AN EXAMINATION OF LOCAL OPTION SALES TAXES:

ARE LOCAL GOVERNMENTS GETTING LOST?

by

WHITNEY BLAIR SCOTT AFONSO

(Under the Direction of Yilin Hou)

ABSTRACT

This dissertation examines how the use of local option sales taxes affects county governments' fiscal behavior. Local option sales taxes are becoming a popular form of revenue for many local governments; almost eleven thousand local governments have a local option sales tax in place (Tax Policy Center 2006). Therefore, it is important to understand how money generated by local option sales taxes is being used. I examine four different aspects of how local option sales taxes affect a government's revenue and behavior using an interstate data set I collected from thirty-five states at the county level from 1983 to 2004. The use of local option sales taxes and how it relates to property taxes, own source revenue, stability of own source revenue, and when its revenue is earmarked for transportation are explored within my dissertation.

Chapter 2 of my dissertation, entitled "LOST and Found: Local option sales taxes, property taxes, and own source revenue," examines the effect of local option sales taxes on property tax burden and own source revenue per capita. My results suggest that local option sales taxes do reduce property tax burdens as well as increasing own source

revenue, under certain circumstances. Chapter 3, entitled "Diversification Towards Stability? The Effect of Local Sales Taxes on Own Source Revenue," examines the effect of local option sales taxes on the elasticity of own source revenue with regard to median household income. I find that the use of local option sales taxes does increase the elasticity of own source revenue, but the estimated effect is small in magnitude. Chapter 4, entitled "Local Sales Tax Earmarking and Transportation Outlay," examines the use of tax earmarks on spending for the respective program. I find that local option sales taxes, when earmarked for transportation, do distort spending on transportation in the form of an increase.

INDEX WORDS: local sales taxes, property taxes, local governments, public finance

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DEDICATION

This dissertation is dedicated to my family. Thank you to my parents for their support and faith through my long academic career. Thank you to my extended and new family for their help through this time. Finally, thank you to Esteban and TJ for helping me get through this and putting a smile on my face. I am so blessed for all of the wonderful people in my life that helped me get here.

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CHAPTER 1

Introduction

Local option sales taxes (LOSTs) are sales taxes that can be adopted by local governments (school districts, counties, and municipalities for example) after voter approval. The revenue generated by LOSTs is a part of general revenue and can be used at the discretion of local governments. LOSTs were first adopted in the 1930's in New York City and New Orleans but they did not start to become widespread until the 1970's. Currently thirty-six states permit LOSTs and approximately eleven thousand local governments have a LOST in place (Tax Policy Center 2006). Accordingly, when looking at the revenue make-up of local governments they are also becoming more prominent. LOSTs make up seventeen percent of own source revenue at the local level (Mikesell 2010b). Their growing importance requires that their use be examined and studied.

Historically local governments have been dependent on property tax revenue for financing. Even though this has been changing over the years, primarily because of increased dependence on intergovernmental transfers, property tax remains the greatest source of own source tax revenue for local governments; property taxes make up approximately seventy-two percent of own source revenue at the local level (Delisle 2010). However, many local governments have to explore alternate revenue streams due to the current commonality of tax and expenditure limitations (TELs) and increasing demand for services. TELs limit the revenue raising capacity of local governments. Thus, local governments may want to explore alternate forms of taxation, like LOSTs.

The increasing use, and thus importance, of LOSTs is what motivates this dissertation. There has been previous research conducted on the use of LOSTs, but it has mostly been limited to single state analyses and shorter time periods. This is in part due to the difficulty that data collection presents. There are so many local governments and the way they report their LOSTs is so diverse that it makes data difficult and time consuming to collect. Also, LOSTs make up a relatively small fraction of local governments total revenue. Furthermore, there already exists research on sales taxes at the state level of government. However, these state level analyses are not sufficient for understanding the behavior of LOSTs. Local governments have extremely different compositions of revenue and more limitations than their state counterparts. Also, LOSTs are different because of the way they are adopted and modified, which is usually through public referendum.

The research presented in my dissertation differs from previous analyses in several ways including the fact that I have county LOST rates for thirty-five states. I collected the LOST rates by hand and for the most part the data were available from the respective states department of revenue. The reason I only use thirty-five states is because fifteen of the states that allow LOSTs do not have their county rates available over the complete time period. An important question when looking at only a subset of states is: are the ones included representative of the nation? Table 1.1 presents some basic demographics of the states and whether they are included within my analyses. Looking at some of these variables it is clear that the selection bias is minimal. For all of the descriptive demographics like population and income it is evenly distributed; there are no clusters at the bottom or top. The only slight exception is persons per square mile. In the top eight most densely populated states, none of them are excluded from the analysis. The states

that are less densely populated are slightly under represented, however, when looking at the top half and the bottom half of states they are close to equally separated. There are six in the top half and nine in the bottom half.

As a further measure to ensure that there is not a sample selection bias I calculate a Pearson chi-square test statistic for each of the demographic variables listed in Table 1.1. I report these test statistics in Table 1.2. The results suggest that there are no systematic differences between the thirty-five states included in my analysis and the fifteen that are not. This allows for greater confidence in the findings presented in this dissertation.

The number of states included in the following analyses represents a dramatic change. A primary reason for expanding beyond the scope of previous LOST studies is because single state analyses may not be generalizable to other states. For example, studying the state of Georgia may not provide insight into how LOSTs work elsewhere. Georgia has been the focus of many of LOST studies (Jung 2001; Hou and Seligman 2005; Zhao 2005; Sjoquist, Smith, Walker, and Wallace 2007; Zhao and Jung 2008) and it is somewhat unique. Georgia has one very large and sprawling metropolitan area, Atlanta, and a great deal of very rural farm land. Furthermore, it has more county governments than most states; in fact it has almost three times as many as California. This may lead to results specific to Georgia because there may be more catering to specific populations or more competition amongst local governments. People may be more capable of "voting with their feet" than in other states. Although these single state studies are meritorious, by broadening the scope I am able to eliminate some of the state-level biases that may be present and get closer to isolating the real relationships between LOST use and local governments.

Another innovation of this research is that it spans a time period of twenty-one years, 1983 to 2004. So it expands on the previous literature by going beyond state-level analysis and looking at much longer time periods. This allows me to look more accurately at how the adoption of LOSTs and changes to its rates may affect behavior of local governments and provide more robust and reliable results. My dissertation also examines some problems not yet tackled in the literature, like the elasticity of own source revenue when LOSTs are in place and the effect of earmarked LOSTs on spending.

This dissertation is a strong starting place for understanding the use of LOSTs. It does not however address all of the concerns that may face county practitioners. This dissertation focuses on a subset of efficiency issues. There are other important considerations that practitioners should consider, like equity. Sales taxes are inherently regressive and greater reliance on them needs to be carefully evaluated. This is a topic that desires special attention and I do plan on addressing it in future working, so that I can better understand why they are popular and how equity concerns may be incorporated into policies.

I investigate three ways in which the use of a LOST by a county may affect the local government's behavior. In Chapter 2, entitled "LOST and Found: Local option sales taxes, property taxes, and own source revenue," I explore LOSTs relationship with property taxes and own source revenue. I find that LOSTs act both reduce property tax burden and increase own source revenue in some circumstances. For local governments with a maximum LOST rate of 1 percent, property tax burden is correlated with a reduction of $2.17 per capita for a 1 percentage point increase in the LOST rate and own source revenue is also increased by $50.37 per capita. This result is consistent with previous studies.

What is most interesting is that I find that there are two distinct groups, those with maximum LOST rate of 1 or less and those with a maximum rate of over 1. Local governments belonging to the second group use LOST revenue to neither reduce property tax burden nor increase to own source revenue. I hypothesize that the LOST revenue is used to offset reduced own source revenue in times of fiscal stress for the second group of counties.

Chapter 3 entitled "Diversification Towards Stability? The Effect of Local Sales Taxes on Own Source Revenue," examines the impact of LOSTs on the volatility of own source revenue. Modern portfolio theory suggests that diversification will lead to increased stability of revenue. However, for local governments diversifying their tax portfolios almost necessarily means that they are relying less on property taxes. Thus, in the case of local governments they are diversifying away from a very stable and inelastic tax (Groves and Kahn 1952, McCubbins and Moule 2010) and moving towards an elastic sales tax. Therefore local governments may not be moving towards increased stability of own source revenue and may actually be increasing the elasticity of their own source revenue receipts. I examine the effect of local option sales taxes (LOST) on the elasticity of own source revenue with regard to median household income. I find that there is a relationship between increased reliance on LOSTs and increased elasticity of own source revenue, but it is minor in magnitude. A one percentage point increase in the LOST rate increases the elasticity of own source revenue with regard to median household income by 0.002 and by only 0.008 when looking at the elasticity of non-property tax own source revenue with regard to median household income.

Chapter 4 entitled "Local Sales Tax Earmarking and Transportation Outlay" examines the impact of earmarked LOSTs on spending on the respective program, in this case transportation. I explore the fungibility between earmarked local option sales taxes and general revenue. I predict that as the political costs to the budget grow, there will be less compensation from general revenue and revenue generated from the earmarked tax will act as supplemental funding to the recipient programs. I find that counties with local option sales taxes earmarked for transportation (LOST-T) spend more on transportation: a one percentage point increase in the LOST-T rate increases per capita transportation outlay by $40. This is an important result, shedding light on the impact of earmarked taxes which has been inconclusive in the literature.

Table 1.1: Comparison of State Characteristics

State	Permits LOST	Included in Dataset	Population, 2010	Persons 65 years and over, percent, 2010	Female persons, percent, 2010	White persons not Hispanic, percent, 2010	High school graduates, percent of persons age 25+, 2006-2010	Median household income 2006-2010	Persons below poverty level, percent, 2006-2010	Total number of firms, 2007	Persons per square mile, 2010
Alabama	Yes	1	4,779,736	13.8%	51.5%	67.0%	81.4%	$42,081	17.1%	382,350	94.4
Alaska	Yes	0	710,231	7.7%	48.0%	64.1%	90.7%	$66,521	9.5%	68,728	1.2
Arizona	Yes	0	6,392,017	13.8%	50.3%	57.8%	85.0%	$50,448	15.3%	491,529	56.3
Arkansas	Yes	1	2,915,918	14.4%	50.9%	74.5%	81.9%	$39,267	18.0%	238,994	56
California	Yes	1	37,253,956	11.4%	50.3%	40.1%	80.7%	$60,883	13.7%	3,425,510	239.1
Colorado	Yes	0	5,029,196	10.9%	49.9%	70.0%	89.3%	$56,456	12.2%	547,770	48.5
Connecticut	No	1	3,574,097	14.2%	51.3%	71.2%	88.4%	$67,740	9.2%	332,150	738.1
Delaware	No	1	897,934	14.4%	51.6%	65.3%	87.0%	$57,599	11.0%	74,573	460.8
Florida	Yes	1	18,801,310	17.3%	51.1%	57.9%	85.3%	$47,661	13.8%	2,009,589	350.6
Georgia	Yes	1	9,687,653	10.7%	51.2%	55.9%	83.5%	$49,347	15.7%	901,105	168.4
Hawaii	Yes	1	1,360,301	14.3%	49.9%	22.7%	89.8%	$66,420	9.6%	120,374	211.8
Idaho	No	1	1,567,582	12.4%	49.9%	84.0%	88.2%	$46,423	13.6%	151,671	19
Illinois	Yes	0	12,830,632	12.5%	51.0%	63.7%	86.2%	$55,735	12.6%	1,123,817	231.1
Indiana	No	1	6,483,802	13.0%	50.8%	81.5%	86.2%	$47,697	13.5%	482,847	181
Iowa	Yes	1	3,046,355	14.9%	50.5%	88.7%	89.9%	$48,872	11.6%	259,931	54.5
Kansas	Yes	1	2,853,118	13.2%	50.4%	78.2%	89.2%	$49,424	12.4%	237,040	34.9
Kentucky	No	1	4,339,367	13.3%	50.8%	86.3%	81.0%	$41,576	17.7%	337,600	109.9
Louisiana	Yes	0	4,533,372	12.3%	51.0%	60.3%	81.0%	$43,445	18.1%	375,808	104.9
Maine	No	1	1,328,361	15.9%	51.1%	94.4%	89.8%	$46,933	12.6%	150,389	43.1
Maryland	No	1	5,773,552	12.3%	51.6%	54.7%	87.8%	$70,647	8.6%	528,112	594.8
Massachusetts	No	1	6,547,629	13.8%	51.6%	76.1%	88.7%	$64,509	10.5%	596,790	839.4
Michigan	No	1	9,883,640	13.8%	50.9%	76.6%	88.0%	$48,432	14.8%	816,972	174.8
Minnesota	Yes	1	5,303,925	12.9%	50.4%	83.1%	91.3%	$57,243	10.6%	496,657	66.6
Mississippi	No	1	2,967,297	12.8%	51.4%	58.0%	79.6%	$37,881	21.2%	225,977	63.2

Data taken from US Census State and County QuickFacts (2012).

Table 1.1: Comparison of State Characteristics: continued											
State	Permits LOST	Included in Dataset	Population, 2010	Persons 65 years and over, percent, 2010	Female persons, percent, 2010	White persons not Hispanic, percent, 2010	High school graduates, percent of persons age 25+, 2006-2010	Median household income 2006-2010	Persons below poverty level, percent, 2006-2010	Total number of firms, 2007	Persons per square mile, 2010
Missouri	No	1	5,988,927	14.0%	51.0%	81.0%	86.2%	$46,262	14.0%	501,064	87.1
Montana	No	1	989,415	14.8%	49.8%	87.8%	91.0%	$43,872	14.5%	114,398	6.8
Nebraska	Yes	0	1,826,341	13.5%	50.4%	82.1%	90.0%	$49,342	11.8%	159,665	23.8
Nevada	No	1	2,700,551	12.0%	49.5%	54.1%	84.3%	$55,726	11.9%	221,260	24.6
New Hampshire	No	1	1,316,470	13.5%	50.7%	92.3%	90.9%	$63,277	7.8%	137,815	147
New Jersey	No	1	8,791,894	13.5%	51.3%	59.3%	87.3%	$69,811	9.1%	781,622	1,195.5
New Mexico	Yes	0	2,059,179	13.2%	50.6%	40.5%	82.7%	$43,820	18.4%	157,231	17
New York	Yes	1	19,378,102	13.5%	51.6%	58.3%	84.4%	$55,603	14.2%	1,956,733	411.2
North Carolina	Yes	1	9,535,483	12.9%	51.3%	65.3%	83.6%	$45,570	15.5%	798,791	196.1
North Dakota	Yes	1	672,591	14.5%	49.5%	88.9%	89.4%	$46,781	12.3%	61,546	9.7
Ohio	Yes	1	11,536,504	14.1%	51.2%	81.1%	87.4%	$47,358	14.2%	897,939	282.3
Oklahoma	Yes	0	3,751,351	13.5%	50.5%	68.7%	85.4%	$42,979	16.2%	333,797	54.7
Oregon	No	1	3,831,074	13.9%	50.5%	78.5%	88.6%	$49,260	14.0%	348,154	39.9
Pennsylvania	Yes	0	12,702,379	15.4%	51.3%	79.5%	87.4%	$50,398	12.4%	981,501	283.9
Rhode Island	No	1	1,052,567	14.4%	51.7%	76.4%	83.7%	$54,902	12.2%	96,822	1,018.1
South Carolina	Yes	0	4,625,364	13.7%	51.4%	64.1%	83.0%	$43,939	16.4%	360,397	153.9
South Dakota	Yes	0	814,180	14.3%	50.0%	84.7%	89.3%	$46,369	13.7%	76,997	10.7
Tennessee	Yes	1	6,346,105	13.4%	51.3%	75.6%	82.5%	$43,314	16.5%	545,348	153.9
Texas	Yes	1	25,145,561	10.3%	50.4%	45.3%	80.0%	$49,646	16.8%	2,164,852	96.3
Utah	Yes	0	2,763,885	9.0%	49.8%	80.4%	90.6%	$56,330	10.8%	246,393	33.6
Vermont	No	1	625,741	14.6%	50.7%	94.3%	90.6%	$51,841	11.1%	78,729	67.9
Virginia	No	1	8,001,024	12.2%	50.9%	64.8%	86.1%	$61,406	10.3%	638,643	202.6
Washington	Yes	0	6,724,540	12.3%	50.2%	72.5%	89.6%	$57,244	12.1%	551,340	101.2
West Virginia	No	1	1,852,994	16.0%	50.7%	93.2%	81.9%	$38,380	17.4%	120,381	77.1
Wisconsin	Yes	1	5,686,986	13.7%	50.4%	83.3%	89.4%	$51,598	11.6%	433,797	105
Wyoming	Yes	1	563,626	12.4%	49.0%	85.9%	91.3%	$53,802	9.8%	61,179	5.8
Data taken from US Census State and County QuickFacts (2012).											

Table 1.2: Pearson's Chi-Square Test Statistics Examining the Possibility of Sample Selection Bias		
Characteristic	Pearson chi square test statistic	P-value
Population 2010	50.00	0.43
Persons 65 years and over percent 2010	32.06	0.51
Female persons percent 2010	24.70	0.26
White persons not Hispanic percent 2010	50.00	0.36
High school graduates percent of persons age 25+ 2006-2010	36.77	0.57
Median household income 2006-2010	50.00	0.43
Persons below poverty level percent 2006-2010	40.08	0.56
Total number of firms 2007	50.00	0.43
Persons per square mile 2010	47.52	0.49
Data taken from US Census State and County QuickFacts (2012).		

CHAPTER 2

LOST and Found: Local option sales taxes, property taxes, and own source revenue

Introduction

Local governments are responsible for providing some of the most basic and fundamental services that Americans depend on; like police forces, water, public schools, garbage pickup, and fire stations. This makes local governments an integral part of the average citizen's daily life in ways that state or federal governments are not. Not surprisingly, local governments are responsible for approximately thirty percent of government revenue within the United States; with revenue receipts of approximately $1.54 trillion (Williams 2010). Of local governments' total budgets, a third of the revenue is from intergovernmental transfers and half is from the property tax (Williams 2010, Delisle 2010), which means that other forms of revenue like local option sales taxes (LOSTs) and user fees only make up one-sixth of local government revenue. That may not seem substantial but it is over $256 billion dollars.

Although, property taxes remain the primary source of own source revenue for local governments there is increasing diversity in their revenue streams. In the time period between 1983 and 2004, the percentage of own source revenue generated by property taxes decreased by ten percent within the thirty five states being examined in this chapter. While there are many potential reasons for this, the primary reason is that local governments need to expand their revenue raising capabilities which are often restricted

because of legal limits surrounding property taxes. Property taxes are visible and politically unpopular, as evidenced by the wide spread use of tax and expenditure limitations (TELs).

In many states LOSTs are an option available to local governments. LOSTs are sales taxes that can be adopted by local governments (school districts, counties, and municipalities for example) after voter approval. The revenue generated by LOSTs is a part of general revenue and may be used at the discretion of the local government. Currently thirty-six states permit LOST and almost eleven thousand local governments have a LOST in place (Tax Policy Center 2006). At the local level seventeen percent of own source revenue is derived from LOSTs (Mikesell 2010b). Because of the growing importance of LOSTs, it is vital to understand what impacts their adoption and the effect that growing dependence on them will have on local government's revenue streams.

In this chapter I investigate whether the revenue generated by LOSTs acts as a mechanism to reduce property tax revenue or augment it. This is an interesting question because some states that permit their local governments to adopt LOSTs require them in the state statute to use the revenue to reduce property tax burdens. Within the states included in this analysis only Georgia and Texas have a statute in place requiring the revenue to be used, at least in part, for property tax burden. Counties in Texas may issue a sales tax of one-half percent for the purpose of property tax relief (Texas Legislative Council 2002). Georgia makes its local governments display the reduction in the property tax burden due to the use of LOSTs on homeowner's bills (Georgia Municipal Association 2011). In these states there is the presumption that LOST use will reduce property tax burden, however there is still no guarantee. Take Georgia, they must show the reduction in

property tax burden created by LOST revenue of property tax bills, however there is no proof or even reason to believe that the millage rate being used is the rate that would have existed with no LOST in place. The same is true for Texas.

The previous literature finds that some degree of both occurs (Jung 2001; Sjoquist, Walker, and Wallace 2005). Using interstate data from 1983 to 2004 of county governments I hope to shed light on the effect of LOSTs on property taxes and own source revenue. I find that there are two types of local governments that utilize LOSTs. The first has a maximum LOST rate of 1 percent and uses the revenue generated by LOST to both reduce property tax burden and increase own source revenue.

