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The Effect of Local Option Sales Taxes on Local Sales

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Abstract

Because retail sales taxes generate substantial revenue for many local governments, public officials contemplating differential local option tax rates must carefully assess the potential impacts of such decisions on purchasing decisions. The authors use a unique pooled time series to examine these impacts and apply a methodology that permits an analysis of the effects on purchasing decisions of sales tax rate differences across numerous consumer goods. The results indicate that the response to sales tax rate differences depends on the general characteristics of the goods being purchased. A unique variable that controls for the distance to the next significant alternative for making a purchase also provides key insights. The observed significance for this variable and its interaction with tax rates has significant public policy implications.

Keywords

local options sales taxes, retail sales, consumer behavior, restricted maximum likelihood estimation, panel data

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The retail sales tax generates substantial revenue for forty-four state governments in the United States.[1] In those thirty-four states where allowed, the local option sales tax also produces revenue for thousands of substate governments. This includes large and small cities and towns, counties, special districts, mass transit districts, and even a few school districts that receive some funding from local sales taxes.[2] Such decisions are not without risk. For example, if a municipality opts to raise the tax rate, policy makers must anticipate whether consumers will simply migrate to lower tax jurisdictions.

In this article, we focus exclusively on the impacts on purchasing decisions of differences between local tax rates. The local public finance literature already establishes that nonuniform tax rates between jurisdictions can distort economic decisions (Duncombe 1992; Due and Mikesell 1994; Mikesell 1997; Murray 1997). We augment this literature with conclusions derived from a novel modeling approach applied to a unique panel of sales tax revenues. The uniqueness of our data set allows the application of longitudinal econometric methodology to show that policy makers should exercise caution when changing local options sales tax rates. The results of this study should aid local officials as they evaluate the potential negative impacts of local sales tax policy on purchasing decisions.

The richness of the methodology and data allows this article to augment the public finance literature by permitting an analysis of the implications of sales tax rate differences across numerous consumer goods and multiple shopping decisions within a specific state. The data also facilitate both intra- and intercounty comparisons. As a result, we are able to extend the current understanding about the consequences of sales tax rate differences. Our results also offer policy makers information that encourages more nuanced decisions around local sales tax rate questions, especially on how differences in local sales tax rates affect consumer behavior for different types of products.

Other things equal, a different sales tax rate between neighboring or proximate tax jurisdictions creates a potential incentive for tax-induced market inefficiencies. We investigate this incentive by first reviewing previously reported research on the effect of differential sales tax rates on subnational economic activity. Next, we review the expected economic consequences of differential local sales tax rates. This leads to a model specification that exploits a unique data resource, which allows us to examine the effect of retail tax differences within a single state. The model and data allow an extension of the current received understanding about local option sales taxes and provide insights for policy makers contemplating tax revisions.

Review of the Literature

Consumer Behavior and Local Sales Tax-Induced Inefficiencies

Following standard economic assumptions, retail sales taxes have three potential effects on consumers. First, sales taxes reduce disposable income and thus potentially change consumption levels of goods and services. Second, substitution among products occurs when nonuniform tax bases apply differential rates to taxed and tax-free goods and services (Merriman and Skidmore 2000; Hawkins 2002). Third, another type of substitution occurs when nonuniform sales tax rates induce differential prices. This causes consumers to avoid the higher tax by purchasing at an alternative intrastate or interstate location with a lower tax rate. Because the data used in this analysis cover a single state, the definition of the taxable goods and services is uniform across the state. As a result, the first two effects do not explicitly affect consumer behavior in the proposed model. This last effect, the role of differential sales tax rates in altering purchasing location, is the focus of this article.

The elasticity of the response to geographic differences in sales tax rates is influenced by numerous factors. These include the geographic distance to the alternative location of purchase, the relative price of the good or service, and the frequency of use of the good or service.[3] The proposed model assumes that factors like these, when coupled with the geographic dispersion of consumers and retail firms, give local firms some market power (Alm, Sennoga, and Skidmore 2009).

In general, the occurrence of a tax-induced inefficiency is most likely to occur when a good or service is readily available in a low-tax jurisdiction and easily transported to a different location for consumption or use. Easily purchased and transported goods and services represent commodities that are ''strong substitutes'' and therefore consumers may benefit by purchasing in the jurisdiction with the lower tax rate (Yamada 1996).[4] However, as noted by Fisher (2006), the gains in the low-tax community can never be large enough to offset the efficiency loss in the higher-taxing jurisdiction unless the transaction costs associated with purchasing the good or service in the low-tax jurisdiction equal zero.[5]

Finally, because opportunity costs of shopping and explicit outlays for travel can differ significantly for various products, it is important to consider these potential influences and their interactions on purchasing decisions. Because distance traveled, total expenditure, and product characteristics combine to influence purchasing decisions, their interaction complicates deciphering their influence on the product's sensitivity to

geographical dimensions. Expensive and infrequently purchased goods and services are potentially more sensitive to sales tax rate differences than regularly procured products that insignificantly diminish a consumer's budget.

As an example of decision complexity, consider the importance of location in the purchase of an automobile versus food. It might be expected that consumers purchase automobiles where sales taxes are low. In contrast, food might be purchased without regard to sales tax rates. However, even shopping for food can be influenced by out-of-area shopping for more expensive goods and services. Consider consumers who leave a local shopping area to avoid a higher sales tax on an expensive good like an automobile. The same economic logic to seek lower taxes would lead the consumer to recognize the incentive to also purchase less expensive goods, like food, during the shopping trip. Such behavior spreads the overall fixed cost per purchase. Whatever the interactions, however, the central question remains: do local option sales and use tax differences significantly change economic activity?

