Do State Sales Taxes Crowd-Out Local Option Sales Taxes in the United States?

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ABSTRACT

Sales taxes are imposed at the state and local level in thirty-seven U.S. states. Vertical tax competition occurs when state and local governments share a common sales tax base, and local governments have autonomy over sales tax policy. As states consider sales taxes for additional revenues, local governments may worry about adverse impacts on sales tax revenues as combined state plus local sales tax rates increase. Our approach is to focus on state-municipal and county-municipal vertical spillovers in empirical models that address endogenous policy leadership, voter tax fatigue with respect to combined sales tax rates, and both vertical and horizontal tax competition. We use longitudinal data from Oklahoma, where local governments have autonomy over their tax rates and sales tax revenues play a dominant role in local budgets. We find that increases in both state and county level sales tax rates significantly crowds out future rate increases for municipalities that are followers, but does not significantly impact the decisions of leaders. Our results suggest that state and county sales tax increases extend the time between tax rate increases for most jurisdictions.

KEY WORDS:

Local sales taxes, vertical and horizontal policy spillovers, crowd-out effects, voter tax fatigue

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"[Our] understanding of what drives state tax reforms—as well as our understanding of what are the effects of these reforms—is grossly inadequate."
(Alm, Dronyk-Trosper and Sheffrin, 2017, p 444)

1. Introduction

The nature of fiscal federalism in the United States links state and local governments in a complex milieu of relationships. This is particularly true of sales tax policy for the thirty-seven states which impose sales taxes at the state and local levels, often with considerable overlap of the sales tax base.[1] Tax base sharing creates horizontal, vertical and diagonal tax competition among taxing jurisdictions, where policy changes of one jurisdiction can impact revenues and policy choices of other jurisdictions. Importantly, this paper investigates the extent to which state-level tax policy changes can negatively impact local government revenues.[2] We offer a novel exploration of vertical sales tax interactions between state and local governments in an environment where sales tax bases are shared and local governments have considerable autonomy regarding sales tax rates.

Sales tax revenue is important for both state and local governments in the United States. Sales taxes contributed $412 billion and $105 billion to state and local governments in 2014, respectively.[3] Many state governments are considering sales taxes to shore up revenues shortfalls. In the past few years, Kansas, Louisiana and South Dakota have increased state sales tax rates and several other states have considered expanding sales taxes.[4] Whereas broadening the sales tax base or raising sales tax rates can increase state own source revenues, local government revenues can be negatively impacted, particularly in the 37 U.S states where both state and local jurisdictions tax retail sales.

State sales tax increases can create negative externalities on local governments in two important ways. The first is through the erosion of the local sales tax base. Consumers respond to higher after-tax prices in predictable ways by reducing retail purchases or by shifting purchases

[1] Sharing a common tax base is also referred to as overlapping, co-occupation or concurrent taxation.
[2] Galle (2014) provides an excellent review vertical crowd out.
[3] Tax Policy Center Briefing Book: State (and Local) Taxes, downloaded from http://www.taxpolicycenter.org/briefing-book/how-do-state-and-local-sales-taxes-work, 7/6/2017.
[4] Kansas' state sales tax increased from 6.15 percent to 6.5 percent effective July 1, 2015. Louisiana's sales tax rate increased from 4% to 5% effective April 2016. South Dakota's sales tax rate increased from 4% to 4.5% starting in June 2016. Oklahoma voters rejected an additional 1% sales tax for education in November 2016 Oklahoma. Governors of Maine and Pennsylvania were considering raising sales taxes. (Maciag, 2015)

across state borders or to internet purchases.[5] Such elasticity-driven price responses can of course lead to reduced local sales tax revenues through the channel of a smaller sales tax base. Of course, local governments may seek to respond to these revenue losses by increasing their own local sales tax rate. However, a key feature of local sales tax policy is that rate increases typically require voter approval. This motivates a second channel by which a state sales tax rate increases can influence local sales tax collections: tax morale and/or voters tax fatigue (Lago-Peñas and Lago-Peñas, 2010). Tax fatigue occurs if voters become less likely to support ballot initiatives that raise local sales taxes immediately following situations where combined sales tax rates (i.e., state + county + municipal) recently increased due to policy changes at a higher level of government. In this way, state sales tax policy changes can indirectly limit local tax capacity, even without the presence of explicit caps on local sales tax rates.