The second type of county has a maximum LOST rate of greater than 1 percent and the revenue generated by LOSTs acts as neither. This is perhaps because of reduced revenue raising capacity created by TELs and economic constraints. If revenue raising capacity is restricted to the point where local governments are not only able to not increase property taxes, but that even with additional revenue being generated from LOSTs, not able to reduce property tax burdens than this result is not surprising. This result may be evidence that there are local governments that are using LOST revenue to merely "tread water" to stay afloat. No matter the interpretation these results suggest that the circumstances under which the two types of county governments adopt LOST is different, and I hypothesize it to be varying levels of fiscal stress.

Literature Review

LOSTs are an opportunity for local governments to diversify their revenue streams. Two of the potential outcomes for local governments who chose to adopt LOSTs and diversify their revenues are: 1) reducing the burden associated with the other taxes

currently in use and 2) increasing own source revenue.[1] To evaluate these two outcomes we need to understand why local governments may choose to diversify in the first place and the nature of the taxes being utilized. In this section I discuss these questions and synthesize the previous research that has been done with regards to the adoption of LOSTs on property tax burden and own source revenue.

According to modern portfolio theory there is an optimal bundle that combines both low and higher risk assets (or in this case revenue streams) to get rid of idiosyncratic risk. Risk is defined as how sensitive returns (or revenues) are to changes in the economy. Ideally, the bundle would include revenue streams that negatively covary, so as one goes up the other goes down and vice versa (Markowitz 1952). This combination of assets, or in this case revenue streams, allows for increased stability in revenue in the face of fiscal variation (White 1983).[2] Diversification is often advocated for increasing revenue stability and budget flexibility (Hendrick 2002). Despite what the theory suggests, there may be trade-offs between stability and growth when diversifying away from reliance on property taxes at the local level (Berg, Marlin, and Heydarpour 2000). Although there is no consensus about the effect of diversification by local governments, there is evidence that it reduces revenue volatility as theory suggests (Carroll 2009).

Local governments may choose to adopt new taxes so that they can reduce their reliance or simply not increase their reliance on their existing taxes as their revenue needs grow. Since seventy-two percent of own source revenue for local governments comes from the property tax (Delisle 2010) it is reasonable to argue that diversification for the sake of

[1] To see a model that shows these two outcomes and the underlying assumptions associated with each, please see Sjoquist, Wallace, and Edwards (2002).
[2] Though modern portfolio theory originates in corporate finance theory and usually assumes that the diversity of assets involved is much greater than it will be in local government revenue streams.

reducing existing tax burdens is an effort to reduce property tax burdens. There is evidence that increased revenue diversity may lead to reduced property tax burdens anywhere between $135 and $12 per capita (Deran 1968; Inman 1979; Ulbrich, Mabry, and Warner 1990; Jung 2001; Sjoquist, Walker, and Wallace 2005).

The wide range of estimates is likely due to the time periods being examined, and the specific samples being used, both of which vary greatly from paper to paper. For example Jung (2001) examines Georgia counties over the time frame of 1984 to 1997 and finds that property tax burden is reduced by $12 per capita. Whereas, Ulbrich, Mabry, and Warner (1990) look at all fifty states in a single year analysis and find that property tax burden per capita is reduced by $135.

Interestingly, Sjoquist, Walker, and Wallace (2005) isolate two groups of cities that behave differently from one another, with no distinguishable differences, using a mixed model analysis. They hypothesize that some cities adopt LOSTs to reduce property tax burdens while others do not. Their results show there are differences in the reduction in property tax burden, but that both groups of cities do reduce their property tax burdens. This warrants further exploration and some initial inquiries into the differences in these two types of governments will be taken in this chapter.

Diversification at the local level may be focused on decreasing reliance on property taxes, but it may also be used to increase revenue and horizontal equity. Thus, LOSTs may increase own source revenue by: 1) expanding their tax base and gain efficiency through decreased economic distortions, 2) increasing own source revenue in times of fiscal pressure, 3) introducing fiscal illusions that create increased revenue complexity that allow governments to collect and therefore spend more, and 4) increasing the elasticity and

growth potential of local governments revenue streams. First, sales taxes have much larger bases than property taxes. Property taxes only tax property owners whereas sales taxes arguably tax all citizens and even have the ability to export some of the burden to consumers who may not live in the jurisdiction. Furthermore, with a larger sales tax base the tax rate can be lower and still generate the necessary revenue. Lower rates cause fewer economic or behavioral distortions amongst taxpayers.

Second, increases in fiscal pressure may create scenarios where local governments need additional revenue. The source of the local government's fiscal pressure may be increases in demand for public goods and services, economic downturns, or decreases in revenue created by restrictions like TELs. The effect of fiscal pressure on the relationship between diversification and increased spending is unclear. In one study, fiscal pressure does not appear to be the motivation for the adoption of LOSTs (Zhao 2005). However, another study finds that fiscal pressure[3] is a factor in the adoption of LOST (Sjoquist, Smith, Walker, and Wallace 2007). If fiscal pressure is one of the motivations for the adoption of LOST it explains why they are becoming so widespread, fifty-nine percent of municipalities say that they experience constraints on their ability to generate the necessary revenue (Hefetz and Warner 2004).

Third, fiscal illusion is another reason that greater revenue diversity may lead to increases in own source revenue and subsequent increases in spending. This is because increased revenue diversification enables governments to expand because the cost of government services becomes less clear to taxpayers (Wagner 1976; Oates 1988, 1991). Although fiscal illusion leads to increases in expenditures in theory, there is no consensus

[3] Though the authors refer to it as fiscal stress not pressure.

within the empirical literature on whether diversification actually does. Wagner (1976), Breeden and Hunter (1985), Turnbull (1998), Jung (2001) and Sjoquist, Walker, and Wallace (2005) find that local governments with greater diversity in their revenue streams experience greater expenditures as the theory predicts. However, Inman (1979) and Carroll (2009) find that diversification of revenues does not have a positive effect on local government's expenditures.

Fourth, since local governments rely heavily on property taxes which are inelastic, it is most likely the case that diversification would lead to increased elasticity. Furthermore, Oates (1975) and Craig and Heins (1980) find that revenue streams with higher elasticity produce higher levels of expenditures. This suggests that even though the literature is divided about the expected effect of diversification on spending, that in the case of LOSTs and local governments, we can expect spending to increase with LOSTs.

So, knowing that adding LOSTs to local governments' revenue portfolio may allow them to increase their own source revenue, how do practitioners proceed? The importance of choosing the correct taxes and maintaining fiscal responsibility are the motivation for this chapter. The results within this chapter provide guidance to practitioners about the state of LOST use and perhaps some of the misconceptions of its use. Property taxes are the foundation of local government's own source revenue and LOSTs are becoming extremely widespread, so they are the focus of this research. They are also appropriate for this analysis because of their politics. Property taxes have become a less attractive revenue source due to their high visibility and unpopularity amongst voters. They are also frequently limited by TELs. Whereas, LOSTs are a good contribution to local government's portfolio and may balance out weaknesses of property taxes. By looking at the use of

LOSTs and how it affects property tax burdens and own source revenue I can take the first step in identifying the relationship between these forms of taxation and fiscal health. To understand these taxes we need to understand both their economic and political aspects.

First, TELs are common and represent a major restriction to the revenue raising capacity of local governments. Currently, forty-six states have TELs that restrict both the types and rates of taxes governments can utilize (Mullins and Wallin 2004) and some local governments have self-imposed TELs (Brooks et al 2007). The most well-known TEL is Proposition 13 from California, which capped the millage rate that local governments can employ. TELs are often viewed as evidence that voters believe that government has grown too large and that they want their local government's spending and/or scope scaled back (Joyce and Mullins 1991) or that voters view the government as unresponsive and budget maximizing (Temple 1996). However, there is also evidence that TELs are not evidence of excess service provision, that voters may even prefer more services; that TELs are simply evidence that voters are unwilling to pay for additional services (Brazer 1981). No matter the reason for adoption, TELs limit the revenue raising capacity of local governments. Thus, local governments may want to explore alternate forms of taxation, like LOSTs.

Second, diversifying revenue portfolios may be advantageous if the correct tax is chosen. Property taxes are inelastic[4] (Groves and Kahn 1952) and despite the recent period of high growth that has been corrected with the 2007 recession, when the property bubble burst, they have the slow growth that is associated with being inelastic (Cornia and Nelson 2010). Property taxes are also slow to adjust to respective income growth, for

[4] In fact, one seminal paper estimates them to have an elasticity of zero (Groves and Kahn 1952).

example it takes approximately three years for property tax revenues to reflect changes in home values because of sluggish assessment cycles (Lutz 2008).

Therefore, local governments may benefit from combining their use of property taxes with a more elastic tax. However, they ideally want a tax that is not too volatile, since they must balance their budgets. Sales tax elasticity is above one in the short run, 1.431, and below one in the long run, 0.732, for non-food retail sales (Sobel and Holcombe 1996). Sales taxes are even more inelastic when food is also taxed; however thirty-eight states either exempt food sales for home consumption or tax it at a lower rate. Within those thirty-eight, six of them allow local governments to tax food sales (CBPP 2009). Sales taxes, with or without food exemptions, have higher growth than property taxes and corporate income taxes and are less volatile than individual income taxes, making sales taxes a good compromise (Cornia and Nelson 2010, Mikesell 2010b). Elastic taxes, like sales taxes, coupled with inelastic taxes, like the property tax, should still produce stable revenue streams while allowing for growth.

Another difference between property taxes and sales taxes is who bears the burden. Depending on whether you view property taxes through the benefit view or new view, you either consider them user fees or as progressive respectively[5] (Zodrow and Mieszkowski 1997). However, there is little debate over sales taxes; they are regressive, but capable of being exported to non-citizens and voters.

Even though diversifying revenue portfolios may create a fiscal revenue illusion, it may also offset one. Property taxes are less accountable and create more fiscal illusion than other forms of taxation. Fiscal illusion, specifically renter illusion, is one consequence

[5] Depending on the benefit bundle.

of property tax use. Non-head of households or non-property owners are not as aware of the full tax price and vote for higher expenditures than they would have otherwise (Goetz 1977, Oates 2005). Reduced accountability can be occur when there are fewer taxpayers than voters in a jurisdiction. These voters who are non-taxpayers face a "zero tax-price and will vote for higher expenditures (compared to a tax-paying decisive voter)" (Gemmell, Morrissey, and Pinar 2002, 202). Property taxes do have smaller bases than other forms of taxation which will lead to more non-taxpaying voters than other forms of taxation. Of course, there are non-taxpayers within the household who are not responsible for paying the tax who may still aware of the burden, i.e. the spouse, so this may diminish the distortion created by non-taxpaying voters (Cullis, Jones, and Morrissey 1993a and 1993b).

So why discuss LOSTs specifically? LOSTs are a unique form of taxation for many reasons. First, they are one of the few taxes that local governments may have available to them, depending on the state's laws. Second, the way in which they are adopted or amended is unusual. All taxes are a part of the political process, but LOSTs are voted on directly by citizens. Third, LOSTs are especially interesting to study because of their, perhaps skewed, perception by voters. They are relatively palatable by voters, and since sales taxes are inherently regressive, one may think that low income voters would reject them. This is not the case. *The explanation may be some sort of fiscal illusion or the idea that the burden can be partially exported.* This potential fiscal illusion will be examined in future work.

Hypotheses and models

LOSTs are adopted to either offset property tax burdens on taxpayers or to increase own source revenue without having to increase property tax burden. Therefore, it is

important to establish whether they actually do. By using a national dataset of counties, not just certain states or large cities, I will help establish the overall effect of LOST use and property tax burden. I expect to find that LOSTs lower the county's reliance on property taxes. This relationship is tested in two ways. First, I look at the effect that LOSTs have on revenue from property taxes per capita and the effect of LOSTs on property tax reliance overall. Second, I look at if LOSTs increase total own source revenue. I hypothesize that LOST will both roll back property taxes [H1] and augment them increasing overall tax revenue for the county [H2].

To test my two hypotheses, that LOST revenue both off-sets and augments property tax revenue, I use a random effects panel estimation and three specifications of the model. The assumption that my counties are independent and identically distributed (i.i.d.) random variables, especially since my time period is twenty-one years long, is one that is not reasonable to make. For this reason I use robust standard errors. Robust standard errors remain valid even when error terms are not i.i.d. (Croux, Dhaene, and Hoorelbeke 2003).

The first is designed to test whether the property tax burden is being rolled back when LOSTs are in place. I estimate my model [M1] with the dependent variable as property tax revenue per capita, PT_{it}. Counties with LOSTs are hypothesized to have lower property tax revenue per capita and this effect should grow as the LOST rate grows. This is especially true since voters must approve LOSTs and many vote on the belief that the county will roll back their property taxes. In fact, some states, like Georgia and South Carolina, it is required that LOSTs reduce the property tax burden.

[M1] $$PT_{it} = \beta_0 + \beta_1 LR_{it} + \gamma EV_{it} + \delta DV_{it} + \theta BV_{it} + \varepsilon_{it}$$

To test whether counties become less dependent on property tax revenue once a LOST is adopted I also estimate my model with the dependent variable as the percentage of total own source revenue coming from property taxes, PPT_{it}. I expect to see that the percentage of own source revenue from property tax revenue goes down as the LOST rate increases [M2]. This is for two reasons: 1) if a LOST is in place it will generate revenue thus own source revenue will increase and even if the property tax revenue is unchanged it should make up a smaller percentage of overall own source revenue and 2) if my first hypothesis is correct and property tax burden is rolled back then property tax revenue should also represent a smaller percentage of own source revenue. The results of [M2] add validity to those of [M1].

[M2] $$PPT_{it} = \beta_0 + \beta_1 LR_{it} + \gamma EV_{it} + \delta DV_{it} + \theta BV_{it} + \varepsilon_{it}$$

Lastly, I estimate a model with total own source revenue per capita, OSR_{it}, as the dependent variable to see if LOST is used to solely reduce property tax revenue or if it also augments it [M3]. If LOST also augments property tax revenue then I expect to see own source revenue increase per capita when LOSTs are in place and for this effect to grow when higher rates are in place.

[M3] $$OSR_{it} = \beta_0 + \beta_1 LR_{it} + \gamma EV_{it} + \delta DV_{it} + \theta BV_{it} + \varepsilon_{it}$$

The three dependent variables are: PT_{it}, PPT_{it}, and OSR_{it} where i is an index for county and t is an index for year. The independent variables of interest are: LR_{it} which is the county's LOST rate, the two lag differences of the LOST rate, a binary variable for whether the state permits its local governments to adopt LOSTs, and a binary variable for if the state has a property tax TEL. There are also three vectors of control variables: EV_{it} represents the economic controls; DV_{it} represents the demographic controls; and BV_{it} represents the binary controls. They are described below in the data section.

Data

To test my hypotheses I use a hand collected data set compromised of thirty-five states from 1983 to 2004 at the county level; these are the states with complete information on county LOST rates for the entire time period. Seventeen of the states in my data set allow counties to implement a LOST and eighteen do not. Table 2.1 has the list of the thirty-five states used in this analysis and whether or not the state allows LOSTs. The remaining fifteen states not included in the analysis do not keep records of the LOST rate by county for the entire period of analysis and are not able to be included. Figures 2.1 and 2.2 are a map of the country and allow us to see the states that are included in this analysis as well as the percentage of the state's counties that have LOSTs at the start of the period and at the end. Clearly counties located within states that permit LOSTs have become more likely to have adopted a LOST over this time period. The thirty-five states included do not systematically differ from the fifteen states excluded. Tables 1.1 and 1.2 provide a comparison of these states with basic demographic differences and I find no evidence of a sample selection bias.

The three dependent variables I use to examine the effect of LOST on property tax revenue are: property tax revenue per capita, percentage of total own source revenue that comes from property tax, and own source revenue per capita. All three of these variables are calculated using data from the U.S. Census Bureau (2010).

The first set of variables necessary to my analyses are comprised of LOST variables. I have two types of LOST independent variables: LOST rate and one and two year lag differences of the LOST rate. The LOST rates were obtained from individual states and sometimes counties, most frequently from the state's Department of Revenue. There are also two state level LOST variables; they are if the state has a property tax TEL (Mullins and Wallin 2004)[6] and if the state allows counties to adopt LOST (Padgitt 2009).

Each of my analyses includes three sets of controls: economic controls, demographic controls, and binary controls. The economic controls are unemployment insurance spending and income. They are both in per capita terms and adjusted by the CPI in real 2000 dollars (Inflation Data 2009). The wage and salary data come from the IRS county income data (2010) and unemployment insurance is taken from the U.S. Census Bureau (2010).

The demographic controls I include are: median age, the percentage of the population that is rural, the percentage of the population that is African-American, the percentage of the population that is male, the percentage of the population that voted for the Republican Senatorial candidate in the previous election respectively, and population density. The electoral data are taken from CQ Voting and Elections (2010). The remainder of the data is taken from the U.S. Census Bureau (2010). These variables are included to

[6] A property tax TEL is given a value of 1 if there is an overall property tax limit, specific property tax rate limit, a property tax revenue limit, or an assessment increase limit.

capture the effect that demographics may have on the dependent variables. I also include two sets of binary control variables: year and state effects. Many of the control variables have been used before in such analyses to control for confounding effects. For example, income and race were important factors in how Atlanta voters decided to adopt a LOST (Biegeleisen and Sjoquist 1988).

The inclusion of the state effects should eliminate the need for state level controls. However, as a robustness check, I run the models with three additional controls: if the state does not have a sales tax, if food is exempted from the sales tax[7], and if there is a state statute that requires some portion of LOST revenue to be used to reduce property tax.

The summary statistics are found in Table 2.2.

To further test the validity of the model I examine the distribution of the residuals. Figure 2.3, 2.4, and 2.5 show the frequency of the residuals from all three models using a histogram plot with a normal curve imposed on top. It is clear that there is not a perfectly normal distribution, but that the distributions of the residuals are approaching normal, though it is leptokurtic.[8] They all also have a mean of zero. This is important because it suggests that the model is appropriate and that the errors are approximately normal and independently distributed.

Results

To test [H1], whether the use of LOSTs reduce property tax burden, I run two models, the results are in Tables 2.3 and 2.4. First, we can look at [M1] whose results are reported in Table 2.3. In this model I test whether the availability of LOST and higher LOST

[7] This is a statewide variable though there are states where it is exempted for the state sales tax but they allow local governments to tax it. For those states it is not coded as an exemption since the unit of analysis is the county level.

[8] This suggests that there is less variation within the observations than expected.

rates lead to reduced property tax burden per capita. The table is broken into three columns of results. The first column presents the results of the regression using all thirty-five states. The second column presents the results of the regression using just the states where LOSTs are not permitted by the state and counties that have a maximum LOST rate of one or below one in the time period being analyzed, this will be referred to as the bottom half. The third column presents the results of the regression analysis using just the states where LOSTs are not permitted and the counties where the maximum LOST rate is above one, this will be referred to as the top half.

The first variable of interest is "state LOST", it is a binary variable and represents whether the state permits the county to issue a LOST. State LOST is not statistically significant in any of the three divisions of the data set. This suggests the mere availability of a LOST does not change the property tax burden per capita, this is as expected.

The second variable of interest is the LOST rate. I expect that as the LOST rate increases by 1 percentage point that property tax burden per capita will be reduced and this is what the results suggest. For the entire dataset, all thirty-five states, the results suggest that as the LOST rate increases by 1 percentage point, property tax burden is reduced by $0.57 per capita. It is statistically significant at the 5 percent level. The results are even stronger when analyzing the bottom half of the data set. The bottom half of the data set is when I examine just the counties where their maximum LOST rate is 1 percent or less. When these counties have a LOST rate of 1 percent, their property tax burden is associated with a reduction of $2.17 per capita. This result is statistically significant at the 1 percent level.

Interestingly, when looking at only the counties with a maximum LOST rate of above one and the counties that are not permitted to have LOSTs, there is no statistically significant effect of the LOST rate on property tax burden per capita. Other scholars in previous analyses find that LOST does reduce property tax burden (Inman 1979; Jung 2001; and Sjoquist, Walker, and Wallace 2005), so my analysis supports that previous finding in part. However, what is most interesting is that this is not the case for the top half of the data set, suggesting that there is something unique about counties with higher LOST rates.[9]

The lag differences are also mostly statistically significant and positive. This may suggest why and when LOST is adopted. I believe their positive effect on property tax burden can be attributed to the financial need of and fiscal pressure on the counties. There is evidence to support this explanation (Sjoquist, Smith, Walker, and Wallace 2007). Therefore, this result suggests that LOSTs are adopted or increased when a county needs additional revenue. Because of this increased need these counties may also have temporarily higher millage rates, resulting in increases in property tax burdens per capita in the short run.

