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CHAPTER 6

Earmarking Tax Revenues: Leviathan's Secret Weapon?

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The practice of dedicating a portion of tax revenue to a specific expenditure category is a popular fiscal tool for state governments. Despite its widespread use, this practice, also known as earmarking, has ambiguous theoretical effects in terms of how it should affect the amount or composition of expenditures. Empirical studies have found evidence that some portion of earmarked revenue does “stick” to its intended target, though the majority of the earmarked revenue goes elsewhere. In this chapter, we outline a political economy theory of earmarking that seeks to explain its widespread use in the face of these apparent shortcomings.

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The fundamental theoretical issue with earmarking tax revenue is fungibility. So long as expenditures from the general fund are at least as large as the amount of the earmarked revenue, there is no reason to expect an earmarked dollar to have any more of an impact on expenditures than an undedicated dollar—in other words, tax revenues (like all dollars) can be perfectly substituted for one another. In the extreme case, policymakers can use an additional earmarked dollar in place of a previously used general fund dollar, freeing that general fund dollar to be used elsewhere. The result would be no change in spending on the targeted expenditure category. In the event that the earmarked revenue exceeds previously used general fund monies, however, an increase in expenditures would be expected.

Despite this potential meaninglessness of the practice, several arguments favor the earmarking of revenue, such as guaranteeing funding for important programs or constraining politicians' choices on budgetary matters. However, by applying the "Leviathan" model of government, which assumes government seeks to maximize its size, a possible use of earmarking that runs contrary to these arguments is uncovered. Since earmarked funds may be used (in theory) to increase spending in other areas through the fungibility of revenues, policymakers in government may turn to tax increases earmarked to politically popular programs (e.g., education) or highly visible public goods (e.g., highways) when more general tax increases are not feasible politically. In other words, the potential theoretical shortcomings of earmarking tax revenue may be viewed by some policymakers as an attractive feature allowing for an increase in total government size through an increase in revenue purportedly dedicated to some popular program.

In this chapter, we present evidence from forty-nine states (as is common in the state fiscal-policy literature, we drop Alaska from the analysis). Unlike previous studies of earmarking, which rely on some aggregate measure of total dollars earmarked to a specific program, we separate specific taxes and other revenue sources to determine any differences in the relative stickiness (and thus ability of government to use the funds elsewhere) across earmarks. Our results indicate that the majority of earmarks fail to increase spending in their target expenditure category. These same earmarks, however, are quite effective at increasing spending on other expenditure categories. In general, the practice of earmarking tax revenue leads to larger government overall. In other words, we find evidence that policymakers may use earmarking to mask increases in government spending.

EARMARKING TAX REVENUE: THEORY, PRACTICE, AND EMPIRICAL EVIDENCE

Earmarking tax revenue is a budgetary practice that involves dedicating a percentage of the tax revenue from a specific source to a specific expenditure. Every US state earmarks a percentage of its revenue for a certain purpose, but the percentage of total state revenue that is earmarked varies widely. In 2005, Alabama earmarked 84 percent of its total state revenue, the largest percentage in the United States, while Rhode Island earmarked only 4 percent of its revenue, the lowest among US states.¹

Table 1 presents a summary of popular earmarked revenue sources and their most common destination in 2005. The tax revenue sources earmarked the most frequently were the motor fuels tax and the general sales tax. The most popular expenditure categories to receive earmarked funding were education, state highways, and local governments. Overwhelmingly, the most common earmark across the fifty states is gasoline tax revenues targeted to highway expenditures.

Earmarking practices not only vary across states, but they also have changed substantially over time. The National Conference of State Legislatures first collected and reported data on state earmarking practices in 1954. That year, 54 percent of all state revenue was specifically dedicated to some expenditure category. Its recent survey of fiscal year 2005 shows that only 24 percent of state revenues were earmarked.²

Given the differences in earmarking practices through time and across states, it is necessary to discuss why earmarks are implemented in the first place. Earmarked tax revenues are typically justified by legislators for several reasons. An earmark may be assigned to a source of tax revenue as a means for guaranteeing funding for a particular government expenditure category. This is often used to gain popular support for the creation of a new source of government revenue. A popular example of this has been governments' justifying the implementation of lotteries, the proceeds of which are to be used to fund such programs as education.³

