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STRATEGIC FISCAL INTERDEPENDENCE: COUNTY AND MUNICIPAL ADOPTIONS OF LOCAL OPTION SALES TAXES

Gregory S. Burge and Brian Piper

This study contributes to the tax competition literature by investigating the determinants of local option sales tax (LOST) adoptions using a model that simultaneously accounts for the presence of horizontal and vertical fiscal interactions. We use discrete time Cox Proportional Hazard regressions to study adoption patterns for county and municipal LOSTs in an environment where municipalities were authorized to implement LOSTs nearly two decades before counties. Controlling for factors measuring fiscal stress and the jurisdiction's ability to export its taxes, we demonstrate that both vertical and horizontal fiscal spillovers play an important role in characterizing the strategic interdependence of local governments when they tax a common retail sales base.

Keywords: tax competition, fiscal spillovers, sales taxes

JEL Codes: C41, H71, H77

The theory supporting (home rule) is that a locality is in a better position to choose its sources of revenue than is the state, and for much the same reasons that it is better able to determine the character and amount of its expenditures.

Horace Secrist (1914, p. 490)

I. INTRODUCTION

Scholars and practitioners of public finance have long been interested in the heterogeneity among revenue raising methods used by local governments in federal states.¹ Broad literatures have highlighted the various advantages and disadvantages

¹ An important branch of this literature investigates how patterns of taxation and spending across local governments in federal states (e.g., the United States, Canada, and Switzerland) differ from patterns in unitary states (e.g., the United Kingdom, France, and Italy). Our study examines the nature of local governmental interactions in a federal context.

associated with local fiscal autonomy. An important but often underemphasized point is that the observed distribution of local tax policies in this setting is a function of two factors: (1) *local authority* to adopt a particular tax, and (2) *local discretion* to implement a particular tax given that state authorization has occurred (Rogers, 2010). Our study explores the nature of local discretion using a 41-year panel from Oklahoma, where municipal and county governments were given authority to adopt local option sales taxes (LOSTs) in 1966 and 1984, respectively.²

Over the past 50 years, locally imposed retail sales taxes have gone from being virtually nonexistent to playing a major role in the arena of local public finance. Due to this rapid transition, LOSTs are now the second most important revenue source for local governments in the United States, behind the property tax (Brunori, 2007). Figure 1 demonstrates the considerable reliance on local sales tax revenues in the 16 U.S. states currently authorizing LOSTs at both the county and municipal level.³ Furthermore, within many states, including Oklahoma, LOST revenues rival or even exceed property tax revenues.

Given their important role, it is somewhat surprising that the causes and consequences of LOSTs are not better understood. Our study poses the question: “When authorized to do so by their parent state, why do some local governments adopt LOSTs almost immediately, while others wait decades, or fail to adopt the policy altogether?” In addressing this question, we are particularly interested in the role played by horizontal (within governmental tier) and vertical (between tiers) fiscal spillovers that stem from the strategic interdependence of local governments. Our empirical analyses suggest that both horizontal and vertical spillovers play a significant role in determining county and municipal LOST adoption patterns. Additionally, we find that the ability to export a portion of the tax burden and the presence of fiscal stress both speed up a community’s LOST adoption.

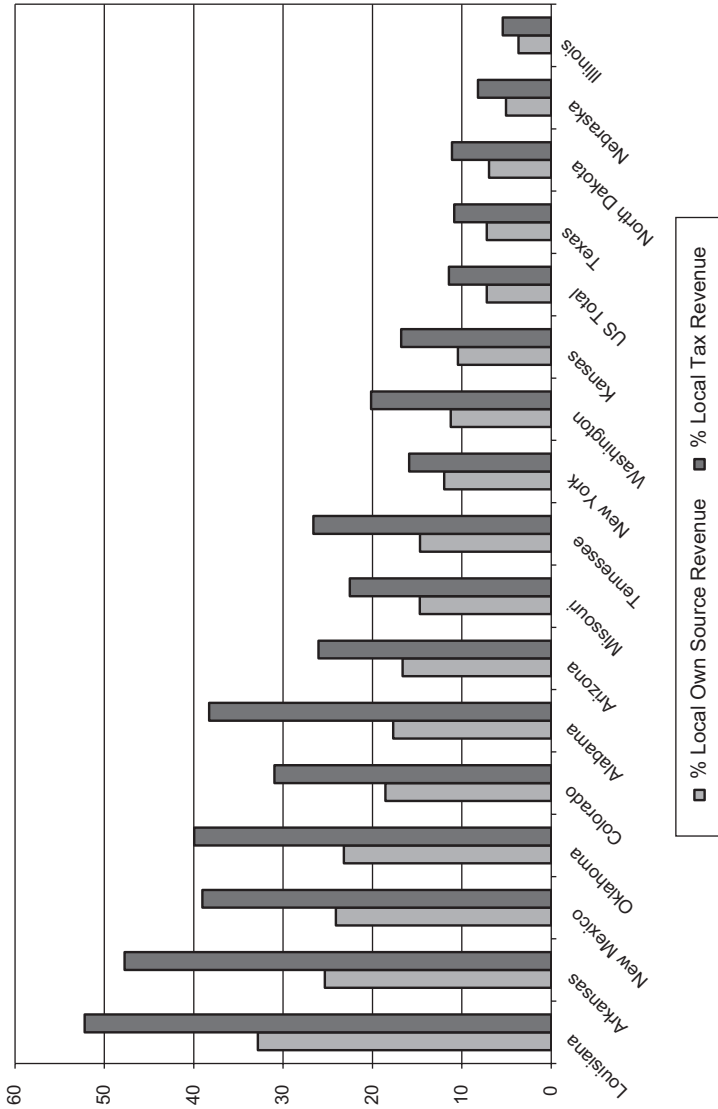
Our study is not the first to investigate the adoption of LOSTs, as we build upon the work of Zhao (2005) and Sjoquist et al. (2007). Although pioneering, both studies use data from Georgia, which only allows county-level LOST adoptions. We extend their contributions by investigating county and municipal LOST adoptions in Oklahoma, a setting where both levels of government autonomously set LOST policy. Hence, we believe our study is the first to consider horizontal and vertical spillovers simultaneously.

To our knowledge, our study also represents the first investigation of municipal LOST adoptions to date. Additionally, because municipalities in Oklahoma were authorized to

² Two other endeavors lie outside the scope of our study. First, it would be interesting to explore the determinants of state level LOST-enabling legislation. Additionally, one could consider the ongoing nature of fiscal interdependence by exploring the determinants of subsequent rate changes taking place once LOST programs are widespread.

³ For a more detailed discussion of autonomy as it relates to local sales taxes in the United States, see Mu and Rogers (2005). A small number of states impose local sales taxes that are mandatory and uniform, and are therefore not included in Figure 1. Finally, note that county LOSTs in Oklahoma apply to the entire county and require electoral support through a countywide vote. While common, this convention is not uniform across U.S. states, as a small number of states have county LOSTs that apply only to unincorporated areas.

Figure 1
Shares of LOST Revenues for States with County and Municipal LOSTs (%)



Source: U.S. Census, Division of Governments, 2005–2006, www.census.gov/govs/estimate/.

implement LOSTs nearly two decades before counties, we examine one case (municipal adoptions) where a single level of local government has autonomy and another (county adoptions) where both levels of local government have autonomy. We know of no previous study where LOST adoptions have been examined in an environment where LOSTs already played a role at another level of government. Accordingly, we believe two distinct groups of states should be interested in our results. The municipal model is most relevant to the 16 states where no local sales taxes are currently imposed (Connecticut, Delaware, Indiana, Kentucky, Maine, Maryland, Massachusetts, Michigan, Mississippi, Montana, New Hampshire, New Jersey, Oregon, Rhode Island, Vermont, and West Virginia). On the other hand, our county model should be useful for the thirteen states (Florida, Idaho, Iowa, Minnesota, Nebraska, Nevada, North Carolina, Ohio, Pennsylvania, South Dakota, Virginia, Wisconsin, and Wyoming) where one level of local government, but not the other, is currently authorized to implement a LOST.⁴

The following section presents a literature review. Section III develops a simple theoretical background. Section IV documents Oklahoma's experiences with LOSTs and shows how it serves as an ideal environment for a study of this nature. Section V outlines our empirical approach. We present our results in Section VI and conclude with Section VII.