Empirical research considering state-local sales tax policy interactions is quite limited.[6] Using Tennessee data encompassing two state sales tax rate changes and a change in local sales tax rate cap, Luna (2004) finds positive contemporaneous interaction between state and county sales tax rates for the 1977 to 1993 period, whereas Hill (2004) finds a negative relationship between country rates and lagged state tax rates using a spatial analysis for the period from 1981 to 2001.[7] Luna et al. (2007) highlight important heterogeneity among counties in their decisions to reach typically binding rate caps. Burge and Piper (2012) find evidence that county sales tax program adoptions crowd out municipal sales tax program adoptions. While this study relates to the present work, in their model state sales tax rate changes are only considered indirectly via year effects, and subsequent local sales tax rate changes beyond initial adoptions were ignored. Finally, using nationwide cross-sectional data, Agrawal (2016) demonstrates a significant inverse correlation between state and local sales tax rates, at least suggesting that in the aggregate, states with higher (lower) sales tax rates govern over localities that implement lower (higher) sales tax rates. While these contributions all provide valuable findings, one notable shortcoming of the previous literature is the lack of analysis of plausibly exogenous variation in state sales tax policies as the starting point for evaluating the possibility of state-municipal crowd out.

[5] Leal, Lopez-Laborda, and Rodrigo (2010) survey the extensive literature on interjurisdictional tax differentials and the way they influence household purchases near borders and government tax revenues.
[6] Several studies consider federal-state tax policy interactions for various taxes. For instances see Besley and Rosen (1998), Goodspeed (2000), Hayashi and Boadway (2001), Esteller–More and Sole–Olle (2002), and Rork (2003).
[7] The local rate cap was one half the state rate until 1984 when it was set to 2.75%. The state sales tax rate increased from 4.5% to 5.5% in 1984 and then to 6% in 1993.

We contribute to the literature by focusing on whether state tax rate increases hamper the ability of municipal jurisdictions to raise their local sales tax rates. Using a 24 year panel of state and local sales tax rates from Oklahoma, we test whether municipalities are more or less likely to increase their local tax rates in the year of state sales tax increases and/or during the few years that immediately follow. While the use of nationwide data offers significant appeal for obvious reasons, our single state focus offers many countervailing advantages. To begin, it allows for the construction of a lengthy panel, ensures that all governments in question tax a common sales tax base across jurisdictions, and means all municipal governments operate in a common local tax policy environment. In addition, Oklahoma is similar to fifteen other states that allow extensive municipal autonomy over sales taxes and sales taxes are a primary source of local own source revenues, creating vertical and horizontal interactions.[8]

An important advantage of our investigation is that it focuses on state sales tax rate increases which were clearly driven by unexpected and severely adverse economic conditions that were plausibly unrelated to prior sales tax levels implemented by Oklahoma's local governments. The plummeting price of oil during the early to mid-1980s left Oklahoma, a deeply energy reliant economy, with a series of critical budgetary shortfalls. Predictably, the state legislature reacted by increasing the state sales tax rate four times between 1984 and 1990. Consequently, the political circumstances surrounding the sales tax rate increases mitigate concerns of reverse causality (i.e., the possibility that state rate changes are influenced by local sales tax rates) in our analysis. Moreover, our findings mitigate concerns about omitted variable bias – for example if unobserved factors jointly influenced state and local sales tax. The weak Oklahoma economy of the 1980s generated fiscal stress for local governments, clearly making them *more* likely to turn to local sales tax rate increases. However, we of course find just the opposite: local governments increased local rates less frequently following state tax rate hikes.

To our knowledge, we are the first to consider the nature of state-municipal sales tax crowd-out in panel data models that specifically address potential endogeneity.[9] We draw on recent theoretical models of policy leadership involving horizontal tax competition to guide our empirical work (Kempf and Rota-Graziosi, 2010; Hindriks and Nishimura, 2015; Jiancai and Xuyang, 2017). Additionally, following the approach recently taken by Burge and Rogers

[8] For an overview of state and local sales tax programs across U.S. states, see Mu and Rogers (2004).
[9] Hill (2004) points out this concern for state-county crowd-out. He uses lagged state tax rates as well as a number of state level variables to capture potentially endogenous state conditions.

(2016), we allow for endogenous policy leadership among local jurisdictions and account for regional economic segmentation. Our results reveal meaningfully asymmetric crowd-out effects. Municipalities defined as followers are less likely to increase sales tax rates during the two years that follow a state sales tax increase. However, evidence for significant vertical crowd-out is not seen for municipalities defined as leaders. Importantly, this is not simply an issue of statistical power – as one might suspect given that leaders only constitute about seven percent of our sample – but a case where the otherwise significant negative effect is clearly removed (becomes insignificant and even reverses in sign). Our results are of interest for states considering tax policy reform and stand as reinforcement of recent work that suggests jurisdictions with access to significant retail agglomerations set local sales tax rates in ways that are subject to fundamentally different governing dynamics than the majority of other jurisdictions.