This use of earmarking may be implemented as an attractive marketing strategy. Governments may be able to encourage additional consumption of a taxed good by promoting the advertised expenditure destination. In the case of lottery revenue earmarked for education expenditures, politicians can politicize the need for additional education revenue to sell more lottery tickets—not unlike the use of small-scale lotteries (e.g., 50/50 raffles) as fundraisers for nonprofit organizations. Participants are often willing to purchase tickets, not

Table 1. Earmarking in the United States, 2005

	Revenue Source												
	General Sales	Tobacco	Alcohol	Insurance	Utilities	Pari-mutuel	Personal Income	Corporate Income	Motor Fuel	Motor Vehicle Registration	Gaming	State Property	Severance
States levying tax	45	50	50	50	50	37	43	45	50	50	20	37	39
States earmarking tax	35	26	23	26	10	9	20	14	49	12	14	9	26
Expenditure Targeted by Earmark													
Local government	17	14	10	7	4	1	7	4	22	5	6	n/a	24
Education	11	10	4	4	3	2	8	5	2	1	4	3	6
State highways	7	1	n/a	n/a	1	n/a	n/a	n/a	45	8	1	n/a	n/a
Health/Welfare/Human services	2	23	13	3	2	n/a	2	1	n/a	n/a	1	1	n/a
Pensions	2	1	1	7	n/a	n/a	2	1	n/a	n/a	1	1	n/a
Parks/Natural resources	4	2	1	n/a	n/a	n/a	n/a	n/a	12	1	1	2	6
Debt service	5	4	1	n/a	n/a	1	4	1	10	3	4	2	4
Environmental programs	4	2	n/a	n/a	n/a	n/a	n/a	n/a	3	n/a	n/a	n/a	6
Other	14	7	13	11	3	8	5	3	19	5	5	3	8

Source: Pérez (2008).

Note: n/a = nonapplicable.

only at the hope of winning, but also because they know their money goes to an organization they support.

Another popular argument in favor of earmarks is that they act as the transfer medium of a Pigouvian tax; that is, when a tax is placed on a good that creates a negative externality in an effort to deter consumption, the earmark ensures transfer of the revenue to government programs that are designed to alleviate the burden of the externality. A related justification is tied to the principle of benefits-received taxation and the provision of public goods.⁴ In this case, the tax acts as a mechanism to help mitigate the free-rider problem, and the revenues are dedicated to the provision of the public good. A popular example of this type of earmark is state gasoline excise tax revenues that fund state highway and road expenditures, which are generally considered to have public-good characteristics. Gasoline tax revenues can be used to maintain roads, which incur wear and tear due to drivers' use. In a sense, a gasoline tax "charges" drivers in direct proportion to their contribution to the need for road maintenance: those who drive more will purchase more gasoline and therefore pay more in taxes used to fund repairs.

Stratmann and Bruntrager (2011) describe why this use of earmarks is unjustified, primarily from the perspective that excise taxes fail to fully capture any externalities (1) created by the product being taxed or (2) created by the public good. In describing the gasoline excise tax, they argue that charging tolls and a broader tax on all carbon emissions would be a more accurate way to match benefits received to expenses paid.⁵ Nevertheless, several of these earmarks remain in place today. In 2005, every state earmarked a percentage of its gasoline tax to spending on roads, with the median percentage of revenue earmarked at 95.9 percent.⁶

Looking at how states choose to earmark revenues, this logic is clearly incomplete; many earmarks exist that are entirely unrelated to the Pigouvian argument. For example, in 2005, Alabama earmarked 40 percent of its beer tax revenue to public schools and higher education. While many argue that education provides positive externalities enjoyed by all citizens of a state, it is difficult to justify why individuals who purchase alcohol reap any higher proportion of the positive spillovers. Thus, while the Pigouvian argument is a popular one for the justification of earmarked tax revenues, other motivations for the practice clearly exist.

