 – each municipality has 10 closest neighbors	Illinois Department of Revenue (n.d.) U.S. Census Bureau (2000)
$dwrtk20_0$	Distance weighted municipal telecommunication tax rate of neighbors in 2003 – each municipality has 20 closest neighbors	Illinois Department of Revenue (n.d.) U.S. Census Bureau (2000)
$dwrtk50_0$	Distance weighted municipal telecommunication tax rate of neighbors in 2003 – each municipality has 50 closest neighbors	Illinois Department of Revenue (n.d.) U.S. Census Bureau (2000)

Note: a. Own-source revenues and total revenues do not include the simplified municipal telecommunication tax.

Table 3: Descriptive statistics

Variable	N	Mean	Std. Dev.	Min	Max
Change of simplified municipal telecommunications tax rate 2003-2008	1,301	0.50	1.41	-6.00	6.00
Simplified municipal telecommunications tax rate in 2003	1,301	1.97	2.42	0.00	6.00
Percent of GF, SR & DS own-source revenues in total revenues in 2003	1,284	44.09	17.30	0.00	93.35
Percent of GF, SR & DS ending fund balance in total revenues in 2003	1,276	139.74	168.46	-122.12	1,631.24
Municipal population (in logarithm) in 2003	1,282	7.27	1.68	3.18	11.97
Distance weighted municipal telecommunication tax rate of neighbors in 2003 – 5 closest neighbors	1,286	2.01	1.65	0.00	6.00
Distance weighted municipal telecommunication tax rate of neighbors in 2003 – 10 closest neighbors	1,286	2.00	1.48	0.00	5.90
Distance weighted municipal telecommunication tax rate of neighbors in 2003 – 20 closest neighbors	1,286	1.98	1.38	0.04	5.68
Distance weighted municipal telecommunication tax rate of neighbors in 2003 – 50 closest neighbors	1,286	1.99	1.27	0.12	5.21

Note: The descriptive statistics do not include Chicago. However, we include Chicago in the spatial weight matrixes in the computation of distance weighted municipal telecommunication tax rates.

Table 4: The transition matrix of telecommunications tax rates (percentages are in parentheses)

Tax rate	0	0.25	0.5	0.75	1	1.5	2	3	3.25	3.5	3.75	4	4.25	4.5	5	5.75	6	Total
0	2,858 (97.71)	1 (0.03)			4 (0.14)	1 (0.03)	2 (0.07)	12 (0.41)				1 (0.03)	1 (0.03)		16 (0.55)		28 (0.96)	2,925 (100)
0.25		51 (98.08)															1 (1.92)	52 (100)
0.5			21 (91.3)				1 (4.35)					1 (4.35)						23 (100)
0.75				25 (96.15)													1 (3.85)	26 (100)
1	1 (0.14)				681 (92.8)		4 (0.54)	10 (1.36)		1 (0.14)	1 (0.14)	8 (1.09)		2 (0.27)	6 (0.82)		19 (2.59)	734 (100)
1.5						24 (96)											1 (4)	25 (100)
2							96 (88.07)	2 (1.83)			1 (0.92)	1 (0.92)			2 (1.83)		7 (6.42)	109 (100)
3								164 (88.65)	1 (0.54)			3 (1.62)		2 (1.08)	6 (3.24)		9 (4.86)	185 (100)
3.25									19 (95)								1 (5)	20 (100)
3.5										179 (96.76)							6 (3.24)	185 (100)
3.75											23 (95.83)						1 (4.17)	24 (100)
4												105 (92.92)			3 (2.65)		5 (4.42)	113 (100)
4.25													6 (75)				2 (25)	8 (100)
4.5														160 (94.67)	1 (0.59)		8 (4.73)	169 (100)
5															459 (96.84)		14 (2.95)	474 (100)
5.75																20 (100)		20 (100)
6	1 (0.07)														1 (0.07)		1,385 (99.86)	1,387 (100)
Total	2,860 (43.97)	52 (0.8)	21 (0.32)	25 (0.38)	685 (10.53)	26 (0.4)	103 (1.58)	188 (2.89)	20 (0.31)	180 (2.77)	25 (0.38)	119 (1.83)	7 (0.11)	164 (2.52)	494 (7.59)	20 (0.31)	1,490 (22.91)	6,505 (100)