Local Option Sales Tax Literature

Local option sales taxes affect the majority of U.S. citizens. The decentralized tax regimes of 9,000-plus local governments currently allow different tax rates between the local jurisdictions within a state. Furthermore, in most of these states, it is not just a single local rate that differs between communities; in many cases, multiple sales taxes are adopted by substate governments. In a study of sales tax rates in five states, Cornia et al. (2000) reported as many as five different state and local sales tax rates applied in a single taxing jurisdiction.

Unease about the consequences of differential sales tax rates is far from new. Over forty-five years ago, Shultz and Harris (1965) examined the economic distortions that can result from nonuniform sales tax rates. The subsequent literature about the economic consequences of sales tax rate distortions has attained sufficient importance to merit mention and review in current public finance texts (Fisher 2006; Anderson 2003).

As noted by Fisher (2006) and Rogers (2004), previous studies consider a variety of geographical comparisons and analyze an assortment of taxed goods. The reported studies contrast the effects of tax codes that differ across interstate or intrastate boundaries. Among these studies, most of them focus on retail products. Usually, the studies report results for only food purchases or a limited variety of goods. Some studies also examine the

effect of local option sales taxes on retail employment, personal income, and retail establishments.

By examining the effect of sales tax differences between neighboring states, the earliest studies conclude that sales tax rate differentials do alter consumer behavior. McAllister (1961) contrasted Washington State cities with neighboring Oregon cities with no sales tax, and he concluded that tax rate differences fostered tax arbitrage decisions. Similarly, Mikesell (1971) used 1963 sales tax data to demonstrate that relatively lower tax rates in bordering counties in other states reduced taxable sales in Illinois, especially for general sales and consumer durables.[6]

Fisher (1980) examined the effect of differential tax rates between the District of Columbia and its neighbors, Maryland and Virginia. He reported that a 1-percent higher tax rate reduced district food sales by 7 percent but that the differential did not significantly affect the purchase of apparel or general sales.

Subsequently, Fox (1986) incorporated provisions for types of goods purchased and distance traveled in his models. He compared three border counties in Tennessee and their counterparts in three coterminous states: Georgia, Kentucky, and Virginia. He based his analysis on annual time-series data that covered the period from 1965 to 1982 and quarterly sales tax data from 1974.3 to 1982.4.[7] Fox (1986) found that the strength of the response to differences in the sales tax was dependent on the proximity of the border communities, but he also suggested that the reaction to different sales tax rates is likely nonlinear in terms of geographic distances. He also found that for relatively expensive consumer durables, the propensity to search for lower taxes was statistically significant. For nondurable goods, such as food and apparel, there was only modest evidence that consumers would alter their consumption to avoid higher sales tax rates.

Mikesell and Zorn (1986) used a natural experiment that allowed an examination of how differential sales tax rates might influence consumption between neighboring cities. The data for their analysis came from a small community that was court ordered to increase its local option sales tax rate by one-half percent to fund a civil judgment against the town.[8] They found that reported retail sales did decline modestly in the community during the period the additional tax rate was imposed. They also concluded that the rate difference did not alter the number of businesses located in the city and that the reduction in revenue was more than offset by the increase in tax revenue due to the higher tax rates.

Virtually every study concludes that differences in both state and local sales tax rates result in some proportional reduction in sales in the taxing

jurisdiction with the higher sales tax rate and a proportional increase in sales in the taxing jurisdiction with a lower sales tax rate. Notwithstanding previous research, important issues regarding local sales taxes still remain. These consist of unanswered questions about the effect of differences in intragovernment sales taxes (Asplund, Friberg, and Wilander 2007). Especially important are those about personal consumption responses associated with specific goods and services.

Total Taxable Sales Model

The current examination is clearly related to previous studies that have explored the relationship between sales tax rates and consumer purchasing patterns. This study uses sales and tax data collected at point of sale by the Utah State Tax Commission (USTC). In Utah, retail vendors report transactions at point of sale using the standard industrial classifications (SIC) code assigned to them by the USTC and are required to file monthly returns. For firms with multiple locations, like chain stores, the USTC requires the vendors to report on the location of the actual sale. All sales taxes are collected by the vendor and first remitted to the USTC, which then remits the appropriate revenue to the local government.[9] This study exploits the richness of this pooled cross section to achieve several notable contributions to the public finance literature.

Our study adds to the literature in several ways. First, we are able to expand considerably the number of products analyzed. Previous studies examined the influence of sales tax rates on a limited number of consumer goods such as food, specific types of consumer stores, or aggregate purchases. We investigate consumers' responses to rate differences on a variety of goods in both nondurable goods and durable goods. This fulfills a need identified in the literature for a more discrete measure of sales (Torralba 2004).

Second, we focus only on the consequences of sales tax rates within a single state. Most previous analyses have focused on sales tax differences between neighboring states. This introduces the potential for confounding institutional and political influences in addition to differences in tax rates. Durable goods may be perceived as more difficult when acquired out of state. Furthermore, for some large purchases that require licensing, automobiles, for example, interstate purchases may be sufficiently complex to suggest the value of an intrastate analysis. Limiting the analysis to a single state improves the chances that the research design will isolate the tax rate effect.

A third important difference that sets this study apart from previous research is the ability to examine the individual effects of different local

option sales taxes. Previous studies that have considered local option sales taxes have evaluated them in the aggregate. The intrastate comparison gives a uniform tax base and administration. Thus, any base or administrative changes that occur affect every taxing jurisdiction in the same manner.[10] Controlling for the various versions of a local option tax structure also gives a more realistic view of current practices.

A final distinction is that the data allow an examination of consumer consumption patterns over a nine-year period, or 1994 to 2003. A few previous studies have used time-series data, but, as noted, those studies have considered only a modest number of goods. The pooled cross section of a large number of products is important because the consumption of durable and nondurable goods differ markedly in their sensitivity to the business cycle.