II. LITERATURE REVIEW

Over recent decades, a rich literature concerning the determinants of state and local taxation in the United States has emerged. On the one hand, even before the idea was eloquently formalized by the seminal work of Tiebout (1956), it had long been understood that local autonomy and differences between local policies can be valuable to society if they accurately reflect the heterogeneous preferences of citizens. This side of tax portfolio differences across local governments is captured by the quotation introducing our paper. On the other hand, the literature on tax competition and tax harmonization has established that differences in taxes (or levels of taxes) based solely upon communities following their individual interests, while ignoring external effects the policy has on other jurisdictions, can lead to inefficiencies (Oates, 1972). While reviewing the literature explains differences in local tax policies and the relative merits of those differences lies beyond the scope of this paper, it is worth noting that a branch explores situations where new local revenue sources are adopted. Biegeleisen and Sjoquist (1988), Berry and Berry (1990), Alm, McKee, and Skidmore (1993), Gill and Haurin (2001), Ashworth, Geys, and Heyndels (2006), and Jeong (2006), are just a few examples of such studies. Our study extends this literature, as we investigate why some local governments adopted LOSTs almost immediately following authorization, while decades elapsed before others adopted the policy and others have not yet done so.

The studies most related to our own are Zhao (2005) and Sjoquist et al. (2007), as each investigated the determinants of LOST adoptions. They examine county LOST

⁴ See Burge and Rogers (2011) for a more detailed overview of LOSTs in the United States.

adoptions using data from Georgia. In 1975, Georgia authorized county governments to enact, subject to voter approval, a 1 percent general sales and use tax. LOST revenues were to be distributed between the county and the municipal governments located within the county based on formulas set prior to adoption. Tax revenues could either be designated as general purpose (property tax relief), or earmarked for education, transportation, or capital infrastructure improvements.⁵

Zhao uses discrete-time event history analysis methods to analyze county level adoptions between 1975–2002. Among other results, the study finds that counties with higher millage rates and a higher potential to export the sales tax burden are more likely to be early adopters. Zhao also demonstrates the significance of policy spillovers in this context — previous adoptions by bordering counties exert a significant positive effect on the likelihood of adoption. Sjoquist et al. use similar data (a panel spanning 1976–2001) and employ a duration modeling approach similar to that used in our study. They show counties are more likely to adopt LOSTs as the number of neighboring counties that have adopted increases. Consistent with Zhao, they show preexisting fiscal stress and the capacity to export the tax also speeds up LOST adoptions. We extend their insights by investigating LOST adoption patterns in an environment where counties and municipalities were both granted LOST authority, but at significantly different points in time.

At the same time, the characteristics of a jurisdiction and its citizenry are not the only factors that affect policy outcomes. Political scientists and economists have built a considerable literature over time investigating the extent to which a given government's decisions may be affected by the overall policy environment.⁶ Studies generally posit that governments are subject to “reaction functions,” such that optimal policy decisions depend not only on their own traits or traits of their citizenry, but also upon the policy choices of other governments.

A shortcoming of several early studies investigating patterns of local taxation was the inability to effectively address the role of policy diffusion between governments. By construction, studies that employ cross-sectional data are somewhat poorly equipped to verify the causal effect of one jurisdiction's policy choices on another. As such, investigations of local tax policy that simultaneously recognize the importance of observable differences in the characteristics of jurisdictions and the nature of intergovernmental policy spillovers are somewhat limited. Importantly for our study, state LOST authorization to multiple levels of local government offers an ideal environment for investigating the nature of policy spillovers. Accordingly, our study contributes to the literature concerning county-municipal strategic interactions, as well as the previously mentioned literature that seeks to explain the determinants of novel tax instruments used by local governments.

⁵ Specifically, only city governments had access to the earmarked LOST options, as county governments were required to designate their portion towards property tax relief. Interestingly, city governments could also enact special purpose sales taxes (SPLOSTs) independent of the county — creating a situation that did exhibit some limited aspects of inter-municipal interaction in regards to LOSTs.

⁶ Walker (1969) and Gray (1973) are two early examples. See Berry and Berry (1999) for a review of this literature.

Several previous studies have investigated the nature of vertical and horizontal policy spillovers. For example, Feldstein and Metcalf (1987) and Esteller-Moré and Solé-Ollé (2001) demonstrate the significance of vertical interactions. Both estimate the effects of changes in federal tax policies on the subsequent tax policies of state and local governments.⁷ Zodrow and Mieszkowski (1986), Wilson (1986), Ladd (1992), Brueckner and Saavedra (2001), Rork (2003), and Luna (2004) are some of the many studies that investigate horizontal spillovers, generally demonstrating a tendency for state and local governments to adopt similar policies. A tendency towards policy convergence can occur for at least three reasons: spillover (externality) effects, tax competition, and follow-the-leader yardstick competition. As we discuss below, we expect that at least the latter two reasons will play important roles in the context of LOST adoptions.

III. LOST ADOPTIONS

The following framework guides our empirical models. We follow the general approach of Sjoquist et al. (2007), adding modifications that reflect the contextual differences between Oklahoma's and Georgia's experiences with LOSTs. We assume the following conditions hold:

- Three levels of government exist: state, county, and municipal. County governments are contained within the state government. Municipal governments are contained within county governments.⁸ Counties may contain multiple municipalities.
- County and municipal governments raise revenue only through property or sales taxes.⁹
- County and municipal governments can adopt sales taxes only after being authorized by the state and receiving support through a majority rule vote in the jurisdiction.
- Except for voter approval, there are no restrictions on the sales tax levels that can be implemented by county and municipal governments.¹⁰

⁷ The 2001 study by Esteller-Moré and Solé-Ollé also considers the role of horizontal spillovers between states, but finds that they play a relatively small role relative to vertical spillovers.

⁸ The latter claim does not hold perfectly in our data as a small number of municipalities cross a county boundary. In these rare instances, the municipality is assigned to the county holding the greatest share of its retail sales tax base.

⁹ In Oklahoma, during fiscal year 2001–2002, 54.31 percent of county and municipal government tax revenue came from property taxes and 39.23 percent came from sales taxes for a total of 93.54 percent from the two sources combined.

¹⁰ This is true for municipal governments in Oklahoma. As we outline in Section V, county tax rates are capped at 2 percent but the constraint is largely non-binding. We only model the adoption of LOST and do not investigate differences in adopted rates. This is because the largest predictor (by far) of the initial rate is the time period of adoption. For example, all municipal adoptions prior to 1971 were 1 percent, while municipal adoptions from 1980–1985 averaged 1.96 percent. On the other hand, county rates at initial adoption decreased over time. Initial rates adopted before 1990 averaged almost exactly 1 percent while rates adopted during or after 2000 averaged 0.525 percent.

- Municipal governments are given authorization to implement sales taxes long before counties. Additionally, a state sales tax is in place well before municipal authorization.
- Once adopted, a sales tax stays in place permanently.¹¹
- Governments must balance their budgets.

Following the state's decision to grant taxing authority to either level of local government, the likelihood of LOST adoption will depend upon the level of support for the tax among local voters who maximize their utility. Utility increases with the consumption of local public services and decreases with taxes paid. While many factors affect a given household's utility and, in turn, their level of support for the LOST, we assume that the median voter model provides the mechanism that guides the distribution of voter's preferences towards a collective outcome.

A. Community Characteristics Influencing LOST Adoption

In theory, a community could adopt a LOST because its citizens wish to increase the overall level of taxation in the community, because they wish to alter the composition of the tax base, or due to a combination of both desires. In the discussion that follows, we identify several observable variables that should be systematically related to these motivations.

