Does Earmarked Revenue Provide Property Tax Relief? Long-Term Budgetary Effects of Georgia's Local Option Sales Tax*

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This study examines the long-term effects of the 1% General-purpose Local Option Sales Tax (LOST) on the level of property tax in Georgia counties with a pooled interrupted time-series analysis. The LOST has been earmarked for property tax relief in Georgia counties since 1976, but debates remain on whether the proceeds have been used as additional revenues. We find that the adoption of LOST brought short-term property tax relief but not long-term property tax reduction. The result suggests that long-term property tax relief would not be realized by earmarked revenue without careful policy design to safeguard fungibility.

INTRODUCTION

In the wake of the "property taxpayer revolts" that have swept the nation since the late 1970s, local officials find it more difficult to increase property taxes to meet the growing service demands. In order to respond to growing service needs, an increasing number of local governments have adopted local sales taxes and other revenue sources (e.g., local income taxes, user charges and fees, and impact fees). Since the mid-1970s, a growing number of states have authorized the levying of a local sales tax by at least some of their municipalities and counties. By 2003, local sales taxes have been used in thousands of local governments in 33 states.[1] In most states, the adoption of local sales taxes was intended to provide a means of funding additional service delivery and/or to diversify

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1. Council of State Governments, *The Book of the States 2003* (Lexington, KY: Council of State Governments, 2003), 350.

local revenue systems.[2] However, in a few states, local sales taxes were also authorized to provide either a direct or indirect means of property tax relief. To use the local sales tax, some states mandated that part or all of the sales tax proceeds be used to reduce the property tax in the form of a limit on tax rates, a limit on assessment increases, a limit on the tax levy, or a combination of two or more of these limits.[3] For example, in Georgia, the proceeds of the 1 percent general-purpose local option sales tax (LOST) are required to be used for the reduction of property tax in the second year of the tax and all subsequent years.[4] Likewise, state law in Wisconsin mandates that the full amount of LOST proceeds be used to roll back the property tax during the next year.[5] In South Carolina, 63 percent of first-year LOST revenues must be used for a property tax roll-back, and the proportion increases in subsequent years.[6] Moreover, in Iowa, most counties earmark a specific portion of their LOST proceeds for property tax relief, although mandatory reduction of the property tax is not required by the state.[7] Unlike the aforementioned states, many states do not require a direct relief of the property tax burden in authorizing their local sales tax. However, the use of sales taxes, even in these states, may provide indirect property tax relief by preempting the need for an increase in property tax revenue to finance local service delivery.[8]

Although thousands of local governments in several states are using local sales taxes with mandatory property tax reduction requirements, only a few studies have systematically studied the effects of local sales taxes on the property tax relief to date, and almost no studies have analyzed the long-term effects of such taxes on property tax relief. While a local sales tax earmarked for property tax relief is currently levied in Georgia, South Carolina, and Wisconsin, Georgia is one of a few states that adopted the local sales tax dating back in the late 1970s, and thus, the state provides an excellent case to investigate the long-term effects of local sales taxes on property tax relief. Based on previous studies regarding earmarking behavior, this paper investigates the long-term effects of local sales taxes on property tax relief in Georgia counties during the years 1984–2002 by employing a pooled interrupted time series research design. In so doing, this study tests competing scenarios concerning the fungibility of earmarked revenue sources to explain the long-term budgetary effects of earmarked revenue sources.

2. Robert L. Bland, *A Revenue Guide for Local Government*, 2nd ed. (Washington, DC: ICMA, 2005): 105–120.

3. Daniel Mullins and Sharon Cox, *Tax and Expenditure Limits on Local Governments* (Washington, DC: Advisory Commission on Intergovernmental Relations, 1995).

4. Changhoon Jung, "Does the Local Option Sales Tax Provide Property Tax Relief? The Georgia Case," *Public Budgeting & Finance* 21, no. 1 (2001): 73–86.

5. Wisconsin Taxpayers Alliance, *Do County Sales Taxes Lower Property Taxes?* vol. 70 (Madison, WI: Wisconsin Taxpayers Alliance, 2002).

6. Holley H. Ulbrich, "Local Option Sales Taxes and Municipal Finance in South Carolina: A Look at the First Few Years," paper prepared for the Municipal Association of South Carolina, 1996.

7. See Iowa Department of Revenue and Finance (2003). 2003 County Financial Overview; available from: *http://ww.iowacounties.org/fiscalinfo/cfo/cfo2003.htm*: Retrieved 22 April 2004

8. Steven Gold, *Property Tax Relief* (Lexington, MA: Lexington Books, 1979), 207.

Understanding the long-run budgetary effects of LOST on property tax relief will greatly enhance our knowledge concerning the local fiscal behavior of earmarking practices.

This paper is organized as follows. The next section briefly provides background information on the use of LOST in Georgia counties. The third section reviews literature, while the fourth section lays out the conceptual framework and research hypotheses of the study. The fifth section discusses the research method, and the sixth section presents the research findings. The final section concludes the paper with a discussion of the implication and future direction of the study.

BACKGROUND INFORMATION ON THE LOST IN GEORGIA COUNTIES

The General-purpose Local Option Sales Tax (LOST) Act was first passed in 1975 and amended in 1976 in the Georgia General Assembly. Upon the approval of voters, the Act permitted counties to enact a one-percent general-purpose sales and use tax which was to be shared between the county and the cities within the county.[9] The tax can be collected unless it is repealed by a referendum or by a county and its qualified municipalities pursuant to an agreement negotiated by the county government and these cities based on criteria established by general law.[10] Since the adoption of the tax, no counties have repealed the tax to date, and thus, the tax has almost become an institutionalized revenue source for local governments in Georgia.