To reinforce the results of the first model I run a second model, [M2], also tests the relationship between LOSTs and property tax revenues. The results of this analysis can be found in Table 2.4. Table 2.4 is also broken into three columns, like Table 2.3. The first variable of interest is state LOST. It is statistically insignificant for the full data set and for the analysis using only the states without LOST and those with maximum rates of 1 percent or less. However, it is statistically significant at the 1 percent level for the analysis using

[9] This may be explained in part by state laws, but since state effects are included in the analysis it should not be a problem.

the top half of the data set. For the top half of the data set, the percentage of own source revenue from property tax revenue increases by 4.25 percent, meaning they are more reliant on property tax revenue than otherwise when states permit local governments to adopt LOSTs. The increased reliance for the top half when LOST is available may demonstrate that these states permit LOST because of excessive property tax burdens. This is not what I expected and once again it signifies that the top half of the data set is distinct from the bottom half.

The second variable of interest is the LOST rate. For a 1 percentage point increase in the LOST rate, the percentage of own source revenue that comes from the property tax decreases by 2.38 percent within the full data set. Looking at the second column, with the results for the bottom half of the LOST rates, the impact is even larger. An increase in the LOST rate of 1 percentage point leads to a reduction in own source revenue from property tax revenue by 9.11 percent. Both coefficients are statistically significant at the 1 percent level. This is in keeping with the results from [M1] and from the previous analyses. However, the coefficient for the LOST rate is not statistically significant for the top half of the data set. This is further evidence that there is something different about the behavior of counties that have a maximum LOST rate of over 1 percent. These results add validity to [M1]'s results.

The lag differences for LOSTs are positive as they were in [M1]; however they are only statistically significant the first year. I believe that this positive relationship is attributable to LOSTs being adopted and/or increased in periods of increased need when higher millage rates may be being utilized.

These results suggest two interesting facts about the nature and use of LOSTs. First, LOSTs do roll back the property tax burden and reduce local governments' reliance upon property taxes. This is the expected finding. Second, they suggest that there is something different in the behavior of counties that limit themselves (or are limited by the state) to a LOST rate of 1 percent or less. There is previous evidence (Sjoquist, Walker, and Wallace 2005) that there may be two types of governments that adopt LOST and whom behave differently. These findings suggest that this is true and one of the distinguishing characteristics is the maximum LOST rate.

The second hypothesis that I test in this chapter, [H2], asserts that own source revenue will increase when LOSTs are adopted or increased. I hypothesize that LOST revenue will also augment property tax revenue. The results are found in Table 2.5 and once again they are mixed. The binary variable, state LOST, is not statistically significant for any of the specifications. So the ability to adopt a LOST does not have an effect of own source revenue and this is as expected.

LOST rate is statistically significant at the 5 percent level for the entire data set and a 1 percentage point increase in the LOST rate has an estimated impact of an increase in own source revenue per capita of $13.35. For the counties with maximum LOST rates of 1 percent or less, an 1 percentage point increase in the LOST rate increases own source revenue per capita by $50.37. The coefficient is statistically significant at the 5 percent level. This is the expected result and suggests that for the bottom half of the data set that LOSTs act to both reduce property tax burden and to augment it thus increasing own source revenue. LOST rate does not have a statistically significant effect on own source revenue when looking at the top half of the data set. Similar to the results of [M1] and

[M2], the results of [M3] indicate different behavior for the top half and the bottom half of the data set.

The lag differences for 1 year are statistically insignificant across the board in [M3], however the 2 year lag differences are statistically significant at the 1 or 5 percent level for all three specifications. All of the 2 year lag differences have negative coefficients. Once again, this suggests that LOSTs are adopted and/or increased in times of fiscal distress. This result reinforces the results found testing [H1], where the lag differences have a positive effect on property tax burden. Together the three sets of results paint a picture of fiscal strain and help in understanding why LOSTs are adopted and/or increased by local governments.

Are there alternative explanations to why own source revenue may not increase when LOSTs are adopted and/or increased? Yes. Median voter theory suggests that if the median voter is not a taxpayer spending will be higher, all else being equal. The results show that overall, own source revenue is not increased when LOSTs are introduced. This may be explained by the fact that sales taxes have a much larger base than property taxes and so the median voter is more likely to be paying LOSTs than property taxes.

If taxpayers are more aware of the cost of government services, this awareness may act to limit increases in expenditures, and thus own source revenue. This is further supported by the fact that counties with lower LOST rates, so presumably lower sales tax burden for the median voter, experience increases in own source revenue and those with higher LOST rates, so presumably higher sales tax burdens for the median voter, do not have increases in own source revenue. The results presented in this chapter support

median voter theory and its application to our understanding of fiscal illusion and accountability.

In Table 2.6 are the results of the models run for the bottom half of the dataset as an example of the robustness checks performed. Table 2.6 has all three of the hypotheses being tested included. The effect of the LOST rate on all three dependent variables being tested remains statistically significant. The magnitude and the direction of the effect remain very close. For the first hypothesis, the effect of LOST on property tax, the magnitude is very close, but slightly greater when the controls are in place. The effect of LOST rate on own source revenue is even less changed. The magnitude is approximately $0.30 less when the state level controls are included.

I also run all three specifications using a fixed effects model for the entire dataset.[10] The estimated coefficients are largely unchanged. The estimated coefficient for a 1 percentage point change in the LOST rate on property tax revenue per capita is $0.54 for fixed effect and $0.57 for random effects. Both estimates are statistically significant at the 1 percent level. A 1 percentage point increase in the LOST rate decreases the percentage of own source revenue that comes from property taxes by 2.25 with fixed effects estimation and by 2.38 with random effects. Both estimates are statistically significant at the 1 percent level. A 1 percentage point change in the LOST rate is expected to change per

[10] I also run a Hausman specification test for each specification of the model. The results are mixed. When the dependent variable is own source revenue per capita the Hausman test cannot be calculated because the model specification does not meet the asymptotic assumptions necessary. So I modified it an ran it with both variance matrices based on the efficient estimator and calculated a chi square of 149.01 and reject the null. For the second specification where the dependent variable is the percentage of own source revenue from the property tax there is an estimate chi square of 31.33 where I fail to reject the null which supports the use of random effects. The final specification when property tax revenue per capita is the dependent variable I obtain a chi square of 46.98 which is statistically significant at the 5 percent level. This suggests that the results of random effects are not efficient estimators. These results suggest that moving forward I may need to reconsider my estimation techniques.

capita own source revenue by $13.85 instead of the $13.35 that random effects reports. Both estimates are statistically significant at the 5 percent level.

Conclusion

LOSTs have become common over the last few decades, but there is still a great deal unknown about how their adoption and use impacts local government's behavior. This chapter explores the impact of LOSTs on property tax revenue and own source revenue. It examines the question of what the additional revenue provided by LOSTs acts as; if it reduces or augments property tax revenue per capita. My results are mixed, but I find that LOST revenue acts as both under certain circumstances.

I find that there are two distinct types of local governments; for one type LOST revenue acts both as a means to reduce property tax burden as well as a way to increase own source revenue and for the other type of local government it acts as neither. Previous literature has suggested that there are two types of local governments and that they behave differently with regard to their treatment of LOST revenue (Sjoquist, Walker, and Wallace 2005) and the effect of fiscal stress has not been conclusive (Zhao 2005; Sjoquist, Smith, Walker, and Wallace 2007), my analysis contributes another piece to both puzzles.

LOST revenue does indeed act to reduce property tax burden when analyzing the entire data set which is consistent with the previous literature. Looking at all thirty-five states from 1983 to 2004, as the LOST rate increases by 1 percent the property tax burden per capita is reduced by $0.57. This relationship is larger in magnitude for those counties with a maximum LOST rate of 1 percent, where there is an associated $2.17 decrease in property tax burden per capita. This too is in keeping with the previous research.

However, LOSTs do not appear to reduce the property tax burden for counties where the maximum LOST rate is above 1 percent. These results are reinforced when looking at the share of own source revenue that comes from property taxes. For the entire data set, an increase in the LOST rate of 1 percent decreases the percentage of own source revenue from property taxes by 2.38 percent, and by 9.11 percent for the counties with a maximum LOST rate of 1 percent. The LOST rate does not have a statistically significant effect on the percentage of own source revenue that comes from property taxes for counties with maximum LOST rates above 1 percent.

When looking at total own source revenue, I once again find that counties with maximum LOST rates of 1 percent behave differently than those with maximum rates above 1 percent. A 1 percentage point increase in the LOST rate increases own source revenue by $50.37 per capita for counties with a maximum LOST rate of 1 percent. LOST rate has no effect on own source revenue for those counties with a maximum LOST rate of over 1 percent. When looking at the entire dataset of thirty-five states I find that it does also increase own source revenue per capita by an estimated $13.35.

While this chapter answers some questions, it raises others. Primarily, why do counties with maximum rates of over 1 percent behave so differently than those with maximum rates of 1 percent? I speculate that the difference is due to why LOSTs are being adopted. I believe that counties who adopt LOSTs and have rates no greater than 1 percent are doing so to diversify their tax portfolios and roll back property taxes. Whereas, I believe counties that choose to adopt LOSTs with rates over 1 percent are doing so because of diminished revenue raising capacity and increased financial need. Another explanation for the differences in the two types of governments with regard to the effect of LOST rates

on own source revenue is median voter theory. The next step in this research is to test these theories and try to identify why these two groups are so dissimilar.

Figure 2.1:

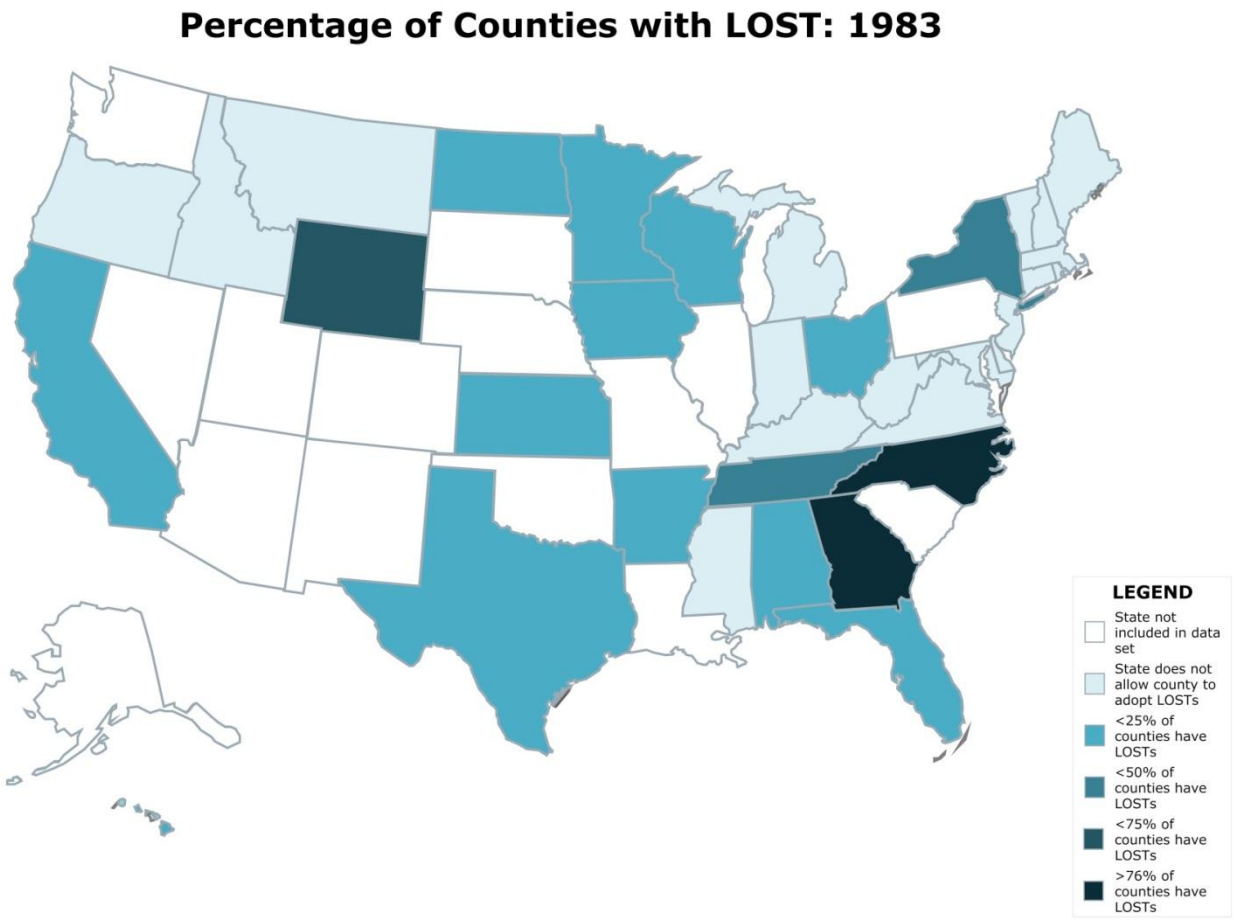

Percentage of Counties with LOST: 1983
LEGEND
State not included in data set
State does not allow county to adopt LOSTs
<25% of counties have LOSTs
<50% of counties have LOSTs
<75% of counties have LOSTs
>76% of counties have LOSTs

Figure 2.2:

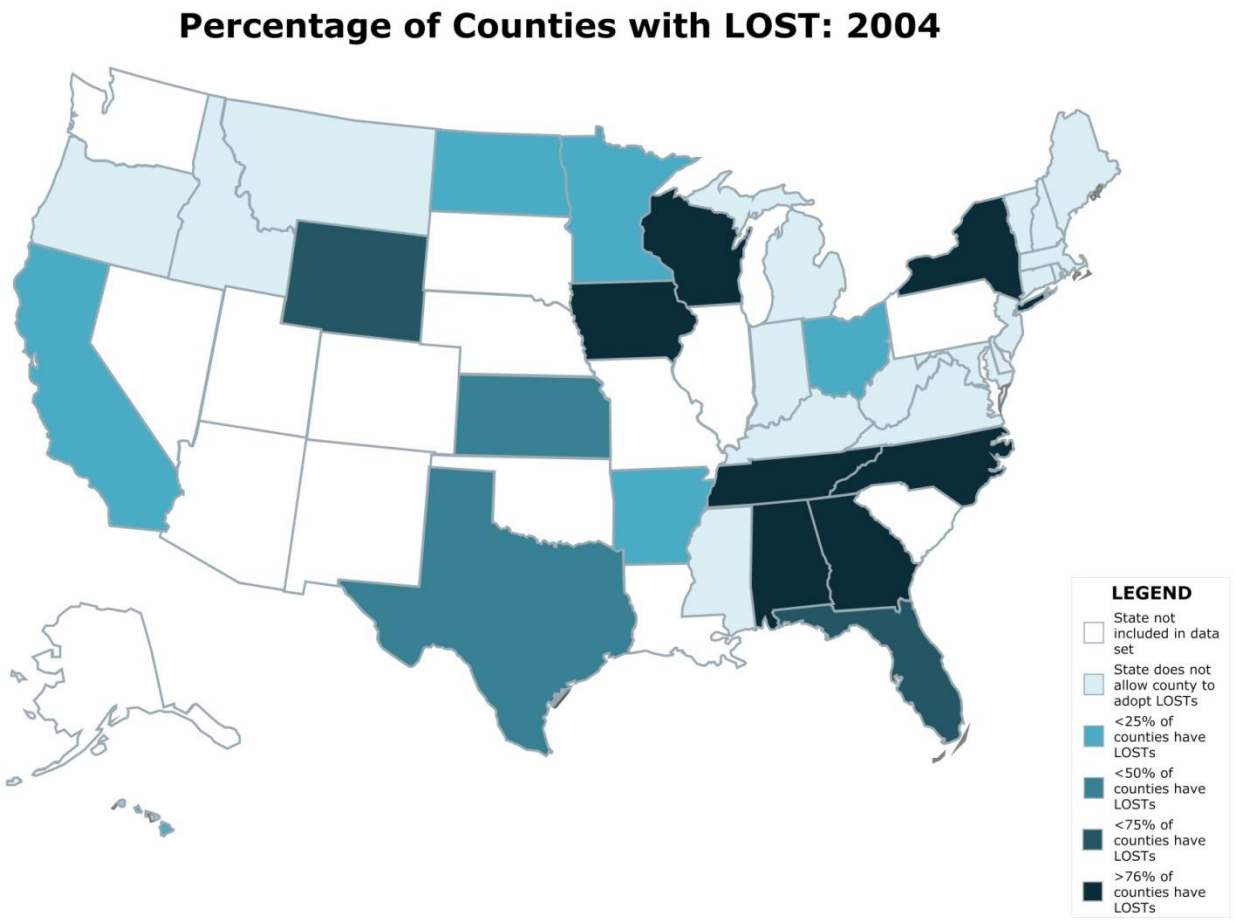

Percentage of Counties with LOST: 2004
LEGEND
State not included in data set
State does not allow county to adopt LOSTs
<25% of counties have LOSTs
<50% of counties have LOSTs
<75% of counties have LOSTs
>76% of counties have LOSTs

Figure 2.3: The Distribution of the Residuals when Property Tax Revenue per capita is the Dependent Variable with Normal Curve

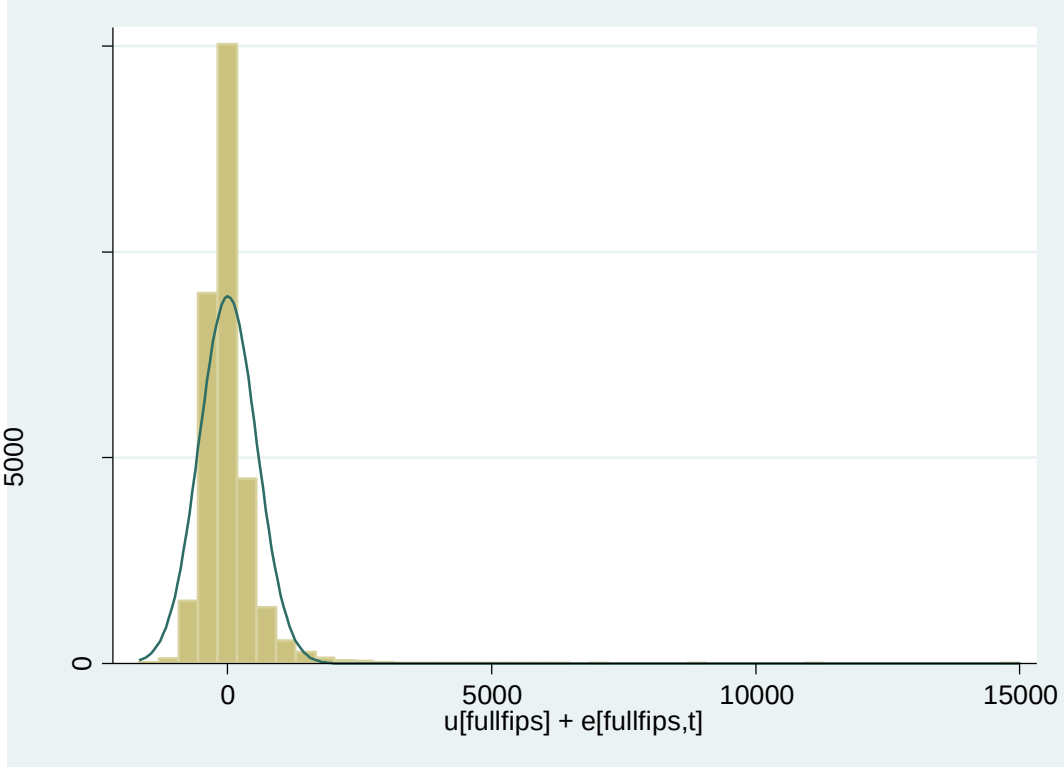


Figure 2.4: The Distribution of the Residuals when Percentage of Own Source Revenue from Property Tax Revenue is the Dependent Variable with Normal Curve