Dependent Variable

The dependent variable is the annual taxable sales (*TS*) reported in a taxing jurisdiction for seven specific vendor SIC categories. A taxing jurisdiction is each city, town, or county area that uses a local option sales tax. Following the literature (Poterba 1996; Besley and Rosen 1998; Alm, Sennoga, and Skidmore 2009), it is assumed that the local option sales tax is passed forward to consumers. The SIC codes are accumulated within two-digit SIC industries, and the seven chosen in this article represent approximately 49 percent of Utah statewide annual taxable sales. The modeled industries include both durable and nondurable goods.

Independent Variables

To focus on the effect of local option sales tax rates, other factors such as travel distance, population, income, and the business cycle must also be considered as potential determinants of total taxable sales for each jurisdiction. Consider each of these as independent variables.

Tax rates. The rate levied in any given sales tax jurisdiction has two components, state and local. The first independent variable is the sum of the combined locally imposed sales tax rates (*CR*) in each community in the study. Since the data are aggregated to annual taxable sales, the sales tax rate (available monthly) must be transformed to an appropriate annual quantity. To achieve conformity between taxable sales and sales tax rate, we use a weighted average over months. The assigned weights are the quarterly or monthly taxable sales. In most cases, a midyear change in the sales

tax rate in a tax jurisdiction resulted in a weighted mean sales tax rate that represents most of the months in the year.

In addition to the state sales tax, there are potentially seven other local tax rates that can be imposed by local governments within Utah. They include optional rates for cities, counties, mass transit support, arts and cultural events support, hospitals, roads, and a special resort community tax. The last three tax rates are most commonly found in rural Utah communities. Table 1 lists the actual tariff associated with each tax and the number and percentage of cities in Utah where each tax was imposed between 1993 and 2005. The degree of diversity between local option tax rates is substantial. For example, among the five counties that form the urban core in Utah and represent 70 percent of the state's population, every major city in each of the counties has a different tax rate. In several rural counties, there are no differences in the tax rates within the counties, but in twenty-six of the twenty-nine counties in Utah, 30 percent of the local taxing jurisdictions have tax rate different from each other.

We use a set of dummy variables to account for these differentially imposed local options. Each variable indicates if a taxing jurisdiction adopted a specific tax. We focus on the potential effects of highway (*Highway*), rural hospital (*RHospital*), mass transit (*MTransit*), and arts (*Arts*). This allows a test of the proposition that a higher local option sales tax rate increases the propensity to shop and purchase goods in a lower tax jurisdiction. It would be expected that *TS* is therefore negatively related to higher sales tax rates.

Distance and alternative sales centers. We assume that a consumer's decision to avoid a higher sales tax rate can be influenced by supply chain complexity and selection process difficulty (Cornia, Sjoquist, and Walters 2004). Versions of this assumption have been considered in most of studies on the effect of sales tax differentials on purchasing decisions. The standard control variable for shopping complexity has been geographical distance based on a measure of distance between the taxing jurisdictions (high tax vs. low tax) to account for the travel costs associated with shopping in an adjoining community. The variable most often used to account for distance has been the linear distance between the county seats of the neighboring counties, a value that remains constant for all goods being examined.

Here, we allow for the importance of distance to vary by commodity and over time. The logic behind this approach argues that consumers may willingly travel greater distances for some commodities but not others. The available alternative locations are likely to vary as jurisdictions change their tax rates and as vendors enter and exit markets over the years. While there may be no alternatives to offer a lower tax rate within a reasonable distance

Table 1. Local Option Sales Tax Rates and Percentage Use, 1993 and 2005

	1993			2005		
Tax	Minimum rate (%)	Maximum rate (%)	Percentage of jurisdictions	Minimum rate (%)	Maximum rate (%)	Percentage of jurisdictions
State	5	5	100	4.75	4.75	100
County	0	0	n/a	0.25	0.25	89.7
Local	1	1	93.2	1	1	99.3
Resort	0.875	1	1.4	0.5	1	5
Rural highway	0	0	n/a	0.25	0.25	6.8
Town	0	0	n/a	1	1	0.4
Rural hospital	1	1	2.1	0.4	1	7.1
Mass transit	0.25	0.25	20.6	0.25	0.25	31
Zoo, arts	0	0	n/a	0.1	0.1	23.5
Additional resort	0	0	n/a	0.5	0.5	1.8
Additional mass transit	0	0	n/a	0.25	0.25	17.4
Combined rate	5	7.25		5.75	8.1	

Source: Compiled by the authors.

in a given year, new stores may have open or relative tax rates may change during the next year.

For each jurisdiction and industry combination, we construct a distance measure to the nearest viable alternative location that offers a lower sales tax rate. More specifically, the distance measure for the *i*th jurisdiction (*Dist*) is the minimum geometric distance to another jurisdiction ($j, i \neq j$) that meets two criteria: the within-industry sales per capita in *j* are greater than or equal to those in the *i*th jurisdiction at time *t*; and the combined sales tax rate in *j* is lower than that in *i* at time *t*. Thus, for each reporting period and each industry, the sales per capita and the tax rate of each jurisdiction are compared to every other jurisdiction in the state. Using the longitude and latitude of each jurisdiction, the distance variable is defined as the minimum distance in kilometers to an alternative jurisdiction meeting the two criteria at that point in time. The comparison was carried out for each month–year combination and then averaged across months to arrive at the distance measure for the year.