In order to achieve the goal of property tax relief, the LOST Act mandated that all LOST revenue collected in the second year of the tax and all subsequent years be used for a reduction of property taxes. The LOST revenues are used to reduce county millage rates across the board on all taxable property within the county, including property within municipalities located in the county. If a city located in a county collected its own LOST independent from the county, taxpayers who own property within the incorporated city also have their city millage rate reduced for all taxable property within the city. The Act required that the tax bill of all property taxpayers show the reduced county and city millage rates resulting from the receipt of sales tax revenue from the previous year, as well as the reduced dollar amount of the property tax resulting from the receipt of such revenue.[11] Since the law specified that all LOST revenues were to be used for a dollar-for-dollar property tax relief in the second year of collection, a property tax rollback appears to be certain in the second year of the collection. However, after the second year, the legislation is "less explicit" about the use of LOST revenue for property tax rollbacks, although it requires local governments to show the millage rates and the amount of the

9. In counties in which the county government did not enact the LOST, cities could, with voter approval, impose their own sales tax. However, no city has ever adopted the LOST independently.

10. Betty J. Clements and Devereux Weeks, *County and Municipal Revenue Sources in Georgia* (Athens, GA: Carl Vinson Institute of Government, 1990), 4.

11. Clements and Week, *5*. City governments, however, were not required to roll back property taxes after the second year.

property tax rollback resulting from the collection of the LOST.[12] Because it is very difficult to determine what the property tax rate (or dollar amount) would have been in the absence of LOST revenue, a "paper rollback" is possible, and as a result, a portion of the LOST may be a new revenue source for at least some counties.[13]

The LOST has been a very popular revenue source for most local governments, and the number of counties adopting it has gradually increased since its inception in 1975. Thirteen of the 159 Georgia counties adopted the tax in 1976 and by 1979, the number had increased to 82 counties. It further increased to 104 by 1981, 131 by 1984, 144 by 1988, 148 by 1992, and 153 by 1997. By January 2004, all but five Georgia counties had adopted the tax.[14] Additionally, LOST proceeds now make up 7–35 percent of general revenue sources in counties, which makes the tax the second largest source of revenue following property taxes.[15]

LITERATURE

Nonproperty taxes, such as local sales taxes or local income taxes could provide property tax relief in two ways.[16] First, when the adoption of nonproperty taxes is earmarked for property tax relief (e.g., dollar-for-dollar reduction requirement), a direct provision of property tax relief would be highly likely at least in the short-term if the enacting legislation requires a strict implementation of the mandatory relief. However, if there is no rigorous requirement of continued or subsequent reduction of the property tax burden by local governments, there may be high probabilities that the true long-term reduction of the property tax burden would not be realized in the midst of growing service needs of local governments. Few states (Georgia, South Carolina, and Wisconsin) require a property tax relief with LOST, and the review section of this literature primarily examines the effects of such direct earmarking on property tax relief. Second, although the adoption of a nonproperty tax does not require property tax relief, the collection of additional revenue sources could provide property tax relief indirectly because the additional available revenue may make it possible for local governments to rely less heavily on the property taxes. Efforts to diversify the local revenue structure in many states may have resulted in such indirect property tax relief.

Despite the theoretical and empirical importance of the effectiveness of earmarking, few studies have examined the effects of earmarked local sales taxes on the property tax

12. Dan Durning, *Distributing Georgia's General Purpose Local Option Sales Tax Revenues: An Examination of the Present Policy and Some Options* (Athens, GA: Carl Vinson Institute of Government, 1992), 6–7.

13. Durning, 29.

14. Georgia Department of Revenue, *Historic Rate Chart* (Atlanta, GA: Georgia Department of Revenue, 2004).

15. Jung, 76.

16. Steven Gold, *Property Tax Relief* (Lexington, MA: Lexington Books, 1979), 207; Jung, 76.

burden to date. Examining the use of the LOST in South Carolina cities, Ulbrich found that the property tax growth rates in LOST-cities (1.5%) was less than one-tenth of that in non-LOST-cities (17.9%) after comparing the revenue structures in LOST cities and non-LOST cities.[17] Moreover, she found that the per capita property tax between FY 1991 and FY 1994 increased by about $7 in LOST-cities, compared with about $32 in non-LOST-cities. Thus, Ulbrich concluded that LOST has been "almost exclusively a substitute for rather than an addition to the property tax" in South Carolina.[18] Caution should be exercised in interpreting Ulbrich's finding, however, because her study simply compared property tax levels in LOST and non-LOST cities without controlling for other factors that may affect the property tax level. In addition, the study covered only several years, and thus it does not adequately capture the long-term effects of the earmarking. It should be noted that South Carolina authorized the use of LOST to its local governments in 1990 with the requirement that the property tax be rolled back by an amount equal to 63% of the LOST proceeds received in the first year. In addition, this percentage increases in subsequent years.

Employing a fixed effects model of a pooled time-series research design, Jung examined the effects of LOST on the level of property tax burden (per capita property tax and millage rate) and total spending in 136 Georgia counties during a 13-year period (1984–1997).[19] His findings show that counties with LOST on average have a $12 (or 1.8 mill) lower property tax than those counties without LOST. However, while an extra dollar of LOST revenue provides about 28 cents in property tax relief, it also leads to about a 48 cent increase in total spending. Thus, Jung concluded that although LOST achieved the objectives of property tax relief, "the use of LOST is more of an augmentation of than an effective substitute for property taxes in Georgia counties."[20] Although Jung's study advanced our understanding of the effects of earmarked LOST on the degree of property tax relief in general, the study was rather limited in explaining how the degree of the property tax relief changes in the long-term in counties because the study did not employ variables to capture a long-term change in the study. However, this limitation can be overcome by employing a pooled interrupted time series research design in this study.

The Wisconsin Taxpayers Alliance study provides additional insights into the budgetary effects of LOST. Analyzing fiscal data of 56 Wisconsin counties between 1986 and 2001, the study compared the actual property tax changes to the property tax trend (calculated by the previous five-year patterns before LOST was adopted).[21] The analysis shows that the property tax relief effect of LOST phases out over time. That is, the tax relief was relatively high during the first few years, but it began to wane in the sixth and seventh years. On average, the study also found that only 28 cents per dollar of LOST

17. Ulbrich, 15–17.
18. Ulbrich, 16.
19. Jung, 83.
20. Jung, 86.
21. Wisconsin Taxpayers Alliance, 12–20.

have been used to reduce property taxes. Although the Wisconsin case is a more advanced longitudinal study in investigating the long-term effects of LOST on property tax relief, using a longer time period in a study would help to better capture the changing effects of earmarking behavior over a long-term period. As with the Wisconsin case, the budgetary effects of LOST in Georgia may also vary over time. With a pooled interrupted time series research design, this paper investigates the long-term effects of LOST on property tax relief in Georgia counties, which will improve our understanding about long-term fiscal behavior of earmarked revenue sources.