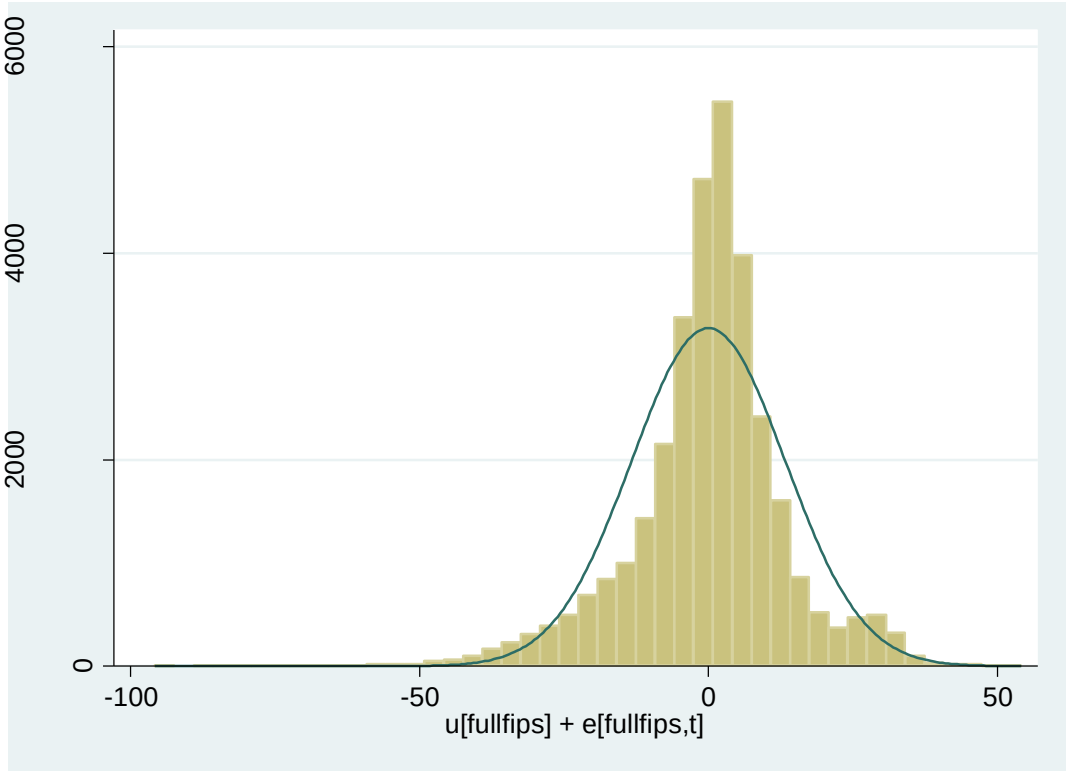


Figure 2.5: The Distribution of the Residuals when Own Source Revenue per capita is the Dependent Variable with Normal Curve

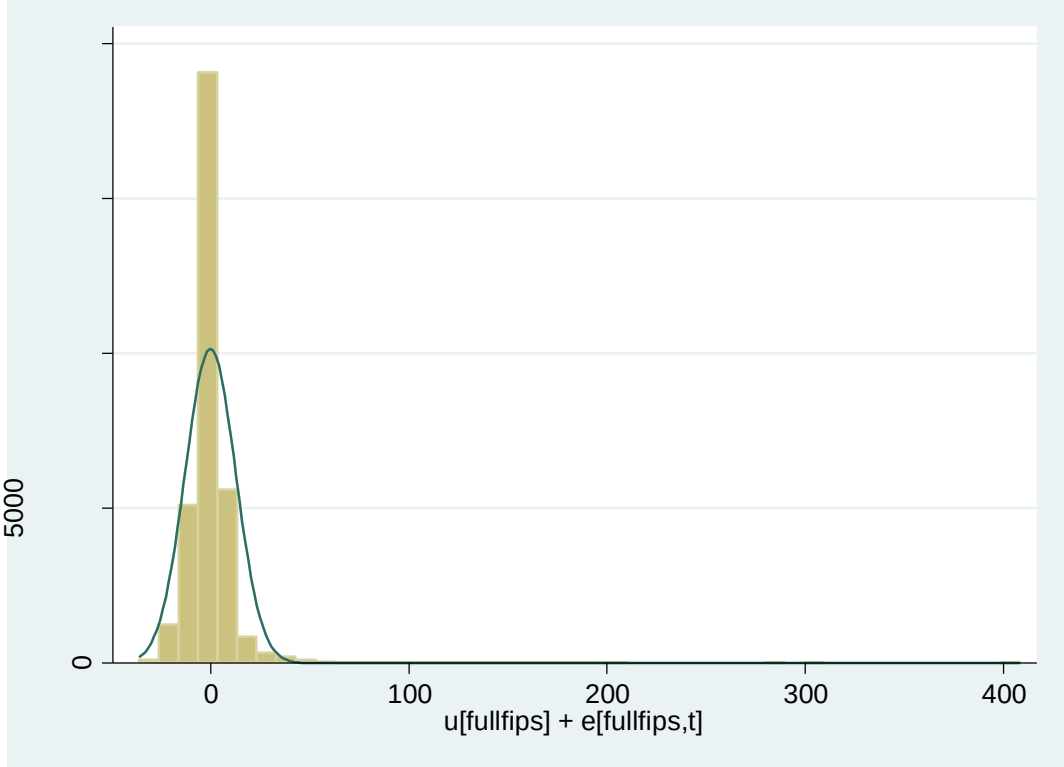


Table 2.1: States included in data set and whether they have LOSTs	
State	Permits LOST
Alabama	Yes
Arkansas	Yes
California	Yes
Connecticut	No
Delaware	No
Florida	Yes
Georgia	Yes
Hawaii	Yes
Iowa	Yes
Idaho	No
Indiana	No
Kansas	Yes
Kentucky	No
Massachusetts	No
Maryland	No
Maine	No
Michigan	No
Minnesota	Yes
Missouri	No
Missippi	No
Montana	No
North Carolina	Yes
North Dakota	Yes
New Hampshire	No
New Jersey	No
Nevada	No
New York	Yes
Ohio	Yes
Oregon	No
Rhode Island	No
Tennessee	Yes
Texas	Yes
Virginia	No
Vermont	No
Wisconsin	Yes
West Virginia	No
Wyoming	Yes

Table 2.2: Summary Statistics of all 35 States					
Variable	Variable Description	Mean	Std. Dev.	Min	Max
Property Tax	Property Tax Revenue per capita in $100	18.834	83.708	0.000	5365.612
Percentage from Property Tax	Percentage of Own Source Revenue from Property Tax	78.186	21.027	0.000	100.000
Own Source Revenue	Own Source Revenue per capita	1103.398	1191.522	0.473	62357.200
State LOST	If the County has the Option of Implementing LOST, binary	0.697	0.460	0.000	1.000
LOST Rate	Local Option Sales Tax Rate	0.352	0.775	0.000	8.000
Property Tax TEL	If the state has a tax or exependiture limit for property taxes	0.912	0.283	0.000	1.000
Income	Real per capita income	12616.040	6405.741	1913.579	88323.550
Unemployment Insurance	Unemployment Insurance Spending per capita in $100	0.086	0.063	0.000	0.935
Age	Median Age	37.354	3.967	20.000	54.300
Rural	Percentage of the county characterized as Rural	0.608	0.303	0.000	1.000
Black	Percentage of the county characterized as Black	0.088	0.145	0.000	0.865
Male	Percentage of the county characterized as Male	0.496	0.019	0.426	0.673
Density	County Population per square mile	164.981	500.744	0.053	13092.910
Republican	Percentage of the County that voted for the Republican Candidate in the Last Senatorial Election	0.499	0.217	0.000	1.000

Table 2.3: The Effect of LOSTs on Property Tax Burden per capita using County Level Data and Random Effects

Variable Name	Entire Data Set	Bottom Half of LOST Rates	Top Half of LOST Rates
State LOST	-0.328	-0.014	-0.336
	[0.371]	[0.393]	[0.343]
LOST Rate	-0.565	-2.174	-0.186
	[0.249]**	[0.573]***	[0.226]
LOST lag difference: 1 yr	0.188	0.420	-0.129
	[0.108]*	[0.148]***	[0.100]
LOST lag difference: 2 yr	0.519	0.613	0.331
	[0.161]***	[0.228]***	[0.131]**
Property Tax TEL	-0.265	1.731	-4.783
	[5.657]	[5.664]	[8.127]
Income	0.001	0.001	0.001
	[0.000]***	[0.000]***	[0.000]***
Unemployment Insurance	11.605	5.826	9.658
	[3.551]***	[3.957]	[3.147]***
Age	0.140	0.107	0.136
	[0.093]	[0.096]	[0.093]
Rural	11.334	11.935	10.732
	[1.492]***	[1.536]***	[1.493]***
Black	0.289	-0.558	3.991
	[2.312]	[2.538]	[2.365]*
Male	-5.287	-9.701	-12.947
	[11.873]	[11.890]	[13.789]
Density	0.005	0.004	0.008
	[0.002]**	[0.002]*	[0.002]***
Republican	1.767	2.322	1.564
	[0.542]***	[0.596]***	[0.632]**
Constant	14.824	16.989	13.950
	[8.146]*	[8.261]**	[9.090]
N	32,891	27,764	25,997

The robust standard errors are in parantheses below the estimated coefficents.

* Significant at 10% level, ** Significant at the 5% level, *** Significant at the 1%

All regressions include state and year effects. All three regressions include states that do not have LOSTs.

Table 2.4: The Effect of LOSTs on the Percentage of Own Source Revenue that comes from Property Taxes using County Level Data and Random Effects

Variable Name	Entire Data Set	Bottom Half of LOST Rates	Top Half of LOST Rates
State LOST	-0.967	-0.163	4.251
	[0.619]	[0.530]	[0.329]***
LOST Rate	-2.378	-9.111	-0.412
	[0.493]***	[0.869]***	[0.547]
LOST lag difference: 1 yr	1.419	1.352	0.624
	[0.240]***	[0.313]***	[0.261]**
LOST lag difference: 2 yr	0.178	0.580	0.007
	[0.268]	[0.362]	[0.301]
Property Tax TEL	0.962	7.192	-22.381
	[3.509]	[3.109]**	[6.783]***
Income	0.000	0.000	0.000
	[0.000]	[0.000]	[0.000]
Unemployment Insurance	0.597	-5.151	-3.713
	[3.008]	[3.248]	[3.524]
Age	0.048	0.094	0.155
	[0.069]	[0.074]	[0.077]**
Rural	7.047	5.982	8.336
	[1.057]***	[1.140]***	[1.160]***
Black	4.135	3.167	6.604
	[2.549]	[3.021]	[2.626]**
Male	-4.496	-4.101	7.568
	[15.040]	[16.680]	[15.577]
Density	0.003	0.001	0.001
	[0.001]**	[0.001]	[0.001]
Republican	-0.518	-0.933	-1.629
	[0.548]	[0.574]	[0.610]***
Constant	65.823	62.877	52.629
	[8.529]***	[9.309]***	[9.538]***
N	32858	27733	25970

The robust standard errors are in parantheses below the estimated coefficents.

* Significant at 10% level, ** Significant at the 5% level, *** Significant at the 1%

All regressions include state and year effects. All three regressions include states that do not have LOSTs.

Table 2.5: The Effect of LOSTs on Own Source Revenue per capita using County Level Data and Random Effects			
Variable Name	Entire Data Set	Bottom Half of LOST Rates	Top Half of LOST Rates
State LOST	14.688	-3.942	4.544
	[18.263]	[18.709]	[13.477]
LOST Rate	13.351	50.371	16.084
	[11.260]**	[24.536]**	[11.587]
LOST lag difference: 1 yr	0.759	-1.731	-4.433
	[4.346]	[5.421]	[4.239]
LOST lag difference: 2 yr	-18.303	-12.732	-21.921
	[5.246]***	[6.438]**	[5.913]***
Property Tax TEL	1,331.741	1,338.538	1,546.022
	[165.182]***	[166.867]***	[291.763]***
Income	0.040	0.036	0.043
	[0.005]***	[0.005]***	[0.004]***
Unemployment Insurance	430.940	470.668	520.536
	[154.675]***	[170.887]***	[182.732]***
Age	6.998	6.137	9.614
	[3.585]*	[3.728]*	[3.790]**
Rural	-40.580	1.495	-121.199
	[53.054]	[54.700]	[53.473]**
Black	134.493	64.906	267.326
	[88.221]	[96.618]	[87.972]***
Male	37.881	-49.551	-308.184
	[656.406]	[671.317]	[693.727]
Density	0.128	0.104	0.090
	[0.056]**	[0.046]**	[0.056]
Republican	31.151	33.200	4.879
	[23.016]	[25.408]	[25.952]
Constant	-1,281.910	-1,076.535	-1,484.092
	[417.534]***	[427.164]**	[488.970]***
N	32,891	27,764	25,997

The robust standard errors are in parentheses below the estimated coefficients.

* Significant at 10% level, ** Significant at the 5% level, *** Significant at the 1%

All regressions include state and year effects. All three regressions include states that do not have LOSTs.

Table 2.6: Robustness Check- The Effect of LOSTs on Property Tax and Own Source Revenue per capita using County Level Data and Random Effects with additional state controls- Bottom Half

Variable Name	Property Tax Burden per capita	Property Tax as a % of OSR	Own Source Revenue per capita
State LOST	0.304	-0.496	-4.186
	[0.319]	[0.433]	[14.112]
LOST Rate	-3.126	-12.410	50.600
	[0.454]***	[0.885]***	[23.156]**
No State Sales Tax	8.906	11.172	153.368
	[2.218]***	[1.079]***	[78.794]*
Exempt Food	-0.814	-3.048	-78.757
	[0.826]	[0.809]***	[26.614]***
State Statute for Property Tax Reduction	4.938	-4.549	315.646
	[0.936]***	[1.180]***	[35.518]***
Property Tax TEL	-9.470	1.172	-31.336
	[1.228]***	[1.245]	[28.452]
N	38,390	38,287	38,390

The robust standard errors are in parentheses below the estimated coefficients.

* Significant at 10% level, ** Significant at the 5% level, *** Significant at the 1%

All regressions include state and year effects. All three include Income, Unemployment Insurance, Age, Rural, Black, Male, Density, and Republican. All three regressions include states that do not have LOSTs.

CHAPTER 3

Diversification Towards Stability? The Effect of Local Sales Taxes on Own Source Revenue

Introduction

Local governments are facing challenging economic times. They must cope with many difficulties including limitations on the types of taxation they are permitted to use, the rates and total revenue collections that they may institute, economic downturns, and greater demand for their services. Therefore the search for additional revenue streams is becoming a reality for many local governments. However, taxes behave differently and have different characteristics from one another: for example they may be elastic, have large bases, be visible, and/or be regressive. Thus, understanding how the choice of taxes may affect the stability and potential for growth of local governments' revenue is becoming more critical than it has been in the past.

Traditionally property taxes make up the greatest share of own source revenue for local governments and they continue to make up seventy-two percent of local governments' own source revenue (Delisle 2010). Local governments have benefited from this dependence because property taxes are considered inelastic (Groves and Kahn 1952, McCubbins and Moule 2010) and a stable source of revenue. However tax and expenditure limits (TELs) are in place in forty-six states (Mullins and Wallin 2004) forcing local governments to expand their revenue sources to include other and, by default, taxes that are more elastic. One form of revenue that is becoming more popular and relied upon is local option sales taxes (LOSTs). Currently thirty-six states permit local governments to

institute a local sales tax and approximately eleven thousand local governments have LOSTs (Tax Policy Center 2006).

A natural question is: do these LOSTs allow states to expand their revenue raising capacity, or do they simply act as a way to reduce burdens on other forms of taxation like the property tax? The evidence largely suggests LOST revenue is used as both (Ulbrich, Mabry, and Warner 1990; Jung 2001; Sjoquist, Walker, and Wallace 2005). However, there is little known about the effect of greater reliance on LOST revenue on the stability of local governments' own source revenue. This question is especially interesting because there is evidence that suggests that diversification of revenue streams will lead to greater stability (Hendrick 2002, Carroll 2009). On the contrary, sales taxes are more elastic than property taxes making them a less stable form of taxation. Greater elasticity can cause more variability in tax receipts throughout economic cycles: larger increases in the "good" times and larger decreases in the "bad." Despite the attractive elements of a sales tax, like a large tax base and relative popularity, the cost in stability may be too great for local governments who face balanced budget requirements.

In this chapter I examine the effect of LOSTs on the elasticity of own source revenue per capita with respect to median household income. I hypothesize that substitution away from the property tax towards a LOST will increase the elasticity of own source revenue for the local governments that choose to adopt a LOST and/or increase its rate. I find that an increase in the LOST rate by 1 percentage point does increase the elasticity of own source revenue but the increase is small in magnitude. The impact of the LOST rate is four times larger when looking at the elasticity of non-property tax own source revenue, but is still small in magnitude. These results suggest that increased dependence on sales taxes does

increase the elasticity of own source revenue, as hypothesized, but perhaps not so much that it justifies avoidance by local governments as a potential revenue stream. Furthermore, the estimated effect remains small even when removing the bulk of own source revenue, the property tax, implying that the small magnitude is not simply a byproduct of the fact that LOSTs constitute only about twenty percent of own source revenue.

Literature Review

> *"Adequacy of tax revenue involves stability of revenue in periods of recession but also growth in revenue to finance increases in government goods and services demanded by an increasing society. These two goals are clearly in conflict as the growth criterion requires that tax revenues be responsive to changes in income, while the stability criterion requires that they be unresponsive to an economic slowdown which is also measured by changes in income"* (White 1979, 205).

In the face of conflicting goals how can local governments manage their tax portfolios? One strategy is diversification: coupling taxes that are stable and inelastic with ones that have greater growth and are more elastic. However, increased elasticity makes taxes more volatile. The bulk of the tax base for local governments is the property tax, so the decision is what taxes to add, if any. Of course, in the face of tax limitations or TELs many local governments may have no choice but to add additional revenue streams or dramatically reduce their spending. This is what has been observed in previous research; states and local governments have become increasingly dependent on sales taxes, income taxes, and user fees when there are TELs in place (Schwartz 1997, Thompson and Green 2004).

If local governments are considering diversifying their tax portfolio they need to understand how the taxes available to them will behave and how those taxes may interact

with their existing taxes. Financial managers and policymakers should consider if the increased revenue generated from the new tax will create more complexity and fiscal illusions and if the additional revenue will reduce the tax effort of the other taxes. The potential fiscal illusions created and the relationship between diversification and tax effort by property taxes and, in this case, LOSTs has been explored elsewhere (Jung 2001; Sjoquist, Walker, and Wallace 2005; Hendrick 2002; Carroll 2009). However, what remains an equally important question is how does diversification at the local level actually affect revenue volatility and what is the impact that diversification has on own source revenue elasticity.

Diversification is often touted to be a performance increasing behavior. This is because it is believed to result in revenue growth and improved performance by increasing revenue stability. Stability is improved by removing some of the risk that is associated with dependence on a limited number of revenue sources (White 1983, Hendrick 2002). Classic modern portfolio theory evolved out of financial economics where it theorizes that investing in different stocks and bonds will allow the investment portfolio to be more stable. Thus, modern portfolio theory when applied to tax dictates that more diverse tax portfolios will result in less elastic revenue streams making them less responsive to economic conditions.

Additionally, in a political climate where TELs are common and property taxes are unpopular, diversification may in part insulate local governments from policy changes regarding property tax limitations (Shannon 1987, Hendrick 2002). Analyses performed at the state level have found that diversification leads to reduced volatility in revenue and other positive outcomes such as increased financial flexibility (White 1983, Gentry and

Ladd 1994, Harmon and Mallick 1994). Furthermore, local governments are more sensitive to economic fluctuations because of their homogeneous revenue bases (Bahl 1984) and need more cyclical smoothing (Wolkoff 1987) than their state counterparts. This suggests that local governments would benefit from diversifying their revenue streams even more than states do.

Despite the analyses at the state level and modern portfolio theory, if stability is the local government's goal then there is evidence that relying on the stable and inelastic property tax is the wisest course of action (Berg, Marlin, Heydarpour 2000). Clearly there is no consensus, despite the theory, on whether the use of alternative forms of taxation will lead to decreased volatility in revenue and there is evidence that diversification does lead to greater stability for local governments especially when the new tax does not add to the complexity of the tax system and is visible (Carroll 2009) as a LOST is. Though, the author is careful to note that she is advocating neither the sales nor the income tax if the purpose of diversification is increased stability.

Why is there skepticism that diversification at the local level will lead to greater stability when it has been shown to at the state level? It is because property taxes are relied upon heavily by local governments since they are one of the few taxes available to them (Chicone and Walzer 1986, Due and Mikesell 1994) and property taxes are considered the most stable form of revenue. Unlike local governments, states rely heavily on income taxes and statewide sales taxes, each making up approximately a third of their total revenue. This is why state revenue receipts vary more than their local counterparts. However, since the 1970's there has been a shift from property tax to more unstable forms

of revenue, like LOSTs, due to the growing unpopularity of property taxes and the "tax revolts" (Holcombe and Sobel 1997).