2. Vertical Tax Competition and Crowd-Out

There is an extensive literature on vertical tax interactions in a federation, the vast majority of which focuses on federal-state interactions. We highlight key insights from this literature and point out important distinctions when investigating state-local fiscal interactions. The literature confirms vertical tax competition when there is tax base sharing (Brulhart and Jametti, 2006). Tax externalities occur if different tiers of government ignore the impacts of their tax policies on the revenue of other governments. By setting federal taxes high, the federal government can crowd out state revenue capacity via a number of channels. One way this occurs is if the federal and state governments tax the same base, thereby raising the after tax price. Galle (2014) points out the economic argument for the existence of crowd-out. The existence of crowd-out requires higher and lower tiers of government to tax the same sources, to share a legal definition of the tax base, and for tax payers to respond to the combined tax rates in making consumption decisions. Whereas these conditions are unlikely to hold at the federal-state level for the case of sales taxes in the U.S., these requirements are closer to reality *within* many U.S. states which authorize both state and local sales taxes.

State policy determines the hierarchical relationship and similarity of tax bases between levels of governments within a state. In states like Oklahoma, state and local governments are largely dependent on sales taxes to fund expenditures, share a common sales tax base, and the

combined state plus local rates are readily observed by consumers at the cash register. This creates a situation in which state sales tax rate increases are likely crowd-out local sales tax revenues. Local governments may respond to sales tax base erosion from border shopping, internet shopping or less shopping by raising their own sales tax rates to compensate for lost revenues. On the other hand, in states like Tennessee where local sales tax rates are capped, local governments that are at (or close to) the caps have little ability to increase their own rates. Importantly though, even when local governments do not face rate caps, there is still a potential for vertical crowd out due to voter tax fatigue. Voters may get tired of tax increases or the combined sales tax rate might hit a meaningful psychological threshold.[10] Thus, crowd-out can come in the form of limiting local sales tax rate capacity.

As discussed above, there are very few empirical investigations of vertical crowd-out between state and municipal governments. We focus whether state sales tax rate changes crowd out the ability of municipal governments to increase local sales tax rates in response to tax base erosion. This focus is highly pragmatic for policy making. Twenty states allow sales taxation by three tiers of government (state, county and municipal).[11] In most states with multi-tiered sales taxation, the base is uniform and localities have limited authority over the base, making decisions about local sales tax rates the only option.[12] Furthermore, state tax reform is more likely to involve marginal changes rather than major overhaul (Alm, Tropser-Dronyk, and Sheffrin, 2017). Fox, Hill, and Murray (2014) suggest that state governments act as Stackelberg leaders with respect to business taxation.[13] Given the backdrop surrounding the state tax policy changes in our setting, it is reasonable that state and local interactions are similar to the Fox, Hill, and Murray story about business taxation, when shifting to consider sales taxation. We expect state tax policy reform to lead, and subsequently causally impact, local tax policy responses.

[10] There is little work done on sales tax rate thresholds due to the endogenous nature of sales tax rate increases.
[11] The twenty states are Alabama, Arizona, Arkansas, California, Colorado, Georgia, Hawaii, Illinois, Kansas, Louisiana, Missouri, New Mexico, New York, North Dakota, Oklahoma, South Carolina, Tennessee, Texas, Utah, and Washington
[12] See Fletcher and Murray (2006) for a discussion of state competition over sales tax base.
[13] Fox, Hill and Murray (2015) investigate vertical competition with respect to business taxes. We expect that if state leadership in sales taxation to be similar.

3. Data and Empirical Specification

Our application uses comprehensive administrative records of state, county, and city sales tax rates imposed and sales taxes collected in Oklahoma.[14] For several reasons, we eventually estimate our models using the years 1977 through 2000, although our underlying raw data panel is longer on both ends. Typical of states with multi-tiered sales taxation, the sales tax base is uniform across all local jurisdictions in Oklahoma.[15] The sales tax base includes the vast majority of consumer retail sales, as well as business purchases of certain non-retail items. Originally set at 1% in 1933, the Oklahoma state sales tax rate was increased to 2% in 1936, to 3% in 1984, to 3.25% in 1985, to 4% in 1987, and finally to its current level of 4.5% in 1990. Authorized in 1966, Oklahoma municipalities can raise their sales tax rates without limit, subject to voter approval. Burge and Rogers (2011) show that municipal sales tax programs diffused quickly; with more than 300 different municipalities adopting programs by 1975, and over 500 programs (effectively making them ubiquitous) in place by 2016. Most municipal sales tax rates were initially set at 1%, but reach levels as high as 5% by the end of our sample. Counties were authorized to impose sales taxes up to 2% cap as of 1984. Following previous literature, we control for the effect of county rates on municipal rate setting behaviors.