Table 5: Statistical results – Ordinary least squares (OLS) model (1)

Variable	OLS (1)	OLS (2)	OLS (3)	OLS (4)	OLS (5)	OLS (6)
Dummy for tax rate at 0	0.4948*** (0.0612)	-0.7549*** (0.2138)	-0.7173*** (0.2266)	-0.6953*** (0.2257)	-0.6743*** (0.2256)	-0.6646*** (0.2258)
Dummy for tax rate 0 through 1	1.1206*** (0.1363)	-0.5461** (0.2521)	-0.5077* (0.2655)	-0.4878* (0.2647)	-0.4678* (0.2647)	-0.4624* (0.2643)
Dummy for tax rate 1 through 2	1.2407*** (0.3556)	-0.4805 (0.4241)	-0.4227 (0.4346)	-0.3964 (0.4343)	-0.3683 (0.4345)	-0.3477 (0.4353)
Dummy for tax rate 2 through 3	0.9931*** (0.2172)	-0.6144** (0.3122)	-0.5711* (0.3209)	-0.5519* (0.3198)	-0.5294* (0.3197)	-0.5238 (0.3189)
Dummy for tax rate 3 through 4	0.4328*** (0.1085)	-1.2797*** (0.2735)	-1.2703*** (0.2803)	-1.2491*** (0.2805)	-1.2369*** (0.2799)	-1.2235*** (0.2802)
Dummy for tax rate 4 through 5	0.2278*** (0.0442)	-1.4997*** (0.269)	-1.5098*** (0.2738)	-1.501*** (0.2732)	-1.498*** (0.2722)	-1.4915*** (0.2725)
Dummy for tax rate 5 through 6	-0.0306 (0.0266)	-1.8541*** (0.278)	-1.8759*** (0.2829)	-1.8645*** (0.2824)	-1.8541*** (0.2819)	-1.8463*** (0.2825)
Percent of GF, SR & DS own-source revenues in total revenues in 2003	/	-0.001 (0.0023)	-0.0013 (0.0024)	-0.0019 (0.0025)	-0.0022 (0.0025)	-0.0026 (0.0025)
Percent of GF, SR & DS ending fund balance in total revenues in 2003	/	-0.0005** (0.0002)	-0.0005** (0.0002)	-0.0005** (0.0002)	-0.0005** (0.0002)	-0.0005** (0.0002)
Municipal population (in logarithm) in 2003	/	0.2226*** (0.0295)	0.2072*** (0.032)	0.2024*** (0.032)	0.1973*** (0.0323)	0.1927*** (0.0326)
Distance weighted tax rate of neighbors in 2003 – 5 closest neighbors	/	/	0.0517 (0.0325)	/	/	/
Distance weighted tax rate of neighbors in 2003 – 10 closest neighbors	/	/	/	0.072** (0.0358)	/	/
Distance weighted tax rate of neighbors in 2003 – 20 closest neighbors	/	/	/	/	0.0913** (0.04)	/
Distance weighted tax rate of neighbors in 2003 – 50 closest neighbors	/	/	/	/	/	0.1113** (0.045)
N	1,301	1,274	1,271	1,271	1,271	1,271
R-squared	0.1695	0.2209	0.2241	0.225	0.2259	0.2268

Note: The dependent variable is the *change of Simplified municipal telecommunication tax rate* (2003-2008). The model is Ordinary least squares (OLS) without constant. Robust standard errors are in parentheses. *** denotes significance level <1%, ** for 5%, and * for 10%.