The formal theoretical discussion of the practice of earmarking begins with Buchanan (1963). Buchanan argued from a position of methodological individualism that viewed the distinction of earmarked versus general fund revenues as analogous to consumer choice over individual goods versus a "tie-in-sale"

or “bundle.” For Buchanan, the unbundling of expenditure programs inherent in the practice of earmarking revenues allowed a median voter greater control over the taxing and spending activities of government and could serve as a constraint on policymakers; conversely, financing government out of a general fund distorted the median voter’s choice calculus. The extent to which overall spending would be affected by using general fund versus earmarked revenue would depend on the relative elasticity of the publicly provided goods and services being discussed. Specifically, if a move was made from a system of strict earmarking toward a new general fund financing scheme that favored spending on a good or service for which demand was relatively elastic, Buchanan expected overall government expenditure to increase—a situation that would indicate earmarking acted as a constraint. Should the new general fund financing scheme favor spending on goods for which demand was relatively inelastic, however, the move away from earmarking would result in smaller government—in other words, general fund financing was more effective at limiting the size of government. In short, the extent to which earmarking affects total government size is left as an empirical question.

Further complicating the practice of earmarking is the issue of fungibility: because governments allocate much of their spending through a general fund, the revenue they receive from any source is easily transferred to any expenditure. Thus additional earmarked revenue dedicated to a specific expenditure can be used as a substitute for previous funding that had been coming from the general fund, so long as this previous level of spending was at least as large as the earmarked revenue. This characteristic was identified by Buchanan (1963), who showed that under some specific circumstances, earmarking tax revenue to a specific expenditure category should have, by itself, no theoretical effect on the amount of spending on the targeted program.⁷ This issue of fungibility is crucial to our hypothesis of earmarking as a tool used to increase general fund revenues and the overall size of government, presented in a later section of this chapter.

Despite earmarking’s theoretical shortcomings and occasionally dubious economic justifications, state governments have widely adopted the practice. Furthermore, empirical studies have shown that despite the issue of fungibility, some percentage of revenue (typically in the form of intergovernmental grants or revenues from special sources, such as lotteries) will tend to stick to its targeted expenditure. This phenomenon, known as the “flypaper effect,” is discussed in the following section. We then turn our discussion to a political economy framework of why the practice of earmarking remains popular.

THE FLYPAPER EFFECT

The concept of fungible revenue is central to a separate but related literature concerning the so-called flypaper effect. Inman (2008) claims there may be as many as 3,500 studies that investigate the flypaper effect. These papers investigate whether fungible revenue sticks to its intended expenditure destination. Theoretically, because revenues are fungible, there is no reason that an increase in revenue from a new source—say, a federal grant to a state—should have an impact on expenditures different from any other increase in income in the state. Taken a step further, economic theory predicts that in most scenarios, governments receiving revenue from a new source will increase expenditure by the same amount they would have had the new revenue come simply from an increase in income. In other words, government would be expected to treat this new income (which may very well be earmarked for a specific expenditure program) in the same way it did the revenue it had previously been using, and therefore relatively little of the new revenue will reach its intended destination—just as an increase in income would be expected to result in only a relatively small increase in demand for government expenditures.⁸ Counter to theory, however, the common theme among empirical studies is that a higher than expected portion of such revenue sticks where it hits.

Estimates of how much sticks vary widely. Gramlich (1977), Hines and Thaler (1995), and Bailey and Connolly (1998) provide summaries of empirical studies that investigate the effects of lump-sum grants. Like earmarked tax revenue, grant revenue is a new source of fungible funding that can be used as a substitute for previously used general fund revenue. The most popular of these investigated grants have been intergovernmental grants (federal to state and local governments, and state to local governments). Gramlich and Galper (1973) find a flypaper effect of 0.25 (indicating that 25 cents of every dollar sticks), while Inman (1971) finds a unitary increase in spending from a \$1 increase in revenue. Generally, however, the flypaper estimates tend to range from 0.30 to 0.70, with a median of around 0.45 (Sobel and Crowley 2014). This suggests that an extra dollar in federal grants to a state will result in increased spending of about 45 cents and a potential tax reduction of approximately 55 cents.