So when looking at the question of what happens when local governments branch out, or diversify, scholars are really examining what happens when local governments move away from property taxes towards a tax like the sales tax. It is important to evaluate sales taxes and other revenue options for local governments to see what effect if any it will have on the financial management. Amongst the needs for scholarship, attention needs to be given to understanding the effect of LOSTs elasticity on local governments' revenue receipts. Sales tax elasticity is estimated to be between 0.93 (McCubbins and Moule 2010) and 1.08[11] (Sobel and Holcombe 1996) in the short run. In the long run sales taxes become increasingly inelastic with an estimated elasticity of 0.69 (Sobel and Holcombe 1996). Even though sales taxes are estimated to be inelastic in the long run, property taxes remain even more so. Property taxes have had their elasticity estimated to approach zero (Groves and Kahn 1952) and, more recently, 0.12 (McCubbins and Moule 2010). Groves and Kahn (1952) analyze various states over time periods ranging from the late 1920's to 1950. McCubbins and Moule (2010) look at a more modern time period, from 1965 to 2005, and a national data set, but find similar results. Property taxes have also been characterized as having low volatility (Cornia and Nelson 2010).

Does the elasticity of sales tax revenue suggest that sales taxes are a poor choice for local governments? Not necessarily. The large difference between the elasticities of the two taxes suggests that diversification away from a property tax towards a sales tax should

[11] Sobel and Holcombe (1996) also estimate non-food retail sales elasticity to be 1.43 in the short run. This is of note since thirty-eight states either exempt food sales for home consumption or tax it at a lower rate. Though, six of these states allow local governments to tax food sales even though they are exempt at the state level (CBPP 2009).

increase overall elasticity. This may cause unwanted volatility in revenue for local governments, but there may be benefits to adopting a more elastic tax such as more growth. However, if increases in volatility are of concern to the local government then relying more heavily on LOSTs has been shown to increase own source revenue volatility (Hou and Seligman 2005) and may not be the optimal strategy.

Since most revenue volatility comes in the form of shortfalls, policymakers should look for revenue sources that are less volatile; "local sales taxes are related to very significant increases in short-run volatility, and that property taxes are related to more modest decreases in both the long- and short-run volatility, are important for current debates regarding the efficacy and efficiency of revenue" (Hou and Seligman 2005, 15). This finding should lead policymakers to question their use of LOST if stability is their primary goal or even an important consideration. However, more research is warranted, especially since the stakes are so high for local governments.

Research Question

In this chapter I explore whether modern portfolio theory's predictions apply to county level governments using LOST rates as evidence of diversification. I expect to find that the use of LOSTs will cause the elasticity of own source revenue with respect to median household income to increase. This is due to the fact that introducing a sales tax to a local government's tax portfolio is adding a revenue source which is more elastic than the revenue base, the property tax. Sales tax revenue is expected to fluctuate and be more responsive to changes in the economy and to be income-elastic (Jung 2001).

This is not in keeping with what modern portfolio suggests the outcome will be. There are numerous reasons why I am not hypothesizing the expected outcome. First,

modern portfolio theory evolved out of investment literature and comments on diversified stocks and bonds portfolios. It is discussing hundreds of revenue streams and this is not an accurate reflection of what local government revenue portfolios are composed of. Second, it is natural to assume that some stocks are going to grow while others lose their value and that there will be natural and unforeseen variation in their returns. With taxes, we have estimates of their elasticities and how they are anticipated to change with economic fluctuations. Therefore it is reasonable to assume that shifting from a property tax to a sales tax will increase elasticity of own source revenue with respect to median household income. To test modern portfolio theory's applicability and my hypothesis I use interstate county level data from 1983 to 2004.

When examining LOSTs I expect that counties with higher LOST rates will have own source revenue that is more responsive to changes in median household income, all else being equal. Despite my hypothesis and reasoning, it appears that the use of LOSTs do not increase own source revenue when looking at the trends of LOST rate and elasticity over time. Figure 3.1 shows the average value of elasticity of own source revenue with regard to median household income and the average LOST rate from 1983 to 2004 within the thirty-five states being examined. As you can see, own source revenue elasticity is relatively stable over this time period and inelastic, with an average value of 0.728. The average LOST rate, on the other hand, is steadily growing over this time period. This is mainly because more counties are adopting LOSTs.[12] This figure suggests that there is not a strong relationship between elasticity of own source revenue and LOST rate. This is not what I expect to find.

[12] For a visual representation of the adoption patterns of LOST, please see Figures 2.1 and 2.2 in the previous chapter.

Methodology and Data

I test my hypothesis using a data set of thirty-five states at the county level from 1983 to 2004 using a random effects model. Seventeen of the states allow counties to implement a LOST and eighteen do not. The remaining fifteen states do not publish their LOST rate by county for the entire period of analysis and are not included. The thirty-five states included do not systematically differ from the fifteen states excluded. Tables 1.1 and 1.2 provide a comparison of these states with basic demographic differences and I find no evidence of a sample selection bias.

My model looks at the elasticity of own source revenue and controls for LOST rates and property tax TELs while also controlling for socio-economic factors.

The primary specification is:

$$EOSR_{it} = \beta_0 + \beta_1 LR_{it} + \pi TEL_{it} + \delta DV_{it} + \theta BV_{it} + \varepsilon_{it}$$

Where $EOSR_{it}$ is calculated by:

$$Elasticity\ of\ Own\ Source\ Revenue = \frac{\log(\text{Own Source Revenue pc})}{\log(\text{Median Household Income})}$$

The dependent variable, $EOSR_{it}$, is the county's elasticity of own source with respect to median household income, where *i* is an index for county and *t* is an index for year. My primary specification of the model uses elasticity of own source revenue as described above, but I also run it with three alternate dependent variables as a robustness check. The second dependent variable I use simply takes the elasticity of own source revenue with regard to median household income lagged one year. I do this to test the possibility that

the impact of income on own source revenue elasticity and sales tax revenue takes time to manifest. The third dependent variable is non-property tax own source revenue's elasticity with regard to median household income. I use this dependent variable to see if the effect is dramatically different than for all own source revenue, and I expect it to be much larger. This is because LOSTs make up a much greater share of the revenue once property taxes are removed since property taxes make up seventy-two percent of own source revenue (Delisle 2010). The fourth dependent variable I use is elasticity of own source revenue with regard to median household income, one year differenced. This model is also known as a relative change model also referred to as a logged and differenced model.

The dependent variables are computed using median household income, own source revenue per capita, and non-property tax own source revenue. Median household income is taken from IRS county income data (2010). The revenue variables are all from the US Census Bureau (2010).

I use all four of these dependent variables in the same model, meaning the same independent variables. The variable of interest, LR_{it}, is the LOST rate. TEL_{it} represents if there is a property tax limit in place. There are also two vectors of control variables: DV_{it} represents the demographic controls and BV_{it} represents the binary controls. They are described below.

The independent variable of interest is LOST rates, they were obtained from individual states and sometimes counties, most frequently from the state's Department of Revenue. Additionally, each of my specifications includes three sets of controls: if there is a property tax TEL in place, demographic controls, and binary controls. The TEL variable is taken from Mullins and Wallin (2004). It is time invariant.

The demographic controls include unemployment insurance spending; median age; percentages of the population that is rural, African-American, and male, that voted for the Republican Senatorial candidate in the last election respectively; and population density. The electoral data is taken from CQ Voting and Elections (2010). The remainder of the data is taken from the U.S. Census Bureau (2010). These variables are included to capture the effect that demographics may have on my dependent variables. All monetary variables are per capita and adjusted by the CPI in real 2000 dollars (Inflation Data 2009). I include two binary control variables: year and state.

The summary statistics can be found in Table 3.1.

I use a random effects model to analyze my hypotheses. There are three ways that I try to ensure the validity of these results. First, I use robust standard errors. The assumption that my counties are independent and identically distributed (i.i.d.) random variables, especially since my time period is twenty-one years long, is one that is not reasonable to make. This is why I use robust standard errors. Robust standard errors remain valid even when error terms are not i.i.d. (Croux, Dhaene, and Hoorelbeke 2003). Second, I run an alternate specification with three additional state level variables that may have a confounding effect. The inclusion of the state effects should eliminate the need for state level controls, but this adds another robustness check.

Third, I have created a histogram of the residuals. To further test the validity of the model I examine the distribution of the residuals. Figure 3.2 shows the frequency of the residuals from the primary specification of the model, with elasticity of own source revenue with regard to median household income as the dependent variable, using a histogram plot with a normal curve imposed on top. It is clear that it is not a perfectly

normal distribution, there is a slight skew, but the distribution of the residuals is approaching normal. It also has a mean of zero. This is important because it suggests that the model is appropriate and that the errors approach normal and are independently distributed.

Results

The results of the model using all four dependent variables are presented in Table 3.2. The first column presents the results of the model using elasticity of own source revenue with regard to median household income. The variable of interest is the LOST rate and as the LOST rate increases by 1 percentage point the estimated impact of it on elasticity of own source revenue is 0.002. It is statistically significant at the 1 percent level. This suggests that, as expected, as the use of LOSTs increase so does the elasticity of own source revenue. However, the magnitude of the effect is minor.

The effect is the same when running the model with the dependent variable as the elasticity of own source revenue with regard to median household income lagged by one year. The results of this regression are reported in the second column of Table 3.2. The estimated effect of a 1 percentage point increase in LOST rate on elasticity of own source revenue is an increase of 0.002 and is statistically significant at the 1 percent level. This reinforces the first result. These results reinforce what Figure 3.1 illustrates, that even as the use of LOSTs or the LOST rate increases, the elasticity of own source revenue with regard to median household income is largely unaffected.

It should be noted that this may be a somewhat artificially small estimate. If the effective tax rate were available and being used I believe the own source elasticity would be more affected. This is because it would include exemptions and would itself be more

elastic. I mitigate some of the problems of not having it by including an income control and using the food exemption variable in my robustness check.

However, I do expect to see the estimated effect grow when looking at the elasticity of non-property tax own source revenue with regard to median household income. This is what I find and the results are presented in the third column of Table 3.2. The estimated increase of elasticity of non-property tax own source revenue is 0.008 for every increase in the LOST rate of 1 percentage point. It is statistically significant at the 5 percent level. Even though it is small in magnitude the estimated effect is four times larger than the estimated effect for the elasticity of own source revenue when all revenue sources are included.

In the final column of Table 3.2 the results of the relative change model are reported. The dependent variable can be interpreted as the predicted percentage change in own source revenue in the absence of a change in median household income (Nau 2010). The estimated effect of an increase in the LOST rate of 1 percentage point is -0.03. So as the use of LOSTs increase, holding median household income constant, the percentage change in own source revenue is expected to go down. This means that higher LOST rates cause own source revenue to become less volatile when median household income does not change. This is an interesting result and deserves to be explored in a follow-up paper. One explanation may be that the economic conditions that affect the volatility of sales tax receipts are primarily shifts in income. Thus, if income remains constant sales taxes are a stable source of income for local governments.

As expected, having a property tax TEL increases elasticity of own source revenue with regard to median household income and with regard to lagged median household

income. A property tax TEL being in place increases elasticity by an estimated 0.128 and 0.126 respectively. TELs have the largest estimated impact on elasticity of any of the independent variables included. This is not surprising because it may indicate reliance upon other sources of revenue like LOSTs, personal income taxes (which have an estimated elasticity of 2.17), or charges and fees (which have an estimated elasticity of 1.06) (McCubbins and Moule 2010). The TEL variable is statistically significant at the 1 percent level in both specifications.

Interestingly, a property tax TEL does have a statistically significant effect even when the dependent variable is elasticity of non-property tax revenue with regard to median household income. When a TEL is in place it actually decreases non-property tax revenue elasticity by 0.086 and the effect is statistically significant at the 1 percent level. This result is somewhat counter-intuitive. One explanation may be that counties, when faced with limitations on their property taxes, actively seek out stable alternatives and rely less heavily on elastic taxes like sales and income taxes.

However, the effect of a property tax TEL being in place becomes positive once again when looking at the relative change model and this makes sense. The estimated effect suggests that when holding median household income constant, own source revenue will change more when a property tax TEL is in place. This is intuitive because, in many cases, TELs force local governments to diversify their revenue streams to include more elastic taxes.

The estimated impacts for the remaining controls are not surprising.

Table 3.3 has the results with the additional three state level controls. The estimates for the impact of LOST rate on elasticity remain unchanged. They are still

statistically significant and the estimated coefficients are the same as the results in Table 3.2. This suggests that the results in the primary specification are accurate. I also run the model with fixed effects instead of random effects, as another measure to ensure that the estimates are accurate. When running fixed effects on the primary specification I still get a coefficient on the effect of a 1 percentage point increase in the LOST rate of 0.002, and it is statistically significant at the 1 percent level.[13] The results are consistent with the other specifications of the model as well, with one exception. Running the model with the dependent variable as the elasticity of non-property own source revenue with regard to median household income with fixed effects the estimated coefficient for a 1 percentage point increase in LOST rate is 0.007 instead of 0.008 and is still statistically significant at the 1 percent level.

Conclusion

Local governments provide many of the most fundamental services that citizens benefit from on a daily basis. However, local governments are restricted by state laws on the type of taxes they can use as well as the rates they can institute. This leaves many local governments *needing* to diversify and modify their tax portfolios as demand for public service increases. One way in which local governments can either increase their revenue or reduce their dependence on the property tax is by adopting a LOST.

The question of whether diversifying local tax portfolios will make their own source revenue more or less elastic, and therefore stable, is a complicated one. Modern portfolio theory suggests that diversification will lead to more stability and less variability in

[13] I also run a Hausman specification test but the model specification do not meet the asymptotic assumptions of the Hausman specification test. So I calculate it again this time using the variance matrices from the efficient, or fixed effects estimator, as the base for both and calculate a chi square of 132.24 and reject the null. This suggests that moving forward I should explore other models for this data.

revenues. However, diversifying away from stable and inelastic taxes like the property tax to less stable and more elastic taxes like the sales tax would lead one to believe that this move would increase own sources revenue's elasticity and sensitivity to economic fluctuations. Thus, increasing reliance on sales taxes may have financial consequences for local governments. Since local governments must balance their budgets increasing the volatility and elasticity of their revenue may be problematic. In this chapter, I test whether the use of LOSTs does in fact increase the elasticity of own source revenue with regard to median household income. I find that diversification does increase elasticity, but only by a small amount, an estimated increase of 0.002 when the LOST rate increases by 1 percentage point.

If sales taxes do not significantly increase the elasticity of own source revenue then it should alter the discussion of how to balance revenue portfolios for local governments. These results should minimize concerns about adopting or relying more heavily on LOSTs. If volatility and stability are not of significant concern then the discussion becomes focused on political feasibility, popularity, efficiency, and equity. All of these remain complicated questions for local governments and need to be thoroughly considered when examining potential revenue streams.

Figure 3.1:

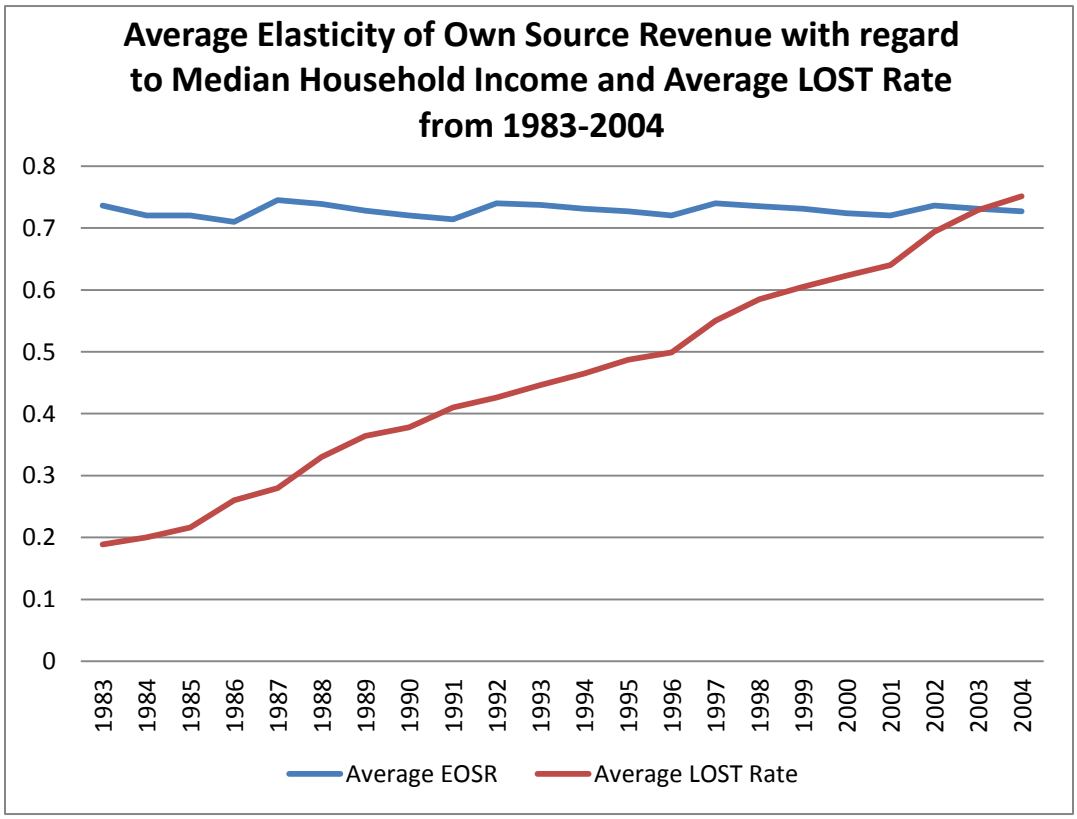

Average Elasticity of Own Source Revenue with regard to Median Household Income and Average LOST Rate from 1983-2004
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
1983
1984
1985
1986
1987
1988
1989
1990
1991
1992
1993
1994
1995
1996
1997
1998
1999
2000
2001
2002
2003
2004
Average EOSR
Average LOST Rate

Figure 3.2: The Distribution of the Residuals of Elasticity of Own Source Revenue with Regard to Median Household Income with Normal Curve

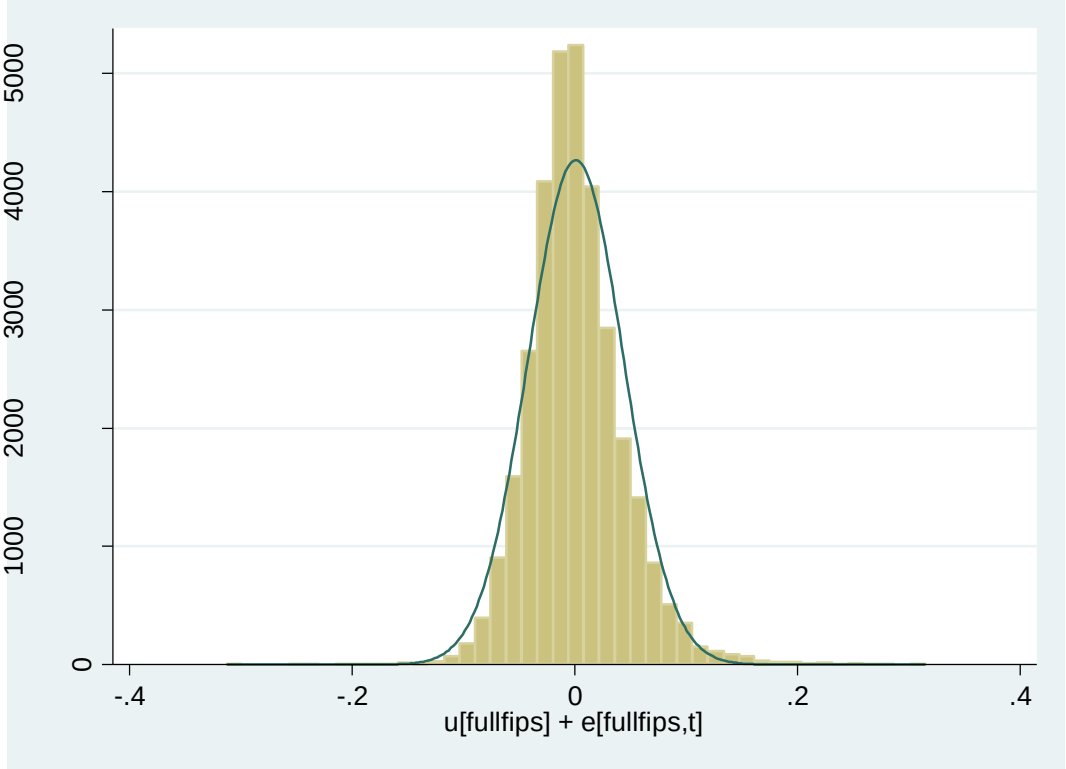


Table 3.1: Summary Statistics					
Variable	Variable Description	Mean	Std. Dev.	Min	Max
EOSR	Elasticity of Own Source Revenue with regard to Median Household Income	0.729	0.057	0.374	1.036
EOSR with L1	Elasticity of Own Source Revenue with regard to 1 yr lag of Median Household Income	0.729	0.062	0.315	1.054
ENPOSR	Elasticity of Non-Property Tax Own Source Revenue with regard to Median Household Income	-0.480	0.226	-1.431	0.012
EOSR lag differences	Elasticity of Own Source Revenue with regard to Median Household Income, lagged and differenced	0.448	0.369	-1.491	11.680
LOST Rate	Local Option Sales Tax Rate	0.352	0.775	0.000	8.000
Property Tax TEL	If the state has a tax or exependiture limit for property taxes	0.912	0.283	0.000	1.000
Unemployment Insurance	Unemployment Insurance Spending per capita in $100	0.086	0.063	0.000	0.935
Age	Median Age	37.354	3.967	20.000	54.300
Rural	Percentage of the county characterized as Rural	0.608	0.303	0.000	1.000
Black	Percentage of the county characterized as Black	0.088	0.145	0.000	0.865
Male	Percentage of the county characterized as Male	0.496	0.019	0.426	0.673
Density	County Population per square mile	164.981	500.744	0.053	13092.910
Republican	Percentage of the County that voted for the Republican Candidate in the Last Senatorial Election	0.499	0.217	0.000	1.000