Our raw panel covers the years 1966 through 2010, bracketing the four state sales tax rate increases by a very large window. The tax rates variables represent the rates imposed at each governmental level in December of a given calendar year.[16] Noting the importance of endogenous policy leadership, we apply the procedure outlined by Burge and Rogers (2016) to designate sales tax policy leaders and followers. Thirty-seven municipalities were designated a sales tax policy leaders and 469 municipalities as followers. Leaders were early adopters in their respective regions and had sales tax rates above others in the region during the 1966 to 1976 period.[17] As shown in Figures 1 and 2, the frequency of increases in municipal sales tax rates appears to fall in the years following the four distinct state sales tax rate increases for followers. This pattern is not apparent for leaders. Given the use of the years 1966 through 1976 for the leader/followers identification exercise, we drop those same years from the eventual regressions

[14] The data were obtained from the Oklahoma Tax commission.

[15] Only a handful of states allow non uniform definitions of qualified sales subject to taxation. See Drenkard (2015) for details.

[16] The few mid-year changes are handled using a simple time weighted average, $\tau_{i,t}$ *(weighted) = tax rate*$_1$*$month_1/12$ + *tax rate*$_2$*$month_2/12$, where $month_1$ and $month_2$ are the number of months that each rate was in effect.

[17] The nine regions were the defined by the Federal government in the 1998 Workforce Act.

investigating the vertical crowd out dynamics we are interested in. Importantly, those dropped years, as well as the years on the end of the panel, do not represent periods where the state tax rate changed, and therefore do not carry variation in our main variables of interest.

Recognizing this important heterogeneity and following previous investigations of tax competition among local governments in a multi-tiered tax environment, we estimate two separate panel OLS fixed-effects models:

(1) *Follower:* $$\tau_{i,r,c,t} = \beta_1 S_t + \beta_2 C_{i,c,t} + \beta_3 L_{r,t} + \beta_4 OF_{r,t} + \beta_5 X_i + e_{i,t},$$

(2) *Leader:* $$\tau_{i,r,c,t} = \beta_1 S_t + \beta_2 C_{i,c,t} + \beta_3 OL_{r,t} + \beta_4 F_{r,t} + \beta_5 X_i + e_{i,t},$$

where $\tau_{i,r,c,t}$ is the sales tax rate in municipality *i*, in region, *r* and county *c*, at time *t*.[18] Vertical spillovers are captured by S_t, the state-wide sales tax rate in year *t*, and $C_{i,c,t}$, the sales tax rate of municipality *i*'s parent county in year *t*. Even though our main focus is the nature of state-municipal vertical tax competition, it is important to control for the aspects of horizontal tax competition that simultaneously operate in this environment. In equation (1) $L_{r,t}$ and $OF_{r,t}$ are the populated weighted municipal sales tax rate averages for the other leaders and followers in the region, respectively. In equation (2), $OL_{r,t}$ and $F_{r,t}$ are the population weighted sales tax rate averages for the other leaders and all followers in the region, respectively.

Following Gibbons and Overman (2012) we apply a regional framework instead of a spatial econometric approach. X_i is a vector of fixed-effect municipal dummy variables which control for unobserved time-invariant factors unique to municipality *i*.[19] Due to concerns of significant collinearity with the state sales tax rate changes of interest, year dummies are not included in the baseline estimates. Robustness checks that include year fixed effects produce results which are qualitatively similar but, as expected, draw some attention away from the state sales tax rate changes of interest. Importantly, a dummy variable indicating whether or not a municipality increased its sales tax in the last four years is also included in both regressions. According to the voter "tax fatigue" (Lago-Peñas and Lago-Peñas, 2010) hypothesis, we expect

[18] Burge and Rogers (2016) estimate a similar model to investigate municipal sales tax rate and fiscal interdependence with endogenous leadership. Notably, they do not investigate the impact of state sales tax rates. State sales tax rate changes are captured in the year dummy variables instead.
[19] Annual municipal level socio-economic data are unavailable.

that it is not politically expedient to ask voters for sales tax increases frequently, and furthermore, that when requests do come frequently – they are less likely to be successful.[20] Finally, we include dummy variables to indicate whether the municipality borders Texas, Kansas, and/or Arkansas to control for any border-related tax competition effects. All estimated standard errors are clustered at the municipal level to account for observed heteroskedasticity.