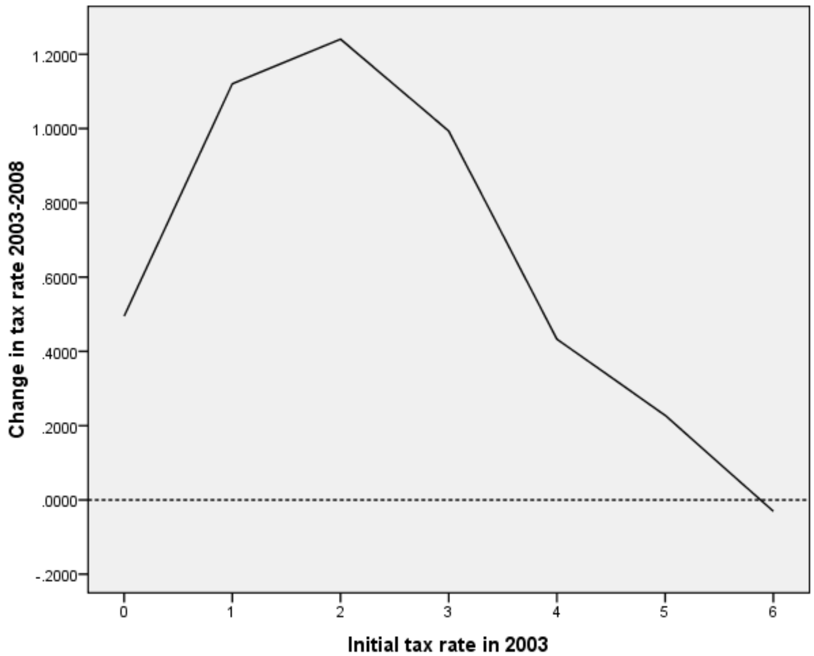

Figure 4: Relationship of change in tax rate 2003-2008 and initial tax rate in 2003

Table 6: Statistical results – Ordinary least squares (OLS) model (2)

Variable	OLS (1)	OLS (2)	OLS (3)	OLS (4)	OLS (5)	OLS (6)
Dummy for tax rate at 0	0.4948*** (0.0612)	-0.7589*** (0.2139)	-0.7221*** (0.2265)	-0.7004*** (0.2256)	-0.6797*** (0.2254)	-0.6707*** (0.2255)
Dummy for tax rate 0 through 3	1.1154*** (0.1137)	-0.5534** (0.2468)	-0.5131** (0.2603)	-0.4931* (0.2595)	-0.4722* (0.2595)	-0.466* (0.2592)
Dummy for tax rate 3 through 4	0.4328*** (0.1084)	-1.2842*** (0.2735)	-1.2755*** (0.2802)	-1.2546*** (0.2804)	-1.2427*** (0.2797)	-1.23*** (0.28)
Dummy for tax rate 4 through 5	0.2278*** (0.0442)	-1.5042*** (0.269)	-1.5149*** (0.2737)	-1.5064*** (0.2731)	-1.5036*** (0.272)	-1.4977*** (0.2723)
Dummy for tax rate 5 through 6	-0.0306 (0.0265)	-1.8589*** (0.2781)	-1.8812*** (0.2828)	-1.8701*** (0.2823)	-1.86*** (0.2818)	-1.8528*** (0.2823)
Percent of GF, SR & DS own-source revenues in total revenues in 2003	/	-0.001 (0.0023)	-0.0014 (0.0024)	-0.0019 (0.0025)	-0.0022 (0.0025)	-0.0026 (0.0025)
Percent of GF, SR & DS ending fund balance in total revenues in 2003	/	-0.0005** (0.0002)	-0.0005** (0.0002)	-0.0005** (0.0002)	-0.0005** (0.0002)	-0.0005** (0.0002)
Municipal population (in logarithm) in 2003	/	0.2233*** (0.0295)	0.208*** (0.032)	0.2033*** (0.032)	0.1982*** (0.0323)	0.1938*** (0.0327)
Distance weighted tax rate of neighbors in 2003 – 5 closest neighbors	/	/	0.0514 (0.0325)	/	/	/
Distance weighted tax rate of neighbors in 2003 – 10 closest neighbors	/	/	/	0.0715** (0.0359)	/	/
Distance weighted tax rate of neighbors in 2003 – 20 closest neighbors	/	/	/	/	0.0907** (0.0401)	/
Distance weighted tax rate of neighbors in 2003 – 50 closest neighbors	/	/	/	/	/	0.1102** (0.045)
N	1,301	1,274	1,271	1,271	1,271	1,271
R-squared	0.1692	0.2208	0.224	0.2249	0.2258	0.2267