Table 3.2: The effect of LOSTs on the Elasticity of Own Source Revenue per capita with respect to Median Household Income

Panel Estimation with Random Effects

	Dependent variable: Elasticity of OSR wrt Inc		Dependent variable: Elasticity of OSR wrt Inc lagged one year		Dependent variable: Elasticity of Non-Property Tax OSR wrt INC		Dependent variable: Elasticity of OSR wrt Inc, one year differenced	
	Coefficient	Robust Std. Error	Coefficient	Robust Std. Error	Coefficient	Robust Std. Error	Coefficient	Robust Std. Error
LOST Rate	0.002	(0.001)***	0.002	(0.001)***	0.008	(0.003)**	-0.03	(0.007)***
Property Tax TEL	0.128	(0.01)***	0.126	(0.01)***	-0.086	(0.032)***	0.235	(0.056)***
Unemployment Insurance	0.033	(0.007)***	0.022	(0.007)***	0.016	(0.032)	-0.206	(0.08)***
Median Age	0.001	(0)***	0.001	(0)***	0.002	(0.001)***	0	(0.001)
Rural	-0.023	(0.004)***	-0.026	(0.004)***	-0.046	(0.01)***	0.031	(0.018)*
Black	0.026	(0.009)***	0.027	(0.009)***	-0.022	(0.018)	-0.005	(0.039)
Male	-0.082	(0.079)	-0.089	(0.08)	-0.133	(0.102)	-0.033	(0.261)
Population Density	0	(0)	0	(0)	0	(0)	0	(0)
Republican	0.01	(0.001)***	0.01	(0.001)***	0.01	(0.007)	0.03	(0.028)
Constant	0.658	(0.041)***	0.668	(0.042)***	-0.098	(0.063)	0.458	(0.149)***

The robust standard errors are in parantheses below the estimated coefficents.

* Significant at 10% level, ** Significant at the 5% level, *** Significant at the 1%

All regressions include state and year effects. All three regressions include states that do not have LOSTs.

Table 3.3: Robustness Check- The effect of LOSTs on Elasticity of Own Source Revenue per capita with respect to Median Household Income with additional state controls

	Dependent variable: Elasticity of OSR wrt Inc		Dependent variable: Elasticity of OSR wrt Inc lagged one year		Elasticity of Non-Property Tax OSR wrt INC		Elasticity of OSR wrt Inc, one year differenced	
	Coefficient	Robust Std. Error	Coefficient	Robust Std. Error	Coefficient	Robust Std. Error	Coefficient	Robust Std. Error
LOST Rate	0.002	(0.001)***	0.002	(0.001)**	0.008	(0.003)**	-0.028	(0.007)***
No State Sales Tax	-0.050	(0.011)***	-0.047	(0.011)***	-0.205	(0.038)***	0.200	(0.045)***
Exempt Food	0.111	(0.010)***	0.109	(0.010)***	-0.071	(0.030)**	0.217	(0.056)***
State Statute for Property Tax Reduction	-0.042	(0.010)***	-0.041	(0.010)***	-0.058	(0.030)*	-0.123	(0.056)**
Property Tax TEL	0.135	(0.010)***	0.132	(0.010)***	-0.130	(0.031)***	0.098	(0.029)***
The robust standard errors are in parantheses below the estimated coefficents.								
* Significant at 10% level, ** Significant at the 5% level, *** Significant at the 1%								
All regressions include median age, unemployment insurance, rural, black, male, population density, republican, state, and year effects. All three regressions include states that do not have LOSTs.								

CHAPTER 4

Local Sales Tax Earmarking and Transportation Outlay

Introduction

Economists and practitioners alike criticize the use of tax earmarks, yet many levels of government employ them. Tax earmarks are created when revenue from a specific form of taxation is assigned to a specific government activity (McCleary 1991). Tax earmarks are prevalent in the states, averaging about 20 percent of states budgets; 10 states earmark more than a third of their budgets. It is estimated that local governments earmark an even greater percentage (Fox 2010[14], Mikesell 2010). Despite their widespread use, there is little known on how tax earmarks impact government spending. I find that earmarked revenue is used to supplement existing f unding from general revenue and increases overall spending on the recipient program.

One justification for using tax earmarks is that they offset the burden on general revenue. I assume that all, else being equal,[15] revenue from tax earmarks should behave as a substitute for general revenue and not a supplement. In fact, a recent survey found that more than four times as many county commissioners say that earmarked local option sales taxes (LOSTs) in their counties were adopted to be a substitute to general revenues (Afonso 2011). The previous empirical results are mixed, finding no effect, increased spending, or even decreased spending when tax earmarks are in place (Deran 1965, Eklund

[14] In the form of user fees.
[15] Including increased demand and need.

1972, Borg and Mason 1988, Dye and McGuire 1992, Spindler 1995, Miller and Pierce 1997, Landry and Price 2007). Scholars need consistent evidence; policymakers need to understand the effects of their policy so that they may budget and govern rationally.

In this chapter I look at transportation tax earmarks at the county level and examine how local spending on transportation changes when an earmark is in place. I hypothesize that earmarked revenue for transportation will increase overall spending on transportation because of political costs. Adjustment costs are the costs that economic agents incur when decision variables are altered (Calhoun 2002) and political costs are one form of them. In this case the altered decision variables are the increased revenues from the tax earmarks. I find evidence that political costs do exist. Using data from 1983 to 2004 and 35 states[16], I find that as the rate of local option sales tax that is earmarked for transportation (LOST-T) increases by one percentage point, spending by the county is expected to increase by almost $40 dollars per capita; the result is consistent across different models. My results suggest that earmarked revenue acts more as additional own source revenue rather than a means to reduce property tax burden.

Tax Earmarking and Public Choice

Tax earmarks come in several forms, including user fees, excise taxes, and LOSTs. Accompanying the different forms of earmarks there are also many advocates and critics of tax earmarks. Advocates point to four primary benefits. First, earmarks guarantee a base level of funding for the recipient program. Second, the earmark is a predictable revenue source, allowing agencies to plan long term. Third, local tax earmarks put the funding

[16] I only use thirty-five states because fifteen states did not have complete historical data on LOST rates available.

decision in voters' hands; this is viewed as depoliticizing the decision, because earmarks usually must be voted on in referendum, so taxpayers are able to choose whether or not to institute the tax. Fourth, it allows for substitution from general revenue.

Policymakers may choose to utilize tax earmarks. The first reason is to ensure a base level of funding for the recipient program. When policymakers earmark tax revenue they are specifying that all of the money raised must be used on the specified program; there is no discretion on the part of the budget makers for where these monies are used. These earmarks can be seen as commitments to programs, an assurance that they will be funded and sustained in the future (Marsiliani & Renstrom 2000). Policymakers can create tax earmarks to ensure that the programs they are most invested in live on, no matter who is in office (Anesi 2006) or what the current economic climate is. Second, tax earmarks allow programs to plan long term. Recipient programs know that the minimum expected revenue from the earmarked tax is the lowest threshold for their expected budget appropriation. Earmarked revenues and a portion of the funding for their recipient programs are able to circumvent the annual or biennial budgeting process. Public choice theorists champion earmarks to give voters greater control of how money is being spent (Buchanan 1963, Bracewell-Milnes 1991). This may be especially true of LOST-T since it expires unlike their general LOST counterpart.

The public choice view of tax earmarks is that they are an outlet for the public to express their preferences. "Tax-earmarking is proposed to individuals making up the community, as an alternative or complement to other voting rules (Bilodeau 1994, 52)." This allows the programs that are supported by the public to be guaranteed funding or

receive additional funding. James Buchanan, one of the greatest advocates of tax earmarks within academia, contends that tax earmarks allow citizens to restrict government spending by choosing the policies they wish to finance (1963). Buchanan's view of tax earmarks fits within the public choice framework because earmarking gives voters power by unbundling services in the government budget and allows voters to be more specific about their policy and financing preferences than traditional taxes. This viewpoint also works with the idea that tax earmarks are preferred by policymakers because it is perceived that people are more willing to pay taxes if they know exactly what the money is being used for and support these expenditures. Since taxpayers elect to have these tax earmarks, policymakers like them because they may be a palatable tax increase. This is especially true at the county level since the 1970's when the "tax revolts" took place (Rivlin 1989) causing decreases in property tax revenues, necessitating the use of other forms of taxation. This ties into the fourth reason mentioned above, that tax earmarks can be additional funds to act as a way to free general revenue funds.

Despite all of these purported benefits, tax earmarks face many criticisms. Four of the most common criticisms are the loss of budgetary control, problematic funding fluctuations due to dependence on earmarks, misleading voters, and distorting spending behavior. First, tax earmarks lead to less budget control and greater inflexibility. Inflexibility is most noticed in the lack of control for program funding. Programs receive at least as much funding as the tax generates which may exceed their need. This means that "earmarking leads to a misallocation of funds, giving excess revenues to some functions while others are under-supported (Deran 1965, 24)." Control is further diminished because there is less oversight. By eliminating budget control, periodic review and

oversight is also diminished or even completely removed. This is in keeping with one of the most common criticisms of tax earmarks, that they "presumptively distort(s) budget allocations in a less efficient direction by constraining decisions of the legislature (Stocker 2005, 90)".

Second, critics argue that the associated revenue fluctuations and contrasting expectations are a fundamental flaw with the use of tax earmarks. Budget makers allocate resources to programs on the basis of what they believe the tax earmark will generate. If the earmarked revenue falls short of expectation, the recipient program may not receive the funding it needs.

Third, earmarks may be misleading because the revenue may not be used as expected. Tax earmarks may gain enough public support to get passed based on the perception that the revenue will provide additional funds for their program, when instead there may be substitution between general revenue and the earmarks. This means that by adopting earmarks that are dedicated to popular programs, less opposition may arise to adopting otherwise unpopular revenue streams, state lottery systems for education are the classic examples of this (Stocker 2005). Oakland (1985) sees this as a probable outcome; tax earmarks allow government to overtax and overspend since they are essentially increasing general revenue by shifting costs of popular programs like education and roads to alternative revenue sources.[17]

Fourth and perhaps most importantly, tax earmarks change spending decisions. Revenue from tax earmarks must be used on specific programs. This is an interesting

[17] Another issue is that earmarks increase the cost of compliance; they require tax administrators to separately track and account for these revenues (Michael 2008).

point. Above, I mentioned that tax earmarks may mislead the public who believes that it is additional funding for the recipient program, that it can be supplemental funding. However, Buchanan (1963) supports tax earmarks because they can offset expenses to the general revenue; that they can be a substitute. Either supplementation or substitution may be an appropriate role for the revenue, presuming that it is being used in the way it was intended.

All of the criticisms, when accurate, will lead to inefficient budgeting practices. However, it is important to clarify that not all tax earmarks suffer from the same problems. For example, user fees[18] and excise taxes[19] are two of the more popular forms of tax earmarks and they are considered fairer than their general sales tax counterparts. This is because they function as preference revelation and reveal tax payers willingness to pay which leads to allocative efficiency. Thus those who benefit from the public good pay for it which may lead to the correct level of public good provision. These tax earmarks, such as user fees, are also where equity rationales are most utilized and accepted.[20]

Additionally, not all tax earmarks are inefficient. In fact, Buchanan (1963) advocates earmarks for projects that are beneficial to the entire public, not just direct beneficiaries, because their funds are more inelastic and less distortionary. He argues that programs with limited beneficiaries are in fact the ones that should benefit from non-earmarked taxes. Another way that tax earmarks may be more economically efficient than non-

[18] Musgrave and Musgrave (1989) for example support the use of user fees but recognize the restrictions that accompany these earmarks on the budget practices. So it is possible for even one form to have mixed reviews.
[19] Though if the excise tax is applied to a good with elastic demand then it may distort consumption quite a bit, making it less efficient.
[20] Unless the taxation becomes too regressive.

earmarked taxes is if they are Pigouvian. Pigouvian taxes are levied on goods or industries that create negative externalities and in the process correct supply. If enacted properly they can be more efficient than a typical tax. Gasoline taxes are a good example of a Pigouvian earmarked tax. Driving causes pollution which negatively impacts both drivers and the larger community. So governments can impose gasoline taxes that only tax drivers, who are causing the pollution and using the roads, to pay for road maintenance and help protect air quality.[21]

There has been limited research conducted on this topic. Buchanan (1963) constructs a model to show that under certain circumstances, programs financed with earmarks may actually receive less funding than they would have if they were funded with general revenue. Under Buchanan's assumptions this is not the intended effect, thus is an unwanted consequence. Some quantitative evidence also suggests that earmarks may lower spending for the respective program. Spindler (1995) and Miller and Pierce (1997) look at state lottery systems that finance education and find a proportional decrease in school funding compared to other expenditures. This is in keeping with earlier findings by Borg and Mason (1988) who find that lotteries cause a decrease in school financing. These findings support the claims that substitution occurs and that the revenue from earmarks is used in lieu of general revenue. Interestingly, Landry and Price (2007) find that lotteries generate more revenue when their revenue is earmarked for education. Their explanation is that people feel more inclined to participate in lotteries when they are also benefiting

[21] Gasoline taxes are only truly Pigouvian if the revenue generated is used to treat the air and it lowers the pollution to a more manageable level.

from the revenue collected, via education. This may translate some into an explanation for why voters pass LOST-T and agree to pay higher sales taxes.

Other studies have found no effect on spending when programs are partially funded with earmarked taxes. Kim, Bae, and Egger (2009) use per capita income as a measure for infrastructure demand and find that it does not create demand for an infrastructure tax. Suggesting that tax earmarks are not distortionary, as theory suggests. In older works, Deran (1965) looks at earmarking at the state level and finds no relationship between earmarking and share of expenditures. However, there are other works with contradicting results. Dye and McGuire (1992) find "either no change in expenditures or increases in expenditures that are much smaller than a dollar (554)." They find that with an additional dollar of earmarked taxes for highways there is only a 19-cent increase in spending. Whereas Eklund (1972) finds that there is a positive relationship between earmarks and their respective programs. Similarly, Lauth and Robbins (2002) find that lottery funds act as a supplement to education financing. Their explanation for the lack of findings in the previous studies is the policy architectures in place that allow greater flexibility in the use of funds. Whereas Georgia mandates that the lottery monies are used to increase the scope and types of educational programs that the state supports.

There has been research done examining the effect of LOSTs specifically earmarked for reducing property tax burden on property tax burden (Zhao and Jung 2008). LOSTs in the state of Georgia although, not earmarked for specific functions, require local governments to reduce their reliance on the property tax. They find that there are short term reductions in property tax burdens but in the long run it acts as a supplement to

property tax increasing overall revenue. Although there have been other studies examining this relationship (Inman 1979; Ulbrich 1996; Jung 2001; Sjoquist, Walker, and Wallace 2005), this is the most comprehensive and the one that looks directly at the fungibility of earmarked LOSTs.

There has so far been no consensus about the overall effect of earmarked revenue on a project's funding. Existing evidence shows a full spectrum from decrease to increase; only the no change result supports the conclusion that tax earmarks do not distort or change budgeting and appropriation behavior. This chapter attempts to provide a more comprehensive analysis of the effect of tax earmarks of spending levels for their respective programs.

Transportation Earmarks

Transportation earmarks are the most common form of tax earmarks, specifically gasoline taxes at the state and federal levels (American Petroleum Institute 2008). The commonality of transportation tax earmarks makes them a good place to begin my analysis. Moreover, transportation is a vital component to community health. Transportation spending also represents a great deal of the expenditures by local communities as well as intergovernmental transfers. Federal highway programs are the largest grant programs, $55.1 billion in 2010 (U.S. Government Spending 2011). If money is any indication of priority, then there is no denying that transportation is fundamental.

The reason for the emphasis on transportation is because a strong transportation system leads to lower travel times, lower vehicle operating costs, greater market access, higher productivity, and many safety benefits (Mudge 1996). Investing in transportation

infrastructure provides numerous benefits, such as encouraging economic development. Transportation infrastructure also has a long economic life and interacts with other parts of the system making it very worthwhile despite its high investment costs (Bell et al 2006).

The cost of transportation infrastructure is being shifted from the federal and state to county governments. Devolution occurs when the federal government shifts responsibility and cost to states and/or local governments and second order devolution occurs when states shift responsibility and costs to local governments. I observe both first-order and second-order devolution. Presumably the increased responsibility for highways will cause county governments to spend more. The devolution of ownership and responsibility for highways has been growing over my sample period as evidenced in Figure 4.1. Counties are becoming increasingly responsible for not only the construction of new roads, but for the high costs of maintaining the roads in place, through changing ownership of roads. These repairs and maintenance costs are on the rise, which is why the devolution of road ownership is considered by some to be an unfunded mandate (Wachs 2003).

With the costs of transportation being passed to the county, how do they pay for it? Property taxes make up the traditional own source revenue for counties, but transportation infrastructure is paid for by many additional sources such as intergovernmental grants (Moulder 1993, Morris 2001) and tax earmarks. Highway devolution may be somewhat be offset by intergovernmental transfers for transportation from the state and the federal government. These transfers have also been on the rise in my sample period, as shown in Figure 4.2. The question becomes: with devolution of

ownership and increasing repairs and maintenance costs of roads, do these transfers compensate the county governments enough? It appears from Figure 4.2 they may, however there are critics that disagree (Wachs 2003) and it may be that these mandates are better funded in times of fiscal health for the states (Pagano 1990). To accommodate these different theories I include intergovernmental grants from the state and federal government as well if the state has a small GSP.

Local governments typically finance their transportation with property taxes which are augmented with gasoline and vehicle sales taxes, whose revenues are earmarked for transportation (Morris 2001). In this chapter I examine another source of earmarked revenues for transportation; local option sales tax for transportation (LOST-T). Gasoline and vehicle taxes are different from LOST-T because they are taxes that fall under the benefit principle. Those who use the roads pay for them. This is not the case for LOST-T, they are tacked on to the existing sales taxes and tax all purchases made.[22] In some ways they are also a benefit tax because good transportation systems are a benefit to the county overall. LOST-T in California has been examined previously (Crabbe, Hiatt, Poliwka, and Wachs 2005), with a focus on the types of projects funded by its revenue. The authors conclude that it is mainly used as a benefit tax, for programs that benefit the county specifically and is used on costly large capital projects. This emphasis on capital projects suggests to the authors that it is used as a supplement more than a substitute. Their analysis is much wider in breadth, but does not control for some of the factors included here, and I are hoping to isolate the political costs to adjusting the budget, if they exist.

[22] Unless there are exemptions from the state sales taxes, then they are also exempted from LOST and LOST-T. These exemptions are common. In fact all but four states offer some form of tax exemption for food, prescription drugs, or non-prescription drugs (Federation of Tax Administrators 2010).

Formal Theory

Given the theory, the revenue from LOST-T should act as a substitute for general revenue funds, all else being equal.[23] However, I hypothesize that counties with LOST-T will spend more on transportation than those without. I theorize that the reason for the supplementation of transportation spending is that budget adjustments from general revenue will be sluggish because of political costs that prevent budget makers from fully compensating for the LOST-T revenue.