Following standard procedures in this literature, we estimate first-differenced versions of equations (1) and (2), eliminating the municipal fixed effects and centering all other variables as change-variables. R-squared measures from the first-differenced models are an order of magnitude smaller than those obtained from models estimated in levels. Simultaneous decision making on the part of different levels of government would tend to create contemporaneous interactions (Agrawal 2014). However, vertical crowd-out effects might also occur over time (i.e., rather than being limited in time to just a single year where the effect is allowed register), motivating the use of lagged variables. Furthermore, the literature suggests a Stackelberg-type state leader dynamic should be present. Collectively, this motivated us to estimate this relationship using both contemporaneous and lagged effects. Lacking theoretical guidance, we initially investigated both one and two year lags of the state sales tax rate changes. Results are similar across in both specifications.

4. Results, robustness checks, and placebo estimations.

We estimate panel OLS regressions using the first differenced versions of equations (1) and (2) above. Table 1 gives the main estimates for the sample of followers. Consistent with voter tax fatigue, a recent increase in a municipality's own sales tax rate is a strong deterrent to further municipal sales tax increases in the years that immediately follow. Recent state and county sales tax rate increases also suggest potential tax fatigue. Vertical crowd-out is evident from the lagged-change variables for both state and county level sales tax rates. Municipal sales tax rate increases are less likely to occur in the two years following a state sales tax rate increase. Explorations using longer (3 years) and shorter (1 year) windows for the lagged variable produce similar results. Admittedly, this would be expected since the four state increases occur over a relatively short period of time. Our estimates suggest that, on average, a 1% increase in the state

[20] Burge and Rogers (2016) found estimated interactions to be stable across alternative specifications of years (in the three to six- year window) used to construct this variable.

sales tax adds roughly six years onto the length of time between municipal rate increases – moving the baseline average of nine years between increases up to approximately fifteen years. Hence, while the estimated effects may seem small, they are both statistically significant and qualitatively meaningful.

Municipalities are also less likely to increase their local rates in the three-year period following a rate increase in the home county. This expected result is similar to the cross-tier impacts found by Agrawal (2014) and Burge and Rogers (2016). The magnitude of the state-municipal crowd-out effect (with lags) is just over half the size of the similar effects associated with a county rate change. This is consistent with greater intergovernmental competition between county-municipal sales tax programs relative to state-municipal interactions, especially since the extent of sales tax base overlap is greatest among competing local governments.

Regional factors are also evident with respect to municipal rate setting probabilities. Followers are significantly impacted by the lagged rate changes of leaders in their region. This is consistent with policy learning (i.e., yardstick competition), as well as models of strategic tax competition. Sales tax increases by regional leaders seem to provide breathing room for followers to follow suit, possibly because they can then operate with less fear of losing their retail sales to jurisdictions with more expansive retail agglomerations. The results also contain evidence of border effects, consistent with the tax competition literature. Interestingly, the one border that does not seem to play a role is with the state of Arkansas. This makes good sense as Arkansas has collective sales tax rates that are similarly high on average – much like Oklahoma.

Table 2 presents the results for the subset of leaders. As expected, having a recent increase in the jurisdiction's own sales tax rate deters further rates changes and the impact is of similar magnitude for both leaders and followers. The vertical crowd-out effects, however, are notably different between the follower and leader estimates. Unlike followers, our leader jurisdictions do not display statistically significant delayed responses to state or county sales tax increases. Apparently, state decisions and leader sales tax rates behave largely independently from one another, suggesting that the leader jurisdictions have voters who may consider additional factors not present in other jurisdictions. Most notably, leader jurisdictions benefit from retail agglomerations that allow for tax exportation (Burge and Piper, 2012). These positive effects associated with sales tax increases seem to help insulate leaders from pressure related to tax competition and voter tax fatigue. Additionally, the omitted variables concern we

outlined above suggests that at the same time the state was experiencing budgetary shortfalls; municipal governments were coming up short as well. In that case, one may speculate that the budgetary conditions in leader jurisdictions were worse on average than in follower jurisdictions, a possibility we acknowledge. Another potential explanation for the difference is that voters in rural areas (i.e., largely our followers jurisdictions) may exhibit stronger tendencies towards feelings of tax fatigue than do voters in the more predominantly urban and suburban areas that contain the vast majority of our leaders. This difference warrants further investigation, especially given our relatively small sample of leaders.