Under this approach, not all jurisdictions will have a viable alternative location. For example, if the combined sales tax rate within the state is relatively uniform as it was before 1998, then there may be few viable alternatives to shopping locally. Likewise, retail centers with high per capita sales volumes in a given industry offer agglomeration advantages that make it less likely for shoppers with those commodities to look elsewhere. In the data used for this analysis, the number of jurisdictions with viable in-state alternative choices varies from 28.2 percent in 1993 to 88.9 percent in 2002 and 2003. To accommodate jurisdiction–industry–period combinations that do not have an alternative location meeting the specified criteria, a dichotomous variable (*NAlt*) is coded as one if no alternative exists that met the above criteria at that point in time and zero in all other cases. Again, this assessment was made for each month–year combination. The aggregated annual value of (*NAlt*) was set to one if more than half the monthly values of (*NAlt*) were one for that year.

Socioeconomic variables. As is often the case when using a time series involving small local governments, finding consistent socioeconomic variables is difficult. Many of the potentially insightful variables are reported only at the county level and even then not on an annual basis. However, there are population and income variables that consistently account for income and population changes in Utah cities and towns over the period of analysis. We control for the population of the taxing jurisdiction using annual population (*Pop*) as an independent variable. Obviously, as population increases, retail sales in a community are likely to increase as well. The same relationship is assumed for per capita income, but here the measures

used in this study become less precise because of data limitations. The per capita income variable is the annual per capita income (*Inc*) reported for each county. Each subcounty jurisdiction is simply assigned its corresponding countywide per capita income value.

Time. The time-series nature of the data suggests using a set of dummy variables (*YR*) to control for trends and the business cycle. The expectation is that these time variables will account for the business cycles fluctuations and product specific trends that occurred during this period in Utah. Since 1990, there have been three phases of economic activity. During the early 1990s, a period of reduced economic growth corresponded to a national recession. The more rapid growth of the mid- and late 1990s was the composite of the national expansion that was augmented in Utah by the buildup leading to the Winter Olympics. The increased spending associated with the Olympic Games moderated the national recession that occurred during 2001. This business cycle pattern undoubtedly affected total taxable sales and is modeled with the series of dummy variables. While having *YR* as a fixed effect in the model helps address the stationarity, the estimation methodology addresses the correlation between years for the same tax jurisdiction.

Jurisdiction. To address the cross-sectional dimension of the model, we use a set of independent variables $\alpha(Jurisdiction)_j$ to identify the jurisdiction of each observation. This allows each jurisdiction of have its own unique effect on total taxable sales.

Estimation

We estimate separate models, one for each industry, to examine the influence of the sales tax on consumption patterns. All models use logged values for the dependent variable and the population, income, sales tax, and distance independent variables. The actual model for each SIC class is

$$\begin{aligned}\ln(TS_{jt}) = {} & \beta_0 + \beta_1 \ln(CR_{jt}) + \beta_2 \ln(Dist_{jt}) + \beta_3 NAlt_{jt} + \\ & \beta_4 \ln(CR_{jt}) \times \ln(Dist_{jt}) + \beta_5 \ln(CR_{jt}) \times NAlt_{jt} + \\ & \beta_6 Highway_{jt} + \beta_7 RHospital_{jt} + \beta_8 MTransit_{jt} + \\ & \beta_8 Arts_{jt} + \beta_9 \ln(Pop_{jt}) + \beta_{10} \ln(Inc_{jt}) + \\ & \alpha(Jurisdiction)_j + \sum_{k=1993}^{2003} \beta_k YR(k)_t + \varepsilon_{jt}\end{aligned}$$

where

TS_{jt} = annual taxable sales within the jth jurisdiction reported in the tth year;
CR_{jt} = combined locally imposed sales tax rate of the jth jurisdiction in the tth year;
$Dist_{jt}$ = distance (km) to nearest alternative jurisdiction with a lower tax rate for the jth jurisdiction in the tth year;
$NAlt_{jt} = 1$ if there is no other in-state alternative jurisdiction with a lower tax rate for the jth jurisdiction in the tth year, 0 otherwise;
$Highway_{jt} = 1$ if jth jurisdiction in the tth year has a highway tax, 0 otherwise;
$RHospital_{jt} = 1$ if jth jurisdiction in the tth year has a rural hospital tax, 0 otherwise;
$MTransit_{jt} = 1$ if jth jurisdiction in the tth year has a mass transit tax, 0 otherwise;
$Arts_{jt} = 1$ if jth jurisdiction in the tth year has an arts and culture tax, 0 otherwise;
Pop_{jt} = population of the jth jurisdiction in the tth year;
Inc_{jt} = per capita income of the country of the jth jurisdiction in the tth year;
$\alpha(Jurisdiction)_j$ = effect of the jth jurisdiction;
$YR(k)_t = 1$ if tth year is k, with 2003 as the omitted year; and
ε_{jt} = error term;

Estimating the βs in the model is complicated by the cross-sectional and longitudinal characteristics of the data. While the population, income, tax rate, distance, special tax, and year independent variables are fixed effects, jurisdiction is a random effect; that is, each jurisdiction is allowed to have a potentially different effect, with the size of the effect estimated by the variance of the $\alpha(Jurisdiction)_j$. If there is no difference between jurisdictions, then $Var\left[\alpha(Jurisdiction)_j\right] = 0$. The repeated measurements between 1993 and 2003 on the same jurisdiction will be correlated. An AR(1) model assumes the correlation between observations on the same jurisdiction that are h years apart is ρ^h.

Another common model for longitudinal data is an MA(q), where the correlations of observations on the same jurisdiction that are$h = 1, 2, \ldots, q$ years apart are estimated individually. An MA(10) correlation model was

also investigated, but the Akaike's information criterion (AIC) for both time-series models are nearly equal, so the simpler AR(1) model is reported.