CONCEPTUAL FRAMEWORK AND RESEARCH HYPOTHESES

The LOST Act in Georgia mandates that local governments use LOST revenues to roll back property taxes during the second year and in "all subsequent years." In so doing, LOST collecting counties are required to show: (1) the reduced millage rate resulting from the receipt of LOST revenue from the previous year, (2) the amount of property tax that would have been levied without LOST (PT_t^*), (3) the amount of LOST proceeds of the preceding year (LT_{t-1}), and (4) the resulting net property tax for the calendar year (PT_t). Mathematically, the rollback can be illustrated in the following equation: $PT_t = PT_t^* - LT_{t-1}$.

Despite these requirements, the extent of the actual rollback becomes less certain after the second year—because it is difficult to assess the amount of property tax that would have been levied without LOST (PT_t^*). Actually, there is not a binding limit on the property tax to be levied (PT_t), given the amount of LOST proceeds of the preceding year (LT_{t-1}). Thus, in fact, local governments might calculate the rollback in a reverse way. At first, the net property tax millage rate to be levied is assessed and is then added with the millage rollback provided by the LOST receipts of the preceding year, which results in the "would-be" millage rate without the LOST.[22] In this case, the property tax relief requirement has little influence on the actual budgetary decision, and the actual effect would be less than the "paper rollback."[23] Without a "binding" limitation on the property tax levy, local governments could receive more revenue from a combination of sales tax and property tax than they would have received without LOST.

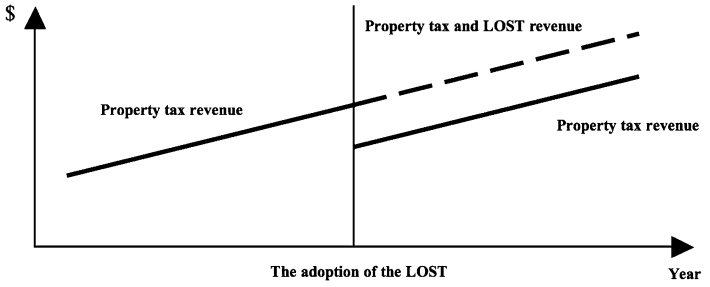
Conceptually, in explaining the long-term effects of LOST (or other earmarked revenues) on property relief, a couple scenarios could be employed.[24] Figures 1–3 depict three commonly assumed scenarios regarding the effects of LOST on property tax relief.

22. This is one of the authors' interpretations from a personal interview with Chris Caldwell in the Office of Budget and Finance, Athens-Clarke County, on December 22, 2003.

23. Durning, 29.

24. There are two assumptions underlying these scenarios. First, there is a stable trend of property tax growth if the LOST was not levied. Second, LOST proceeds in these counties remain unchanged over time. The first assumption is critical for the model, while the second one is for the purpose of simple interpretation.

FIGURE 1
Scenario I—LOST is a substitute for property tax



For example, counties may use all LOST proceeds to provide property tax relief (Scenario I—Figure 1). In this case, the sum of property tax and LOST revenue after the collection of the LOST should not exceed the projected property tax level, and thus LOST works as a full substitute for the property tax. Alternatively, the counties may use all LOST proceeds as additional revenues (Scenario II—Figure 2), which results in no property tax relief at all. Under this scenario, the projected property tax level follows the pre-LOST path, even after the collection of LOST. In many cases, however, LOST proceeds may be used for both purposes (Scenario III—Figure 3) in the long term. Under this scenario, part of LOST revenue is used to provide property tax relief and part provides an additional revenue source. Accordingly, the property tax level is lowered after the collection of LOST, but the sum of property tax and LOST revenue after the collection of LOST exceeds the projected property tax level of the pre-LOST period. However, it remains lower than the sum of property tax and LOST revenue than in Scenario II. This scenario can be described by the concept of "fungibility." Basically, if the earmarked revenue was not fully used for the earmarked function and part of it were used for other purposes, the earmarked revenue is fungible. Literature on earmarked revenue sources reports this fungibility problem. For example, several studies investigating the effects of earmarked state lotteries for educational spending found that the

FIGURE 2
Scenario II—LOST is an additional revenue source

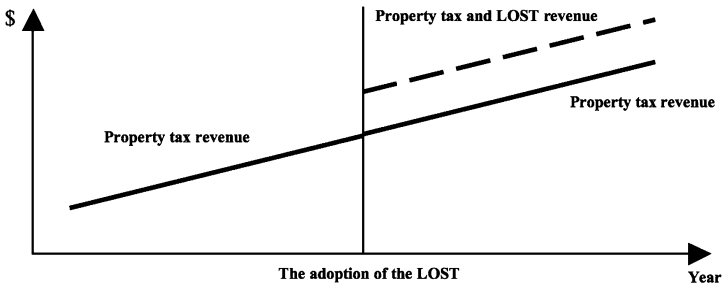
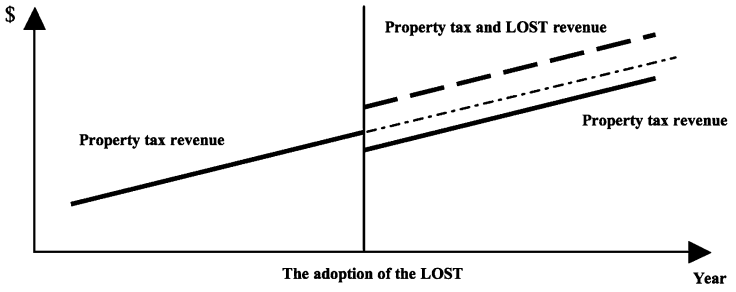


FIGURE 3
Scenario III—LOST is a substitute for property tax and additional revenue



earmarking did not increase the level of total education spending as states were likely to decrease their education appropriation in anticipation of lottery revenue.[25]