Communities should be more likely to desire an increase in the overall level of local taxation when they face fiscal problems, so that we expect a high level of fiscal stress will accelerate a LOST adoption. We measure fiscal stress in two ways. First, we calculate the annual percentage change in the property tax base ($\% \Delta PTB$) using data obtained from the Oklahoma Tax Commission, Ad Valorem Division.¹² When $\% \Delta PTB$ per capita is large and positive, communities should experience less fiscal stress than when it is small or negative.

Second, fiscal stress may be associated with changes in population within the community in several interesting ways. Consider a community losing population over a sustained period. Holding tax policies constant, revenues and service demands will both decline. Property tax revenues may decline quickly in jurisdictions where assessments reflect current market values, but should have a more delayed response in jurisdictions where re-assessments are less frequent. If revenue declines more rapidly than expenditure needs, fiscal stress should increase. On the other hand, sustained rapid population

¹¹ This assumption is violated for only a small number of cases. We observe seven counties and two municipalities in our data where LOSTs are enacted and subsequently disappear. This represents less than 2 percent of all initial adoptions.

¹² *PTB* and all other monetary variables used in our analyses are adjusted for inflation. All real series use 2005 as the base year and modifications follow the Oklahoma Quantity Indexes for real gross domestic product (GDP) by state, available at "Oklahoma Quantity Indexes for Real GDP by State." Bureau of Economic Analysis, U.S. Department of Commerce, Washington, DC, <http://www.bea.gov/>. The Standard Industrial Classification (SIC) series is for 1966–1997 and the North American Industrial Classification System (NAICS) series is for 1997–2006.

growth may necessitate the expansion of existing public infrastructure systems. While the tax base also expands during periods of growth, revenues may not keep pace with expenditure needs, and communities in this situation can feel intense fiscal stress (Altshuler, Gómez-Ibáñez, and Howitt, 1993). Further complicating matters, the average cost per person of providing local public services (of a given level of quality) is U-shaped. As such, very small communities may have not yet reached levels of population where they fully take advantage of the economies of scale associated with the production of local public services.¹³ In this case, adding population in a slow and sustained manner lowers per unit costs of providing services and may actually *reduce* the level of fiscal stress. We define the variable *Pop_Growth* to be the annual percentage change in the population and use this variable to obtain our main results. However, we later discuss extensions that more closely consider the role of population. Unfortunately, measures of property tax base (*PTB*) and population are not available annually at the municipal level, a problem that also surfaces for several of our other variables. In Section VI we discuss our strategy for dealing with the scarcity of data available at the municipal level.

If a community adopts a LOST to alter the composition of the tax base but not the level, then consumption of public services will remain constant. This implies two offsetting effects: the loss from paying higher sales taxes and the gain from paying lower property taxes. A voter considering a LOST will support (oppose) adoption if the increase in their sales tax liability is less than (more than) the reduction in their property tax. Let ST_i and PT_i represent the increase in sales tax liability and corresponding decrease in property taxes for household i when a jurisdiction adopts a LOST. The median voter model predicts a LOST will be adopted when ST_i exceeds PT_i (in absolute value) for over 50 percent of the voters in the jurisdiction. Therefore, we are interested in factors that shift the overall distribution of these costs and benefits within the community and, in turn, affect the relationship between ST_i and PT_i for the median voter.

To begin, the costs and benefits of LOST adoption will be affected by the jurisdiction's ability to engage in sales tax exportation relative to property tax exportation. Tax exportation occurs when the economic incidence of a tax levied by one jurisdiction is at least partially shifted to individuals residing outside the taxing jurisdiction. The capacity to engage in tax exportation has been shown to affect the distribution of public taxation and spending (Sjoquist, 1981; Zimmerman, 1983; Blackley and DeBoer, 1987; Wildasin, 1987; Gade and Adkins, 1990; Zhao, 2005; Sjoquist et al., 2007). Regarding the burden of newly adopted sales taxes, revenues from purchases made by households living outside the jurisdiction still lower property taxes for individuals inside the jurisdiction. On the other hand, residents can export part of the property tax burden if there are large amounts of vacation homes (Anderson, 2006) or immobile factors such as land associated with non-residential property (Greene and Munley, 1984).

Ideally, we would be able to obtain precise measures of the effective cost to the median voter of raising a dollar through both sales taxes and property taxes over each

¹³ Using 2000 census data, over half of the municipalities in our data (284 of 502) had populations less than 1,000.

jurisdiction/year observation in our panel. Since this is not feasible, we use a proxy that reflects how the adoption of a sales tax will reduce the median voter's millage rate under revenue neutrality. All else equal, when the ratio of a jurisdiction's retail sales tax base (RSTB) relative to its PTB is high, a sales tax of a given size will lead to a larger reduction in the property tax rate. Whether this actually reduces the median voter's tax liability depends upon the allocation of the median voter's budget between housing and other forms of consumption. If $RSTB/PTB$ is high in a community because non-residents shop there frequently, the median voter sees a net tax reduction. On the other hand, if $RSTB/PTB$ in the jurisdiction is high only because residents of the community consume little housing relative to other goods, the tax burden remains the same. Since we expect that most jurisdictions in our data displaying high values for this variable benefit from at least some sales tax exportation, our expectation is that the timing of adoption should be accelerated when $RSTB/PTB$ is high. We also construct the variable $\% \Delta RSTB$ since expansions in the sales tax base could lead to an increased ability to export the sales tax burden in the future.

Although we observe RSTB for municipalities, recall that measures of PTB are not available at the municipal level. We attempt to account for municipalities' potential to engage in tax exportation using a classification system developed in Burge and Rogers (2011), who identify 30 regional retail centers in Oklahoma that are likely to be independent shopping destinations for households living outside of the jurisdiction. We adopt their classification system and create a dummy variable called *Reg_Center* that captures whether a regional retail center is located within a municipality.

The composition of the property tax base may also affect the costs and benefits of LOST adoption for the median voter in a community. In comparison to their urban and suburban counterparts, rural residents are more likely to hold wealth in the form of real property (as opposed to financial instruments). This is particularly true in farming communities. Higher property tax rates have been shown to significantly lower the value of farmland (Blase and Staub, 1971; Pasour, 1975). Hence, voters in farming communities may have incentives to seek property tax relief. If so, the likelihood of LOST adoption will increase as the value of agriculturally zoned parcels becomes a larger percentage of the property tax base. This expectation is consistent with the "Homevoter Hypothesis" popularized by William Fischel (2001). On the other hand, if the owners of agricultural parcels face lower effective property tax rates than those applied to other types of property, the benefits associated with seeking property tax relief are diminished. Agricultural land is generally assessed based upon usage value rather than full market value, lowering the average effective tax rate relative to other property. In our application, we care about how potential reductions in the property tax rate affect the median voter in communities dominated by farming.¹⁴ Since these two countervailing forces are present, signing the relationship between LOST adoption and

¹⁴ Fischel (1992) presents a convincing argument that the median voter in a farming community need not own farmland for this idea to hold. A dependence upon the farming industry (for work) of the median voter suffices.

the fraction of the property tax base coming from agriculturally zoned parcels requires empirical evidence. Again, from the Ad Valorem Division, we were able to obtain the annual aggregate value of agriculturally zoned parcels (*AgPTB*) for counties, but not for municipalities.

Another consideration is that the income levels of median voters may influence the extent to which they bear the burdens of a general sales tax relative to a property tax.¹⁵ Where the median voter has low (high) income, one would expect the more progressive (regressive) tax to be favored. Since the adoption of a LOST reflects the implementation of a tax by a single jurisdiction, the relevant framework for tax incidence is that of an excise tax driven. The conventional wisdom tends to suggest that a sales tax is characterized by a high level of regressivity. However, this conclusion is primarily reflects short run tax burdens that do not account for consumption smoothing over the life cycle by households. Studies that consider the lifetime incidence of a general sales tax with exemptions generally find it to be slightly progressive (Metcalf, 1994). As Oklahoma does not have an exemption for food, this suggests that sales tax incidence would be roughly proportional to lifetime income.