Results

We use Restricted Maximum Likelihood (REML) in the mixed model to simultaneously estimate the fixed effects, the random effect for jurisdiction, and the correlation parameter ρ. Additional assumptions are that the random effect for jurisdiction and the error term are normally distributed. For all industries, the algorithm converges with estimates presented in table 2. The REML parameter estimates possess the usual large sample properties of maximum likelihood estimators, so test statistics for the fixed effects are based on the Wald test. Table 2 also reports the number of jurisdictions with at least one year of taxable sales (*TS*) for each industry, and the mean number of years reported on a jurisdiction.

Tax Rates

As expected, the estimated regression coefficient on tax rate is negative, reflecting the naive interpretation that as tax rates increase, the taxable sales decreases. The analysis also considers the effect of four local option sales taxes that are earmarked for a specific purpose: arts and cultural events, rural highway, rural hospital, and mass transit. Recall that each component of the local sales tax is included in the model as a dummy variable (equal to 1 if the jurisdiction has imposed the tax during this period and 0 otherwise). In general, the signs associated with these taxes are usually positive but mixed as far as statistical significance.

In terms of analysis, the most interesting of these four taxes is the ARTS tax (zoo, arts, and parks). The proceeds from this tax are used to supplement the revenues of the artistic, cultural, and recreational functions, including some smaller communities located in metro areas of Utah. The majority of the revenue goes to metropolitan Salt Lake City and is used to help underwrite the funding of the Salt Lake Zoo. The empirical results suggest that, while this tax has frequently been negatively portrayed in the print media, there is very little significant evidence that it has affected the level of consumption in the areas where adopted.

Table 2 also reports the results for the mass transit, rural highways, and rural hospital. In six of the models, the sign on this coefficient is positive for mass transit. The results for rural highways and hospitals are inconclusive.

Table 2. Standard Industrial Classification (SIC) Vendor Model of ln(*TS*)

	Manufacturing		Retail—Apparel		Retail–Building Materials		Retail—Auto Dealers		Retail—Home Furniture		Retail—Department Stores		Retail—Grocery Stores	
Variable	Coefficients	*t* values	Coefficients	*t* values	Coefficients	*t* values	Coefficients	*t* values	Coefficients	*t* values	Coefficients	*t* values	Coefficients	*t* values
Intercept	−56.6668**	−2.51	−15.4736	−0.47	−150.39***	−4.92	−110.46***	−5.47	−37.9387	−1.46	−23.7625	−0.60	−18.4513	−0.79
ln(*CR*)	−18.5193**	−2.3	−2.4546	−0.21	−53.0821***	−4.85	−39.7004***	−5.51	−10.7724	−1.15	−5.1251	−0.36	−5.9366	−0.72
ln(*Dist*)	15.9645***	3.03	11.6806	1.47	39.2090***	5.33	32.4371***	6.84	15.6813**	2.50	10.6933	1.16	10.1377*	1.88
NAlt	78.4094***	3.13	71.3670**	2.16	193.62***	5.75	129.77***	6.23	73.7623***	2.82	127.32***	3.14	60.5990**	2.48
ln(*CR*) × ln(*Dist*)	5.6589***	3.00	3.9914	1.41	13.8438***	5.25	11.4491***	6.75	5.4690**	2.43	3.4502	1.04	3.5486*	1.84
ln(CR) × ln(*NAlt*)	27.7188***	3.10	24.3289**	2.05	68.2106***	5.66	45.5751***	6.12	25.4963***	2.72	43.3662***	2.98	21.1207**	2.42
Highway	1.0582***	3.84	0.9055***	3.23	−0.0196	−0.06	0.1851	0.82	0.4732*	1.88	−0.1887	−0.51	0.2357	0.87
RHospital	−0.2456	−0.72	−0.2345	−0.49	0.6854	1.41	0.2525	0.79	−0.3093	−0.72	−0.0496	−0.10	−0.0071	−0.02
MTransit	0.8225***	3.17	1.2832***	24.73	0.0806	0.25	1.3569***	5.77	0.7719***	3.37	1.3257***	3.45	0.5794**	2.13
Arts	0.0996	0.43	0.6466***	2.60	0.7287***	3.01	0.5598***	2.65	0.4144*	1.95	0.6051*	1.96	0.3417	1.42
ln(*Pop*)	1.5893***	19.94	1.385***	17.47	1.1324***	9.45	0.9624***	11.06	1.4583***	19.51	1.4423***	10.37	1.3159***	13.62
ln(*Inc*)	0.1604	1.24	0.2734**	1.96	0.1289	0.80	0.1580	1.28	0.3774***	2.94	0.2835	1.49	0.1377	1.00
Year														
1993	−0.3227		−0.6221		−1.1234		−1.1869		−0.7515		−1.6731		−0.6420	
1994	0.0057		−0.1474		−0.8405		−0.9299		−0.3125		−1.4264		−0.2565	
1995	0.1733		−0.1316		−0.6965		−0.9621		−0.1265		−1.2414		−0.1640	
1996	0.1329		−0.1378		−0.5130		−1.0311		−0.0642		−1.0667		−0.0111	
1997	0.2848		−0.0252		−0.3486		−0.9193		0.0854		−1.0990		0.0267	
1998	0.4959		0.5006		0.1839		−0.4279		0.2960		−0.1977		0.2480	
1999	0.2266		0.1517		0.1273		−0.3614		0.1935		−0.2094		0.1272	
2000	0.1314		−0.0425		−0.0878		−0.3976		−0.1813		−0.3216		0.0216	
2001	0.1746		−0.0401		−0.0543		−0.2119		−0.2589		−0.2345		−0.0995	
2002	0.0393		−0.0461		0.0151		−0.0963		−0.1873		−0.2294		−0.0244	
2003	0.0000		0.0000		0.0000		0.0000		0.0000		0.0000		0.0000	

Var(*Jurisdiction*)	2.6390	0.1833	5.6412	1.3343	2.6447	3.4733	5.2663
AR(1)	0.8531	0.8970	0.7470	0.9161	0.7105	0.9044	0.8453
Residual	3.6626	5.4118	2.5314	4.3456	1.7515	6.5537	3.5955
No. of Jurisdictions	256	243	193	210	220	176	253
Mean years for each jurisdiction	9.0	6.6	8.3	9.0	8.1	7.2	8.9

*90% ** 95% *** 99%

Analysis of the estimated parameters reveals both positive and negative relationships with statistical significance for about half of the cases.