Assuming that county governments make their spending decisions by trying to maximize utility, given their revenues, their decisions can be characterized with the following utility function. It specifies that utility is a function of both spending on transportation and all other government services. The restriction that county governments face is that they can only spend as much as they receive in revenue due to balanced budget requirements.

$$max_{P,T}\mathrm{U}(\mathrm{P},\mathrm{T}+\mathrm{E})-\mathrm{b}(\mathrm{T}-\mathrm{T}_0)^2$$

$$\text{such that } \mathrm{P}+\mathrm{T}+\mathrm{E}=\mathrm{B}+\mathrm{E}$$

Where P is spending on all goods other than transportation; T is spending on transportation from the general revenue of the county; E is revenue from LOST-T; T_0 is spending on transportation in the last period, with no LOST-T revenue; B is the budget using only non-earmarked revenue, so all monies but E; and b are the political costs of changing the allocation from general revenue. In this model, I incorporate political costs. The utility is

[23] To help ensure the validity of this assertation, I control for many of the indicators of increased need like increased ownership of highways, population density, urban population, and median income.

being maximized within a world where there may be sluggish political costs. If b=0 then there are no political costs and governments are able to completely substitute earmarked revenue for general revenue.

The next step when trying to isolate the sign of b, is to take the Lagrangian.

$$L = \mathrm{U}(\mathrm{P}, \mathrm{T} + \mathrm{E}) - \mathrm{b}(\mathrm{T} - \mathrm{T}_0)^2 + \lambda(\mathrm{P} + \mathrm{T} + \mathrm{E} - \mathrm{B} - \mathrm{E})$$

Once the Lagrangian has been established, I take the first order conditions and the second derivatives, and solve for effects. They can be found in Appendix A at the end of the chapter. Upon completion I can sign the effect of earmarked revenue on general revenue spending for transportation, which gives me:

$$\frac{dT}{dE} = \frac{U_{TE} - U_{PE}}{|H|} = \frac{U_{TE} - U_{PE}}{2b - U_{PP} - U_{TT} + 2U_{TP}}$$

$$\frac{dT}{dE} < 0$$

To solve for $\frac{dT}{dE}$'s sign, I make the following assumptions: 1) UTT is negative due to diminishing marginal returns. 2) UPP is negative due to diminishing marginal returns. Diminishing marginal returns is a traditional assumption of spending (Skidmore, Toya, and Merriman 2004). 3) I know that UTP is equal to UPT mathematically and I are assuming that they are positive; this is because I believe that transportation spending and all other government spending are complements. This assumption is valid because the literature shows that good transportation infrastructure is beneficial to government functions and

economic development (Mudge 1996, Bell et al 2006). Given the above three assumptions, my theory shows that: As $b \rightarrow \infty \frac{dT}{dE} \rightarrow 0$.

This means that as the political costs, b, go up there will be less compensation from general revenue for the revenue from tax earmarks. If b gets large enough there will be no substitution, meaning that recipient programs will receive the same money from the general fund as if there was no additional revenue being provided from tax earmarks. A large b shows that supplementation, not substitution, takes place.

There are many types of adjustment costs; I feel that the most likely type to face county budget makers are the political costs that are endogenously linked to sluggish budget practices. Political costs are accrued when policymakers lose political capital by taking a certain course of action. One theory suggests these costs may be present in the budget process. Alesina and Drazen (1991) theorize that negative shocks to the budget will be adjusted for sluggishly and that instead of making cutbacks or raising taxes, governments will chose to accrue debt. Delays to efficient budgeting are caused by struggles between various interests. Alesina and Drazen (1991) are analyzing negative shocks, but I believe that their theory holds that budgets are slow to respond to shocks (positive or negative) because of interest groups and budget maximizing bureaucrats. Interested parties, in this case transportation, will want to maximize their budget and will try to prevent substitution from general revenue. This can be manifested in sluggish budget practices and understood as political costs to budget makers.

These political costs are difficult to capture empirically, but I are trying to capture part of their effect. To do so I will control for many factors that may explain an increased

need for transportation spending, with need removed (at least in part) from the equation any difference in spending can be attributed to political costs. So if there are political costs I expect to see additional money spent on transportation per capita when LOST-T is in place, all else being equal.

Hypothesis, Model, and Data

The literature is mixed on the effect tax earmarks have on the budget. In this chapter I examine the actual effect of an earmarked sales tax on spending for its respective program. When looking at LOST-T I expect to find that counties with these earmarks will spend more on transportation, all else being equal. In some cases this may have been the intention, however I do control for factors that are proxies for increased need like mileage owned by the county. Furthermore, there is evidence that when earmarked LOSTs are adopted they are intended to free up monies from the general revenue; more than 4.5 times more county commissioners say that substitution from general revenue is the reason earmarked LOSTs are adopted in their counties (Afonso 2011).

I hypothesize that the use of local option sales taxes that are earmarked for transportation will increase spending on transportation. I believe that LOST-T will cause efficiency losses by distorting behavior. This distortion, or change in behavior, will manifest itself in outlay increases on transportation. If my assumption that LOST-T revenue should be a substitute, than any additional funds for transportation caused by LOST-T are unintended by the policymakers, thus not an efficient use of the monies. The mechanism for this distortion is presumed to be political costs. My formal theory shows that political costs can in fact cause less fungibility between earmarked revenue and

revenue from the general fund. If these political costs are present I expect to find that LOST-T will increase spending on transportation, all else being equal. I will first describe my model and data, and then present the results of my model.

My model looks at total transportation spending and controls for LOST laws and the LOST-T rate while also controlling for socio-economic factors and highway ownership. The primary specification is:

$$TR_{it} = \beta_0 + \beta_1 SL_{it} + \beta_2 TRR_{it} + \Lambda MV_{it} + \Gamma EV_{it} + \Sigma DV_{it} + \Omega BV_{it} + \varepsilon_{it}$$

The dependent variable, TR_{it}, is real spending on transportation by the counties own funds, *i* being an index for county and *t* an index for year. Transportation spending is aggregated; it includes highways, public transportation, transportation capital projects, etc. The data is from the U.S. Census Bureau (2010). There are two LOST independent variables: SL_{it} is a binary variable for if the state legally permits LOST; the state's LOST laws are taken from Padgitt (2009). This is included to control for whether counties are permitted to adopt a LOST, to help eliminate some of the noise in the model. TRR_{it} is the LOST-T rate. If TRR_{it} is greater than zero, then it will provide evidence of supplementation due to political costs. For all the states except Georgia, California, and Colorado the value will be zero. Within these three states, the values will be zero for the counties without LOST-T, otherwise it will be the tax rate. The TRR_{it} rates were gathered from the individual states, sometimes from the county. For the majority of these, they were obtained from the state's Department of Revenue. They vary over time and between counties.

There are four vectors of control variables: MV_{it} represents the mileage variables; EV_{it} represents the economic controls; DV_{it} represents the demographic controls; and BV_{it} represents the binary controls. I employ a random effects panel model with robust standard errors to test my hypothesis. The assumption that my counties are independent and identically distributed (i.i.d.) random variables, especially since my time period is twenty-one years long, is one that is not reasonable to make. This is why I use robust standard errors. Robust standard errors remain valid even when error terms are not i.i.d. (Croux, Dhaene, and Hoorelbeke 2003). The model is run four different ways: 1) as specified above with mileage variables but no mileage lags, 2) as above but with additional mileage lags, 3) as above but also with three additional state level variables for a robustness check, and 4) with no mileage variables at all.

To test the hypothesis I use a data set of thirty-five states from 1983 to 2004 at the county level; these are the states with complete information on county LOST rates in the counties for the entire time period. Seventeen of the states allow counties to implement a LOST and eighteen do not. The thirty-five states included do not systematically differ from the fifteen states excluded. Tables 1.1 and 1.2 provide a comparison of these states with basic demographic differences and I find no evidence of a sample selection bias.

By utilizing states that allow LOSTs and ones that do not I are able to avoid some of the traditional selection bias trappings, it does also prevent me from employing a fixed effects model. Among the thirty-five, three states have transportation sales tax earmarks and complete information on their LOST-T rates: they are California, Colorado, and Georgia. California has had transportation earmarks since 1970, Georgia since 1972, and Colorado

since 1991. For a good overview of LOST-T in California, see Crabbe, Hiatt, Poliwka, and Wachs (2005).

Transportation earmarks must be used solely for transportation.[24] This may eliminate some LOSTs that may be *in part* earmarked for transportation. For example, in the state of Georgia counties have the option to adopt special purpose LOSTs (SPLOSTs), which can be earmarked for numerous activities. SPLOSTs are often earmarked for many projects some of which may have to do with transportation, but there is no way to differentiate over the entire time period and what percentage goes to transportation, so they are not included. Even though I only have three states with LOST-T in my analysis, I have quite a few counties: a total of two hundred and eighty-one.

The vector of mileage variables, MV_{it}, is made up of eighteen variables. The first six are calculations to capture the approximate highway mileage that is owned by the county, state, and federal governments within each county, broken up into rural and urban miles. The Department of Transportation's Federal Highway Administration (2010) provides highway ownership data at the state level. There are additional levels of government that "own" highway mileage, like municipalities, but they are not included in my analysis. I take these ownership variables and create a county estimate of how much highway they each own on average. An example of how this variable is calculated is:

$$Urban\ County\ Highway\ Ownership = \frac{urban\ miles\ owned\ by\ county\ in\ \ state * \%\ of\ urban\ population\ in\ \ county}{Total\ urban\ miles\ in\ \ state}$$

[24] This may mean road improvement, public transportation, or other transportation related expenses.

The above equation would give me an estimate of the urban county ownership. In the equation only the percentage of urban population in the county varies at the county level, the other two variables are at the state level. Another way of understanding this variable is that it is the percentage of urban miles owned by all counties in the state, weighted by how urban the individual county is. This equation is then calculated for rural, and then for state and federal ownership, giving me a total of six variables. These variables vary by county and year. The other twelve variables are lag differences for one and two years and included in the secondary specification. These mileage variables are included to capture the effect of devolution and second order devolution of ownership and the subsequent devolution of financial responsibility for roads.

The economic controls, EV_{it}, include unemployment insurance spending, income, total county own source government revenue, if the state has a small GSP, and non-property tax revenue. All monetary variables are per capita and adjusted by the CPI in real 2000 dollars (Inflation Data 2009). The wage and salary data comes from the IRS county income data (2010). The remaining variables are taken from the U.S. Census Bureau (2010). They all vary over county and year. These variables are included to capture the effect that the economic conditions of the county may have on their spending behavior for transportation.

Demographic controls, DV_{it}, include median age; percentages of the population that is rural, African-American, and male, that voted for the Republican Senatorial candidate in the last election respectively; and population density. The electoral data is taken from CQ Voting and Elections (2010). The home rule variable was taken from the National League

of Cities (2010). The remainder of the data is taken from the U.S. Census Bureau (2010). These variables are included to capture the effect that demographics may have on transportation spending. Lastly, BV_{it} are two binary control variables, year and Census regions.

These control variables are not just intended to eliminate some of the noise in the model, but many are specifically intended to control for increased need by the counties. Clearly, the mileage variables may be an indicator of increased need, but average income, intergovernmental transfers from the state and the federal government, population density, and rural population may also be an indicator of the need for public transportation and the quality of roads. By eliminating the increased need, I are able to assume that any increased spending on transportation is due to the political costs.

Some of the variables change by so little over the time period that they require a random effects model be employed: they are state has LOST, rural, black, median age, and male. However, I do include region and year dummies to overcome some of the traditional shortfalls of random effects. Furthermore, the assumption that my counties are independent and identically distributed (i.i.d.) random variables, especially since my time period is twenty-one years long, is one that is not reasonable to make. For this reason I use robust standard errors. Robust standard errors remain valid even when error terms are not i.i.d. (Croux, Dhaene, and Hoorelbeke 2003).

Additionally, I run a specification of the model as a robustness check. I run the models with three additional controls: if the state does not have a sales tax, if food is

exempted from the sales tax[25], and if there is a state statute that requires some portion of LOST revenue to be used to reduce property tax.

Summary statistics can be found in Table 4.1.

To further test the validity of the model I examine the distribution of the residuals. Figure 4.3 is the frequency of the residuals from the primary specification of the model using a histogram plot with a normal curve imposed on top. It is clear that it is not a normal distribution, but that the distributions of the residuals approximate normal, though it is extremely leptokurtic.[26] The residuals also have a mean of zero. This is important because it suggests that the model is appropriate and that the errors are approximately normal and independently distributed.

Results and Discussion

Table 4.2 presents my estimates of the effect of the availability of LOST to a county and the effect of earmarked taxes for transportation on actual transportation outlay. The first variable of interest is the binary variable for whether the state allows counties to enact LOST. I expect it to be positive since it allows counties greater flexibility in revenue raising, and that is what I find. For counties located in states where LOST is permitted they spend between $10.83 and $6.63 more on transportation per capita. All four estimates are statistically significant at the 1 percent level. I find that the mileage variables, when included, explain away some of the increased spending attributed to the option of utilizing LOST.

[25] This is a statewide variable though there are states where it is exempted for the state sales tax but they allow local governments to tax it. For those states it is not coded as an exemption since the unit of analysis is the county level.
[26] Which suggests that there is less variation within the observations than expected.

The second LOST variable of interest is the LOST-T rate. My hypothesis suggests that as the LOST-T rate goes up, so will transportation outlay. By looking at the three specifications I can see that my hypothesis is supported: with no mileage variables, with mileage variables, with mileage variables and state level controls, and then with mileage variables and lag differences of the mileage variables. The results show that as the LOST-T rate increases by one percentage point, spending on transportation per capita goes up by between $34 and $39.17. The magnitude of the impact varies slightly, but all three show a large impact and are statistically significant at the 1 percent level. This is especially astounding when I take into consideration that the average amount spent per capita by the counties on transportation is a mere $155.56. These results provide evidence for my hypothesis, that there are political costs in place that cause budget makers to sluggishly substitute funds away from the general revenue when presented with earmarked revenue. I see once again the importance of including the mileage variables. When not including them the effect of LOST-T is estimated to be less than when they are included, so when including the additional (or reduced) burden created by ownership I find that LOST-T creates a larger distortion in spending.

Both state and federal transfers for transportation have a consistently positive effect almost dollar for dollar. They are statistically significant at the 1 percent level in all specifications. The positive coefficient suggests that states and the federal government are either not compensating counties enough for the devolution of ownership and/or that their funding comes in the form of matching grants. The size of the effects indicates that it is more probable that the transfers are matching grants: for a $1 of state transfer the county responds with an increase of spending of between $0.55 and $0.70. Each dollar of federal

transfer pushes up more county own outlay, by $0.74 to $0.81. Adding in the mileage variables explains away the effect on state transfers but increases that on federal transfers, which points to the efficacy of these mileage indicators.

Referring back to Figure 4.2, I can see that intergovernmental transfers are increasing in this time period. I interpret this to mean that states and the federal government realize that with devolution comes increased financial burden so they have increased transfers for transportation to the counties. However these transfers are not enough to fully cover the increased need so that county own spending increases with the transfers.

Total own source revenue per capita is significant at 1 percent level without the mileage variable and 10 percent level with the mileage variables, respectively. In the latter case, an increase of this indicator by $1,000 pushes up transportation outlay by around $10. (The mean is only $475 though). Non-property tax revenue does not show a statistically significant effect.

When looking at the coefficients for mileage variables, the results are very surprising. There is consistency when comparing the two model specifications: the primary one without lag differences and the secondary one with lag differences. First, I look at those miles owned by the county. For urban county miles I see that they are not statistically significant in either of the two specifications. The results for rural county miles are statistically significant at the 5 percent level when lag differences are included. The estimated impact is an increase in county transportation spending by $10.09. Since these are in per capita dollars, the effect may seem large; however it is important to keep in mind the magnitude of the changes in the mileage variables. It is a percent owned by counties in

the state weighted by the rural/urban make-up of the actual county. Potentially it could be as high as 1, however this is not common because it would require all urban (or rural) miles to be owned by the counties in the state and the county to be all urban (or rural). The values will always be between 0 and 1, so it is not reasonable to expect a 1 unit increase, thus the impact is small in magnitude.

For mileage owned by the states and the federal government I get more interesting results. Looking at state owned urban miles, the results show that as the state ownership of rural miles decreases county spending on transportation per capita by between $21.04 and $42.36, respectively. These estimates are statistically significant at the 1 percent level. I see less of an impact for state owned rural miles. A very small impact is observed, an increase in county spending by $0.001 and $0.007. Even though they are both statistically significant, at the 1 percent level and 5 percent level respectively, the impact is not relevant. Neither of the estimates for urban federal mileage is statistically significant. As rural federal miles increases by unit, county transportation spending on per capita decreases by between $5.99 and $6.51, respectively. The estimate when the lag differences are not included is statistically significant at the 1 percent level, whereas when lag differences are included the estimate is only statistically significant at the 10 percent level. There is evidence that as state ownership of urban miles increase, counties are able to lower their spending. Otherwise, the results are small in magnitude, though rural federal miles are expected to decrease county spending. The mileage lag differences are largely not statistically significant. The only one that is statistically significant at the 5 percent level is rural state miles 1 year lag difference.

There are other independent variables included with interesting effects. A small GSP for the state also leads to higher spending on transportation by the counties. Neither of these results is expected. The higher the median age, the more that is spent on transportation per capita. A denser population leads to less spending, per capita, on transportation by the county. Higher incomes, also consistently lead to greater spending on transportation.

These results signify that the mileage variables do have a confounding impact on how much counties spend on transportation. This is expected, the mileage variables should indicate the effect of the burden on counties for highway ownership; the more miles owned, the more they will spend on transportation.

Table 4.3 presents two additional specifications of the model as a robustness check. The first column has the estimate impacts of the variables when three additional state level controls are used. The results are similar to those found in Table 4.2 and they suggest that the results of the other specifications are robust and do not suffer from omitted variable bias. The second column of results is those estimated using fixed effects. They are also similar, with two exceptions. First, the effect of states permitting LOST is cut by more than half and non-property tax is statistically significant. This suggests that there may be some unobserved heterogeneity; however the majority of the results are in keeping with the random effects estimations. However, the results of the Hausman specification test suggest that moving forward fixed effects may be the superior estimation technique with an estimated chi square of 1,042.17.

Conclusion

Some transportation programs are funded in part by LOST-T. The revenue generated by LOST-T must be used on transportation. This chapter asserts that the revenue supplied by LOST-T will not be compensated for by matching the new revenue with an equal reduction in funds from general revenue. LOST-T distorts behavior. I find that as the county's LOST-T rate increases so does spending on transportation.

This increase in recipient program funding is in keeping with my hypothesis as well as classical economic theory. There are potential policy reasons for this, such as the devolution of highway ownership to counties. The evidence suggests that the changing nature of ownership is not being fully compensated for by either the state or federal government, and that the continued reliance on local governments to pay for our roads is costing them in urban areas.

As the LOST-T rate increases by one percentage point, the spending on transportation increases by as much as $39.52 per capita. This is a large effect. The average spending on transportation per capita by the counties in the data is $155. Therefore the increase in spending is estimated to be an increase between twenty-one and twenty-five percent when LOST-T is in place.

My results are interesting because the effect of earmarked taxes is seldom explored and in the few cases it is there are contradictory effects. This chapter uses interstate data from over twenty years at the county level to examine the effects of an earmarked sales tax and finds that it is distortionary even when controlling for many confounding factors like population, mileage ownership, county income, and intergovernmental transfers for

transportation. I believe this analysis provides solid evidence for the existence of budgeting distortions created by tax earmarks and a formal model to explain why. The formal model provides the mechanism for why earmarked revenue may act as a supplement instead of a substitute: political costs. The next step is to explore other earmarked taxes to further solidify the relationship.

