MEASURING THE ELASTICITY OF THE LOCAL TELECOMMUNICATIONS TAX BASE WITH RESPECT TO THE TAX RATE

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INTRODUCTION

EMPIRICAL STUDIES ON HOW TAXES AFFECT THE behavior of residents and businesses are important for two reasons. First, basic economic theory suggests that commodity taxes distort consumption and reduce economic efficiency. The magnitude of the efficiency loss depends on how responsive taxpayers are to tax rates. Second, it is important for governments to measure the elasticity of the tax base so that they can forecast tax revenue.

This study contributes to the literature by analyzing Illinois' newly restructured municipal telecommunications tax which took effect on January 1, 2003. The *Simplified Municipal Telecommunications Tax Act* replaced the old multipart and nonuniform system of taxes and fees with a single uniform telecommunications tax. Under the new system, a state tax rate of 7 percent is applied to telecommunication services. Municipalities have the option of imposing an additional tax at a rate of up to 6 percent on the same base. We examine data on the rate and revenue of about 1,300 municipalities from the tax's inception in January 2003 through 2007. We estimate the tax rate elasticity of the telecommunications tax base after instrumenting for own telecommunications tax rate. The statistical results suggest that the consumption of telecommunication services is initially fairly unresponsive to tax rate differentials. However, in later years we find some evidence that the tax base falls as the tax rate rises.

This paper is organized as follows: The next section describes the simplified municipal telecommunications tax in Illinois in somewhat more detail. The following sections present the econometric model and data used in this empirical investigation, discuss the statistical results, and conclude.

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 1, 2003. Under the new system, a state tax rate of 7 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 practice, the tax base consists primarily of wireless (mobile) and location-based (land lines) telephone services. Although we do not have municipality-specific or longitudinal data, in fiscal year 2009 roughly 53 percent of the revenue base was wireless devices.[3]

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.[4] 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 in July 2003, the new system allowed municipalities to choose a tax rate of up to 6 percent on the gross charge for telecommunications.[5]

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 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 21 of the prior year.

Once that deadline has passed, the municipality can file a certified copy of the ordinance before March 21 to have the new rate effective starting from July of the same year.[6]

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 tapping 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 (6 percent) – from 224 in July of 2003 to 327 in July of 2008.

Illinois municipalities have collected a substantial amount of revenue from the simplified municipal telecommunications tax since 2003: $243 million in FY 2004, $272 million in FY 2005, $279 million in FY 2006, $272 million in FY 2007, and $289 million in FY 2008.[7] The tax has become a significant part of revenue for Illinois municipal governments. Although more than 40 percent of municipalities did not tap this revenue source, the telecommunications tax, on average, contributed about 4.8 percent of own-source revenues or 8.7 percent of own-source taxes to municipalities' general, special revenues, and debt service funds in 2004-2007. As an excise tax, the mean ratio of municipalities' telecommunications tax to own-source sales tax is about 55 percent, indicating that the contribution of telecommunications tax, on average, is equivalent to more than half of the local option sales tax revenue in this 4-year period. If we consider general fund only, the mean ratios of annual telecommunications tax relative to own-source revenues, own-source taxes, and local sales taxes are 6.8, 11.3, and 69 percent, respectively.

For municipalities that have tapped this revenue source, the mean reliance on this tax is about 8.9 percent of their own-source revenues, or 16 percent of their own-source taxes for general, special revenues, and debt service funds combined in the period 2004-2007. On average, these municipalities collected telecommunications tax equal to 87 percent of the revenue they obtained from the local sales tax. For general fund only, the mean ratios of annual telecommunications tax revenue relative to own-source revenues, own-source taxes, and local sales tax are 12.5, 24.4, and 111 percent, respectively.

These statistics indicate that the simplified municipal telecommunications tax has played an important role in municipal finance in Illinois. It has become the third largest own-source revenue

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.

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.

for municipal governments, next to the property tax and local sales tax. In some municipalities, the telecommunications tax contributed more revenue than the local sales tax.

EMPIRICAL MODEL AND DATA

Econometric Model

We explore how the telecommunications tax base responds to variation in tax rates in different municipalities. By definition, the tax base is the total sale of taxable telecommunication services in a given time period within the boundaries of a specific municipality. Standard consumer theory suggests that consumption depends on income, tastes, and relative prices. We focus on consumption of telecommunication services within a specific municipality that can be affected by the after-tax price consumers pay for the services relative to other nearby communities. We model the tax base as a function of the municipality's own tax rate (τ), the average tax rate of nearby municipalities (φ), and a vector of exogenous determinants of the base (X). Following Fisher (1980) we estimate the tax rate elasticity of the tax base from monthly municipality-specific revenue data. Since tax revenue is the product of the tax base (B) and own tax rate, we take the logarithm of both sides of the equation and obtain

$$\ln R = \ln \tau + \ln B = \beta_0 + (1 + \pi_0) \ln \tau + \pi_0' \ln \varphi + \pi_1 PO + \pi_2 UR + \pi_3 MY + \pi_4 PT + \pi_5 CK + \varepsilon.$$