The incidence of the property tax is also complicated. Aaron (1975) reviews the classical literature on the topic and concludes the property tax is slightly regressive. Note that while the general equilibrium effects of the property tax operate to reduce the overall rate of return on physical capital, producing the “new view” of the property tax with its familiar conclusion that the property tax is progressive (Mieszkowski and Zodrow, 1989), the present analysis calls for a focus on a single jurisdiction adopting a new tax. In this case, the incidence of the property tax *is* dominated by excise tax effects on the taxed goods (Zodrow, 2001). For the present application, it seems reasonable to characterize the property tax as slightly regressive with respect to annual income and roughly proportional with respect to lifetime income. As these conclusions mirror those concerning the sales tax, we have no strong expectation concerning the effect of income on LOST adoption patterns. Unfortunately, for early years in our panel we are only able to obtain mean income levels, not median, from the Bureau of Economic Analysis. While this is not ideal, we expect mean and median income to correlate highly in levels across counties, and to correlate even more highly over time within a county. Again, we are not able to obtain this measure annually for our municipal panel.

B. Horizontal and Vertical Policy Spillovers

To this point, we have focused on how the characteristics of a community may affect the timing of its LOST adoption. However, the preferences of voters and locally elected officials are likely affected by factors outside their jurisdiction as well. That is to say, the timing of LOST adoption may be affected by the previous behavior of competing governments within the same tier (horizontal spillovers), as well as by governments at

¹⁵ We thank an anonymous referee for suggesting the inclusion of income in our analyses.

higher or lower tiers (vertical spillovers). We now consider the nature of strategic fiscal interdependence in our setting.

Strategic interactions between local governments are generally believed to be driven by three (potentially related) factors.¹⁶ The first is the possibility of fiscal spillovers (i.e., policy related externalities). Case, Rosen, and Hines (1993) investigate state level public expenditures while Murdoch, Rahmatian, and Thayer (1993) focus on city level spending — both serve as early examples demonstrating that household utility can be affected by service provision levels in neighboring jurisdictions. A second source of interdependence comes from competition between governments over a mobile tax base. This applies to the adoption of LOSTs as empirical work suggests that when one government implements or increases a LOST, consumers shift away from that community to purchase in other areas (Burge and Rogers, 2011; Luna, 2004). In this case, LOST adoption creates a positive spillover felt by nearby communities as they absorb the additional consumer spending flowing out of the newly taxed jurisdiction. A third factor is the potential for policy diffusion (Walker, 1969; Gray, 1973; Berry and Berry, 1990 and 1992) and/or yardstick competition (Besley and Case, 1995; Rincke, 2009). For example, in the yardstick competition model, voters look at conditions in other jurisdictions to help gather information on whether their own government is following effective practices. The literature on policy diffusion focuses more on the interactions of elected leaders and contends that copycat behavior (often referred to as policy mimicking or follow-the-leader) guides the decisions of local officials. The literature regarding the nature of strategic fiscal interactions between local governments thus suggests a number of potential effects on the speed of LOST adoption.

Vertical tax competition may play a role if voters and local officials are less likely to support a LOST when relatively high sales taxes from a different level of government are already in place. Local officials may be concerned with tax competition — that is, with losing a portion of their sales tax base as purchases move to the internet and other jurisdictions. Voter discontent may stem from the higher level of taxes currently in place or from recent increases in their level. Note that the nature of local-local (county-municipal) vertical tax competition in our described environment is nuanced. Assume, contrary to the actual situation in Oklahoma, that both counties and municipalities were authorized to implement LOSTs simultaneously. In that case, we would have two straightforward — and symmetric — expectations. Higher sales taxes levied at the county level should inhibit the adoption of municipal LOSTs and higher sales taxes levied at the municipal level should inhibit the adoption of county LOSTs. However, the ability to investigate these predictions is complicated if one level of local government receives LOST authorization long before the other. Recall that municipal governments in Oklahoma were authorized to implement LOSTs nearly two decades before counties, and that the overwhelming majority of municipalities had adopted a LOST by 1984. By definition, variation in county LOSTs could not have affected the majority of

¹⁶ For an overview of empirical studies investigating strategic interaction among governments and a more detailed discussion of their underlying causes, see Brueckner (2003).

municipal LOST adoptions in our data. Accordingly, we define the variables *Co_Rate* and *ACo_Rate* to be the level of the tax rate in the parent county and its annual change, respectively, but also later comment on how this variable must be framed in the proper historical context.

To investigate the effect of existing municipal LOSTs on the likelihood that counties adopt LOSTs, we define three related variables. For each county-year, we construct the population-weighted average of municipal rates in the county and label it *Avg_MuniLOST*.¹⁷ We also construct the change in this variable (Δ *Avg_MuniLOST*) as well as its first lagged change (subscripted $t-1$). The historical context frames the performance of these variables. Municipal LOST levels in 1984 are already influenced by the factors identified above. In particular, municipal LOSTs are expected to be high where the capacity to engage in tax exportation is high. This leads directly to two forces that work in opposite directions. On the one hand, county LOSTs should be more attractive in these areas directly because of the strong retail tax base and capacity to export a burden of the tax. However, at the same time, the higher preexisting tax rates should inhibit LOST adoptions for the same reasons outlined above. Most importantly, we must recognize how the historical context could affect this particular result. This also means we must take care in interpreting other results from our county adoptions model, since community characteristics at the county level correlate strongly with their values at the municipal level (i.e., within that county). While there are limitations associated with municipalities receiving taxing authority long before counties, it also provides a unique opportunity. Adoption can be modeled in two environments — one where adopting governments are primarily acting as first-movers and one where they are better characterized as second-movers.

Regarding horizontal fiscal interactions, we expect the likelihood of LOST adoption to be most directly affected by policy decisions made by governments that are nearby. The yardstick competition model suggests that voters are more likely to support a policy if other jurisdictions use the policy. We expect voters will be more aware of policies in nearby communities than for more distant communities. Neighboring counties are defined as those sharing a geographic border. *N_Co_Adopt* is constructed as the average change in neighboring county tax rates due to initial adoptions. For municipalities, we define neighbors as municipalities that share a common parent county, and construct the variable *N_Muni_Adopt* following the same procedure.¹⁸

We expect county adoptions will occur sooner if more neighboring counties have passed subsequent increases in their LOSTs (i.e., increases in the rate not related to an

¹⁷ Our results are robust to the choice of using population weighted or arithmetic averages. An advantage of using a weighted average is that it more closely reflects the taxes levied on a “representative dollar” spent within the county.

¹⁸ We thank an anonymous referee for suggesting that we also calculate these variables using a weighted approach. We weight by population in the county calculation and by magnitude of the retail base in the municipal calculation. Both approaches produce qualitatively similar sets of results in all our estimations. We also tried measures that did not account for the size of rate changes (i.e., only their occurrence) and they also produce similar findings.

initial adoption) and, similarly, that municipalities will be more likely to adopt a LOST if neighboring municipalities have passed subsequent increases. We construct $N_Co_Subsequent$ and $N_Muni_Subsequent$ to reflect only non-adoption related changes. Note that tax competition related factors and policy diffusion/yardstick-competition related factors both work in the same direction and are thus, to some extent, impossible to separate given the nature of our data.

The states bordering Oklahoma had diverse tax policies during our panel, so that unobservable variables could influence voters in jurisdictions near a state border. To control for these factors, we define four dummy variables: TX , AR , MO , and KS .¹⁹ Counties are given a value of one for a dummy variable corresponding to a state for which they share a border. Municipalities are assigned the values of their parent county.

