Maxing Out: An Analysis of Local Option Sales Tax Rate Increases

Abstract *- We examine why and when some local governments choose to reach a legal sales tax rate maximum while others do not. We employ a duration model to study Tennessee local option sales taxes between 1975 and 1999. Our results show that between 1975 and 1984, counties with lower sales tax capacity were more likely to raise their sales tax rates to the maximum allowed by state law. However, between 1985 and 1999, counties with lower property tax capacity or a larger share of Republican voters were more likely to reach the maximum sales tax rate.*

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INTRODUCTION

New York City adopted the first local general sales tax in 1934 partly because of widespread dissatisfaction with real property taxes following the depression. City and county governments in 34 states increasingly turn to the sales tax, often to add diversity and stability to their revenue structure. The number of local governments with sales taxes has grown from just under 3,000 in the early 1970s to over 9,000 today. General sales taxes have become the second largest local revenue source, accounting for approximately 12 percent of local tax revenue in 2002, a 20 percent increase over the previous decade.

At the same time, sales tax bases are shrinking, primarily due to growth in remote sales (Bruce and Fox, 2000), technological changes, legislated exemptions, and changing purchasing patterns (Merriman and Skidmore, 2000).[1] Sales tax bases as a percentage of personal income have declined nearly 27 percent, down from 53.2 percent in 1979 to 39.1 percent in 2003. Local governments must offset the shrinking base and corresponding revenue losses by raising the sales tax rate, exploiting other revenue sources, or reducing spending. Local government tax bases are particularly at risk because of the ease with which people can shop in other nearby jurisdictions or remotely.

In many places the sales tax has moved from simply adding diversity to state and local tax structures to becoming an integral component of local tax revenue, and this presents a set of unique compliance problems in the modern era when

[1] See Fox (1988, 2003) for further discussion of these points.

dealing with remote sales. For example, the Streamlined Sales Tax Project (SSTP) is a national effort by states to harmonize the entire sales tax system by developing uniform definitions of the tax base, simplifying audit and administration procedures, and developing technologies that make compliance feasible for the thousands of remote vendors. Fifteen states have conformed to the SSTP and begun operating together. Officials in several other states, including Tennessee, Texas, and Washington, have delayed full adoption of the SSTP Agreement in part because of concerns that local governments will lose sales tax autonomy as states move toward uniform local structures with destination–based sourcing of the revenues.

Using data on local sales tax rates in Tennessee, we identify the economic and political forces that lead local governments to fully exploit sales tax options by raising local sales tax rates to a legal maximum, and we also examine how these forces have changed over time. The sales tax environment in Tennessee is interesting both because of the state's heavy reliance on the revenue source and the fact that eight states border Tennessee, all of which have lower overall sales tax rates.[2] In addition, Tennessee imposes a statewide limit on local sales tax rates that it periodically increases in discrete steps that apply uniformly to every county. Because of the state–mandated rate limit, rate increases are a natural but limited tool for addressing sales tax base erosion (Mikesell and Zorn, 1986; Ferris, 2000; Bruce and Fox, 2000). However, counties that quickly raise their sales tax rates to the maximum–allowed rate have signaled a strong preference for the sales tax relative to their neighbors, many of whom never reach the maximum rate.

We employ a duration model to study the decision to increase the local rate to the maximum, during a span of time in which the average local option rate increased by 100 basis points from 1.3 percent to 2.3 percent. We further divide this time span into two shorter periods, characterized by different maximum local option sales tax rates. Our focus is on spells of time in years that a county remains below the maximum local option rate, where the end of a spell (or "failure" in duration model terms) occurs when the county reaches the maximum rate. Our results show that in the earlier time period, counties with larger sales tax bases were less likely to raise their sales tax rates to the maximum allowed by law. This was not found during the latter part of our study when a higher local maximum rate was allowed. For that period, counties with a lower property tax base or a larger share of Republican voters were more likely to raise their local sales tax rate to the state maximum.

This study contributes to the literature in a number of important ways. First, the paper provides an empirical contribution to the literature on the determinants of local government tax structure. The paper provides a setting where one can observe how state–driven tax policies may have an affect on local governments' tax rate decisions. In this particular case, we examine the factors that lead a county to adopt the maximum–allowed local option sales tax rate. Further, the paper adds to the limited empirical literature on vertical externalities at the state and local level in the U.S. as we consider the factors in separate time spans where state–level constraints differ.[3] Finally, we use modern duration analysis methods, which allow us to examine the effects of a county's characteristics on the

[2] In 2002, sales taxes represented 22.5 percent of local tax revenue in Tennessee and 60 percent of state tax revenues.

[3] Prior literature generally focused on the determinants of adopting a sales tax or characteristics of the existing structure.

time it takes to reach the maximum rate. This method is preferred to other statistical techniques because it allows us to not only examine characteristics of counties that choose to move to the maximum, rate but also explore the timing of those decisions relative to other counties. Taken together, our research represents a contribution to the literatures on revenue determinants, tax competition, and responses to state–imposed revenue limitations.

This paper is organized as follows. In the next section, we briefly discuss the relevant literature. The third section includes an explanation of Tennessee's sales and property tax structures. We then introduce a model for examining the role of economic and political factors and describe the data used. Following a discussion of the results, we conclude with a summary and suggestions for future research.

PRIOR RESEARCH

Tax rate decisions involve both political and economic considerations. Elected representatives must choose tax rates sufficient to fund desired expenditures but competitive enough to keep the tax base from fleeing. As a result, legislators must consider the tax options (e.g., sales or property taxes), taxable bases in their jurisdiction, and the tax rates necessary to raise the desired amount of revenue. Prior research has found that local option sales tax adoption is a function of expenditures, other revenue sources, neighbor's adoption and fiscal stress (Sjoquist and Wallace, 2003; Sjoquist, Smith, Wallace and Walker, 2005). Seligman and Hou (2006) also find some evidence that adoption of the local sales tax to substitute for the property tax can lead to slower revenue growth.