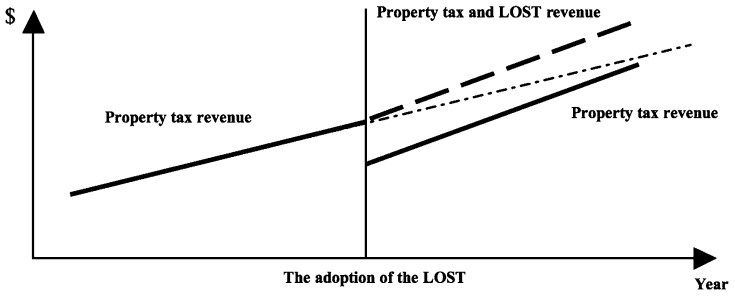
In the case of Georgia, the LOST is basically adopted to provide property tax relief. However, if it did not result in a substantial property tax relief but more of an increase in the total expenditure level, the LOST might have been fungible. In the case of Georgia, scenario III has received some support from Jung's study.[26] However, because Jung did not employ variables to capture the long-term effects of the property tax relief in his study, his finding presents an incomplete picture because it is highly possible that the budgetary effects of the LOST on the property tax level would vary over time as seen in the case of Wisconsin local governments.

The above three scenarios (scenario I, II, and III) basically assumed a linear and parallel trend in the growth (or reduction) of the property tax level before and after the adoption of the sales tax. That is, there is no change in the slope of a pre-LOST property tax trend, even in the post-LOST period. However, if the average growth rate of the property tax level will increase faster in the post-LOST period than in the pre-LOST era (a higher slope of property tax trend in the post-LOST period than in the pre-LOST era), this increasing growth rate of the property tax will eventually offset the short-term effects of the property tax rollback and will lead to an even higher property tax level in the long-term. Since the LOST Act requires property tax relief starting in the second year of LOST collection and continuing in subsequent years, an initial rollback is quite certain. However, because it is difficult to assess the amount of property tax that would have been levied without LOST (PT_t^*), counties may increase their property taxes over a number of years, and this increasing growth rate in the property tax during the

25. Mary O. Borg and Paul M. Mason, "Earmarked Lottery Revenues: Positive Windfalls or Concealed Redistribution Mechanisms?" *Journal of Education Finance* 52 (April 1989): 75–85; Mary O. Borg and Paul M. Mason, "The Budgetary Incidence of a Lottery to Support Education," *National Tax Journal* 41, no. 1 (March 1988): 75–86; John Mikesell and Kurt Zorn, "State Lotteries as Fiscal Savior or Fiscal Fraud: A Look at the Evidence," *Public Administration Review* 46 (July/Aug. 1986): 311–320; Charles Spindler, "The Lottery and Education: Robbing Peter to Pay Paul?" *Public Budgeting & Finance* 15 (Fall 1995): 54–61.

26. Jung, 83.

FIGURE 4
Scenario IV—LOST serves as a source of fiscal illusion



post-LOST era may offset the short-term effects of the property tax rollback. Thus, it may eventually result in an even higher property tax level in the long run. As illustrated in Figure 4, this pattern could be termed as a "fiscal illusion" scenario.

A plausible explanation for this situation is the "fiscal illusion" theory which holds that taxpayers' perceptions of the cost of government can be obscured by the ways in which government taxes are raised, and thus taxpayers are led to pay (accept) even higher tax levels eventually.[27] There are several sources pertaining to perception errors. First, more invisible taxes, such as LOST (or lottery revenue), may make it harder for average taxpayers to assess accurately the true cost of public service. Thus, the public may fail to realize that they are paying for a higher level of government spending after the adoption of these less visible taxes. Second, income-elastic taxes (e.g., a sales tax) will automatically raise more revenues as income increases over time without increasing the tax rate, which eventually results in more total government spending. Finally, the "paper rollback"[28] such as is found in Georgia counties camouflages the nonbinding nature of the property tax relief requirement, and the illusion that property tax has been rolled back may, paradoxically, indulge governments to levy an even higher property tax in the long run.

Given that the LOST Act mandates property tax relief with LOST revenues in the second year of LOST collection and subsequent years, it is almost sure that the adoption of the LOST will bring property tax relief in the second year of LOST collection (short-term relief). However, because the LOST Act does not require binding limitation on the property tax levy or assessment, it will not bring a long-term property tax relief because local governments have incentives to collect more revenue from a combination of the LOST and property taxes. Thus, this study proposes the following hypothesis:

27. Vaughan Dickson and Weqiu Yu, "Revenue Structures, the Perceived Price of Government Output, and Public Expenditures," *Public Finance Review* 28, no. 1 (2000): 48–65; Brian Dollery and Andrew Worthington, "The Empirical Analysis of Fiscal Illusion," *Journal of Economic Surveys* 10, no. 1 (1996): 261–269.

28. Durning, 29.

Hypothesis: *The LOST collection provides a short-term property tax relief, but it does not result in long-term property tax relief.*

RESEARCH METHODS

Property tax level (burden) is measured in several ways in state and local finance literature. Per capita property tax collection appears to be one of the most widely used measures, followed by the per capita property tax as a percentage of per capita personal income (per capita property tax/per capita personal income x 100), effective property tax rate, and property tax millage rate.[29] Each indicator has its strengths and weaknesses in measuring the property tax level. However, millage rate is the least utilized measure of property tax burden because the millage rate may not reflect the actual property tax burden unless property assessment practice and net assessed property tax digest are controlled.[30] For this reason, millage rate is not considered as a measure of property tax burden in this study. It would be ideal to employ per capita property tax, per capita property tax as a percent of per capita personal income, and effective property tax rates as measures of property tax burden at once in this study. However, in part due to the unavailability of an adequate data set, almost no studies employed all the three measures at the same time in longitudinal studies.

Since some Georgia counties started to collect the LOST in 1976, it would be ideal if we could analyze the property tax burden prior to 1976. However, since the Georgia Department of Community Affairs has compiled detailed county finance data (including property tax collection) only since 1984, it is almost impossible to utilize countywide per capita property taxes and property tax as a percent of personal income prior to 1984. In addition, a data set pertaining to countywide effective property tax rates is not available either. Hence, due to the unavailability of a dataset prior to 1984, this study employs two available measures of property tax burden (per capita property taxes and per capita property tax as a percent of per capita personal income) during the 1984–2002 period to investigate the effects of LOST on the property tax burden in Georgia counties.