While our framework has identified several important variables that our empirical models will account for, we make no claim that we effectively control for all the factors that could influence the timing of LOST adoptions in our study. For this reason, all our final estimations include year-specific fixed effects. The main advantage of this approach is that it helps insulate the main estimates we are interested in from any bias associated with unobservable factors. The disadvantage is that we are not able to directly investigate vertical spillovers that stem from changes in the state tax rate, as only four such increases occur in our sample.²⁰ However, we place a higher value on accurately estimating county-municipal interactions than we do on obtaining estimates of vertical spillovers due to changes in the state tax rate. Table 1 provides a list of the variables described in this section, along with summary statistics.²¹

IV. LOSTs IN OKLAHOMA

Sales taxes in Oklahoma were first levied at a rate of 1 percent in 1933.²² This was a statewide tax on the purchase (or rental) price of tangible personal property as well as the provision of limited services. Since 1933 the rate has changed five times: increasing to 2 percent in 1936, 3 percent in 1984, 3.25 percent in 1985, 4 percent in 1987, and moving to its current level of 4.5 percent in 1990.

Beginning in 1966, municipalities were authorized to implement LOSTs subject to local voter approval. Figure 2 reflects the nature of adoption patterns and subsequent

¹⁹ As only a single county borders both Colorado and New Mexico, these dummy variables are omitted.

²⁰ We also ran models where year fixed effects were omitted, but a dummy variable for a state rate increase was included. In the municipal model, the state increase dummy reduced the likelihood of adoptions in those four years. While the opposite occurs in the county model, we were not surprised. The state rate increased in the first, second, and fourth year that counties could conceivably adopt a LOST. As any latent demand for adopting a LOST is likely to be satisfied soon after receiving authorization, we view this odd result as a classic case of correlation without causation.

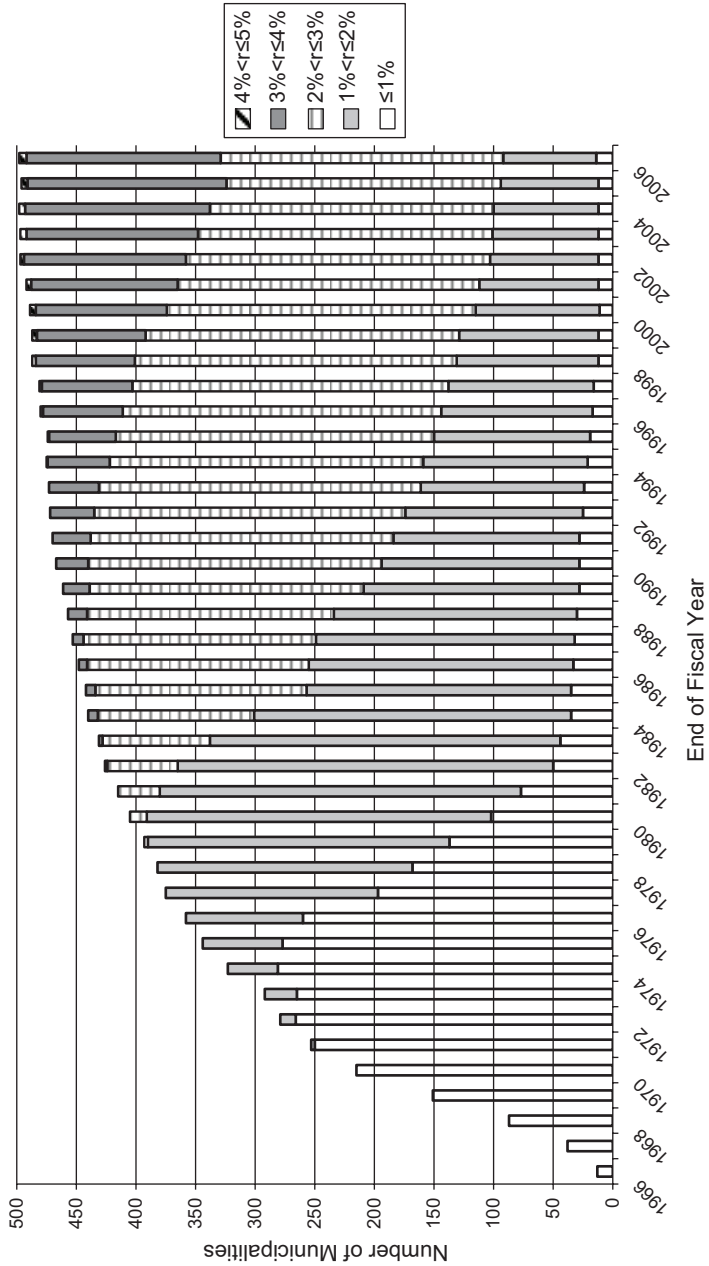
²¹ In Section IV we describe how duration models use only observations up to and including the year of adoption. As such, summary statistics are calculated using only observations that are retained in our final estimations.

²² State, county, and municipal sales tax data were provided by the Oklahoma Tax Commission, at <http://www.tax.ok.gov/>.

Table 1
Variable Descriptions and Summary Statistics

Municipal Variables (N = 4452)	Description	Mean	Standard Deviation
<i>Co_Rate</i>	Level of LOST rate in parent county	0.04	0.19
ΔCo_Rate	Change in LOST rate of parent county from previous year	0.01	0.09
<i>N_Muni_Adopt</i>	Change in average neighboring LOST rates caused by initial municipal adoptions	0.05	0.10
<i>N_Muni_Subsequent</i>	Change in average neighboring LOST rates caused by subsequent changes	0.02	0.07
<i>Reg_Center</i>	Dummy variable indicating if a municipality is classified as a regional retail center	0.02	
<i>TX</i>	Dummy variable indicating if a municipality lies in a county bordering Texas	0.16	
<i>AR</i>	Dummy variable indicating if a municipality lies in a county bordering Arkansas	0.06	
<i>MO</i>	Dummy variable indicating if a municipality lies in a county bordering Missouri	0.03	
<i>KA</i>	Dummy variable indicating if a municipality lies in a county bordering Kansas	0.13	
County Variables (N = 638)			
<i>N_Co_Adopt</i>	Change in average neighboring county LOST rates caused by initial adoptions	0.05	0.11
<i>N_Co_Subsequent</i>	Change in average neighboring county LOST rates caused by subsequent changes	0.00	0.06
<i>Avg_MuniLOST</i>	Average (weighted) municipal LOST rate within the county	1.66	0.58
$\Delta Avg_MuniLOST$	Annual change in <i>Avg_MuniLOST</i>	0.03	0.08
$\% \Delta PTB\ per\ capita$	Annual percentage change in the property tax base	0.04	0.37
<i>Pop_Growth</i>	Annual percentage change in population	-0.01	0.02
<i>AgPTB/PTB</i>	Fraction of property tax base value zoned as agricultural	0.27	0.15
$\% \Delta RSTB$	Annual percentage change in the retail sales tax base	0.10	0.29
<i>RSTB/PTB</i>	Ratio of retail sales tax base to property sales tax base	0.05	0.04
<i>Mean Income</i>	Per capita income within a county (in thousands of dollars)	19.25	3.81
<i>TX</i>	Dummy variable indicating a border with Texas	0.19	
<i>AR</i>	Dummy variable indicating a border with Arkansas	0.07	
<i>MO</i>	Dummy variable indicating a border with Missouri	0.02	
<i>KA</i>	Dummy variable indicating a border with Kansas	0.12	

Figure 2
Local Option Sales Tax Rates: Oklahoma Municipalities 1966–2006



Source: This figure is taken from Burge and Rogers (2011). Sales tax data come from the Oklahoma Tax Commission, <http://www.tax.ok.gov>.

rate increases over the 40 years that followed.²³ LOST adoptions were rapid and, by 1970, over 150 municipalities had adopted the new taxes. During this period LOST rates were uniformly 1 percent. Initial adoptions continued frequently over the next five years, and by 1975 well over 300 municipal governments had adopted. And while the most frequently employed rate was still 1 percent during this period, early signs of higher LOST rates also began to surface in the mid-1970s. By the end of the decade, nearly 400 municipalities had LOSTs and, for the first time, municipal LOSTs exceeding 1 percent were more prevalent than those at or below 1 percent. While the majority of municipal adoptions had taken place by the end of the 1970s, over 75 additional initial adoptions occurred during the 1980s. A relatively smaller number of initial adoptions took place over the two most recent decades.