Prior research also shows that sales tax rate increases may reflect a desire to increase spending, to reduce property taxes or to follow neighboring rate–increasing jurisdictions (Sjoquist, Walker and Wallace, 2005; Luna, 2004; Case, 1993; Rork, 2003; Hill, 2005). Substitution effects may be more prevalent at the local level since every county has a border, but the response to sales tax rate differences differ depending on the type of good being purchased (Cornia, Nelson and Walters, 2005).

While this study does not directly test for vertical externalities, it does provide some evidence about how counties react when faced with changing state tax policies.[4] Empirical research on vertical externalities is limited and finds mixed results. For example, Besley and Rosen (1998) find that states raise tobacco and gasoline tax rates in response to federal tax rate increases, and Esteller–More and Sole–Olle (2001) find that states increase personal income and sales tax rates following an increase in federal income tax rates. However, others have also concluded that a tax interaction between the levels of government exists but find an opposite sign on the interaction (Hayashi and Boadway, 2001; Goodspeed, 2000).

Another important line of research examines how local governments respond to state–imposed tax and/or spending limits. At the state level, limits on local governments have been found to increase the state's role in combined state and local activity (Joyce and Mullins, 1991). At the local level, Shadbegian (1999) found that

[4] Esteller–More and Sole–Olle (2002, p. 236) state, "vertical externalities arise as a consequence of the co–occupancy of the same field of taxation by both the regional and federal layers of government," and this behavioral relationship would also exist between state and local governments. When the State of Tennessee raises the sales tax rate, demand for taxed goods is expected to decline, leading to reduced sales tax receipts for counties and cities that levy their own sales tax. At the same time, the state–level sales tax rate increases were originally tied to increases in the maximum local option tax rate (discussed more fully below), allowing local governments at their discretion to increase their own sales tax rates to make up for the shortfall or, alternatively, increase their reliance on other taxes such as the property tax.

governments increased other forms of revenue (e.g., user fees) when state law limited increases in local property taxes. Stine (1998) takes a different approach and examines what factors influence a jurisdiction's decision to repeal a tax when given the choice. The results of these studies indicate that local governments do not respond uniformly to limits or changes in their taxing options. Fiscal pressures, political forces, and various demographic characteristics all appear to influence taxing decisions.

TENNESSEE LOCAL FINANCE OPTIONS

Tennessee enacted a state–level sales tax in 1947 and added the local option sales tax in 1963.[5] Local sales taxes can be adopted and the rate can be changed when County Commissioners initiate a referendum and a majority of voters approve the proposal.[6] Local rate increases have been extremely common—the general sales tax comprised nearly 19 percent of total local tax revenue in Tennessee in 1972 (compared to a national average of 5.5 percent) and grew to 29 percent by 1985 before sliding to 22.5 percent today (as opposed to less than 12 percent for the U.S.). We revisit the post–1985 decline in our discussion of the results.

Tennessee legally constrains the local option sales tax rate. Until 1992, the rate was capped at one–half the state tax rate. In our first window (1975–1984), the maximum local option rate was 2.25 (i.e., one–half the state rate of 4.5 percent), and in our second window (1985–1999), the maximum rate was 2.75 percent.[7] Cities have the right to levy a local sales tax at a rate no larger than the difference between the allowed maximum and the county tax rate. Therefore, if a county reaches the maximum, a city within the county is precluded from levying a separate tax.[8]

In 1992, Tennessee passed two laws that affected funding for education. First, the Better Education Program, created by the Education Improvement Act of 1992, created a new formula to ensure equitable statewide education funding. A county's share depends largely on the county's fiscal capacity as a percentage of the total fiscal capacity in the state. The second change, created under statute, requires 50 percent of local sales tax collections to be allocated to educational purposes.[9] Accordingly, if the local sales tax rate was increased, local policymakers essentially lost control over half of the new receipts. Local policymakers should have been less likely to favor a sales tax increase and, therefore, this law should have reduced the likelihood of choosing the maximum rate in the second window. We return to this discussion below.

The general pattern of increasing local option sales tax rates can be observed in Table 1. Note that five counties did not impose a local option sales tax initially, but all 95 Tennessee counties had a local option sales tax by 1984. By 1984, 49 counties had reached the maximum 2.25 percent local rate. In the second window, however, only 20 counties had reached the maximum 2.75 percent local option

[5] Shelby County adopted the first local option sales tax in Tennessee in 1964.

[6] There is no variation in the process across counties.

[7] Note, however, that an increase in the state rate from 5.5 percent to 6.0 percent in 1992 was not matched with an increase in the maximum allowable local option rate, which remains fixed at 2.75 percent today. The formal link between the state rate and the maximum local option rate greatly reduces concerns over potential policy endogeneity. Given the importance of the sales tax to Tennessee state finances, actions to increase the state sales tax rate are likely to be driven primarily by state budget pressures rather than the number of counties already at the maximum local rate.

[8] In 2005, only 21 cities had separate local option rates in addition to their county local rate. A portion of the county's sales tax revenue is allocated to the city in accordance with Tennessee state law.

[9] Tennessee Statute §67–6–712.