Data, Statistical Methods, and Variables

To investigate the changing effects of LOST on property tax relief, this study employs fiscal and socioeconomic variables in Georgia counties during 1984–2002. The main source of the fiscal data set is the annual *Report of Local Government Finance*, which has been annually compiled by the Georgia Department of Community Affairs since 1984.

29. Holley H. Ulbrich, Rodney H. Mabry, and John T. Warner, "Does the Local Option Sales Tax Provide Tax Relief?" A paper presented at the Western Economic Association Meetings at Lake Tahoe, NV, in 1990.

30. Ulbrich et al.; Gold, 10–18.

Most of the socioeconomic variables were collected from the *Georgia County Guide*, which is compiled annually by the Center for Agribusiness and Economic Development and the College of Family and Consumer Sciences at the University of Georgia.[31] Sources of others and individual variables are listed in the Summary Statistics (Table 1). At one time Georgia had 159 counties, but three counties have been consolidated with its cities during the period for this study. Since the consolidation affects the property tax level and other fiscal variables, this study excluded these three consolidated counties from the study, and thus examines 156 counties during the time period of 1984–2002.

To capture both the short-term and the long-term effects of LOST on the level of property tax relief over years, this study employs a pooled interrupted time-series research design. This research design often includes three terms to capture the effects of the policy intervention.[32] These include: (1) a time parameter which is coded from 1 to n in order to capture the long-term trend; (2) a term for the change in intercept which is coded 0 before the change and coded 1 afterward to capture the short-term effects of the policy intervention; and (3) a parameter to capture the long-term effects of postintervention which is coded 0 before the change and coded as 1,2,3, . . . n afterward. This research design was popularized by Lewis-Beck and later studies employed this method to examine the long-term effects of lotteries on education or the effects of a county government form on revenue structure.[33] Mathematically, the interrupted time series design can be expressed as the following equation (1).

$$Y_t = b_o + b_1 X_{1t} + b_2 X_{2t} + b_3 X_{3t} + e_t \quad (1)$$

where $Y_t = n$ time-series observations on the dependent variable; X_{1t} = a time parameter (coded from 1 to n to capture long-term trend); X_{2t} = a term for change in intercept (coded 0 before the change and coded 1 afterward to capture the short-term effects for the policy intervention); X_{3t} = a parameter (coded 0 before the change and coded 1,2,3, . . . n afterward to capture the long-term effects of postintervention). In the above equation, b_1 estimates the slope of preintervention (long-term trend), b_2 estimates the postintervention change in intercept (short-term effects of intervention), and b_3 estimates the postintervention change in slope. The sum of the coefficients b_1 and b_3 (b_1+b_3) reflects the slope of the postintervention trend. To estimate the presence (or absence) of polynominal relations in the postintervention period, a term ($b_4 X_{3t}^2$) could be inserted at the equation (1), and this study employed such terms in the analysis.[34]

31. Douglas C. Bachtel and Susan R. Boatright, eds., *The Georgia County Guide 1982–2003* (Athens, GA: Center for Agribusiness and Economic Development, University of Georgia).

32. Michael Lewis-Beck, "Interrupted Time-Series," in *New Tools for Social Scientist*, eds. William Berry and Michael Lewis-Beck (Beverly Hills, CA: Sage, 1986).

33. Donald E. Miller and Patrick A. Pierce, "Lotteries for Education: Windfall or Hoax?" *State and Local Government Review* 29, no. 1 (1997): 34–42; Benton J. Edwin, "County Government Structure and County Revenue Policy: What's the Connection," *State and Local Government Review* 35, no. 1 (2003): 78–89.

34. For details, see Lewis-Beck, 209–226.

TABLE 1
Summary Statistics

Variables	Minimum	Maximum	Mean	SD
Dependent variables				
PROPERTYTX	10.55	548.26	106.97	51.47
PT%PI	0%	5.93%	0.95%	0.49%
TLSPENDING	16.2	1,110.9	280.07	117.9
Independent variables				
TREND	1	27	17.60	5.20
SHORTTERM	0	1	—	—
LONGTERM	0	25	—	—
LOSTAX	0	208.6	33.6	19.3
POPULATION	1,841	825,172	41,841	92,797
DENSITY	5.34	2,491.8	125.9	273.15
AGE65	0.7%	27.2%	12.2%	3.2%
INCOME	6,845.7	26,484.9	11,054.7	2,197.8
UNPAVED	0.2%	70.9%	35.7%	16.7%
HMOWNER	14.3%	88.6%	72.5%	8%
EDULEVEL	4.2%	42.4%	11.4%	5.8%
REPUBLICAN	0.17	0.813	0.543	0.112
SPLOST	0	1	—	—
ASSESSMENT	649	97,806.5	14,707.8	7,713.7
FEDAID	0	423.3	4.9	16.8
STATEAID	0	438.6	25.1	27.1

Variable definitions

PROPERTYTX	Per capita property tax revenue[a]
PT%PI	Property tax as a percent of personal income (per capita property tax/per capita personal income × 100)[a]
TLSPENDING	Per capita total spending[a]
TREND	An annual counter starting 1976 (1976 is coded 1)
SHORTTERM	LOST dummy with one year lag ($LOST_{t-1}$)[a]
LONGTERM	Post-LOST year annual counter (coded 0 before the LOST and 1.2.3 . . . n)[a]
LOSTTAX	Per capita LOST tax revenue[a]
LOGPOP	Log of population size[b]
DENSITY	Population density; number of people living in a square mile[b]
AGE65	Percentage of population of age 65 or above[b]
INCOME	Per capita personal income[b]
UNPAVED	Unpaved miles of county roads as a percentage of total county roads[b]
HMOWNER	Percentage of homeownership (number of owner-occupied housing units/number of occupied housing units × 100)[b]
EDULEVEL	Percentage of population with four-year college degree or higher[b]
REPUBLICAN	Percentage of voters who voted for Republican presidential candidates in the previous election[c]
SPLOST	Special purpose local option sales tax dummy (coded 1, if county collected any amount of SPLOST, 0 otherwise)[a]
ASSESSMENT	Per capita all taxable property[d]
FEDAID	per capita intergovernmental revenue from federal government[a]
STATEAID	Per capita intergovernmental revenue from state government[a]

Sources:
[a]Georgia Department of Community Affairs, Report of the Local Government Finances, FY 1984–2002.
[b]The University of Georgia, The Georgia County Guide, various issues (1980–2004).
[c]Georgia Secretary of State, Presidential Election Results, 1980–2004.
[d]Georgia Department of Revenue, Statistical Report, 1984–2004.