Importantly, leaders display significant contemporaneous co-movement with other regional leaders and with their regional followers – but neither of these contemporaneous correlations holds when shifting to the lagged variables. As such, it seems more reasonable to conclude that some commonly significant unobserved factors are jointly influencing all jurisdictions, but that leaders in our sample are not causally influenced by the rates of their followers or by other leaders in the region.

As a robustness check that accounts for common trends and cycles, we also estimated models that include yearly fixed effects. While this creates a degree of co-linearity between the state change dummy variables and the annual time trend variables, the extension did not meaningfully change the magnitude or significance of the contemporaneous or lagged state tax change variables in any of our estimations. We find this reassuring.

Finally, to verify that the identified vertical interaction is not an artifact of the general environment we examine or of the modeling techniques we use, we estimated multiple placebo models. In this application, we argue the most reasonable conception of a placebo model is one where the variable tracking the actual years of state sales tax increases is instead replaced with a similar variable formed using combinations of four randomly selected years in the panel. We estimated the first two random combinations generated and the actual years of state increases were candidates for selection as were all other years. The placebo estimations produced largely similar sets of coefficients – save the central variable of interest measuring the lagged state rate increases in the follower model. Importantly, that variable loses significance.

5. Conclusion

We investigate whether raising a state's sales tax rate crowds out future municipal sales tax rate hikes. This novel investigation comes at a time when many state and local governments are competing with one another to raise revenue from a common retail sales base. Many proposed state tax policy changes are geared toward changing sales tax rates or establishing a common sales tax base in conjunction with the Streamlined Sales and Use Tax Agreement (Alm, Dronyk-Trosper and Sheffrin, 2017). Our analysis reveals potential unintended negative consequences for local jurisdictions which share a common sales tax base.

Heterogeneity across localities is important. Our results suggest that regional leaders are insulated from these vertical crowd-out effects, but that follower jurisdictions are not. The asymmetry means that rural communities which possess fewer retail establishments are more likely to suffer adverse impacts. All told, the baseline estimate of a nine-year average interval between municipal sales tax rate increases is estimated to lengthen to a fifteen-year average interval subsequent to a 1% increase in the state sales tax rate. Clearly then, raising the state sales tax rate compromises local revenue raising capacity is a meaningful manner.

There are important caveats to our analysis. By no means do we wish to imply that raising the state sales tax rate is a bad idea in all circumstances. In fact, the consensus that rate harmonization minimizes excess burden would lend support to a system where states (or even higher order governments) levied uniform sales tax rates on retail items, and then proportionately redistributed the revenues. Similar redistribution might entail a modified proportional system that respected equity related goals. Additionally, out of sample extrapolation should be undertaken with caution, particularly when moving away from a three-tiered (state + county + municipal) sales tax environment. In our application, all three levels of government possess a strong degree of autonomy in their rate setting decisions. We have no reason to expect the uncovered effects would persist in other environments where that is not the case. Also, every state is unique and tax policy changes are seldom made in a vacuum. States forgoing increases in their sales tax rate, but instead enacting/raising other taxes, may simply be choosing one set of adverse effects on local government revenue raising capacity over another. Given the complex dynamics present in the multi-tier, multi-jurisdictional sales tax environment commonly used in the United States, further investigation into the nature of vertical crowd-out, tax fatigue, and other related issues is merited. We leave these extensions to future work.