More recently, the flypaper effect has been estimated for own sources of revenue that are earmarked for specific expenditures—a strand of the literature more in line with our current topic. Dye and McGuire (1992) show very limited effects on expenditures of earmarks targeting education, highways, or local governments. Other studies have focused on state lottery revenues

earmarked for education. Evans and Zhang (2003) investigate sixteen states that earmark lottery revenues for K–12 education. They find that an extra dollar in lottery revenue leads to an increase in education expenditures between 60 and 80 cents. This increased expenditure on education is 30–50 cents more than a similar increase in lottery revenue in states that earmark lottery revenue for other purposes and 20–30 cents more than a similar increase in revenue in states that do not earmark lottery revenue whatsoever. Similarly, Novarro (2002) finds that earmarked revenues increase K–12 spending 60 cents more than revenue earmarked for other sources and 36 cents more than revenue that was not earmarked.

Other researchers have found less consistent results, indicating a possible substitution of earmarked lottery revenues for previously used general fund revenue. Pantuosco et al. (2007) find no evidence that earmarking lottery revenue for education expenditure increases spending—though, strangely, lottery revenues not earmarked for education (i.e., revenues that enter a state’s general fund) have a positive impact on spending. Garrett (2001) found little evidence that Ohio’s earmarked lottery revenues led to increases in spending on education. Erekson et al. (2002) find significant evidence of fungible lottery revenues substituting for general fund expenditures on education, resulting in no net increase in spending.

Other work has examined the flypaper effect for state highway spending. Nesbit and Kreft (2009) find that a \$1 increase in revenues earmarked for highway expenditures increases expenditure by approximately \$1. Goel and Nelson (2003) find states that earmark their gasoline tax revenue for general funds (rather than for highway expenditures) spend \$2.54 less on highways for each \$1 diverted to the general fund.

Among all these studies, the issue of flypaper-effect asymmetry (i.e., possible differences in response to increases vs. decreases in grant income) remains relatively unexplored. The few studies that have investigated symmetry have found mixed results. Gamkhar and Oates (1996) examine federal grants to state and local governments from 1953 to 1991, finding symmetry effects. Similarly, Gamkhar (2000) and Goodspeed (1998) find symmetry in state and local government responses to changes in aid. Heyndels’s (2001) study of Flemish municipalities, Volden’s (1999) analysis of US states, and Levaggi’s and Zanola’s (2003) study of Italian healthcare expenditures all find asymmetries in the replacement of local government funds. Using Wisconsin municipalities, Deller and Maher (2009) find that the treatment of intergovernmental aid is asymmetric, depending on service. Specifically, local governments are more likely to respond to decreases in intergovernmental aid by substituting

local revenue in the case of vital services (e.g., waste disposal services and road expenditures) than for less vital services (quality of life expenditures, which include spending on libraries, parks, and cultural services).

Thus, although theory predicts that earmarking revenues should have little effect on the size or composition of expenditures, the flypaper literature has shown some effects. Given its limitations, the question remains why states continue to rely on earmarking tax revenues for specific expenditure categories. We propose a hypothesis in the following section.

MASKING INCREASES IN GOVERNMENT SPENDING

The Brennan and Buchanan (1977, 1978, 1980) Leviathan model of government can help explain the disconnect between theory, empirical evidence, and the underlying practice of earmarking. According to this theory, government seeks to maximize its power and size. Barring some strict fiscal constitutional rules, government continues to increase the level of taxation and expenditure.

In this context, the fungibility of the different sources of funds available for expenditure provides policymakers with a way to increase government size without highly unpopular increases in rates on general fund taxation sources. Specifically, by earmarking tax revenues for a specific expenditure, policymakers are able to advocate for increases in the earmarked tax on the basis of benefiting the targeted expenditure category. Should the tax increase be approved, the earmarked revenues may be used in place of previously used general fund revenues, allowing those monies to be spent elsewhere. The result is little to no net effect on the targeted expenditure and an increase in total government size.

An example will help clarify this theory. Assume that a state government spends \$100 from the general fund on education. Suppose the legislature is able to pass a new special sales tax on the basis of its revenue being earmarked for education spending. Further, suppose this new tax brings in \$50 in revenue. Although it may seem natural to assume education spending will increase by \$50 as a result of the earmarked revenue (to \$150), policymakers actually have the option to decrease spending on education out of the general fund. Even if the entire \$50 earmarked to education spending is actually spent on education, total education expenditures may remain unchanged if the legislature decides to decrease general fund spending from \$100 to \$50. This allows policymakers to spend elsewhere \$50 of revenue previously dedicated to education, and the earmark is functionally equivalent to a \$50 increase in unspecified general fund revenue. Importantly (for interpretation of our empirical results), this

substitution would have an observed effect: the earmark would have no impact on education spending.