TABLE 1
DISTRIBUTION OF TENNESSEE LOCAL OPTION SALES TAX RATES, 1975–1999

	Rates								
Year	0.00	0.75	1.00	1.50	1.75	2.00	2.25	2.50	2.75
1975	5	0	24	58	6	1	1	0	0
1976	4	0	17	57	7	2	8	0	0
1977	3	0	17	57	7	3	8	0	0
1978	3	0	13	56	7	6	10	0	0
1979	3	0	11	53	7	8	13	0	0
1980	2	0	9	54	7	9	14	0	0
1981	1	0	8	46	7	10	23	0	0
1982	1	0	7	41	7	11	28	0	0
1983	1	1	4	34	7	12	37	0	0
1984	0	1	3	25	5	12	49	0	0
1985	0	1	2	22	5	12	53	0	0
1986	0	1	2	21	5	13	53	0	0
1987	0	0	1	18	5	14	54	2	1
1988	0	0	1	17	5	13	54	3	2
1989	0	0	1	14	5	12	55	5	3
1990	0	0	1	12	5	12	55	5	5
1991	0	0	1	11	5	12	55	5	6
1992	0	0	1	10	5	12	54	7	6
1993	0	0	1	9	5	12	54	8	6
1994	0	0	1	7	5	13	55	8	6
1995	0	0	1	7	5	12	51	9	10
1996	0	0	1	7	5	12	49	9	12
1997	0	0	1	7	5	11	47	10	14
1998	0	0	1	5	4	10	45	14	16
1999	0	0	1	2	3	10	44	15	20

rate by 1999. It should be noted that local governments are not constrained on the size of proposed local option sales tax rate increases. Indeed, single–year rate increases during our period of analysis ranged from 0.25 to 2.0, averaging about 0.8, among jurisdictions raising their local rates. As an additional note, local governments in Tennessee must defer to state authority on the sales tax base and, thus, have no power to change the set of taxable items.

The second major financing option available to Tennessee counties is the property tax. Similar to local option sales taxes, property tax rate increases are also passed by referendum. The effective property tax rate in Tennessee, however, depends on the county tax assessor's appraised value of the property and the level of the assessment for the type of property in question. Assessment ratios range from five percent to 55 percent, depending on whether the property is classified as utility, industrial, or residential property. For example, industrial real property is assessed at 40 percent of appraised value, while industrial personal property is assessed at 30 percent of appraised value.

In addition, the county assessor must certify the property tax rate following a general reappraisal of property. This certified rate is the hypothetical tax rate that would raise the same amount in taxes that was raised in the previous year, but on the new tax base. Before legislators can approve a rate that is greater than the certified rate, the local government must publicize its intentions.

MODEL AND VARIABLE DEFINITIONS

To examine the role of economic and political factors in the decision to raise sales tax rates to the maximum, we use a duration model. This approach allows us to assess the factors in the probability that a given county will increase its rate to the maximum given that it had not yet done

so. Rather than treat each annual observation as separate, a duration approach links each county's history to form a spell of time spent below the maximum allowable local option rate. Thus, counties are included in our data until they reach the allowed maximum rate, or until the end of the study's time period, in which case they are right–censored. The timing dimension is important because counties face the decision of whether or not to raise their rates on a continuing basis (i.e., annual), and those sequential decisions should be linked in a statistical analysis that recognizes the timing issue. Treating counties that choose to reach the maximum tax rate differently from those that choose not to raise their rate enriches the empirical results in observing differences in county behavior.

As noted above, we perform separate analyses for two windows of time associated with different maximum local option rates: 1975 to 1984 and 1985 to 1999. This approach recognizes the fact that each county's decisions in one maximum–rate regime might be statistically different than those in a later regime. In our duration analysis, we focus on determinants of the probability that a county votes to raise its local option sales tax rate to the state–allowed maximum. Empirically, our model considers factors in the *conditional* probability that the maximum rate is reached given that it has not previously been reached. Duration models are commonly used to study spells of time that might or might not have an observable ending, and that ending need not have positive or negative connotations (e.g., survival or death). Additional details on our estimation procedure are provided in the Appendix.

Factors that influence local sales tax rate decisions can be classified into three groups. The first group, which we call fiscal viability, should capture the in–jurisdiction economic appeal of changing the rate. The second—tax competition—reflects the influence of neighboring jurisdictions. Finally, the other county differences group includes variables that were important in earlier works. Each of these groups of covariates is discussed in greater detail below, and all covariates in the model are permitted to be time–varying.

Fiscal Viability

We identify six variables to represent a county's fiscal viability to control for a county–specific fiscal situation relative to the rest of the state. First, capacity measures a county's ability to raise revenue relative to other Tennessee counties. The capacity calculation begins with the product of the per–capita tax base for each county and the statewide average county tax rate for the revenue source (i.e., sales taxes and property taxes) for that year.[10] We then divide this value by the state average value across all counties to generate a capacity variable in index form. The capacity mean for each revenue source in each year is 100. For example, a county with a sales tax capacity index of 130 would generate 30 percent more sales tax revenue than average if all counties used the same tax rate.

Our use of tax capacity is based on the notion that a county's relative ability to generate revenue from a particular source (e.g., sales or property taxes) will play an important role in decisions about tax rates.[11] If, for example, a county's tax capacity is above 100, the county can raise the same tax revenue as a neighboring county with a lower rate. Therefore, for given spending levels, we expect that counties with higher tax capacities will be less likely to reach the maximum.

[10] This method was developed by the U.S. Advisory Commission on Intergovernmental Relations (ACIR). See, for example, Tannenwald (1998) and Sjoquist (1996).

[11] We also test the model replacing the capacity measures with per–capita base measures. The results are consistent with our baseline model, though the coefficients are smaller.

Of course, using the tax capacity measure carries with it some advantages and disadvantages. One important advantage is that county–specific erosion (or enhancement) in the base is emphasized. One disadvantage is that statewide base erosion/enhancement is not and cannot be captured. For example, when purchases of tax–exempt services grow throughout Tennessee and the sales tax base declines, the cross–sectional capacity scores will not reflect the decline. Our approach does, however, capture the erosion effect for counties that experience it more quickly than the average county.[12]

Another index—tax effort—measures how intensively a county is taxing the available revenue base. We calculate property tax effort by dividing the county weighted average effective property tax rate, as reported in the *Tennessee Statistical Abstract* (1975–1999), by the simple state average for the same variable. Counties that show a high property tax effort have higher property tax rates than the average county in the state.[13] It is not clear whether counties with a higher–than–average property tax effort would be either more willing or less willing to raise sales tax rates. Both of these outcomes are feasible.