In the equation, R refers to telecommunications tax revenue of a specific municipality. The variables τ and φ are the municipality's telecommunications tax rate and the average telecommunications tax rates of the neighboring municipalities, respectively. In this study, φ is the spatially weighted average of neighbors' tax rates. The spatial weights are calculated as the reciprocal of the Euclidean distance between municipalities i and j assuming that the impact of neighboring municipalities declines as distance increases. In addition, we assume that only a few closest neighbors are relevant to the mobility of individual and business users. The weight matrix includes exactly 50 closest neighbors for every municipality. In addition to the tax rates, the aggregate sales of telecommunication services purchased by residents and businesses can be affected by other factors. We control for municipality's population (PO), urban population ratio (UR), and median household income (MY) since these factors may affect expenditures on telecommunication services. We also include *PT* for municipal property tax rate and *CK* for Cook County dummy. All variables in the equation are in logarithm except the zero-one Cook County dummy *CK* and urban population ratio.[8]

We expect that larger population sizes will lead to more users of telecommunication services and higher expenditures. In addition, richer communities are likely to demand more telecommunication services. We also hypothesize that use of telecommunication services is likely to be more intense in urban areas.

Business consumption is an important part of the telecommunications tax base. Unfortunately data is very limited with regard to establishment and employment by industry at the municipal level. In this study, we include the municipal property tax rate because this may be an important determinant of the physical location of business establishments across municipalities. In addition, we use a dummy variable that equals one if a municipality is located in Cook County (which houses the city of Chicago) and zero otherwise. Cook County is the most populous and urbanized county in the state and is the only county in the state that assesses business and other nonresidential real estate at a different rate than residential real estate for property tax purposes. Many investors may prefer to locate their businesses in Cook County in order to be close to Chicago and to benefit from desirable amenities, possible agglomeration effect and the well-developed consumer base. On the other hand, business owners may be repelled by what some view as Cook County's relatively high taxes on business.

As discussed above, the sales of telecommunication services in one municipality could also be affected by the telecommunications tax rates of its geographically close neighbors. If the average level of neighbors' tax rates is high relative to the municipality's rate, it may create an incentive for individual and business users to reside in or move into the low-tax municipality. In particular, it may influence the location of some businesses that rely heavily on telecommunication services to produce and operate.

It may be inappropriate to treat the municipal telecommunications tax rate as exogenous because municipal governments are likely to take the size of the tax base into consideration when they choose the tax rate. We use two instrumental variables to

predict the tax rate. One instrument is the initial rate assigned to municipalities that obtained some revenue from telecommunications before they started collecting the newly restructured tax in 2003. As discussed before, the initial tax rates are likely exogenous because they are assigned by the state government (for details see Wu and Merriman, 2008). The other instrumental variable is the beginning balance of general, special revenues, and debt service funds as a percent of total revenues in 2003. In general, municipalities with a relatively large fund balance have less need to levy or increase their tax on telecommunications.

Because our two instrumental variables are measured in 2003, we decide not to run a panel analysis. Instead, we run cross-sectional regressions for each year from 2004 to 2007 using the same instrumental variables to predict the tax rate variable in each year.

DATA

Because the simplified municipal telecommunications tax is a local option but state-administered tax, the Illinois Department of Revenue is responsible for collecting the tax from telecommunication service providers, and remitting revenues to individual municipalities on a monthly basis. As described in the prior section, municipalities have two opportunities to change their tax rate each year. The Illinois Department of Revenue collects municipal telecommunications tax from service providers by applying the current tax rates on the sales of telecommunication services purchased by customers with addresses in specific municipalities.

We obtained data on tax rates and revenues from the Illinois Department of Revenue.[9] Since the telecommunications tax rate can change at most, semiannually, we calculated semiannual revenues by aggregating the monthly disbursement semiannually: from January through June, and from July through December. The two semiannual revenue sums correspond to the tax rates in effect on January 1 and July 1, respectively. Compared with annual revenues, semiannual revenues allow more detailed examination of the tax revenue and base.