Thus, politicians may use the earmarking of tax revenues to specific expenditure categories to covertly raise revenue and expand total government size. This option becomes especially attractive when the public resists general increases in taxes. Instead, policymakers may choose to enact new taxes earmarked for spending on politically popular programs (e.g., education) or obviously visible public goods (e.g., highways) as a way to expand total government size by exploiting tax revenue fungibility. In other words, politicians may actually view the theoretical and empirical shortcomings of earmarking as attractive features of the practice.

The degree to which earmarking is used in this manner is an empirical question. Although previous studies have looked at how earmarked revenues affect expenditures in the targeted category (the flypaper-effect literature), we are equally interested in how earmarked revenues affect other expenditures. To be clear, we investigate two effects: (1) whether earmarked revenue is used for the intended purpose and (2) whether overall spending and spending on categories other than the intended destination increase as the amount of earmarked revenues grows. Certain earmarks are more likely to stick than others; therefore, we focus on specific taxes earmarked to specific expenditures and not some broader measure of total earmarked revenue as used in previous studies. The following section outlines our empirical test of the hypothesis that earmarking can increase the overall size of government.

EMPIRICAL APPROACH AND DATA

To test the degree to which specific earmarked tax revenues affect their targeted expenditure, we estimate the following equation:

$$EXP_{it} = \beta_1 EAR REV_{it} + \beta_2 OTH REV_{it} + \beta_3 X_{it} + \mu_t + \theta_i + \varepsilon_{it}, \quad (1)$$

where for state i in year t , EXP_{it} is real per capita expenditure in the targeted category; $EAR REV_{it}$ is a collection of real per capita revenue sources earmarked to the expenditure; $OTH REV_{it}$ is real per capita, own-source revenue from sources other than the earmarked taxes; X_{it} is a collection of other demographic and economic control variables; μ_t and θ_i are year and census region fixed effects; and ε_{it} represents the regression model's error term. The primary coefficient of interest is β_1 , which represents how much of each additional dollar of earmarked revenue is spent on its intended expenditure.

If the earmark increases targeted expenditures, β_1 will be positive and statistically significant. The magnitude is also crucially important: if β_1 takes a value less than 1, it indicates some portion of the earmarked revenue is not sticking to its intended expenditure.

Following Dye and McGuire (1992), we focus our analysis on the three major expenditure categories for which tax revenues are earmarked: education, local governments, and highways. To capture potential differences in the stickiness of earmarks, we focus on the individual revenue sources that are earmarked and not on some aggregate measure of earmarked funds as has been used in the previous literature. We analyze revenues from the general sales tax, tobacco tax, alcoholic beverage tax, personal income tax, corporate income tax, gambling tax, gasoline tax, and motor vehicle registration. We then calculate the specific revenue earmarked by multiplying the total revenue from each source by the percentage earmarked for the expenditure category.

As discussed above, many states earmark a variety of taxes for the same expenditure category. Thus, in our specifications, the $EAR REV_{it}$ variable is actually a collection of several variables, accounting for each earmarked revenue source. This approach differs from those previously seen in the literature and allows us to test differences in the degree to which certain earmarked revenue sources may stick to their intended expenditures. In our estimates of education expenditures, $EAR REV_{it}$ comprises real per capita general sales tax revenue, tobacco tax revenue, alcohol tax revenue, personal income tax revenue, and corporate income tax revenue multiplied by the percentage of such revenue specifically earmarked for education spending. For example, if a state earmarks 50 percent of tobacco tax revenue for education spending, our regression includes total tobacco tax revenue multiplied by .5, yielding the total dollars of tobacco tax revenue designated for education. For the estimates of local government spending, $EAR REV_{it}$ contains real per capita general sales tax revenue, tobacco tax revenue, alcohol tax revenue, personal income tax revenue, corporate income tax revenue, gasoline tax revenue, and motor vehicle registration tax revenue, multiplied by the percentage of such revenue specifically earmarked for local government spending. Finally, $EAR REV_{it}$ comprises real per capita gasoline tax revenue and motor vehicle registration tax revenue earmarked for highways in our estimates of highway expenditures.