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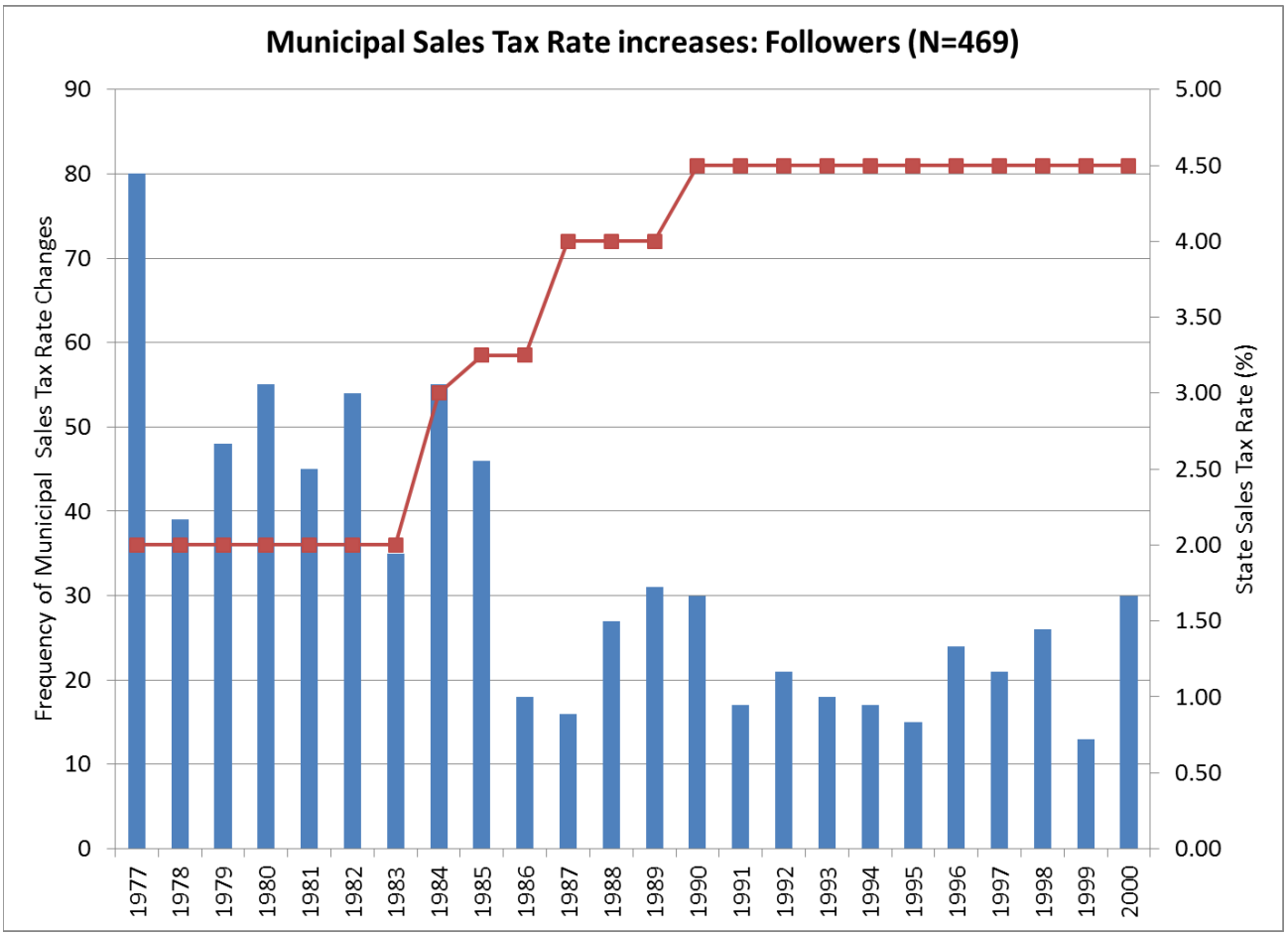

Figure 1: Frequencies of Municipal Rate Increases and the State Sales Tax Rate, Followers.