Since heteroskedasticity and autocorrelation in error terms of the pooled regression equations that are analyzed in the study were detected, this study uses estimates produced by panel-corrected standard errors (PCSE).[35] The PCSE uses the Prais-Winsten transformation which is an improvement to the original Cochrane–Orcutt algorithm for estimating time series regressions in the presence of autocorrelated errors. When computing the standard errors and the variance–covariance estimates, PCSE assumes that the disturbances are, by default, heteroskedastic and contemporaneously correlated across panels. The PCSE model is reported to address problems associated with the panel dataset (heteroskedasticity and autocorrelation in error terms) quite satisfactorily.[36] Moreover, the PCSE technique has advantages over the fixed effects model of the panel research design in capturing the effects of time–invariant variables (e.g., region) since the fixed effects model cannot estimate these variables.[37]

To test the effects of LOST on the level of property tax burden (relief), two dependent variables are employed in this study. These include per capita property tax and per capita property tax as a percent to per capita personal income, and they are denoted PROPERTYTX and PT%PI, respectively, in the study. Per capita property tax is considered to be the best indicator in measuring the property tax burden and thus, this measure becomes the focal point. The fluctuations of the property tax level are reflected in a historical trend disturbed by short and long-term changes associated with the collection of LOST.

In capturing these short- and long-term effects of LOST collection on property tax levels, four independent variables are employed in the study. The first is a "trend" effect variable, which represents an annual counter for the years 1984–2002. Since LOST was first collected in several counties in 1976, the year 1976 is entered as 1, and the second year (1977) is entered as 2, with subsequent years following this pattern. A statistically significant positive coefficient of this trend variable reflects a preintervention trend of property tax level in counties. The trend variable is denoted as TREND in this study. The second variable is a "short-term" effect variable which is measured by a dummy variable, coded 0 for observations made before and the year of the collection of LOST (pre-LOST years), and coded 1 after the first year of LOST (post-LOST dummy variable with one year lag—$LOST_{t-1}$). Because the LOST Act required that LOST revenue collected in the second and subsequent years should be used for property tax relief in counties, the lagged LOST value is employed in the analysis.[38] A statistically negative

35. To estimate the parameters, we used Stata 10 software in the study. The application of xtserial procedure reveals the presence of autocorrelation in the errors terms of regression equations we employed in the study. Likewise, the application of lrtest shows the presence of heteroskedasticity across panels. This justifies the use of PCSE model in the analysis.

36. Nathaniel Beck and Jonathan N. Katz, "What to Do (and Not to Do) with Time-Series Cross-Section Data," *American Political Science Review* 89 (Spring 1985): 634–647.

37. Badi Baltagi, *Econometric Analysis of Panel Data* (New York: John Wiley & Sons, 1995).

38. Instead of using one year lagged value of LOST dummy variable, a two-year lagged value of LOST dummy variable ($LOST_{t-2}$) can be employed to capture the effects of LOST dummy variable as counties are required to provided property tax relief after the second of the LOST collection and subsequent years. However, preliminary regression results show that there is no big difference between the two.

coefficient of this short-term variable represents a property tax rollback (reduction) due to the collection of LOST. The variable is denoted as SHORTTERM in the study. The third independent variable is a "long-term" (postintervention effect) variable which reflects an annual counter in the post-LOST years. The variable is coded 0 for all the pre-LOST and the year of LOST adoption, and is coded 1 after the first year of LOST adoption and 2 after the second year, 3 after the third year, and so on (post-LOST dummy variable with one year lag—$LOST_{t-1}$). This captures the direction of long-term effects of LOST on property tax relief after the adoption of the tax. A statistically negative coefficient of this long-term postintervention variable indicates that the LOST adoption results in a long-term property tax reduction. However, a statistically significant positive coefficient of this variable suggests that the LOST adoption does not lead to a long-term property tax relief, but rather an increase of the property tax burden. The variable is denoted as LONGTERM in the study. As indicated above, it should be noted that the sum of the coefficients of the TREND and LONGTERM variables (b_1+b_3 in equation 1) determine the slope of the property tax level (burden) in the post-LOST era.

In addition to the three independent variables mentioned above, this study also employs two variables which are designed to detect a possible nonlinear (e.g., curvilinear) relationship between the long-term time counter (LONGTERM) and the property tax level. A statistically significant coefficient of $LONGTERM^2$ and $LONGTERM^3$ variables indicates that the initial slope of post-LOST trend reverses as time passes by. The coefficients of a squared and cubed value of the LONGTERM variable is expected to capture a nonlinear relationship between the LONGTERM variable and the property tax level.

Property tax literature suggests that variations in the level of property tax can be explained by demographic and socioeconomic variables, the availability of other revenue sources, and the size of the property tax base among others.[39] To control for demographic and socioeconomic variables that are reported to affect the property tax level in Georgia counties,[40] log of population (LOGPOP),[41] population density (DENSITY), percentage of a population age 65 and above (AGE65), per capita personal income (INCOME), percentage of unpaved county roads (UNPAVED), percentage of homeownership (HMOWNER), percentage of population with four-year college degree or higher (EDULEVEL), and percentage of voters who voted for Republican presidential candidates in the previous election (REPUBLICAN) are employed. In general, previous studies show that income, homeownership, and education level are positively associated with the use of property taxes and the percentage of individuals 65 years and over and

39. David L. Chicoine and Norman Walzer, "Factors Affecting Property Tax Reliance," *Public Choice* 64, no. 1 (1986): 17–28; Gold, 53.