Note: The dependent variable is the *change of Simplified municipal telecommunication tax rate* (2003-2008). The model is Ordinary least squares (OLS) without constant. Robust standard errors are in parentheses. *** denotes significance level <1%, ** for 5%, and * for 10%.

Notes

[1] "Telecommunications, in addition to the meaning ordinarily and popularly ascribed to it, includes, without limitation, messages or information transmitted through use of local, toll, and wide area telephone service, private line services, channel services, telegraph services, teletypewriter, computer exchange services, cellular mobile telecommunications service, specialized mobile radio, stationary two-way radio, paging service, or any other form of mobile and portable one-way or two-way communications, or any other transmission of messages or information by electronic or similar means, between or among points by wire, cable, fiber optics, laser, microwave, radio, satellite, or similar facilities." (35 ILCS 636/)

[2] The three replaced taxes and fees include the old municipal telecommunications tax, the municipal tax on the occupation or privilege of transmitting messages, and the municipal infrastructure maintenance fee.

[3] See 35 ILCS 636/5-30 for more details.

[4] For municipalities with a population of 500,000 or more, the tax may be imposed at a rate not to exceed 7 percent of the gross charge for telecommunications purchased at retail (35 ILCS 636/).

[5] According to the state law, 35 ILCS 636/5-20, (a), (2) "On and after April 1, 2003, any certified copy of an ordinance filed with the Department on or before September 20 or March 20 shall be effective with respect to gross charges billed by telecommunications retailers on or after the following January 1 or July 1, respectively."

[6] The dollar figures are in current dollars. Data were obtained from Illinois Department of Revenue at http://www.revenue.state.il.us/LocalGovernment/Disbursements/telecom.htm.

[7] The "decisive" voter may or may not be the voter with the median preferences.

[8] To avoid a potential endogeneity issue, we exclude the municipal telecommunications tax revenue from both own-source revenues (as numerator) and total revenues (as denominator) in the computation of this variable.

[9] We measure both total and own-source revenues exclusive of revenue from the telecommunications tax. The ending fund balance in a fiscal year is equal to the beginning fund balance of the prior year.

[10] Based on data from U.S. Census Bureau (2002), about 85 percent (1,101 out of 1,291) of municipal governments end their fiscal year on April 30th. The remaining 190 municipalities' ending dates are February 28th, March 31st, April 15th, May 31st, June 30th, July 31st, August 31st, October 31st, November 30th, or December 31st. For municipalities with fiscal year ending from March 31st to August 31st, the law allows them to change their tax rate on January 1st or on July 1st of the following year if they file the ordinance on or before September 20th of the current year, or on or before March 20th of the next year. For municipalities with their fiscal year ending after September 20th, they may introduce new tax rates starting from July 1st of the following if they choose to do so on or before March 20th of the next year.

[11] The transition matrix shows year-to-year changes. Of the 1301 municipalities in the data only about 20 changed their tax rate more than once.

[12] The p value of the F test ranges from 0.000 to 0.11 in the six specifications of the model.

[13] The p value of the F test of the difference between the estimated coefficients of dummy for five through six percent and dummy for four through five percent is 0.

[14] The p value of estimate on the *distance weighted tax rate of neighbors in 2003 – 5 closest neighbors* is 0.11, very close to 0.10.