Distance to Alternative Shopping

The distance variable also has the expected sign for the SIC categories reported in table 2. The farther consumers must travel to a dominant alternative shopping area, the more likely consumers will remain and purchase the goods locally. One finding associated with this variable is that the sign and significance are as expected for low-cost items such as food, shoes, flowers, and books. In such cases, it would not be expected that consumers would travel great distances to purchase "everyday" commodities. The same logic might hold for lumber and other building materials, where transportation and delivery charges become an issue. What is more interesting is that with a major purchase item such as new and used motor vehicles, where the relative price is very substantial and the search time is also relatively long, distance to the nearest alternative sales center still appears to encourage local purchases. It is interesting to note that ours is one of the few studies that have found a significant relationship for the distance variable.

Tax Rates and Distance to Alternative Shopping Interaction

An important contribution of this research is that there is an interaction between the tax rate and the distance to another jurisdiction with a lower tax rate. Notice that the coefficients in table 2 for $\ln(CR_{jt}) \times \ln(Dist_{jt})$ are positive, indicating that as the distance to an alternative jurisdiction with a lower tax rate increases, the coefficient on tax rate will change from negative to flat to increasing. This represents the belief that while consumers may choose to drive to another jurisdiction to take advantage of a lower tax rate but that jurisdiction must be close. At the extreme, the *NAlt* variable indicates the case where there is no in-state alternative jurisdiction with a lower tax rate. The estimated model with $NAlt = 1$ and the interaction between *NAlt* and ln(*CR*) fits a bounding line that has a positive slope, indicating that when there is no in-state alternative with a lower tax rate, then increasing the tax rate increases taxable sales.

To demonstrate the interaction between tax rate and distance, consider figure 1 for Retail—Auto Dealers. The plot is the partial effect of ln(*CR*) on ln(*TS*) for different distances. When there is an alternative jurisdiction 5 km away with a lower tax rate, the impact of raising the tax rate results in lower taxable sales. However, when the distance increases to 30 km the

effect is nearly flat, and when the distance increases to 60 km, the effect is increasing. At the extreme, when there is no in-state jurisdiction with a lower tax rate, then the taxable sales increases as tax rate increases. The solid line demonstrates that the effect of increasing tax rate lowers taxable sales (all else held equal) when there is a jurisdiction with a lower tax rate within 5 km. The dashed lines indicate that when the distance increases the effect flattens and then increases, up to the bounding effect where there is no in-state alternative with a lower tax rate.

The interaction demonstrated in the Retail—Auto Dealer industry between tax rate and distance is present in all industries, and at least two of the five regression coefficients representing the interaction significant at the 5 percent level. At the opposite extreme from Retail—Auto Dealer is the Retail—Grocery, which is presented in figure 2. Notice that even when there is a jurisdiction 5 km away with a lower tax rate, the effect of tax rate is flat. This indicates that for a good such as food, consumers have no sensitivity to tax rate.

Population, Per Capita Income, and Time

As expected, there is a very strong observed relationship between sales and population. In every industry, population has the expected sign, is statistically significant, and is by far the most important predictor of sales. Per capita income also shows the expected positive relationship for every industry, and the estimated parameters are significant in three of the eight models.

The time dummy variables effectively capture the expected time-series patterns of the business cycle. Apparel, building, furniture, department store, and grocery total sales first increase as the economy grows before slowing because of the effects of the national recession. Because 2003 is chosen as the reference year, the negative coefficients actually indicate a general positive trend in all of the product categories. The dummy variables for manufacturing and auto successfully reflect the unique time trends of these two product groups.

Conclusions and Policy Issues

The model presented in this article successfully exploits the pooled time series in a unique data set. The model itself differs from previous studies of local option sales taxes because of its generality, which allows us to investigate the effects of local option sales taxes on vendors in multiple SIC

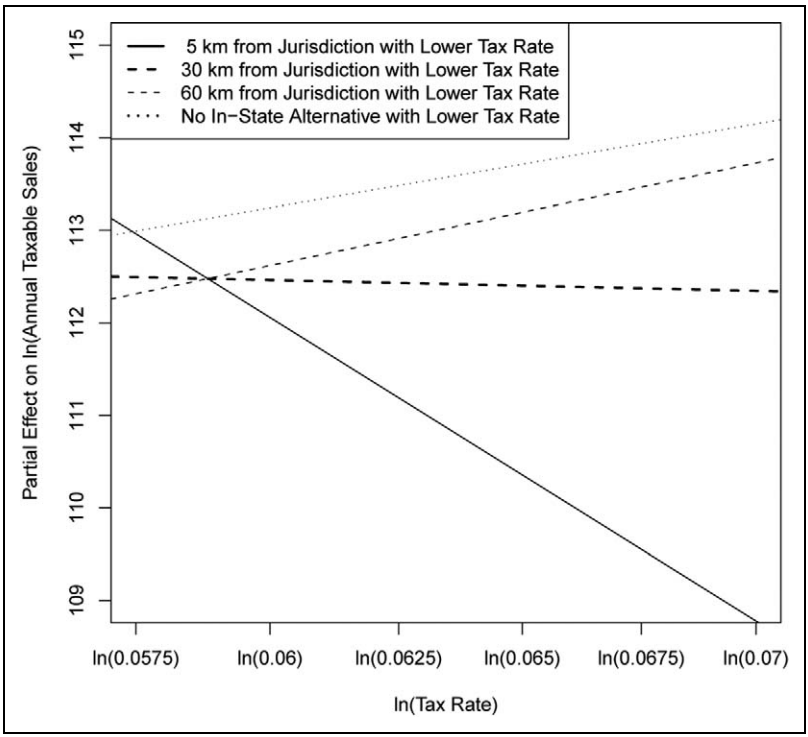

Figure 1. Interaction between tax rate and distance to alternative jurisdiction Retail—Auto Dealers.