Per–capita expenditure levels and population growth (lagged) are included as proxies for fiscal need. If expenditures increase or the county incurs rapid population growth, local governments must raise taxes to fund the increase in demand for services (Wildasin, 1988). The greater are a county's fiscal needs, the more likely it is that a county may raise its sales tax rates and reach the local option maximum. Finally, the level of unemployment is included as a proxy for fiscal stress.[14] We predict that increases in expenditures, population growth, and the unemployment rate will be associated with shorter time periods to reach the maximum local option sales tax rate.

We recognize that property tax effort and per–capita expenditures are likely to be simultaneously determined with sales tax rates. Lacking suitable instrumental variable techniques within a duration modeling framework, we suppress these two variables from our initial models but include them in a set of alternative models in order to gauge the extent of bias from omitted variables or endogeneity.

Tax Competition

In a mobile economy, tax competition between jurisdictions is an important determinant of tax rates. Prior research has documented two primary, but somewhat contradictory, types of tax competition (Brueckner, 2003). First, governments may engage in strategically setting tax rates in the presence of mobile individuals (Zodrow and Mieszkowski, 1986; Wilson, 1999; Mintz and Tulkens, 1986). For example, a smaller county might lower rates in an attempt to draw shoppers from a larger neighbor (Kanbur and Keen, 1993). A different view of the same environment is the yardstick competition models, where voters make comparisons of fiscal policies between jurisdictions and judge their own government by how the tax rate and tax burden compares to those of neighbors (Besley and Case, 1995; Bivand and Szymanski, 1997).

[12] Growth in out–commuting is one source of local base erosion (Hawkins and Murray, 2004). With our approach, the capacity score will decline for a county experiencing new out–commuting patterns.

[13] We should note that results were nearly identical when we replaced the property tax effort index with the actual (weighted average) property tax rate.

[14] While we recognize that the county unemployment rate is an imperfect measure of fiscal stress, we retain it for its role as a general indicator of local economic health. We also recognize that reductions in federal and state grants may also be a source of fiscal stress. We have assumed that the *relative* impact is small and any impact should be accounted for in the time effect.

We choose two variables to proxy for the influence of tax competition. First, we include a variable for neighboring counties' sales tax rates. Prior empirical research has shown that commodity tax rates in the home jurisdiction respond positively to those in neighboring jurisdictions (Rork, 2003; Luna, 2004). In other words, jurisdictions are more likely to raise rates if a neighbor has done so. We define the neighbor variable as the average total sales tax rate of all contiguous counties, weighted by population.[15] By using a weighted average, no single county is selected as the primary competitor, and all contiguous counties are permitted to have some influence. (Case, Hines and Rosen, 1989; Rork, 2003; Luna, 2004; Hill, 2005).[16] Our approach is based on the assumption that larger neighboring counties are more likely to have an impact on the county's tax rate.

Because the total sales tax rate is lower in the eight states adjacent to Tennessee, counties on the state's border may face different competitive pressures than interior counties. Border counties may make a stronger effort to keep their local tax rates low to limit cross–border shopping arising from combined state and local sales tax differentials that are generally larger than those between interior counties. Prior research has shown that consumers respond to sales tax rate differentials between jurisdictions by crossing borders to shop, and the response is more elastic for those residing near borders (Fox, 1986; Walsh and Jones, 1988). We include a dummy variable that takes a value of one for a border county and a value of zero for an interior county, with the expectation that counties along the state border will keep their rates lower. Thus, the neighboring–jurisdiction rate variable and the border dummy variable allow for both rate–increasing regional pressure and rate–decreasing state border pressure.[17]

Other County Differences

A number of other county characteristics are likely to influence the decision to reach the maximum sales tax rate. We identify per–capita personal income, urbanization and the tendency to vote for one political party as potential influences. Because sales taxes are relatively more regressive than other taxes, counties with higher levels of personal income may prefer sales tax rate increases over property tax increases (Murphy and Izraeli, 1997). In addition, urban counties may use their retail outlets to take advantage of non–resident shoppers and the ability to export sales taxes, also preferring sales tax rate increases.[18] Therefore, we include both per–capita personal income and whether a county was designated "urban."

We also expect the political environment to influence tax rates, as political environments regarding tastes for taxes are likely to differ across jurisdictions (Klassen and Shackelford, 1988; Omer and Shelley, 2004). We include a percentage–voting–Republican variable (during the prior presidential election) in an attempt to capture one public choice aspect of sales tax rate increases (Murphy and Izraeli, 1997), but we have no expectation of the sign of its effect.

[15] Since each county has between three and nine neighbors, including the tax rates of all neighboring jurisdictions in the model is not practical.

[16] We test other definitions of neighbor as discussed below.

[17] Our inclusion of tax rates in neighboring jurisdictions also serves as a partial consideration of the influence of spatial autocorrelation. We leave a more thorough investigation of spatial autocorrelation for future research as we are aware of no studies to date that have controlled for it in a survival–model context.

[18] We define urban according to the 2000 Census. Experimentation using the 1980 Census definition did not reveal significant differences.

DATA

The model is estimated for 95 Tennessee counties spanning 1975 to 1999. Descriptive statistics for all of the variables are reported for the two time windows in Table 2.[19] As described above, property tax effort is based on the weighted average effective property tax rate. These data are not available for 1975, 1976 and 1980, so we use forecasted values from separate stepwise autoregressive estimates for each county. In addition, data for the property tax base are missing for 1975 and 1976, and total expenditures are missing for 1997–1999. Here, the same process is used to forecast values in real, per–capita terms, which are then converted to nominal values.

Estimated Nelson–Aalen cumulative hazard rates for the two time periods are shown in Table 3.[20] The entries in Table 3 are estimates of the cumulative probability of reaching the maximum local option sales tax rate in each year of each of the two time periods. The estimates account for right censoring (i.e., the fact that some counties never reach the maximum local rate) in the underlying data and demonstrate that importance of analyzing tax rates in two separate windows. Based on the underlying data, we would have expected over two–thirds of the counties (64 of 95) to reach the maximum local rate during the first window and slightly less than one–quarter (22 of 95) to reach the maximum in the second window.