County governments were authorized to levy countywide LOSTs in 1984.²⁴ By this time, the state tax rate was already 3 percent, and municipal rates exceeding 2 percent were common. An interesting fact is that county LOSTs are limited to a maximum rate of 2 percent and must also be designated for specific purposes outlined in the LOST proposal brought to voters.²⁵ However, as can be seen in Figure 3, the observed pattern of county LOSTs suggests the 2 percent cap is largely non-binding, as only a select few counties have ever reached the cap. County LOST adoption was frequent during the first few years of eligibility and by 1988, 23 counties had programs in place. Somewhat surprisingly, adoptions slowed over the next few years but, starting in 1992, adoptions again became common. By 1995, 50 of Oklahoma's 77 counties had LOSTs in place. And while the past two decades have seen greater variation in levels across counties than was the case during the 1980s, the modal county rate has remained 1 percent throughout our entire sample.

In total, our municipal panel contains 502 municipalities covering the years 1966–2006. We contend this represents complete coverage of the jurisdictions that could have adopted a LOST, such that selection issues are not a problem. While the U.S. Census Bureau lists towns that are not in our sample, most of these communities have fewer than 100 residents, little to no retail activity, and provide no municipal services. As such, we are not treating them as viable taxing entities. Our county panel contains all of Oklahoma's 77 counties spanning the years 1984–2006. The two are linked in the sense that variables in the municipal panel reflect county policies and vice versa. Summary statistics for municipal and county LOSTs in Oklahoma by decade, and for the final year of our panel, are presented in Table 2.

V. A Duration Model Approach to LOST Adoptions

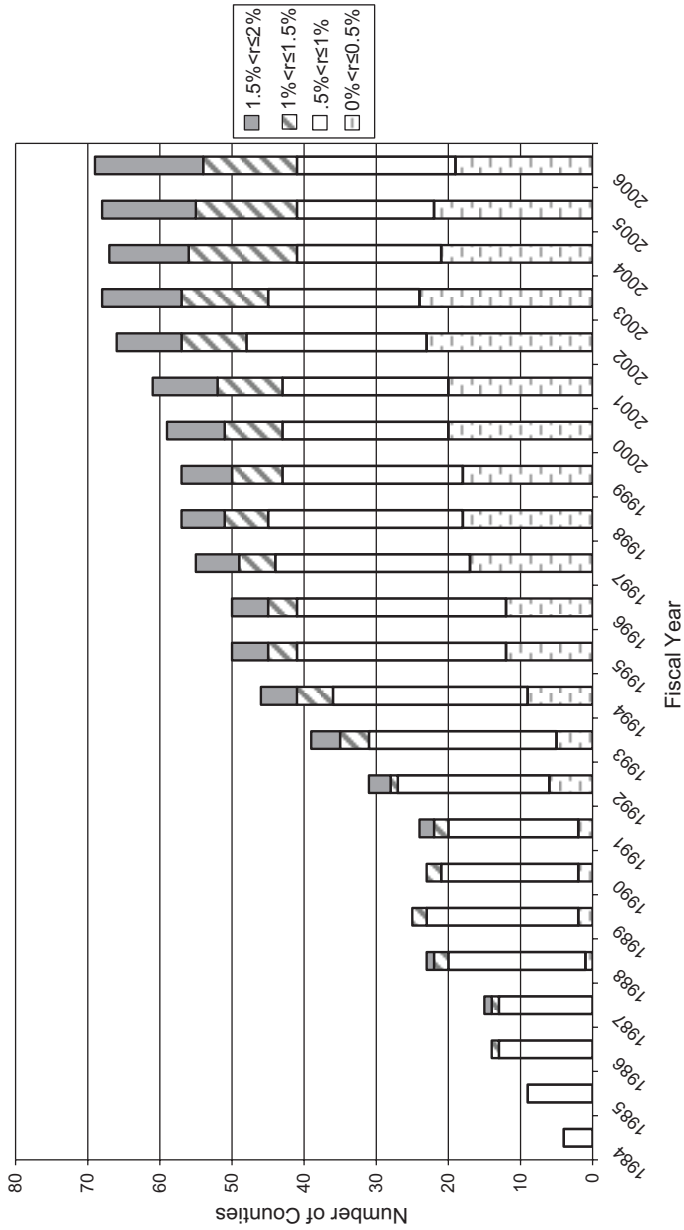
We model LOST adoptions following a standard duration of survival approach. In our application, “survival” corresponds to a jurisdiction that has not yet adopted a

²³ Figures 2 and 3 are taken from Burge and Rogers (2011) who also use panel data on LOST rates and revenues in Oklahoma. The present study investigates the causes of LOST adoptions, while they consider their consequences.

²⁴ Authorization was initially limited to Oklahoma and Tulsa Counties, but the limitation was quickly removed.

²⁵ While municipal LOSTs can be earmarked for specific projects, state law only requires this for county LOSTs.

Figure 3
Local Option Sales Tax Rates: Oklahoma Counties 1984 – 2006



Source: The figure is taken from Burge and Rogers (2011). Sales tax data come from the Oklahoma Tax Commission, <http://www.tax.ok.gov/>.

Table 2
LOST Means and Standard Deviations by Time Period

Time Period	Municipal LOST Rates		County LOST Rates	
	Mean	Standard Deviation	Mean	Standard Deviation
1970–1979	0.428	0.495		
1980–1989	1.420	0.829		
1990–1999	2.376	0.913	0.196	0.389
2000–2006	2.839	0.818	0.577	0.530
2006	3.061	0.765	0.854	0.586
All Years	1.821	1.245	0.248	0.459

LOST. The event occurs only once, when a municipality or county initially implements a LOST.²⁶ As is common in studies investigating policy adoptions, we account for the likelihood of two-way relationships. In the current application, the clearest example is the endogenous relationship between the magnitude of the retail tax base and the presence of a LOST. We previously asserted that higher LOST revenue raising capacity should have a positive impact on LOST adoption. However, consumers prefer lower prices and will react to tax induced price changes. Empirical studies have shown that local sales taxes are fully shifted forward (Poterba, 1996) and even over-shifted on certain commodities (Besley and Rosen, 1999), and that higher sales taxes significantly reduce consumer spending in the implementing jurisdiction (Burge and Rogers, 2011). As such, it is critical that our empirical approach treats the impact of explanatory variables on the duration (i.e., time that passes prior to initial policy adoption) as being distinct from any significant ex post effects the policy itself may have on the explanatory variables. Duration models satisfy this requirement since they remove the observation from the regression once the event has occurred.

We specify a local government's initial adoption of a LOST as a discrete time Cox proportional hazard model (Cox, 1972).²⁷ Adoptions are modeled for municipalities and counties separately. The standard adoption model can be expressed as

$$(1) \quad \lambda_i(t | x_i) = \lambda_0(t) \cdot e^{(x_i' \beta)},$$

²⁶ Two points are worth noting. First, using a survival approach in our application is subject to a drawback. LOST adoption is not identical to other cases where the event is irreversible (birth, death, etc). On rare occasions, we observe LOSTs that lapse. We are not able to capture whether the factors affecting the likelihood of initial adoption also affect the prospects for the policy's permanency. However, over 98 percent of adoptions lead to continual presence thereafter, making it hard to believe anything would be gained by isolating these cases. Second, our data reflects implementation as opposed to the actual passage of LOSTs by voters. While these are not concurrent, our periods (years) are relatively long compared to the typical separation between adoption and implementation. Furthermore, for all of our explanatory variables of interest, we explored the appropriate lag structure in our panel data models.