The $OTH REV_{it}$ variable is total real per capita own-source revenue minus that revenue contained in the $EAR REV_{it}$ variables. The inclusion of this variable allows us to interpret the effect of an earmarked dollar relative to all other

sources of revenue. We also estimate our models using a collection of nonearmarked revenues in place of the $OTH REV_{it}$ variable. This specification allows for an interpretation of a difference in effects between an earmarked dollar of revenue versus a nonearmarked dollar of revenue from the same source. More specifically, it allows for a direct test of the flypaper effect for these revenues, as we can statistically test for any difference between the estimated coefficients on the earmarked and nonearmarked revenues. The group of variables that make up X_{it} includes demographic and economic controls that may influence expenditures. Specifically, these controls include the percentage of the population that is white, the percentage of the population that is under the age of 15, the percentage older than 65, the percentage older than 25 with a high school education, real per capita personal income, real per capita federal grants to the state, and an indicator variable for the political party of the state's governor.⁹

To fully test our hypothesis, we also estimate the effect of earmarking on both nontargeted expenditures ($NON EXP_{it}$),

$$NON EXP_{it} = \beta_1 EAR REV_{it} + \beta_2 OTH REV_{it} + \beta_3 X_{it} + \mu_t + \theta_i + \varepsilon_{it}, \quad (2)$$

and total state government spending ($TOT EXP_{it}$),

$$TOT EXP_{it} = \beta_1 EAR REV_{it} + \beta_2 OTH REV_{it} + \beta_3 X_{it} + \mu_t + \theta_i + \varepsilon_{it}. \quad (3)$$

Again, the variable of interest in these specifications is β_1 , which measures the effect of the marginal earmarked dollar, this time on expenditures other than those for which the earmark is dedicated. If our hypothesis is correct and earmarked dollars are used to increase general fund revenues and thus the size of government, we would expect positive, statistically significant values for β_1 .

Our data span forty-nine states (dropping Alaska, as is common practice in state-level revenue/expenditure studies) and 3 years (1988, 1993, and 2005).¹⁰ Our rather eclectic collection of years is due to the publication dates of the most comprehensive study of state government earmarking practices, the *Earmarking State Taxes* report by the National Conference of State Legislatures, from which we obtain the percentages of specific tax revenues earmarked for specific expenditures (Fabricius and Snell 1990; Pérez and Snell 1995; Pérez 2008). Our data on state expenditures, revenues, personal income, and federal grants come from the Census Bureau's *State Government Finances* report. Data on governors' political affiliation come from the Council of State Governments' *Book of the States*. Finally, our measures of the percentage of the state population that is white and the age and education breakdowns come from the Census Bureau. All fiscal variables are expressed in real per capita terms (2005 dollars) to control for inflation and state population.

RESULTS

Table 2 presents our results for revenues earmarked for spending on education. The first column shows our estimation of equation 1, the effects of earmarked revenues on the targeted expenditure category (in other words, the extent of the flypaper effect). Earmarked general sales tax revenue has no effect on education spending. Roughly 56 cents of every dollar of earmarked personal income tax revenue is spent on education, while earmarked alcohol and tobacco tax revenue also have a positive effect on education spending. The coefficient on earmarked alcohol tax revenue is quite large, implying a complementarity between the earmarked revenue and additional expenditures funded out of the general fund—this result is unsurprising, however, given the relatively small amount of revenue generated by the alcohol tax.¹¹ Earmarked corporate income tax revenue has a negative effect on education spending, implying that when these revenues are earmarked for education, general fund spending is reduced by an amount larger than the earmark. Finally, expendi-