40. Jung, 83.

41. To understand the impact of population growth on property tax burden, log of population is employed instead of number of population.

the percentage of Republicans are negatively associated with property tax uses.[42] The unpaved miles of county roads as a percentage of total county roads (UNPAVED) are used to capture the fiscal pressure of counties as county governments need more money to pay for their unpaved county roads.[43]

To control for the possible effects of other revenue sources on the level of property tax, the use of a special purpose local option sales tax (SPLOST—coded 1 if a county collected SPLOST and 0 otherwise) which is earmarked for local capital spending in Georgia counties, per capita federal aid (FEDAID), and per capita state aid (STATEAID) are also employed in the research models. Other things being equal, the use of an additional own source and intergovernmental revenues may reduce the reliance on property taxes. To control for the effect of the property tax base size on property tax collection, a per capita taxable property value (ASSESSMENT) is employed. The per capita taxable property is expected to be positively associated with per capita property taxes. To control for inflation, nominal dollar values are deflated using a CPI index (with 1982 value as base) for all the fiscal variables employed in the study. Table 1 presents summary statistics with definitions and the sources of variables employed in the regression analysis.

RESEARCH FINDINGS

The first and second columns in Table 2 present regression results of the effects of LOST on two measures of property tax burden for 156 Georgia counties during the time period of 1984–2002. The third and fourth columns present results of the effects of per dollar of LOST on the relative magnitude of property tax relief and total expenditure increase.

The first column <PROPERTYTX (A) model> in Table 2 shows the effects of LOST on the per capita property tax level, and the second column (PT%PI model) presents the effects of LOST on property tax as a percent of personal income. The positive and significant coefficients of the annual counter variables (TREND) in both measures of property tax burden [PROPERTYTX (A) and PT%PI] in Table 2 clearly indicate that counties increased their property tax level prior to the LOST collection. Specifically, before the collection of LOST, per capita property taxes had increased by $2.50 [coefficient of TREND variable in PROPERTYTX (A) model] or by 0.03% of the property tax as percent of personal income (coefficient of TREND variable in PT%PI model) annually in counties. However, after the LOST collection, counties were able to lower their property tax burden by $14.75 [coefficient of SHORTTERM variable in PROPERTYTX (A) model] or 0.10% of the property tax as a percent of personal income

42. John Merrifield, "The Institutional and Political Factors which Influence Taxation," *Public Choice* 69 (1991): 295–310; Jung, 83; John R. Bartle, "The Fiscal Impact of Federal and State Aid to Large U.S. Cities: An Empirical Analysis of Budgetary Response," *Public Budgeting & Finance* 15, no. 4 (1995): 56–67.

43. Jung, 83.

TABLE 2
Effects of LOST on Property Tax Burden and Total Spending

Variable	PROPERTYTX (A)	PT%PI	PROPERTYTX (B)	TLSPENDING
TREND	2.50***	0.03***		
	(0.77)	(0.009)		
SHORTTERM	− 14.75***	− 0.10**		
	(5.64)	(0.05)		
LONGTERM	− 3.06	− 0.03		
	(1.97)	(0.02)		
LONGTERM^2	0.18	0.001		
	(0.20)	(0.002)		
LONGTERM^3	− 0.006	− 0.00004		
	(0.006)	(0.00006)		
POPULATION(LOG)	− 1.37	− 0.04	− 2.57	8.18***
	(2.66)	(0.03)	(3.44)	(2.76)
DENSITY	0.013***	0.00007***	0.02***	0.012
	(0.003)	(0.00003)	(0.004)	(0.025)
AGE65	− 47.47	− 1.26**	− 39.04	52.70
	(51.15)	(0.50)	(43.39)	(110.89)
INCOME	0.004***	− 0.00005***	0.004***	0.005*
	(0.001)	(0.00002)	(0.001)	(0.003)
UNPAVED	18.12	0.09	14.78	43.14
	(15.72)	(0.13)	(11.77)	(30.61)
HMOWNER	52.20***	0.48***	73.29***	78.43*
	(15.56)	(0.18)	(21.41)	(40.63)
EDULEVEL	30.68	0.28	67.93	331.28***
	(37.92)	(0.44)	(52.01)	(63.46)
REPUBLICAN	− 51.34*	− 0.56**	− 65.49***	− 110.94***
	(26.42)	(0.24)	(19.77)	(52.22)
LOSTAX			− 0.17**	0.76***
			(0.08)	(0.22)
SPLOST	− 0.13	0.008	0.43	40.80***
	(1.01)	(0.015)	(1.46)	(5.41)
ASSESSMENT	0.002***	0.00002***	0.002***	0.004***
	(0.0003)	(7.24e − 6)	(0.0007)	(0.0007)
FEDAID	0.017	0.00009	0.018	0.41***
	(0.018)	(0.0002)	(0.017)	(0.04)
STATE AID	0.017	0.0002	0.03	1.01***
	(0.016)	(0.0002)	(0.02)	(0.08)
CONSTANT	22.32	1.51	23.01	− 51.90
R^2	0.67	0.65	0.68	0.57

***Significant at the 99% level.
**Significant at the 95% level.
*Significant at the 90% level. Numbers in parentheses in fixed effects model shows absolute *t*-values, and that of PCSE model indicates *z*-values.

(coefficient of SHORTTERM variable in PT%PI model), as indicated in Table 2 by the negative and statistically significant coefficients of SHORTTERM variables in both measures of property tax burden. Nonetheless, after the LOST collection, the long-term impact on property tax relief is not likely to occur as indicated by statistically insignificant negative coefficients of LONGTERM variables for both PROPERTYTX (A) and PT%PI models. Mathematically, the slope of the property tax burden in the post-LOST era is the sum of the coefficients of the TREND and LONGTERM variables [b_1+b_3 in the regression equation (1)]. However, since statistically insignificant coefficients of LONGTERM, LONGTERM,^{2} and LONGTERM^3 variables do not result in a statistically significant changes in the slope of property tax level in the post-LOST era, the slope of the property tax level in the post-LOST era would remain the same as that of pre-LOST era, although the change in intercept would result in a short-term reduction of per capita property taxes ($14.75) or the property tax as a percent of personal income (0.10%).[44] As a result, the trend line of the property tax level in the post-LOST era would remain linear and parallel to that of pre-LOST, but with a sudden drop of intercept as shown in Figure 3.