²⁷ As a large fraction of adoptions are frontloaded in both panels, we confirm our results using an accelerated time model based on a Weibull distribution. These results are similar to those presented and are available upon request.

where $\lambda_i(t|x_i)$ represents the probability of adoption for jurisdiction i as a function of the time varying explanatory variables included in the vector x , and $\lambda_0(t)$ represents the baseline hazard function. A benefit of the proportional hazard model is that the functional form of $\lambda_0(t)$ need not be specified to consistently estimate the marginal effects of covariates. This convenience relies on the fact that, once a proportion is formed of separate hazards in the same time period, the baseline hazard function cancels out. The difference in hazard probabilities between two observations, i and j , in the same period is then given by the expression

$$(2) \quad \frac{\lambda_i(t|x_i)}{\lambda_j(t|x_j)} = \frac{e^{(x_i'\beta)}}{e^{(x_j'\beta)}},$$

which after simplification yields

$$(3) \quad \frac{\lambda_i(t|x_i)}{\lambda_j(t|x_j)} = e^{(x_i' - x_j')\beta}.$$

This formula for the comparison of hazard rates is among the many direct advantages of using the Cox proportional hazard function. Note that positive regression coefficients accompany factors that, when large and positive, are correlated with earlier adoptions. Conversely, negative coefficients imply that large and positive values of the factor lead to later adoptions.

VI. RESULTS

We first present the results of our municipal adoptions model. This allows us to initially discuss the determinants of LOST adoptions when local governments are best characterized as first-movers, before moving to the environment where adopting county governments are better characterized as operating within an environment where LOST programs already exist. All estimated models include year fixed effects. In addition to being significant using a joint F-test, individual dummies for early panel years are positive and generally individually significant, the latest panel years are negative and generally individually significant, and the middle years are small and insignificant. Full results are available from the authors upon request.

A. Municipal LOST Adoptions

Table 3 presents the results of our survival model for municipalities. We predicted local governments would adopt LOSTs earlier if they could effectively engage in tax exportation. Recall that because we do not observe *PTB* for municipalities, our municipal model includes a dummy variable that classifies 30 municipalities as regional centers. Consistent with our expectation, we find that regional centers are significantly more likely to be early LOST adopters than their counterparts.

We also find evidence that vertical spillovers are important; municipalities tend to adopt later when the county rate is high. On the other hand, the change in the county

Table 3
Municipal Regression Results

Variable	Coefficient	Standard Error
<i>Co_Rate</i>	-3.28*	1.91
ΔCo_Rate	2.75	2.36
<i>N_Muni_Adopt</i>	1.24***	0.37
<i>N_Muni_Adopt</i> _{<i>t</i>-1}	1.12***	0.40
<i>N_Muni_Subsequent</i>	-1.25	1.16
<i>N_Muni_Subsequent</i> _{<i>t</i>-1}	1.17	0.83
<i>Reg_Center</i>	1.75***	0.22
<i>TX</i>	-0.24	0.16
<i>AR</i>	0.23	0.18
<i>MO</i>	0.10	0.24
<i>KA</i>	0.18	0.14

Notes: Year fixed effects are included. There are 4,452 observations. Asterisks denote significance at the 10% (*), 5% (**), and 1% (***) levels.

rate is insignificant and displays the opposite sign. We recognize the limitations that are associated with these results due simply to our historical context. Importantly, no variation in county level LOSTs is present over the first 18 years of our panel (when most municipal adoptions occurred). In the post-1984 environment, there is significant variation in county LOSTs, but we readily acknowledge that municipal adoptions occurring during this late portion of the panel are not a representative sample of communities. We argue that in this context, the level variable does a better job of capturing the fiscal spillover effects we wish to identify, while the change in county LOST variable may indicate that both levels of local government are contemporaneously reacting to common unobserved regional shocks that we have not accounted for in the model. We also find a similar pattern in the county adoption models, which provides some support for this interpretation.

We also estimate several additional models (that are not presented but are available upon request) to help us better understand the nature of vertical spillovers in our unique policy environment. First, we interact all of our main variables with a dummy variable equal to one if the year was 1984 or later, and find that the interaction terms are always insignificant. Going further, we separate 1966–1983 adopters and 1984–2006 adopters and run separate models for each group. The earlier sample produces similar findings to those shown in Table 3, other than the results concerning vertical spillovers (since no variation in county LOSTs is present over this period). The 1984–2006 model also produces coefficients that change very little from those found in Table 3,

but the standard errors become much larger, so that statistical significance is generally lost.

Turning to horizontal tax competition effects, we find strong evidence to support the claim that municipalities are likely to adopt LOST programs earlier if their neighbors have also done so. The *N_Muni_Adopt* variable and its first lagged value are both positive (i.e., accelerating adoption) and significant. And while it can be dangerous to interpret contemporaneous correlations as causal effects in many applications, note that the current change would capture situations where neighboring municipalities are jointly influenced by one another during their initial planning stages. Furthermore, the contemporaneous measure should capture any spillover effects that occur quickly. Collectively, we find consistent evidence that factors related to tax competition and policy diffusion/yardstick competition influence municipal LOST adoptions.

On the other hand, we find no evidence that subsequent increases in LOST rates in neighboring cities further influence municipal LOST adoption patterns. It is, however, difficult to draw any real conclusions from this, given our historical context. To test these variables, ideally one would have a large number of subsequent increases in LOST rates while the many initial adoptions were still occurring (i.e., the first decade or so of the panel). However, that is simply not the case, as moving away from 1 percent was extremely rare until the mid-late 1970s.

The lack of additional covariates in the municipal adoptions model means we are not able to account for factors related to fiscal stress and the composition of the property tax base. This leads to understandable concerns that omitted variable bias could be affecting our results. To address this concern, we estimate our county adoptions model with and without community characteristics, to see if the results concerning horizontal and vertical spillovers are affected.

B. County LOST Adoptions

The results from our county adoption models are presented in Table 4. We first discuss the estimated effects of the community characteristics and then move into a discussion of the horizontal and vertical spillovers that are our primary concern.²⁸

Both variables associated with the level of fiscal stress, *%Δ PTB per capita* and *Pop_Growth*, are found to have significant effects on the likelihood of LOST adoption. Consistent with the idea that expansion of the property tax base should be associated with low levels of fiscal stress and delayed adoption of LOST programs, we find that

²⁸ We thank an anonymous reviewer for suggesting we investigate how well our estimated models fit the data. We calculated pseudo R^2 measures for each presented model, following a procedure applicable to survival models developed by Kent and O'Quigley (1988). The statistic for the municipal adoptions model was 0.21. For counties, the full model statistic was 0.78 and the restricted model statistic was 0.75. The enhanced fit of the county models thus does not seem to be driven by the addition of the community characteristic variables.

Table 4
County Regression Results

Variable	Full Model		Restricted Model	
	Coefficient	Standard Error	Coefficient	Standard Error
<i>N_Co_Adopt</i>	0.35*	0.21	0.62***	0.20
<i>N_Co_Adopt</i> _{<i>t</i>-1}	0.64***	0.22	0.74***	0.20
<i>N_Co_Subsequent</i>	-0.04	0.31	0.04	0.24
<i>N_Co_Subsequent</i> _{<i>t</i>-1}	0.43	0.26	0.18	0.22
<i>Avg_MuniLOST</i>	-0.01	0.06	-0.30***	0.05
Δ <i>Avg_MuniLOST</i>	0.22	0.38	1.11***	0.34
Δ <i>Avg_MuniLOST</i> _{<i>t</i>-1}	1.32***	0.46	1.79***	0.45
% Δ <i>PTB per capita</i>	-1.66*	0.96		
<i>Pop_Growth</i>	-9.62***	2.05		
<i>AgPTB/PTB</i>	-0.44*	0.22		
% Δ <i>RSTB</i>	0.40***	0.13		
<i>RSTB/PTB</i>	1.29*	0.68		
<i>Mean Income</i>	-0.15***	0.02		
<i>TX</i>	0.05	0.06	0.11**	0.05
<i>AR</i>	-0.48***	0.14	-0.55***	0.13
<i>MO</i>	-0.53***	0.16	-0.04	0.14
<i>KA</i>	0.62***	0.11	0.08	0.06

Notes: Year fixed effects are included. There are 638 observations. Asterisks denote significance at the 10% (*), 5% (**), and 1% (***) levels.

higher values of % Δ *PTB per capita* are in fact associated with slower progression towards LOST adoption. On the other hand, recall that Section III outlined how sustained population changes in either direction could be associated with fiscal stress. Our results show positive (negative) changes in population are associated with slower (faster) LOST adoption. In estimations that are not presented, but are available upon request, we further investigate the nature of this result. We find the relationship is not sensitive to the length of lag used to measure population changes. Also, we find our result is driven primarily by the negative population growth case. Using changes ranging from one to three years, we interact population growth with a dummy variable indicating whether population growth was negative. The results are highly informative: the estimated effect on the negative population growth channel always gets larger and more significant while the effects on the positive population growth side become insignificant. This decomposition suggests that, at least for the environment considered, communities losing population adopted LOST programs more rapidly than growing or stable communities (who were

not significantly different from one another).²⁹ We also find evidence to support our expectation that, controlling for other factors, higher levels of income in the community slow down the process of LOST adoptions.