Between 1975 and 1984, there were 75 tax rate increases spread among 63 of the counties in our analysis, and 48 of those counties reached the maximum sales tax rate.[21] Most of these counties chose to increase rates to the maximum immediately, with only eight counties passing at least two rate increases to eventually hit the maximum rate. From 1985 to 1999, 43 counties enacted 45 local option rate increases, with only 20 counties eventually reaching the maximum.

SURVIVAL ANALYSIS RESULTS

Table 4 includes the results from four models for each window: a parsimonious model with only the three key exogenous tax variables (property tax capacity, sales tax capacity, and the weighted–average sales tax rate in neighboring counties), a more inclusive model that includes the exogenous control variables described above, and versions of both of the above that include the two potentially endogenous control variables (property tax effort and per–capita expenditures). Results are converted to time ratios for ease of interpretation. A statistically significant time ratio that is greater than one indicates that a one–unit increase in that independent variable increases the amount of time spent below the maximum rate (i.e., slows down the movement toward the maximum rate). Similarly, a significant time ratio that is less than one indicates that a one–unit increase in that independent variable reduces the amount of time the county is below the maximum tax rate (i.e., accelerates movement toward the maximum rate).[22]

Our most interesting finding is that different factors influenced the decision to maximize the local rate in the pre–1985 environment versus the later time span. The most striking contrast occurs in the

[19] Tennessee state and local sales tax rate and base information and property tax data are obtained from the Tennessee Department of Revenue and the Comptroller's Office, respectively. Rate information for the bordering states is obtained directly from the respective state governments. Demographic information is obtained from the Bureau of the Census, Bureau of Economic Analysis, and U.S. Department of Commerce.

[20] The estimates in Table 3 are calculated using the method of Nelson (1972) and Aalen (1978). See Cleves et al. (2004) for additional discussion of this method.

[21] One additional county started the first window at the maximum rate.

[22] Recall that spells of time in our analysis are measured in years.

TABLE 2
SUMMARY STATISTICS FOR KEY ANALYSIS VARIABLES IN SELECTED YEARS

	1975				1984				
Variable	Mean	S. D.	Min	Max	Mean	S. D.	Min	Max	
Property Tax Capacity	100.00	21.64	57.44	176.63	100.00	21.31	55.80	168.30	
Property Tax Effort	100.00	88.11	36.18	902.75	100.00	29.10	34.87	187.97	
Sales Tax Capacity	100.00	40.27	29.31	226.05	100.00	42.50	36.55	253.01	
Per Capita Expenditures	504.16	112.68	297.48	977.44	457.21	123.90	118.30	914.59	
Wtd. Ave. Neighbor Sales Tax Rate (%)	4.69	0.30	3.91	5.13	**6.06**	**0.43**	**4.75**	**6.68**	>
Unemployment Rate (%)	6.19	2.18	2.80	13.90	14.89	4.47	7.00	28.00	
Per Capita Personal Income ($1,000)	7.24	1.27	4.91	10.71	**8.14**	**1.56**	**5.09**	**14.07**	>
Urban County (1981)	0.24	0.43	0.00	1.00	**0.24**	**0.43**	**0.00**	**1.00**	>
Border County	0.44	0.50	0.00	1.00	0.44	0.50	0.00	1.00	
Population Growth (%)	1.59	1.93	–3.13	6.55	0.71	0.73	–1.15	3.52	
Republican Vote Share (%)	66.78	9.40	40.83	87.08	57.12	10.30	33.92	79.36	
	1985				1999				
Property Tax Capacity	100.00	22.22	64.79	180.42	**100.00**	**28.72**	**54.50**	**232.36**	<
Property Tax Effort	100.00	30.95	35.03	220.82	100.00	23.01	32.98	175.00	
Sales Tax Capacity	100.00	45.99	34.47	261.82	**100.00**	**55.74**	**35.64**	**368.10**	<
Per Capita Expenditures	487.89	138.36	129.37	1305.62	613.87	147.61	53.84	1162.52	
Wtd. Ave. Neighbor Sales Tax Rate (%)	7.07	0.55	5.07	7.75	7.98	0.49	6.72	8.93	
Unemployment Rate (%)	11.04	3.56	3.00	23.00	**5.88**	**2.39**	**1.60**	**13.40**	>
Per Capita Personal Income ($1,000)	8.85	1.67	5.51	15.25	**11.66**	**2.32**	**7.04**	**21.84**	<
Urban County (1981)	0.24	0.43	0.00	1.00	**0.24**	**0.43**	**0.00**	**1.00**	<
Border County	0.44	0.50	0.00	1.00	0.44	0.50	0.00	1.00	
Population Growth (%)	0.70	0.71	–1.16	3.40	**1.55**	**1.13**	**–0.98**	**5.61**	<
Republican Vote Share (%)	57.12	10.30	33.92	79.36	43.78	8.86	22.90	61.55	

Notes: Bold type indicates a statistically significant difference in end–of–period (1984 or 1999) means for counties at the Maximum local option sales tax rate relative to counties below the maximum. "<" and ">" denote that the mean for counties at the maximum rate is significantly below (<) or above (>) the mean in non–maximum counties.

TABLE 3
NELSON–AALEN CUMULATIVE HAZARD RATES

Time (Year)	1975–1984	1985–1999
1	1.05%	0.00%
2	8.50%	0.00%
3	8.50%	1.05%
4	10.80%	2.12%
5	14.33%	3.19%
6	15.55%	5.37%
7	26.66%	6.48%
8	33.60%	6.48%
9	47.04%	6.48%
10	67.73%	6.48%
11		10.97%
12		13.32%
13		15.73%
14		18.20%
15		23.27%

Note: Entries are estimates—based on the underlying data, but accounting for right–censoring—of the cumulative probabilities that counties reach the maximum local option sales tax rate. See the text for additional details.

role of tax capacity. Sales tax capacity is an important factor in reaching the rate maximum in the first window but not in the second. Specifically, high sales tax capacity counties spent more time below the maximum sales tax rate between 1975 and 1984. With each one–percentage–point increase in the sales tax capacity index (e.g., from 100 to 101), the length of time spent below the maximum allowable rate increased by 0.6 to 1.8 percent, depending on the specification.