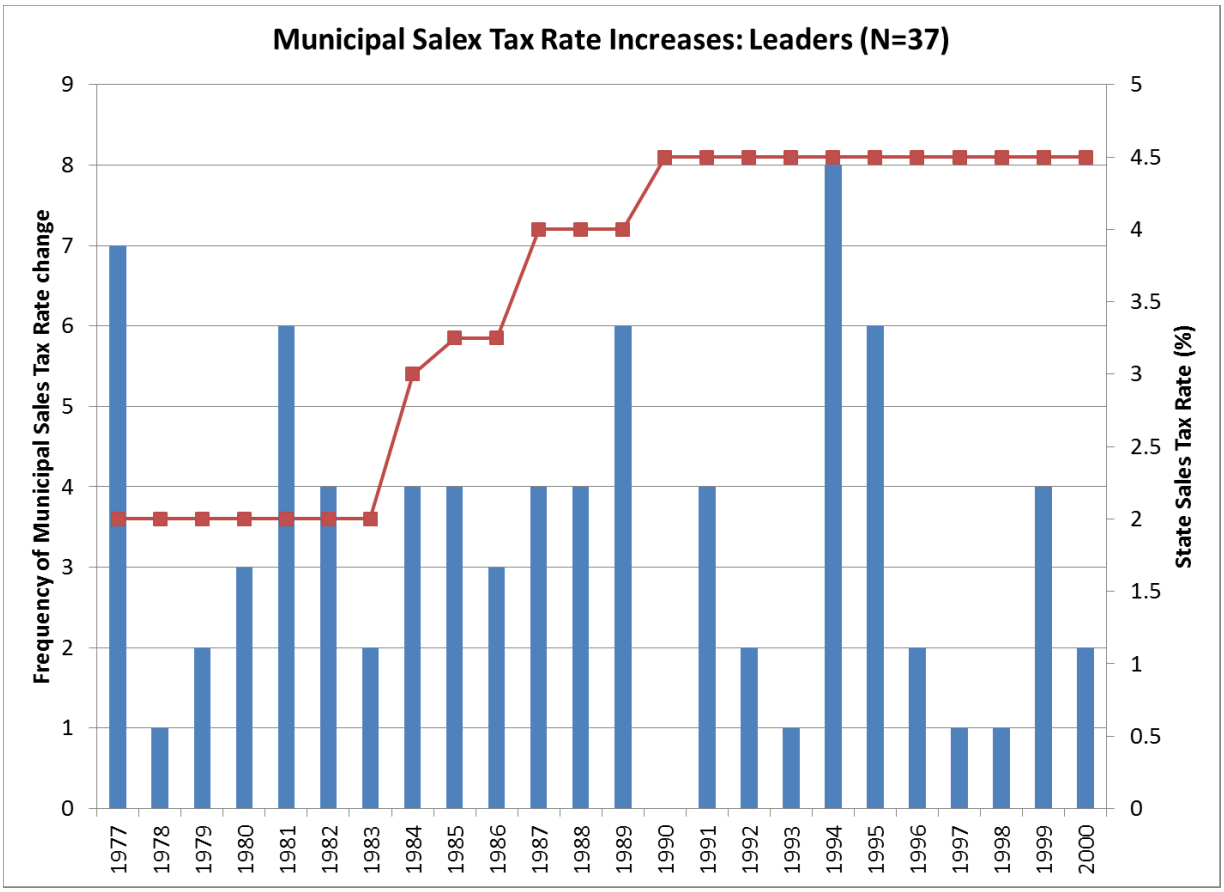

Figure 2: Frequencies of Municipal Rate Increases and the State Sales Tax Rate, Leaders.

Table 1: Panel OLS Regression Results: Follower Jurisdiction Sample

Independent Variable	**Coefficient**	**Std. Error**	**t-statistic**	**P Value**
Recent Own Rate Increase	-0.0942	0.0051	-18.57**	0.000
State Rate Increase (Current Year)	0.0132	0.0098	1.35	0.178
State Rate Increase (Lagged Years)	-0.0238	0.0075	-3.17**	0.002
County Rate (Current Year)	-0.0161	0.0142	-1.14	0.256
County Rate (Lagged Years)	-0.0444	0.0083	-5.35**	0.000
Leader Rate (Current Year)	0.0162	0.0119	1.36	0.174
Leader Rate (Lagged Years)	0.0139	0.0064	2.17*	0.031
Other Followers Rate (Current Year)	0.2121	0.0316	6.71**	0.000
Other Followers Rate (Lagged Years)	0.1034	0.0184	5.62**	0.000
Kansas Border Dummy	-0.0127	0.0052	-2.43*	0.016
Texas Border Dummy	-0.0167	0.0059	-2.85**	0.005
Arkansas Border Dummy	-0.0074	0.0080	-0.93	0.352
Constant	0.0826	0.0065	12.75**	0.000
# observations	11, 256 (469 Municipalities over 24 years)			
F (12, 468)	36.27			
R-Squared	0.027			

** Denotes Significance at the 99% level of confidence
* Denotes Significance at the 95% level of confidence

Table 2: Panel OLS Regression Results: Leaders Jurisdiction Sample

Independent Variable	**Coefficient**	**Std. Error**	**t-statistic**	**P Value**
Recent Own Rate Increase	-0.0862	0.0164	-5.27**	0.000
State Rate Increase (Current Year)	0.0228	0.0266	0.85	0.398
State Rate Increase (Lagged Years)	0.0226	0.0177	1.28	0.209
County Rate (Current Year)	0.0013	0.0346	0.04	0.970
County Rate (Lagged Years)	-0.0019	0.0215	-0.09	0.930
Follower Rate (Current Year)	0.1449	0.0656	2.21	0.033
Follower Rate (Lagged Years)	0.0188	0.0374	0.50	0.618
Other Leader Rate (Current Year)	0.5262	0.1138	4.63**	0.000
Other Leader Rate (Lagged Years)	-0.0140	0.0190	-0.74	0.466
Kansas Border Dummy	-0.0081	0.0198	-0.41	0.686
Texas Border Dummy	-0.0347	0.0091	-3.80**	0.001
Arkansas Border Dummy	-0.0148	0.0079	-1.86	0.071
Constant	0.0489	0.0155	3.15**	0.003
# observations	888 (37 Municipalities over 24 years)			
F (12, 468)	6.67			
R-Squared	0.264			

** Denotes Significance at the 99% level of confidence
* Denotes Significance at the 95% level of confidence