Other data were obtained from the annual financial reports that municipalities are required to file with the state comptroller's office, and 2000 Census data files from the U.S. Census Bureau. A municipality's effective property tax rate was computed by dividing property tax revenues of general, special revenues, and debt service funds by the total equalized assessed property value. Urban population ratio is defined as the division of urban population by total population. We only have data for the urban population ratio in 2000 and for median household income in 1999. Table 2 gives the definition and data

Table 2
Variable definition and data source

Variable	*Definition*	*Data source*
R	Municipal telecommunications tax revenue	Illinois Department of Revenue
τ	Municipal telecommunications tax rate (Property tax revenues of GF, SR, & DS divided by equalized assessed property value)	Illinois Department of Revenue
φ	Distance weighted municipal telecommunication tax rate of 50 closest neighbors	Illinois Department of Revenue U.S. Census Bureau
PO	Municipal population	Illinois State Comptroller Office
UR	Urban population ratio in 2000 (Urban population divided by total population)	U.S. Census Bureau
MY	Median household income in 1999	U.S. Census Bureau
PT	Municipal property tax rate	Illinois State Comptroller Office
CK	Cook County dummy	Illinois State Comptroller Office
FB	Percent of GF, SR, & DS ending fund balance in total revenues	Illinois State Comptroller Office

Note: GF, SR, and DS refer to general, special revenues, and debt service funds, respectively.

Table 3
Statistical results

Variable	*First half of 2004*	*First half of 2004*	*First half of 2005*	*First half of 2005*	*First half of 2006*	*First half of 2006*	*First half of 2007*	*First half of 2007*
Municipal telecommunications tax rate	1.0192***	1.0287***	1.0213***	1.0347***	0.9637***	0.9745***	0.9827***	0.9919***
	(0.0268)	(0.0249)	(0.0327)	(0.0314)	(0.0312)	(0.028)	(0.0312)	(0.0286)
Municipal property tax rate	-0.0454*	-0.0078	-0.036	0.0012	-0.0179	0.0093	-0.0349	-0.0074
	(0.0249)	(0.0226)	(0.0242)	(0.0246)	(0.0257)	(0.0248)	(0.0258)	(0.0234)
Municipal population	1.0777***	1.0284***	1.0216***	0.9261***	1.0408***	0.9489***	1.0678***	1.0034***
	(0.0172)	(0.0267)	(0.0471)	(0.076)	(0.0437)	(0.0724)	(0.0185)	(0.0265)
Distance weighted municipal telecommunication tax rate of neighbors	0.2916***	0.0934**	0.4162***	0.1605***	0.3417***	0.1305**	0.2761***	0.0909*
	(0.0464)	(0.0396)	(0.0871)	(0.0614)	(0.0833)	(0.0574)	(0.0559)	(0.0513)
Cook County dummy		0.0999		0.1369**		0.1275**		0.0897
		(0.0612)		(0.0578)		(0.0595)		(0.0612)
Urban population ratio in 2000		0.0015**		0.0039**		0.0038**		0.0023***
		(0.0007)		(0.0017)		(0.0017)		(0.0006)
Median household income in 1999		0.4909***		0.4876***		0.3861***		0.3823***
		(0.0625)		(0.082)		(0.0643)		(0.0621)
Constant	0.1935	-4.6164***	0.5412*	-3.9574***	0.4982	-2.9639***	0.2870**	-3.2694***
	(0.1392)	(0.7006)	(0.3261)	(0.8293)	(0.323)	(0.6624)	(0.132)	(0.6605)
N	645	645	645	645	625	625	600	600
R-squared	0.9572	0.9633	0.9304	0.9398	0.9379	0.9454	0.9603	0.965

Note: The dependent variable is the *municipal telecommunications tax revenue* during the first half (January through June) of each year (in logarithm). All variables except Cook County dummy and urban population ratio are also in logarithm. The model is the two-stage least squares estimator (2SLS) of single-equation instrumental-variables regression (IV). We use municipal telecommunications tax rate in January 2003 and percent of GF, SR, & DS ending fund balance in total revenues in 2003 as instruments for municipal telecommunications tax rate (January through June). Robust standard errors are in parentheses.

***Significant at the 1 percent level.
**Significant at the 5 percent level.
*Significant at the 10 percent level.

source of each of the variables in our econometric model.

RESULT AND DISCUSSION

We estimated the econometric model on each of the eight semiannual samples of telecommunications tax revenue and rate—first half (January-June) and second half (July-December) of 2004, 2005, 2006, and 2007. The estimation method we use is the two-stage least squares estimator (2SLS) of single-equation instrumental-variables regression.[10] For each sample, we first estimate the model without the Cook County dummy, urban population ratio in 2000, and median household income in 1999. Then we add these three variables that do not vary over time to test the robustness of our results. The regression results for the first half of each year are presented in Table 3 (regression results for the second half of the years are similar).