The results also indicate a tradeoff between capacity and effort in the 1985–1999 window, but property tax capacity replaces sales tax capacity as the most important factor. Results for 1985 to 1999 indicate that counties with higher property tax capacity were less likely to choose the new maximum sales tax rate. Specifically, each one–unit increase in the property tax capacity index increased the length of time spent below the maximum rate by 1.3 to 1.5 percent, depending on the specification. This is an interesting result because the second window includes the repeal in 1986 of the federal deductibility of sales tax payments. Because sales taxes were no longer deductible after the change was fully phased in and property taxes remained fully tax deductible, Tennessee residents who itemized should have preferred property taxes and their lower after–tax cost.

The shift from a focus on sales tax capacity to property tax capacity is consistent with the empirical data mentioned above. During the first window when sales tax capacity was a significant factor, the sales tax share of total local revenue grew from 18.8 percent in 1970 to 27.3 percent in 1984. During the second window when property tax capacity was significant, the sales tax share remained relatively constant.

These findings highlight the role of state–level constraints in local rate decisions. For example, we find no evidence of a neighbor effect in any of our models, while Sjoquist, Smith, Wallace and Walker (2005) find that Georgia counties were more likely to adopt the state's local option sales tax when the neighbors had adopted one. However, the Georgia legislature's mandate that revenue from that tax must be used to roll back local property tax levies probably influences the estimated neighbor effect. Similarly, new school–funding equalization rules in Tennessee changed the influence of the property tax base on adopting the maximum local sales tax rate in the second window. Under the new rules, county commissioners should have been more inclined to favor the property tax as reflected in our results.

Another possible explanation for different results in the second window is that the combination of state and local sales tax rate increases had pushed Tennessee rates up to among the highest in the country. In this environment, local policymakers might have been hesitant to make their county's rates even higher. As was previously mentioned, the eight states that border Tennessee all had lower overall sales tax rates.

Per–capita income is a second significant variable in the pre–1985 window. In

TABLE 4
HAZARD MODEL RESULTS

Variable	1975–1984				1985–1999			
Property Tax Capacity	0.998	0.998	0.996	0.997	1.014*	1.013**	1.013*	1.015**
	0.004	0.005	0.004	0.005	0.008	0.006	0.008	0.007
Property Tax Effort			1.000	1.001			1.004	1.003
			0.000	0.002			0.003	0.003
Sales Tax Capacity	1.006**	1.018**	1.007**	1.018**	1.003	1.007	1.004	1.007
	0.002	0.008	0.003	0.007	0.005	0.006	0.005	0.006
Per Capita Expenditures			1.001	1.001			1.000	1.000
			0.001	0.001			0.001	0.001
Wtd. Ave. Neighbor Sales Tax Rate (%)	1.115	1.313	1.182	1.367	0.940	0.889	0.986	0.892
	0.149	0.266	0.175	0.277	0.210	0.191	0.205	0.194
Unemployment Rate (%)		0.955		0.956		0.942		0.940
		0.032		0.032		0.037		0.038
Per Capita Personal Income ($1,000)		0.660*		0.670*		0.858		0.852
		0.152		0.146		0.092		0.097
Urban County (1981)		0.695		0.692		1.235		1.172
		0.171		0.165		0.341		0.320
Border County		1.072		1.045		0.985		0.970
		0.231		0.234		0.211		0.216
Population Growth (%)		0.957		0.956		1.050		1.052
		0.037		0.039		0.071		0.072
Republican Vote Share (%)		1.002		1.005		0.975***		0.975***
		0.008		0.009		0.009		0.009
Number of Subjects		95				95		
Number of Failures		49				20		
Analysis Time		784				1338		

Notes: Entries are time ratios followed by robust standard errors in smaller type.
***, **, and * denote statistical significance at the 1%, 5%, and 10% levels, respectively.
See text for additional details.

this case, higher–income counties were more likely to reach the maximum local sales tax rate than lower–income counties, all else equal. This supports the idea that higher–income counties may be more likely to raise sales tax rates rather than property tax rates (a similar effect is found in Sjoquist, Smith, Wallace and Walker, 2005). Upper–income taxpayers may tend to spend a smaller percentage of their income on sales taxable items (e.g., tangible goods) than lower–income individuals. Therefore, upper–income taxpayers will not bear the full economic incidence of sales tax rate increases.

Interestingly, during 1985–1999, counties with a higher share of Republican voters (as measured in the most recent prior Presidential election) were more likely to increase the local sales tax rate to the legal ceiling. This might represent the relative popularity of the sales tax with this set of constituents. If the Republican Party attracts a higher percentage of upper–income taxpayers than the Democratic Party, Republicans might prefer sales taxes because of their regressive incidence.

As mentioned, our results differ from the Sjoquist, Smith, Wallace and Walker (2005) paper in that we find no clear evidence that tax rates in neighboring jurisdictions influence the decision to reach the sales tax rate maximum in a particular county.[23] Decisions in neighboring jurisdictions might be important, but the effect may be complicated (e.g., some neighbors may matter more than others) and escape scrutiny in this type of study.

It is worth noting that our main findings in Table 4 are highly robust to the choice of specification. The addition of a large set of covariates, including two that are potentially simultaneous with local sales tax rate decisions, does not have a dramatic impact on signs, magnitudes, or significance levels of the other variables. This suggests a general absence of worrisome bias from omitted variables or endogeneity.