Table 2. Effect on Spending of Revenue Earmarked for Education

	<i>Dependent Variable</i>		
	Education Expenditure	Noneducation Expenditure	Total Expenditure
Earmarked general sales tax revenue per capita	0.232 (0.166)	0.727*** (0.171)	0.958*** (0.144)
Earmarked tobacco tax revenue per capita	1.683* (0.999)	-0.483 (1.536)	1.201 (1.582)
Earmarked alcohol tax revenue per capita	15.269*** (4.642)	-11.628* (6.118)	3.641 (6.313)
Earmarked personal income tax revenue per capita	0.564*** (0.088)	0.113 (0.129)	0.677*** (0.130)
Earmarked corporate income tax revenue per capita	-1.833* (1.070)	4.362*** (1.372)	2.529** (1.065)
Real own-source revenue per capita from other sources	0.295*** (0.035)	0.560*** (0.042)	0.855*** (0.054)
Observations	146	146	146
R-squared	0.78	0.94	0.96

Source: Authors' estimates based on data from Fabricius and Snell 1990; Pérez and Snell 1995; Pérez 2008; US Census Bureau, *Annual Survey of State Government Finances* (<https://www.census.gov/econ/overview/go1500.html>) and other data; and Council of State Governments, *Book of the States* (<http://knowledgecenter.csg.org/kc/category/content-type/bos-archive>).

Note: All specifications include the following controls: the percentage of the state's population that is white, the percentage that is under the age of 15, the percentage over 65, the percentage over 25 with a high school education, real personal income per capita, real federal grants per capita, an indicator variable for the political party of the state's governor, and year and census region fixed effects. Coefficient estimates for these variables are available on request. Robust standard errors in parentheses: *** indicates statistical significance at the 1 percent level, ** at the 5 percent level, and * at the 10 percent level.

tures on education are increased by approximately 30 cents of every dollar of own-source revenue from other sources.

The second column of table 2 shows the results from the first of our tests of the hypothesis that earmarked revenues are used to increase total government size. Here we test equation 2, in which the dependent variable in these specifications is total expenditures less those in the category to which the revenue source is earmarked (i.e., education). Notably, general sales tax revenue and corporate income tax revenue earmarked for education have a positive effect on noneducation expenditures. This result lends credence to our hypothesis, as these earmarks had either no effect or a negative effect on education spending, implying that the revenues were transferred instead to the general fund. Earmarked alcohol tax revenue (which had the largest positive effect on education spending) has a similarly large negative effect on other expenditures, suggesting a complementarity between this particular earmark and expenditures from the general fund. Predictably, earmarked personal income tax and tobacco tax revenue, which each had a positive effect on education spending, have no effect on noneducation expenditures. Notably, an *F*-test on the education-earmarked revenues in this specification yields evidence that earmarked dollars are indeed associated with increases in spending in areas other than education. Specifically, we are able to reject the hypothesis that the earmarked dollars collectively have no effect on noneducation spending, indicating that together, these earmarked revenues do in fact affect spending in areas outside what was targeted.¹²

Finally, the results from our estimation of equation 3, the effects of earmarked revenue on total government expenditure, are shown in the third column. General sales tax revenue, personal income tax revenue, and corporate income tax revenue earmarked for education all increase the overall size of government spending by amounts approaching one full dollar per dollar earmarked. This result provides some evidence of the flypaper effect generally, in that nearly all revenue in these earmarked tax revenues is associated with increases in spending (though not necessarily in the targeted area).

The first column of table 3 shows the estimation of earmark effects on local government expenditures. Nearly all (83 cents) of an additional dollar of general sales tax revenue earmarked for local government expenditures is spent on local governments—the strongest flypaper effect we observe. Earmarked vehicle registration revenue also has a positive impact on expenditures on local governments, with a very large magnitude (though again, the amount of revenue collected by the average state for this tax is relatively small). Earmarked tobacco tax, alcohol tax, personal or corporate income tax, and gambling tax