After the tax rate variable is instrumented, its estimates are fairly consistent across the semiannual samples.[11] We generally cannot reject the hypothesis that the coefficient on own telecommunications tax rate equals 1. Thus we cannot reject the hypothesis that the telecommunications tax base is perfectly inelastic. It is noteworthy that the estimates of the first two years after the tax's inception in 2003 are larger than those of the later two years. This pattern could indicate that, after the tax was restructured in 2003, the long-run elasticity of the tax base is greater than the short-run elasticity. The average estimated coefficient of the tax rate is 1.021 and 0.972 for 2004-2005 and 2006-2007, respectively.[12] These coefficients suggest that, everything else being equal, if municipality A's telecommunications tax rate was 100 percent higher than municipality B's, its telecommunications tax base would be virtually the same as municipality B in 2004 and 2005, but would drop by about 2.8 percent compared to municipality B in the period 2006-2007.

It is noteworthy that the estimates of other variables are also consistent across regressions. As expected, the estimated coefficients on municipal population are statistically significant and positive with the magnitude around one. This indicates that 1 percent increase in population would result in about 1 percent increase in the sales of telecommunication services. This makes sense given that most of the residents are consumers of some telecommunication services. While the majority of estimates on the property tax rate are negative as expected, most of them are not statistically significant. This is not very surprising because the effect of local property tax on business location has been mixed.[13]

Also as we expected, the estimates on the distance weighted average of neighbors' telecommunications tax rates are significant and positive. The magnitude is around 0.1 when the full set of control variables is included. This lends support to our hypothesis that some heavy users of telecommunication services may choose to reside in a municipality if its telecommunications tax rate is low relative to neighboring communities. It is somewhat paradoxical that the tax base appears to be more elastic with respect to neighbors' tax rates than it is with respect to its own tax rate. In addition, the statistical results also support our expectation that the consumption of telecommunication services is higher in richer and more urbanized communities. Consumers in Cook County tend to demand more telecommunication services than those in other counties.

CONCLUSION

This research provides some preliminary empirical evidence that may help local government policy making with regard to the telecommunications tax. Although the consumption of telecommunications is generally expected to be fairly inelastic, there is still reason to be concerned that the tax will drive out business when the rate is high. From the standpoint of the business community, government taxes on telecommunications have been a major cost factor.[14] Some industries are likely to be especially responsive to different tax rates on telecommunications because they rely heavily on telecommunication services.[15] They are likely to locate in or move to municipalities with low tax rates on telecommunications.

As we find from this study, in the short run at least, the telecommunications tax base is relatively inelastic with respect to differentials in tax rate. This is reassuring because it suggests that the tax has a small deadweight loss, so that it may be a relatively good vehicle for local governments to use to raise revenue. However, we find some evidence that after a period of time taxpayers may alter their consumption in reaction to the tax. This should be taken as a potential constraint on local tax policy making in this arena.

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." (Illinois General Assembly, 2005)

[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] This figure is based on an August 3, 2009 private email correspondence with Mr. Tom Regan of the Illinois Department of Revenue (IDOR). IDOR was unable to provide information about the residential and nonresidential shares of the tax base.

[4] See Illinois General Assembly (2005) for more details.

[5] 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/). Chicago is currently the only Illinois city with a population exceeding 500,000.

[6] According to the state law, Illinois General Assembly (2005, 520, (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."

[7] The dollar figures are in current dollars. Data were obtained from Illinois Department of Revenue at http://tax.illinois.gov/LocalGovernment/Disbursements/

[8] We do not measure the urban population ratio (UR) in logs since it is already a proportion and the coefficient on this variable may be interpreted as elasticity. We note that many municipalities have a zero urban population ratio which could complicate the interpretation of the coefficient on UR.

[9] The simplified municipal telecommunications tax rate data are from http://tax.illinois.gov/Publications/sales. The telecommunications tax revenue data are from http://tax.illinois.gov/LocalGovernment/Disbursements/

[10] We use Stata commend ivregress 2SLS with robust standard error option.

[11] The ordinary least squares (OLS) estimates of the own tax rate variable are slightly larger than the 2SLS estimates. The OLS estimates are 1.0210, 1.0417, 1.0133, and 1.0041 for the first half period of 2004, 2005, 2006, and 2007, respectively.

[12] The average estimated coefficient is the average of the four estimates of the tax rate variable in the fully specified model for 2004-2005 and 2006-2007, respectively.

[13] For instance, one recent study does not find a significant effect of local property tax on the growth rate of local population or business employment in the Washington D.C. metropolitan area (Mark, McGuire, and Papke, 2000).

[14] According to one industry report, business purchasers of telecommunication services face quite high relative effective taxes—the effective transaction tax rate on business purchases of telecom services is 2.5 times the average rate of the other selected goods and services (Cline and Phillips, 2005).

[15] The cost of telecommunication services as a share to total value of business inputs is11.3 percent for data processing services industry, 8.3 percent for computer design and programming industry, 6.3 percent for legal services industry, or 5.4 percent for administrative services industry (Cline and Phillips, 2005).

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