To assess the overall fit of our baseline models, Figures 1 and 2 compare the estimated Nelson–Aalen cumulative hazard rates from Table 3 with those estimated by our most inclusive multivariate models for 1975–1984 and 1985–1999, respectively. At first glance, the trends in both series for both windows are similar and both follow the actual underlying data quite well. However, the apparent differences between the two series in each window reveal the importance of controlling for an array of covariates in investigating the process by which local governments move toward the maximum local option sales tax rate. This is especially true in the earlier time window, where the estimated cumulative hazard from the multivariate model more closely aligns with the actual data than does the Nelson–Aalen estimate.

Robustness Checks

We now discuss a series of alternative models, which are intended to further assess the robustness of our main findings. Our first robustness check considers the fact that, as previously discussed, local policymakers are required to publish the certified property tax rate before a property tax increase is permitted. Consequently, certification makes the public more conscious of the new revenue flow to the county. We control for this by including a dummy variable that takes a value of one in the year of certification (real increase in property tax) and zero in all other years. This variable is never statistically significant and none of the other results is affected by its inclusion or exclusion in the model.[24]

[23] This result was highly robust to a number of alternative specifications.

[24] We assume that the year of certification is one year following the year of reappraisal. Results from this and other robustness checks are available upon request from the authors.

Figure 1. Estimated Cumulative Hazard Rates, Window 1 (1975–1984)

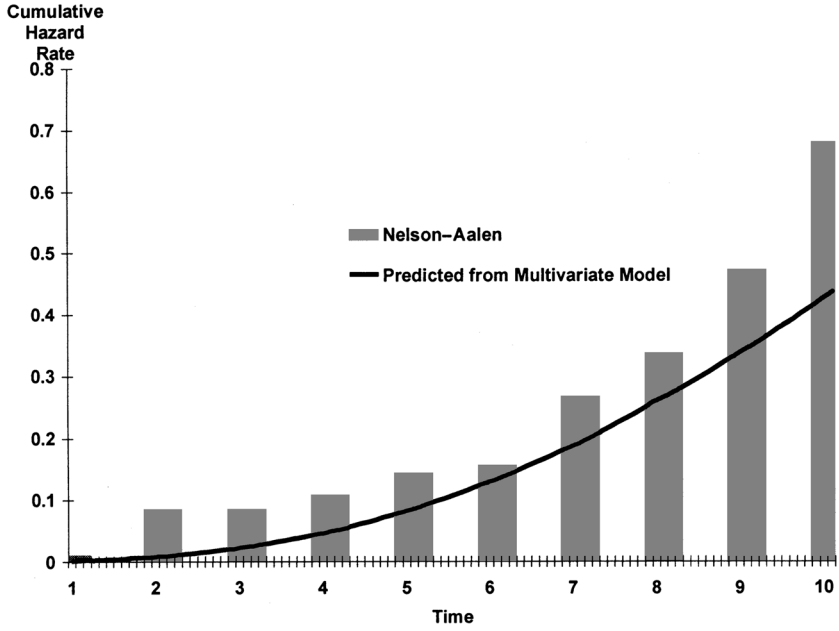
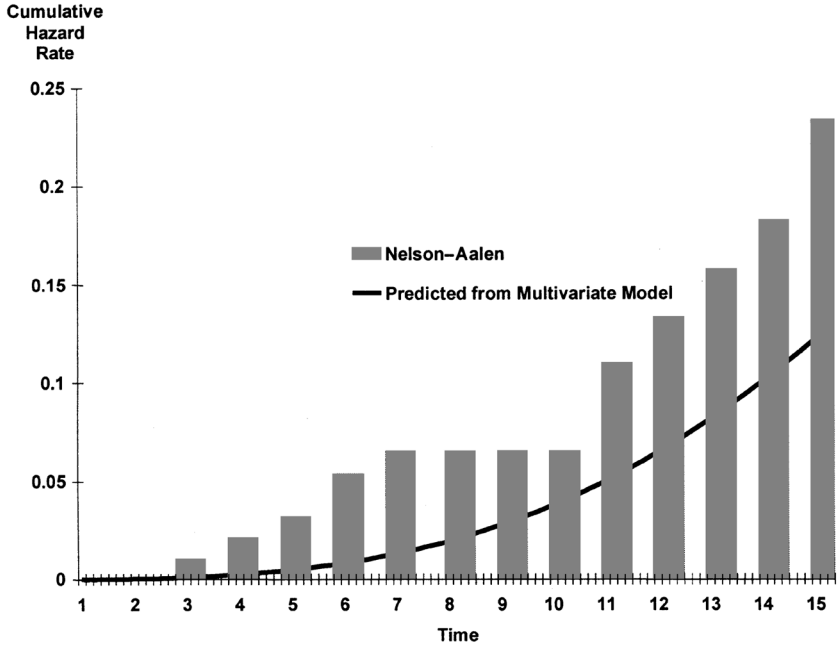


Figure 2. Estimated Cumulative Hazard Rates, Window 2 (1985–1999)



We also explore the effect of separate dummies for counties on the state border (e.g., a dummy variable for Alabama, Kentucky, etc.). We find that the inclusion of separate border state dummies has no effect on the results in the first window. In the second window, however, both unemployment and personal income become statistically significant, but no other results are affected.

We also experimented with alternative definitions of our neighbor variable in order to explore more broadly tax competition factors. Specifically, in five separate models, we replaced the weighted average of the neighboring counties' sales tax rates with (1) the sales tax rate in the contiguous county with the lowest *total* sales tax rate, (2) the sales tax rate in the contiguous county with the lowest *local option* sales tax rate, (3) the number of contiguous counties at or above the Tennessee maximum rate, (4) the share of contiguous counties at or above the Tennessee maximum rate, and (5) the population–weighted share of contiguous counties at or above the Tennessee maximum rate. These alternative measures were not statistically significant, and their inclusion did not impact the main findings from our baseline model.