Consistent with the results from our municipal model, we find the capacity to engage in tax exportation speeds up LOST adoption. First, note that the sign of the variable *RSTB/PTB* is positive and significant. This is consistent with our theoretical framework that predicted communities with high ratios of *RSTB/PTB* would desire LOST programs since they allow public services to be purchased at a lower effective price than if they are paid for using property taxes. Furthermore, there is evidence that current increases additionally speed up adoption as $\% \Delta RSTB$ is also positive and significant. As both work in the same direction, the total effect is cumulative. As such, our results are consistent with previous studies that demonstrate the capacity to export the tax burden is an important predictor of local tax implementation patterns.

Contrary to our initial expectation, the coefficient on *AgPTB/PTB* is positive and significant. Whereas we expected rural farming communities to more aggressively seek out measures capable of providing property tax relief than other communities, we actually find that communities with large fractions of their property tax base held by agricultural parcels adopt LOST programs later. This initially puzzling result merits discussion. We believe certain links may exist between this variable and two other important factors: the level of fiscal stress and the ability to export the tax burden. For example, assume a rural farming community experiences a positive shock to *AgPTB/PTB* due to an increase in the value of farmland. This scenario would provide a reduction in the current level of fiscal stress in a rural farming community, and we argued LOST adoption would likely be postponed when fiscal stress is low. Another possible explanation stems from the fact that farmland is assessed based upon value in its current use, rather than market value. Remote farmland and agriculturally zoned parcels near the current urban fringe are assessed using the same use-based formula, even if the parcel near other developments would sell for a much greater value. Owners of under-assessed parcels have lower relative effective property tax rates than others, and may not be opposed to the property tax. Furthermore, *AgPTB/PTB* is obviously at its highest levels in rural farming communities, but our data clearly indicate that these same communities also tend to have small per capita retail tax bases. As the capacity to export the tax would be very low in this case, it is not altogether surprising that high values of this variable are associated with delayed LOST adoption. Put another way, while we certainly attempt to control for fiscal stress and tax exportation capacity using

²⁹ It is worth noting how the variable $\% \Delta PTB$ per capita changes as counties gain/lose population. Stable observations (defined as those falling between positive and negative 1 percent population growth) averaged 3.9 percent annual growth in *PTB per capita*. For growing (above 1 percent) and shrinking (greater than 1 percent decline) population observations, the average increases were 2.7 percent and 7.9 percent, respectively. Ideally, our estimated models have sufficient variation from each variable to identify their independent effects.

other measures, we have no reason to believe these other measures are either perfect or exhaustive.

Regarding fiscal interactions, a comparison of the full and restricted models demonstrates that horizontal spillovers are affected very little by the exclusion of community characteristics. In each case we see that higher adoption levels among neighboring counties are associated with more rapid LOST adoptions. This is consistent with the yardstick competition, policy diffusion, and tax competition literatures. However, we find no evidence from either model that subsequent changes in tax rates in neighboring counties affect LOST adoption patterns. This is consistent with the idea that the presence of LOST programs in neighboring counties, but not their levels, influences the path towards adoption. This parallels our municipal model and the caveat we described as framing those results again applies. Additionally, we acknowledge the possibility that variation in LOST rates within counties over time is insufficient to reveal these effects.

While horizontal interactions are stable across the full and restricted models, the results pertaining to vertical spillovers are affected. The full model results contain no evidence that higher levels of taxation at the municipal level inhibit parent county LOST adoption. On the other hand, the level variable in the restricted model consistently follows expectations, suggesting higher municipal LOSTs delay the adoption of county LOSTs. Furthermore, we also find a statistically significant negative coefficient on the *Avg_MuniLOST* variable when we run the full model exactly as presented in Table 4, but without the year fixed effects.

The story developed by our series of estimations seems to be one of weak support for the idea that vertical spillovers matter, but that the result is not very robust. We do not find this ambiguity to be problematic in our particular historical setting. Recall that municipalities had nearly 20 years to implement LOST programs before counties received authority to do so. By 1984, high municipal LOST rates could easily be associated with two paradoxical factors. On the one hand, areas of desirable retail agglomerations could be present within the county. Stemming from a desire to engage in tax exportation, municipal LOSTs would already tend to be higher and more prevalent in these areas. County governments presumably have the same desire to tax the desirable retail base, and would therefore be more likely to adopt LOST programs. On the other hand, cases with high preexisting municipal LOSTs may be associated with areas where municipal governments dominate in terms of service provision, such that county governments play a very limited role. In this case, the exact opposite expectation occurs, as these limited-scope county governments may feel less pressure to adopt LOSTs. To further complicate matters, the change variables in both the full and restricted model reveal a pattern similar to that found in the municipal adoptions model. Recall that in that case we argued there is a good chance these are simply picking up common responses to unobserved regional shocks.

On the whole, we believe it is prudent to place a higher degree of confidence in our finding that horizontal interactions play a role in municipal adoptions than one would place in our results regarding vertical interactions from the county model. We acknowl-

edge this result probably relates to our historical context and would expect to see other patterns surface in cases where county and municipal governments were simultaneously given LOST adoption authority.

VII. CONCLUSIONS

Using a 41-year panel from Oklahoma municipalities and counties, this study investigates the adoption patterns of an increasingly popular and important source of revenue for local governments — the local option sales tax (LOST). Using a duration of survival approach, we explore how vertical and horizontal strategic fiscal interactions affect LOST adoptions, while also controlling for factors related to fiscal stress and the potential to export taxes. Our results suggest that the timing of both county and municipal LOST implementation depends on the characteristics of the implementing government. Specifically, the capacity to engage in tax exportation and the presence of fiscal stress are both shown to accelerate LOST adoption significantly. Additionally, the timing of adoption depends upon the policies of other local governments. Regarding vertical tax competition, we find that taxation at the county level inhibits the adoption of municipal LOSTs, and some weaker evidence that municipal decisions influence the adoption of parent county LOSTs. Our strongest and likely most important results pertain to the nature of horizontal fiscal interactions in this setting. We find strong evidence that the timing of both municipal and county LOST adoptions is significantly affected by horizontal policy spillovers that are consistent with policy diffusion and/or yardstick competition models.

Our study contributes to the literature that investigates the nature of county-municipal horizontal and vertical fiscal interactions as well as to an emerging literature that investigates the determinants of tax policy adoptions. To our knowledge, this study is the first to empirically investigate municipal LOST adoptions and to examine LOST adoptions in an environment where both horizontal and vertical strategic interactions play a significant role. Our results suggest that state legislators should be aware that, following authorizing legislation, LOST programs should surface in jurisdictions possessing the potential to export a portion of the sales tax burden to those living in other communities and within jurisdictions facing fiscal stress. Furthermore, we find that early adopters play a critical role in determining the overall patterns of LOST adoptions over time, due to the significance of horizontal and vertical spillovers.

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