Appendix: Formal Theory Expanded

Optimization:

$$max_{P,T}\mathrm{U(P,T+E)} - \mathrm{b(T-T_0)^2}$$
$$\text{such that } \mathrm{P+T+E=B+E}$$

Lagrangian:

$$L = \mathrm{U(P,T+E)} - \mathrm{b(T-T_0)^2} + \lambda(\mathrm{P+T+E-B-E})$$

First Order Conditions:

$$\frac{dL}{dP} = \mathrm{U_P} + \lambda$$
$$\frac{dL}{dT} = \mathrm{U_T} - 2\mathrm{bT} + \lambda$$
$$\frac{dL}{d\lambda} = \mathrm{P+T-B}$$

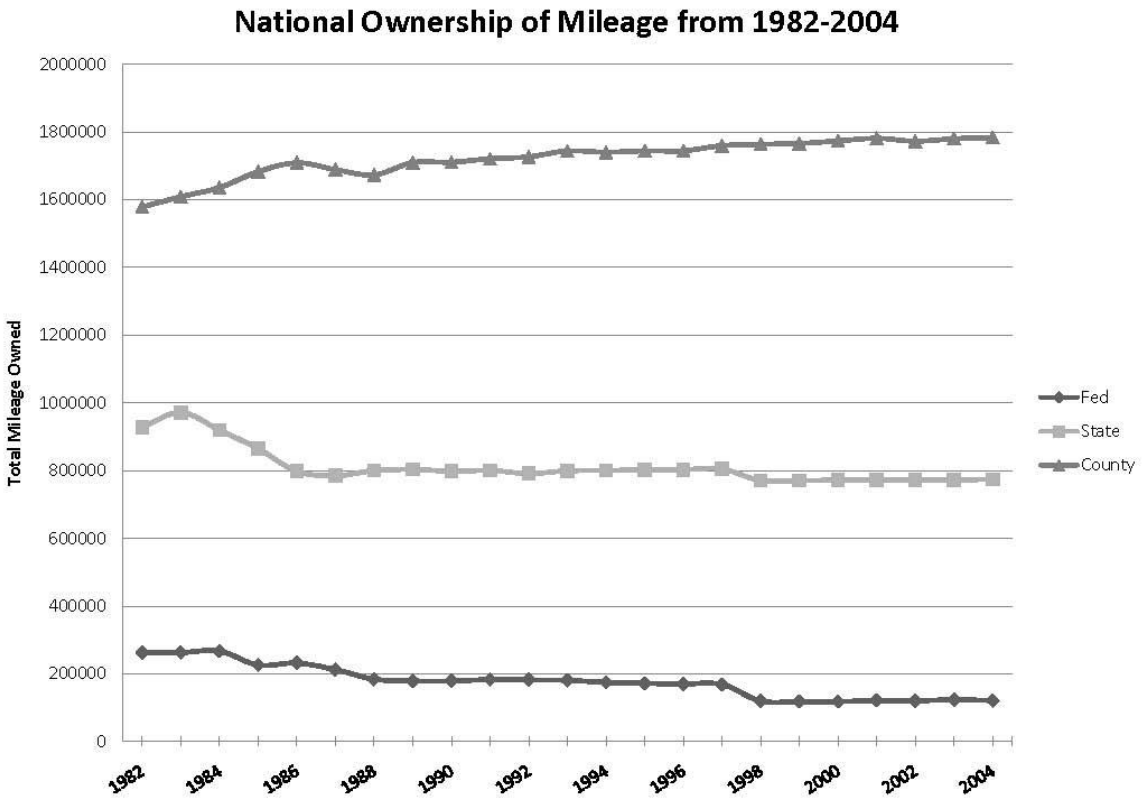
Second Derivatives:

$$\mathrm{U_{PP}dP + U_{PT} + d\lambda + U_{PT}dE = 0}$$
$$\mathrm{U_{TP}dP + (U_{TT} - 2b)dT + d\lambda + U_{TE}dE = 0}$$
$$\mathrm{dP + dT + 0d\lambda + 0dE = 0}$$

Hessian:

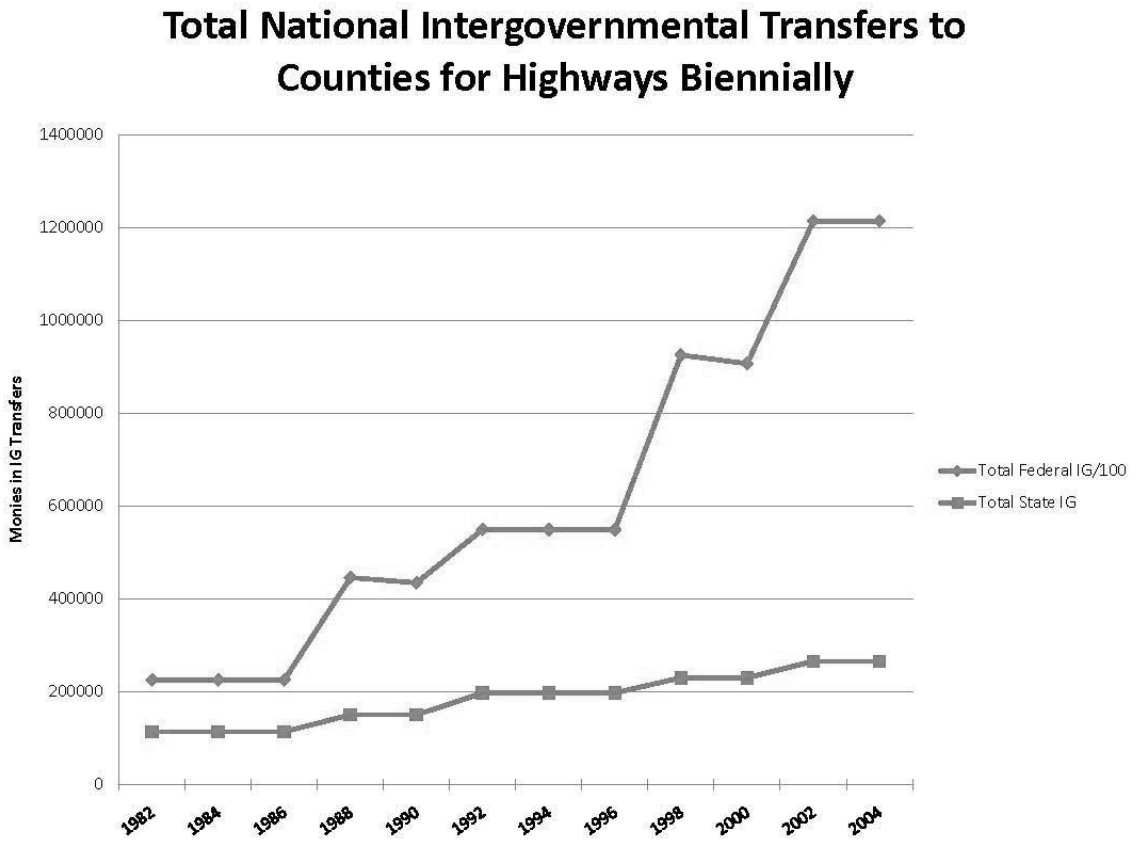
$$|\mathrm{H}| = \mathrm{2b - U_{PP} - U_{TT} + 2U_{TP}}$$
$$|\mathrm{H}| > 0$$

Figure 4.1:



Data is taken from the Department of Transportation's Federal Highway Administration (2010).

Figure 4.2:



Data is taken from the U.S. Census Bureau (2010).

Figure 4.3: The Distribution of the Residuals of Transportation Spending per capita with Normal Curve

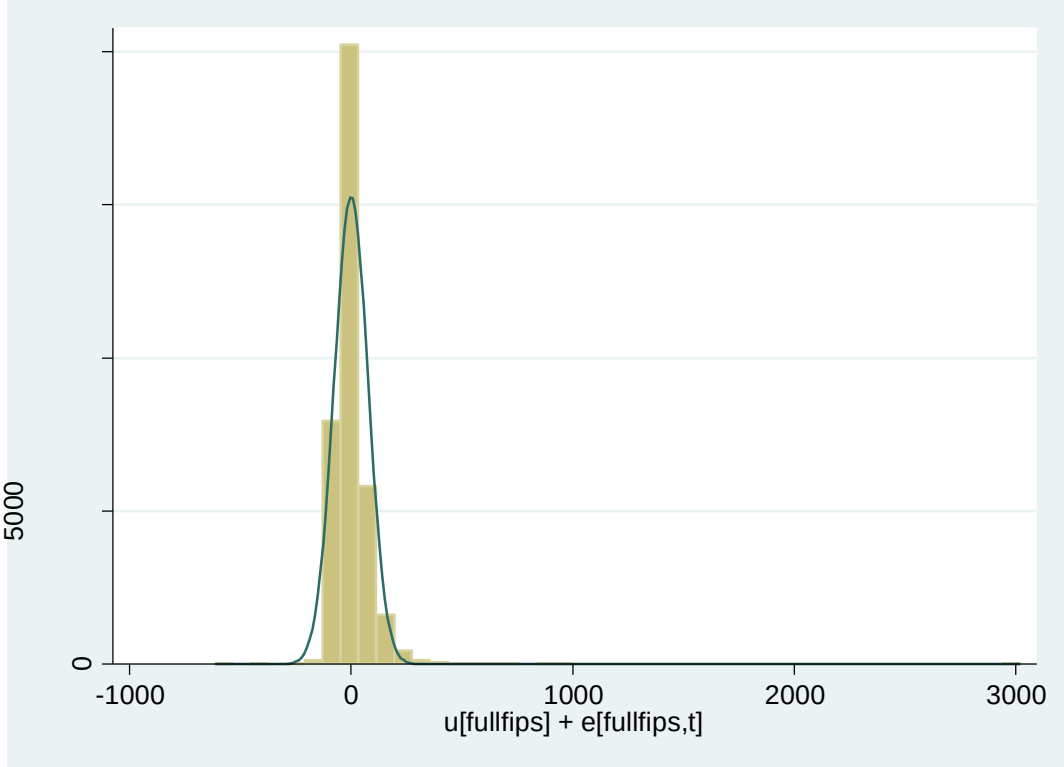


Table 4.1: Summary Statistics of all 35 States					
Variable	Variable Description	Mean	Std. Dev.	Min	Max
Transportation Spending	Total Transportation Spending by the County per capita	155.561	208.008	0.000	13970.710
Property Tax	Property Tax Revenue per capita in $100	18.834	83.708	0.000	5365.612
Percentage from Property Tax	Percentage of Own Source Revenue from Property Tax	78.186	21.027	0.000	100.000
Own Source Revenue	Own Source Revenue per capita	1103.398	1191.522	0.473	62357.200
State LOST	If the County has the Option of Implementing LOST, binary	0.697	0.460	0.000	1.000
LOST Rate	Local Option Sales Tax Rate	0.352	0.775	0.000	8.000
Property Tax TEL	If the state has a tax or exependiture limit for property taxes	0.912	0.283	0.000	1.000
Income	Real per capita income	12616.040	6405.741	1913.579	88323.550
Unemployment Insurance	Unemployment Insurance Spending per capita in $100	0.086	0.063	0.000	0.935
Age	Median Age	37.354	3.967	20.000	54.300
Rural	Percentage of the county characterized as Rural	0.608	0.303	0.000	1.000
Black	Percentage of the county characterized as Black	0.088	0.145	0.000	0.865
Male	Percentage of the county characterized as Male	0.496	0.019	0.426	0.673
Density	County Population per square mile	164.981	500.744	0.053	13092.910
Republican	Percentage of the County that voted for the Republican Candidate in the Last Senatorial Election	0.499	0.217	0.000	1.000

Table 4.2: The Effect of LOST-T on Overall Transportation Spending at the County Level with Random Effects			
Variable Name	With No Mileage Variables	With Mileage Variables	With Mileage Variables and LDs
State LOST	10.834	6.941	6.922
	(2.053)***	(2.115)***	(2.333)***
LOST-T	33.998	39.174	37.523
	(6.301)***	(5.082)***	(4.561)***
State IGT	0.703	0.575	0.549
	(0.121)***	(0.170)***	(0.170)***
Federal IGT	0.742	0.813	0.814
	(0.114)***	(0.115)***	(0.111)***
Total OS Revenue	19.787	9.631	10.254
	(5.533)***	(5.203)*	(5.487)*
Non Property Taxes	8.658	10.536	11.939
	(7.674)	(9.864)	(10.406)
Urban County Miles		-0.137	-1.551
		(6.307)	(6.159)
Rural County Miles		5.195	10.086
		(3.356)	(4.257)**
Urban State Miles		-21.039	-42.36
		(7.968)***	(9.599)***
Rural State Miles		0.001	0.007
		(0.000)***	(0.004)*
Urban Federal Miles		176.745	187.813
		(166.559)	(162.039)
Rural Federal Miles		-5.994	-6.067
		(2.514)**	(3.221)*
Observations	44072	36449	32445
R-squared Overall	0.550	0.519	0.510
The robust standard errors are in parantheses below the estimated coefficents.			
* Significant at 10% level, ** Significant at the 5% level, *** Significant at the 1%			
All regressions include Census regions, and year variables			

Table 4.2: The Effect of LOST-T on Overall Transportation Spending at the County Level with Random Effects: continued			
Variable Name	With No Mileage Variables	With Mileage Variables	With Mileage Variables and LDs
Urban County Miles: lag diff 1			706.839
			(514.559)
Urban County Miles: lag diff 2			-102.640
			(466.947)
Rural County Miles: lag diff 1			-493.398
			(2208.658)
Rural County Miles: lag diff 2			-1543.311
			(2105.049)
Urban State Miles: lag diff 1			190.802
			(140.48)
Urban State Miles: lag diff 2			-123.833
			(406.367)
Rural State Miles: lag diff 1			19.196
			(9.644)**
Rural State Miles: lag diff 2			10.781
			(7.152)
Urban Federal Miles: lag diff 1			-398579.300
			(204333.300)*
Urban Federal Miles: lag diff 2			315551.300
			(182451.200)*
Rural Federal Miles: lag diff 1			77.841
			(564.005)
Rural Federal Miles: lag diff 2			554.996
			(537.9)
Observations	44072	36449	32445
R-squared Overall	0.550	0.519	0.510
The robust standard errors are in parantheses below the estimated coefficents.			
* Significant at 10% level, ** Significant at the 5% level, *** Significant at the 1%			
All regressions include Census regions, and year variables			

Table 4.2: The Effect of LOST-T on Overall Transportation Spending at the County Level with Random Effects: continued			
Variable Name	With No Mileage Variables	With Mileage Variables	With Mileage Variables and LDs
Income	0.003	0.003	0.002
	(0.000)***	(0.000)***	(0.001)***
Unemployment Insurance	-25.634	4.022	0.526
	(14.918)*	(14.893)	(16.257)
Small GSP	0.894	1.758	2.103
	(0.747)	(0.664)***	(0.676)***
Median Age	1.995	1.926	2.132
	(0.467)***	(0.441)***	(0.465)***
Rural	35.378	10.915	14.478
	(8.340)***	(8.938)	(9.649)
Black	36.501	35.723	34.777
	(10.433)***	(10.836)***	(11.120)***
Male	197.008	280.136	281.048
	(74.254)***	(75.662)***	(79.762)***
Population Density	-0.015	-0.020	-0.019
	(0.008)*	(0.009)**	(0.009)**
Republican	-12.300	-4.900	-8.100
	(0.041)***	(0.034)	(0.037)**
Constant	-113.57	-137.752	-140.746
	(44.302)***	(44.719)***	(47.307)***
Observations	44072	36449	32445
R-squared Overall	0.550	0.519	0.510
The robust standard errors are in parantheses below the estimated coefficents.			
* Significant at 10% level, ** Significant at the 5% level, *** Significant at the 1%			
All regressions include Census regions, and year variables			

Table 4.3: Robustness Check: The Effect of LOST-T on Overall Transportation Spending at the County Level with Random Effects with Additional Controls and Fixed Effects		
Variable Name	With Additional State Controls	Using Fixed Effects
State LOST	6.637	3.123
	(2.020)***	(1.641)*
LOST-T	37.080	33.155
	(4.554)***	(3.974)***
State IGT	0.591	0.547
	(0.175)***	(0.007)***
Federal IGT	0.827	0.802
	(0.116)***	(0.023)***
Total OS Revenue	7.689	7.997
	(5.155)	(1.112)***
Non Property Taxes	6.120	18.639
	(9.830)	(10.406)***
No State Sales Tax	-8.549	
	(8.003)	
Exempt Food	0.588	
	(4.149)	
State Statute for Property Tax Reduction	-9.824	
	(1.252)**	
Observations	36426	36449
R-squared Overall	0.464	0.271
The robust standard errors are in parentheses below the estimated coefficients.		
* Significant at 10% level, ** Significant at the 5% level, *** Significant at the 1%		
All regressions include mileage variables, Income, Unemployment Insurance, Small GSP, Median Age, Rural, Black, Male, Population Density, Republican, Census regions, and year variables		

CHAPTER 5

Conclusion

Within this dissertation I examine three aspects of local options sales taxes (LOSTs). I expand upon the understanding of LOSTs and their effect on spending, elasticity of own source revenue, property tax revenue, and total own source revenue. Although, some of these questions have been addressed previously, my research fills in some of the gaps, addresses some of the assumptions, and explores new arenas. First, the associated reduction in property tax burden and the effect of LOST on own source revenue have been explored previously (Inman 1979; Ulbrich, Mabry, and Warner 1990; Jung 2001; Sjoquist, Walker, and Wallace 2005) but my analysis represents an important contribution because of its larger and more diverse geographical scope and time period.

Second, my dissertation confronts some of the classic theory and assumptions surrounding how the choice of taxes and revenue will behave and interact with each other. Modern portfolio theory suggests that increased diversity of revenue streams will lead to more stability. However, when local governments diversify they are moving away from stable property taxes in favor of less stable sales taxes. Therefore, the expected results become less clear and I find that greater diversity does not lead to increased stability. This is an important finding because stability, as measured here by elasticity of own source revenue, is of great consequence to local governments who must balance their budgets.

Third, there has been very little work on how earmarked revenue streams will effect spending on their respective programs, and what has been done has mostly been at the state-level (Deran 1965, Dye and McGuire 1992, Lauth and Robbins 2002). Within my dissertation I examine earmarked LOSTs for transportation and I find that, due to hypothesized political costs, spending on transportation is greater than it otherwise would have been in counties that have earmarked LOSTs in place. This is an important finding because it may encourage financial managers to reconsider their policies or more carefully budget when earmarks are in use.

There are also weaknesses in my analyses. Many of them are due to limitations of my data. First, I am unable to model using all fifty states because of data availability. Fifteen states with LOSTs do not have complete records of their respective county's LOST rates over the entire time period. Second, my analysis would be more interesting if this most recent recession was able to be included and I could analyze the effect that the property bubble has had on local governments and property tax receipts. Third, I do not have actual LOST revenue by county, only rate. I do have non-property tax revenue, but it includes other revenue streams and is a blunt measure. Some of the relationships and magnitudes of the effects would most likely be affected if revenue receipts were being used instead of LOST rates. Fourth, I use random effects because of other limitations like my time invariant TEL variable. Fifth, there is most likely spatial autocorrelation within the counties I am analyzing and it is not dealt with beyond controlling for the state effects or region.

Although imperfect, my dissertation represents solid progress in understanding LOSTs. It has also revealed places where additional research is warranted. First, I find that

there are two types of governments that use LOSTs and in the future I plan on exploring what differentiates them from one another. The first type of government uses LOSTs to both reduce property tax burden and to increase own source revenue, whereas the second type of government uses LOST revenue as neither. I distinguish these two types of governments by their maximum LOST rate, though I do not believe that that is the causal relationship. Therefore, one of my next projects will be investigating what the true difference between these two types of governments is.

Second, I plan on examining the elasticity of own source revenue with regard to income using LOST receipts. I was not able to get this data for this time period, but I may be able to obtain it for either a shorter or more recent time period and this would be especially useful to reinforce and confirm these results. Also, if I am able to get recent data, it would be interesting to test the estimated effect of LOST revenue on elasticity of own source revenue during the "great recession" where property tax revenue and LOSTs are expected to be heavily affected.

Third, another logical step in this stream of research is to examine different types of LOST earmarks. There are unusual circumstances surrounding transportation like the devolution of ownership of roads, and it is important to examine whether these results are generalizable to revenue earmarks in general. In the future, I plan to do a similar analysis looking at health and hospital earmarks.

Fourth, there is still a great deal of LOST research waiting to be done that is not a direct off shoot of the research within this dissertation. For example, I plan on examining the differences in LOST use in urban and rural counties. I believe that LOST will be more successful in urban counties where there are larger sales tax bases and a greater

opportunity to export the burden away from their own citizens. Another avenue for future research is to examine why LOSTs are so common and popular. I believe there may be some sort of fiscal illusion at play; where voters may not believe they are increasing own source revenue of their local governments, that they do not understand that LOSTs are regressive, or even that they believe the tax burden will be exported.

My dissertation uses a data set of thirty-five states at the county level from 1983 to 2004 to examine the use of LOSTs. I explore how the choice of taxes can affect county finances and distort behavior. I find that LOSTs do affect behavior by rolling back property tax burdens, increasing own source revenue, increasing volatility of own source revenue, and distorting behavior by increasing spending on earmarked programs. It is a good first step in examining LOSTs use, though there is still a great deal of work to be done.

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