Our final robustness check considers the fact that in 1992 the state sales tax rate increased from 5.5 percent to 6.0 percent and the discussed revenue sharing was implemented (the maximum allowable local option rate remained at 2.75 percent). We explore the impact of this change by including a dummy variable that takes a value of zero for years 1985–1990 and a value of one for 1991–1999. The results from this exercise are consistent with those presented in all other model variations.

CONCLUSIONS, LIMITATIONS, AND FUTHER RESEARCH

In a state with heavy local sales tax reliance and a legal maximum on the sales tax rate, it is important to understand how political and economic forces combine to push some, but not all, localities to that maximum rate. In this paper, we use a hazard model to analyze the importance of a number of forces on the decision to max out the local option sales tax rate in Tennessee.

Our estimates indicate a tradeoff between capacity and effort—where higher–capacity jurisdictions were more likely to remain below the highest rate—but the capacity source varies across the two time spans analyzed here. In the earlier span, low sales tax capacity areas were more likely to reach the maximum rate. In the latter span, low property tax capacity areas had a greater tendency to choose that strategy. These results show how local tax policies changed over time. By the second window, only counties with low property tax capacity were willing to increase their sales tax rate to the maximum, consistent with the growing unpopularity of the property tax during that time period.

The capacity–source variation is consistent with a change in an important state–level constraint. After 1992, half of local sales tax receipts were retained by the state for education funding equalization purposes. This reduced the appeal of the sales tax in the later time period, except among counties with low property tax capacity. The paper also illustrates the impact of vertical externalities and how changes in state constraints affect local tax policy decisions.

We believe that panel length is an important decision in future research on rate changes, but additional work will be constrained in the short term by restrictions on data availability at the county level. It will also be interesting to learn whether the forces behind local option sales tax rate increases changed during the early years of electronic commerce and the development of the Streamlined Sales Tax Project. Successful streamlining is another

way that state policy should influence local rates, but the direction is not clear. Streamlining should enhance the power of a local rate increase, but could also reduce the need for such rate increases by broadening the sales tax base.

Tennessee is unusual because it does not have a broad–based personal income tax and, therefore, necessarily relies very heavily on sales taxes for state revenues. Local option sales tax levies only add to one of the highest state–level sales tax rates in the country. Even though few U.S. local governments impose their own income taxes, the presence of a state income tax could affect local government tax structure choices for two reasons. An income tax could allow for lower overall state sales tax rates, giving local governments more freedom to increase their own sales tax rates without fear of losing more shoppers to lower taxed neighbors. On the other hand, an income tax could raise the overall tax burden for the state's taxpayers, making sales tax increases more politically difficult. Future empirical research on the effect of income taxes on local government tax structures is warranted.

Finally, while our model allows for separate rate pressure from neighbors (perhaps upward pressure) and from lower–rate jurisdictions in border–shopping environments, the effects are not significant for separate time spans and under different specifications. Future work should explore the importance of spatial tax rate competition in more detail.

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APPENDIX

TECHNICAL DISCUSSION OF THE DURATION MODEL

Denoting T as the length of time in years below the state–allowed maximum rate and t as the current time, the probability that a county reaches the maximum rate this year given that it has not yet done so can be expressed as $P(t \leq T \leq t + \Delta \mid T \geq t)$, where Δ represents a small increment of time. The limit of $\{[P(t \leq T \leq t + \Delta \mid T \geq t)] / \Delta\}$ as Δ goes to zero is known as the *hazard rate*. It is typically assumed that T has a continuous probability distribution function, given by $f(t)$, where the associated cumulative distribution function is .

$$F(t) = \int_0^t f(S)ds = P(T \leq t).$$

We are interested in the probability that a spell–defined here as a period of time spent below the maximum local sales tax rate–lasts

at least as long as some length t, which is given by the *survival (or survivor) function*:

[A1] $S(t) = 1 - F(t) = P(T \geq t)$.

The hazard rate $\lambda(t)$ is the rate at which spells are completed immediately after t, given that they have lasted at least until t, and is related to the survival function as shown in equation [A2].

$$[A2] \quad \lambda(t) = \lim_{\Delta \to 0} \frac{P(t \leq T \leq t + \Delta | T \geq t)}{\Delta}$$
$$= \lim_{\Delta \to 0} \frac{F(t + \Delta) - F(t)}{\Delta S(t)} = \frac{f(t)}{S(t)}.$$

Empirically, hazard models express the hazard rate as a multiplicative function of some baseline hazard, $\lambda_0(t)$, and an exponential function of a set of covariates:

[A3] $\lambda_i(t) = \lambda_0(t) exp(X_i \beta)$,

where β represents the usual vector of coefficients. Estimation of this type of model involves making a decision about the functional form, if any, of the baseline hazard.

A direct extension of the proportional hazards specification above is the accelerated failure time metric, which is the estimation method of choice in the current analysis. Begin by defining τ_i as follows:

[A4] $\tau_i = exp(-X_i \beta) t_i$.

With some manipulation and rearranging, the log of t can then be conveniently expressed as a linear function of a set of relevant covariates:

[A5] $ln(t_i) = X_i \beta + ln(\tau_i)$.

The natural log of τ_i represents something of an error term in equation [A5], the distribution of which determines the particular model in much the same way as the choice of functional form for the baseline hazard in the proportional hazards metric.

We chose the log–logistic distribution based on a comparison of values for the Akaike (1974) Information Criterion for various specifications. However, results were very similar for models with alternative distributions.[25]

[25] All survival–time models in this paper were estimated with the Stata (version 8) statistical software, which permits the researcher to consider a multitude of distributional assumptions as well as the usual controls for censored data. For additional information on these and other methods, interested readers should consult Cleves, Gould, and Gutierrez (2004). The Akaike Information Criterion (AIC) is defined as $-2lnL + 2(k + c)$, where lnL is the model's log–likelihood value, k is the number of model covariates and c is the number of model–specified distributional parameters. AIC values for alternative models were 165.33 for exponential; 157.21 for Weibull; 158.26 for lognormal; and 156.00 for log–logistic.