The effects of some of the control variables are worth mentioning. In the PROPERTYTX (A) model, density (DENSITY), percentage of owner-occupied home (HMOWNER), per capita taxable property (ASSESSMENT) are positively associated with the property tax level. However, the percentage of Republicans (REPUBLICAN) is negatively associated with the property tax level. Likewise, in the PT%PI model, percentage of owner-occupied home (HMOWNER) and per capita taxable property (ASSESSMENT) are positively associated with the property tax as a percentage of personal income. However, percentage of the elderly population (AGE65) and Republicans are negatively associated with the property tax as a percentage of personal income. In both models, the HMONWER and ASSESSMENT variables are positively associated and REPUBLICAN is negatively associated with the different measures of property tax burden. This suggests that counties with a higher percentage of home ownership and a higher per capita taxable property value have a high property tax burden to provide and maintain adequate services to the home and other types of property owners. However, counties with a higher proportion of Republicans do not favor high property tax burden. These findings largely confirm the literature.[45]

Having examined the effects of LOST on property tax relief, an analysis of the relative magnitude of the property tax relief and total expenditure increases that resulted from LOST (LOSTAX) is necessary to further understand the nature of LOST. The third and fourth columns in Table 2 present the effects of per dollar of LOST revenue on per capita property tax relief [PROPERTYTX (B)] and per capita total expenditure (TLSPENDING), respectively. As the statistically significant negative coefficient of the LOSTAX (-0.17) variable in the third column of the PROPERTYTX (B) model indicates, a dollar

44. Lewis-Beck, 209–240.
45. Merrifield, 295–310; Bartle, 56–67; Jung, 83.

of LOST revenue does not bring a dollar-for-dollar property tax relief, but provides only a partial tax relief (17 cents). On the other hand, as the statistically significant positive coefficient of the LOSTAX (0.76) variable in TLSPENDING model shows, a dollar of LOST revenue increases total expenditure by 76 cents.[46] Since a dollar of LOST was used to increase local expenditure by 76 cents, while it relieved property taxes only by 17 cents, the finding confirms Jung's study that "LOST is more of an augmentation of rather than a powerful substitute for property taxes."[47]

Based on the findings from the effects of LOST on property tax burden and effects of per dollar of LOST revenue on the magnitude of property tax relief and total expenditure increase shown in the above, this study concludes that, on average, although the adoption of LOST resulted in an immediate short-term property tax relief, it did not result in a long-term property tax reduction since the slope of the property tax level in the post-LOST era was not leveling off or decreasing at all. Moreover, LOST is more of an augmentation rather than a powerful substitute for property taxes since it results in relatively more expenditure increase than tax property tax relief. As a result, it could be concluded that the Georgia case is a fitting Scenario III reflected in Figure 3, suggesting that LOST provides only partial property tax relief without resulting in a long-term property tax relief. However, it appears that LOST is not a source for fiscal illusion in Georgia counties as illustrated in Figure 4.

IMPLICATIONS AND CONCLUSIONS

This paper examined long-term effects of the earmarked revenue (LOST) on property tax relief by employing a pooled interrupted times design for 156 Georgia counties during the period of 1984–2002. The findings indicate that the adoption of LOST resulted in a short-term property tax relief. However, the LOST did not result in long-term property tax relief because the policy intervention (LOST collection) did not change from the slope of the pre-LOST property tax level. The findings also indicate that the adoption of LOST in counties did not bring a dollar-for-dollar property tax relief. A dollar of LOST revenue provided about 17 cents of property tax relief, and about 76 cents was used to increase the expenditure level. Thus, on average, the findings suggest that the collection of LOST brought short-term property tax relief. However, it provided only partial property tax relief without resulting in a permanent long-term property tax reduction. Thus, the LOST served as a source for a partial substitute for property while providing additional revenues in Georgia counties as illustrated in Figure 3 (Scenario III).

46. Theoretically, an additional dollar LOST revenue could be used either to increase the total expenditure level or to decrease tax or non-tax revenues in the sample counties. Since an additional LOST dollar resulted in about 17 cents property tax decrease and about 76 increase in total expenditure, the remaining (about 7 cents) might have been used to reduce other taxes and non-tax revenue in the sample counties.

47. Jung, 73–85.

The findings of this study provide both theoretical and policy implications. Theoretically, this study adds an important case of fungibility to the local finance literature by examining long-term budgetary effects of a local sales tax which is earmarked for property tax relief. Moreover, this study is one of the first analyses that has revealed a dynamic path of fungibility of an earmarked local sales tax. Findings in the study could be used by policy makers and the general public in designing a better policy to safeguard the fungibility of the earmarked revenue sources.[48] For instance, state governments can establish a fixed cap or equation for the would-be property tax without the LOST (PT_t^*), making the property tax rollback by the LOST a binding requirement.[49] At the local level, knowledge about the budgetary effects of the earmarked revenue would help the public to make a reasonable choice when they cast their votes on the proposed earmarked revenue in the local tax referenda. Being aware of a "fiscal illusion" associated with the LOST would help local residents to hold their governments more accountable. Based on findings from this study, further studies can be done to see if the earmarked revenue reduces a property tax burden in the long-term in other states where similar types of earmarked LOST are used.

48. Thomas P. Lauth and Mark D. Robbins, "The Georgia Lottery and State Appropriations for Education: Substitution or Additional Funding?" *Public Budgeting and Finance* 22, no. 3 (2002): 89–100.

49. Philip G. Joyce and Daniel R. Mullins, "The Changing Fiscal Structure of State and Local Public Sector: The Impact of Tax and Expenditure Limitations," *Public Administration Review* 51, no. 3 (1991): 240–253; Zhirong Zhao, "Motivations, Obstacles, and Resources: The Adoption of the General-Purpose Local Option Sales Tax in Georgia Counties," *Public Finance Review* 33 (2005): 721–746.