product categories. This contrasts with previous studies that have been limited to aggregate sales revenue data, a very few goods, or data from a limited number of specific types of vendors. Analysis of intrastate data avoids the confounding effects of interstate tax base and political influences. Finally, the detail in our data set fosters consideration of the effects of alternative local options. The richness of the model and of the supporting data offers insights for a broad range of vendors.

It is clear that the response to sales tax rate differences vary depending on the general characteristic of the goods being purchased. Indeed, we introduce a unique variable that controls for the distance to the next significant alternative for making a purchase, which provides key insights. This variable is a more realistic way to consider distance in these models. The observed significance for this variable and its interaction with tax rates is an important

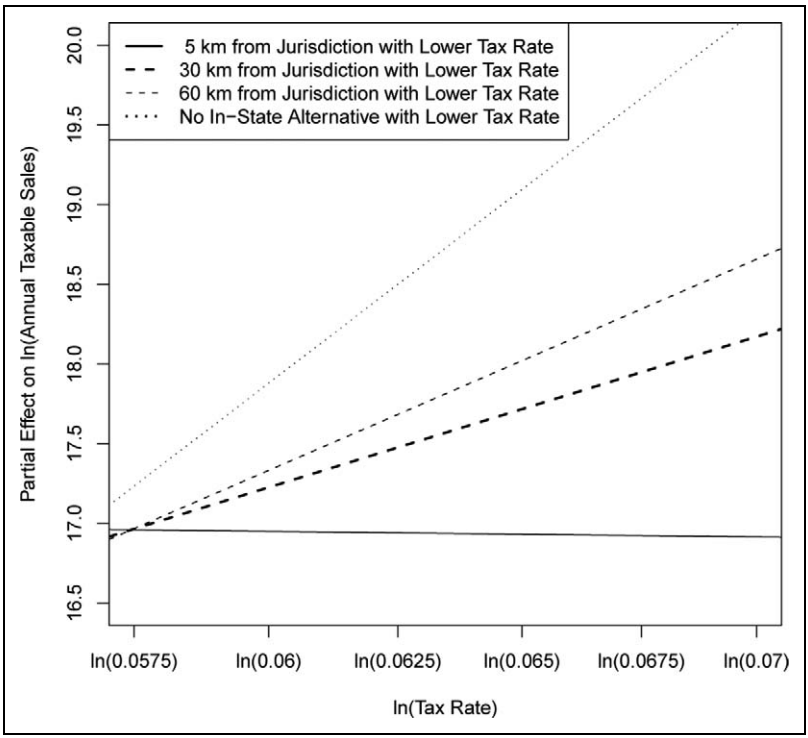

Figure 2. Interaction between tax rate and distance to alternative jurisdiction Retail—Grocery Stores.

finding. Earlier models that included a distance measure often reported the right sign for the variable but did not find it to be statistically significant.

Analytical results suggest that the nature of the local option sales tax may influence the response to the rate difference. However, why the response may differ based on the tax is more difficult to explain. There may be an expenditure effect occurring; the use of some tax proceeds may make some communities less attractive for shopping while other taxes may make them more attractive for shopping. The analysis does not clearly clarify this distinction. However, even with or without an obvious explanation, it appears that decisions about increasing the options around local rates may have unintended implications.

Our analysis alerts state policy makers and community policy makers to long-term implications of implementing local option sales taxes that result

in differential rates between communities. It may be that for some goods, the local options rate decision can be made with little fear of an overall reduction in revenue or a substantial increase in inefficient outcomes. The results presented in this article nevertheless suggest caution. While it would not be practical to consider the makeup of the basket of goods sold within the community in setting local sales tax rates, identifying the differences in the responses to tax rates between goods may provide a better understanding and more thoughtful response to the policy risks associated with tax rate differences and the degree of tax-driven inefficiencies.

The conclusions in this article follow from research that is still in an early stage. Much more can be done with the data and with the modeling. Hopefully, others with an interest in this question will seek similar data sets and will continue to explore the policies relating to local option sales taxes. Such investigations may eventually find that differing tax rates between jurisdictions do not matter. Furthermore, refinements in distance measures constructed from more geographically detailed data may reveal that consumers could be so motivated by the proximity of shopping that differing sales tax rates may not influence their shopping patterns.

Notes

1. The legal title for the retail sales tax in most states is the Sales and Use Tax, but in this article, the reference to the use tax is omitted.
2. Generally, the local sales taxes are piggybacked on the state sales tax base, collected by the state revenue authority, and then remitted to their respective local governments. Some local option sales taxes are administered by local authorities, and some that are piggybacked on the state base do not conform to every aspect of the state base (Bland 2005).
3. This article does not incorporate the rich literature on location economics (e.g., Balchin, Isaac, and Chen 2000).
4. Tax inefficiencies associated with the sales tax have been examined in other contexts, such as the influence of sales tax differences on the growth of the taxed service sector (Merriman and Skidmore 2000) and excise transaction taxes on cigarettes (Sobel and Garrett 1997). Murray (1997) speculates that, if a national sales tax requires a substantial increase in the rate, the degree of tax avoidance will increase substantially, an obvious if extreme form of tax inefficiencies. In addition to tax inefficiencies caused by differences in the sales tax rate, Gale (1999) identifies other types of sales tax inefficiencies, including those created by political activity motivated to have goods and services legislatively exempted from the tax base.
5. An additional issue that is not directly addressed is the compliance challenges that multiple tax rates impose on vendors. We suspect there is a general

assumption that many of the compliance problems are easily solved in today's world of computer-facilitated retail transactions. However, as recently as 2005, changes in the local rates and the application of the new rates created some compliance issues for cities in New York State (Lambert 2005).

6. Mikesell (1997) suggests that sales at convenience stores were not influenced by the differences in the tax rates. This outcome is expected because convenience stores are built for just that reason (e.g., spur-of-the-moment shopping).
7. Fox (1986) also examined retail employment and nonfarm wages during the period 1967 to 1982.
8. Because the additional revenue from the tax was earmarked to fund a civil court settlement, there would be no expectation that spending would increase in the government because of the additional taxes.
9. Only a portion of the tax is remitted back on the basis of point of sale. Some of the local option tax is pooled and allocated within the county on a per capita basis.
10. An additional potential contribution of this analysis is that we may eventually be able to consider the influence of nontraditional distribution channels, specifically the Internet, on the sales of goods and services at the local level. We control for the effect of the Internet on sales and use tax collections by reviewing the rate of change in sales tax collections after accounting for the availability of Internet connections within the state. We posit that the effect of the Internet on local sales will be related to the complexity of the supply chain and purchasing process and the cost of final transportation of the good consumed (Cornia, Sjoquist, and Walters 2004).

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References

Alm, James, Edward Sennoga, and Mark Skidmore. 2009. Perfect competition, urbanization, and tax incidence in the retail gasoline market. *Economic Inquiry* 47:118-34.

Anderson, John E. 2003. *Public finance: Principles and policy*. Boston: Houghton Mifflin Company.

Asplund, Marcus, Richard Friberg, and Fredrik Wilander. 2007. Demand and distance: Evidence on cross-border shopping. *Journal of Public Economics* 91:141-57.

Balchin, Paul N., David Isaac, and Jean Chen. 2000. *Urban economics: A global perspective*. New York: Palgrave Publishing.

Besley, J. Timothy, and Harvey S. Rosen. 1998. Sales taxes and prices: An empirical analysis. *National Tax Journal* 52:157-78.

Bland, Robert L. 2005. *A revenue guide for local government*. 2nd ed. Washington, DC: International City/County Management Association.

Cornia, Gary C., David L. Sjoquist, and Lawrence C. Walters. 2004. Sales and use tax simplification and voluntary compliance. *Public Budgeting and Finance* 24:1-31.

Cornia, Gary C., Kelly D. Edmiston, Steven M. Sheffrin, Terri A. Sexton, David L. Sjoquist, and C. Kurt Zorn. 2000. An analysis of the feasibility of implementing a single rate sales tax. *National Tax Journal* 53:1327-50.

Due, John, and John Mikesell. 1994. *Sales taxation: State and local structure and administration*. Washington, DC: Urban Institute Press.

Duncombe, William. 1992. Economic change and the evolving state tax structure: The case of the sales tax. *National Tax Journal* 45:299-313.

Fisher, Ronald C. 1980. Local sales taxes: Tax rate differentials, sales loss, and revenue estimation. *Public Finance Quarterly* 8:171-88.

Fisher, Ronald C. 2006. *State and local public finance*. Boston: Irwin Publishing.

Fox, William F. 1986. Tax structure and the location of economic activity along state boarders. *National Tax Journal* 39:387-401.

Gale, William G. 1999. The required tax rate in a national retail sales tax. *National Tax Journal* 52:443-58.

Lambert, Bruce. 2005. Sales tax changes confuse merchants around the state. *The New York Times*, June 10, B7.

McAllister, Harry E. 1961. The border tax problem in Washington. *National Tax Journal* 14: 362-74.

Merriman, David, and Mark Skidmore. 2000. Did distortionary sales taxation contribute to the growth of service sector. *National Tax Journal* 53:125-42.

Mikesell, John. 1971. Sales taxation and the border county problem. Quarterly Review of Economics and Business 11:23-29.

Mikesell, John L. and C. Kurt Zorn. 1986. Impact of the sales tax rate on its base: Evidence from a small town. *Public Finance Quarterly*, 14:329-338.

Mikesell, John L. 1997. The American retail sales tax: Considerations on their structure, operations, and potential as a foundation for a federal sales tax. *National Tax Journal* 50:149-65.

Murray, Matthew N. 1997. Would tax evasion and tax avoidance undermine a national retail sales tax? *National Tax Journal* 50:167-82.

Poterba, James M. 1996. Retail price reactions to changes in state and local sales taxes. *National Tax Journal* 49:165-76.

Rogers, Cynthia L. 2004. Local Option Sales Tax (LOST) policy on the urban fringe. *Journal of Regional Analysis and Policy* 34:27-50.

Schultz, William J. and C. Lowell Harriss. 1965. *American Public Finance, 8th Edition*. Prentice-Hall, Inc. Englewood Cliffs, NJ.

Sobel, Russell S., and Thomas A. Garrett. 1997. Taxation and product quality: New evidence from generic cigarettes. *Journal of Political Economy* 105:880-87.

Torralba, Francisco. 2004. New evidence on the effects of local option sales taxes on economic activity. Presented at the Annual Conference of the Southern Regional Science Association. New Orleans.

Yamada, Masatoshi. 1996. Strong substitutes and tax reform: A further interpretation. *International Economic Review* 37:997-99.

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