Table 3. Effect on Spending of Revenue Earmarked for Local Governments

	<i>Dependent Variable</i>		
	Local Government Expenditure	Nonlocal Government Expenditure	Total Expenditure
Earmarked general sales tax revenue per capita	0.830*** (0.315)	0.371 (0.419)	1.201*** (0.195)
Earmarked tobacco tax revenue per capita	-0.972 (0.827)	2.573*** (0.736)	1.601** (0.735)
Earmarked alcohol tax revenue per capita	-0.536 (6.401)	-6.331 (6.669)	-6.867 (4.614)
Earmarked personal income tax revenue per capita	-0.038 (0.172)	0.656*** (0.206)	0.618*** (0.171)
Earmarked corporate income tax revenue per capita	-3.073 (1.913)	5.048*** (1.740)	1.974 (1.339)
Earmarked gambling tax revenue per capita	33.979 (36.044)	-80.095 (55.936)	-46.116 (42.9930)
Earmarked gasoline tax revenue per capita	-2.564** (1.279)	2.256 (1.693)	-0.308 (1.464)
Earmarked vehicle registration revenue per capita	8.562*** (2.489)	-8.111*** (2.378)	0.451 (2.374)
Real own-source revenue per capita from other sources	0.134*** (0.050)	0.708*** (0.076)	0.841*** (0.054)
Observations	146	146	146
R-squared	0.52	0.89	0.96

Source: Authors' estimates based on data from Fabricius and Snell 1990; Pérez and Snell 1995; Pérez 2008; US Census Bureau, *Annual Survey of State Government Finances* (<https://www.census.gov/econ/overview/go1500.html>) and other data; and Council of State Governments, *Book of the States* (<http://knowledgecenter.csg.org/kc/category/content-type/bos-archive>).

Note: All specifications include the following controls: the percentage of the state's population that is white, the percentage that is under the age of 15, the percentage over 65, the percentage over 25 with a high school education, real personal income per capita, real federal grants per capita, an indicator variable for the political party of the state's governor, and year and census region fixed effects. Coefficient estimates for these variables are available on request. Robust standard errors in parentheses: *** indicates statistical significance at the 1 percent level, ** at the 5 percent level, and * at the 10 percent level.

revenues have no effect on spending on local governments, yet earmarked gasoline tax revenue has a negative effect on spending. An additional dollar of own-source revenue from other sources increases expenditures on local government by approximately 13 cents.

The second column of table 3 shows the effects on nonlocal government spending of revenue earmarked for local governments. Earmarked tobacco tax revenue, personal income tax revenue, and corporate income tax revenue (all of which had no effect on expenditures on local government) have a positive effect on all other categories of expenditure, again implying that the earmarks

Table 4. Effect on Spending of Revenue Earmarked for Highways

	<i>Dependent Variable</i>		
	Highway Expenditure	Nonhighway Expenditure	Total Expenditure
Earmarked gasoline tax revenue per capita	0.259 (0.198)	-0.238 (0.499)	0.022 (0.466)
Earmarked vehicle registration revenue per capita	0.304 (0.253)	1.729*** (0.640)	2.033*** (0.612)
Real own-source revenue per capita from other sources	0.041*** (0.016)	0.809*** (0.047)	0.850*** (0.052)
Observations	146	146	146
R-squared	0.55	0.95	0.96

Source: Authors' estimates based on data from Fabricius and Snell 1990; Pérez and Snell 1995; Pérez 2008; US Census Bureau, *Annual Survey of State Government Finances* (<https://www.census.gov/econ/overview/go1500.html>) and other data; and Council of State Governments, *Book of the States* (<http://knowledgecenter.csg.org/kc/category/content-type/bos-archive>).

Note: All specifications include the following controls: the percentage of the state's population that is white, the percentage that is under the age of 15, the percentage over 65, the percentage over 25 with a high school education, real personal income per capita, real federal grants per capita, an indicator variable for the political party of the state's governor, and year and census region fixed effects. Coefficient estimates for these variables are available on request. Robust standard errors in parentheses: *** indicates statistical significance at the 1 percent level, ** at the 5 percent level, and * at the 10 percent level.

were used to effectually increase general fund revenue. Vehicle registration revenue has a predictably negative effect on nonlocal government spending, given its very large positive effect in the previous model. The general sales tax revenue earmarked for local governments, almost all of which was shown to be spent on local governments in the previous results, unsurprisingly has no effect on other expenditures. As before, an *F*-test demonstrates a significant relationship between the earmarked revenues and nontargeted expenditure.¹³ The results of our test of the relationship between revenues earmarked for local governments and total government size are shown in the final column of table 3. Earmarked general sales tax revenue, tobacco tax revenue, and personal income tax revenue all lead to increases in the overall size of government.

Table 4 shows results for the models of revenues earmarked for highway expenditures. The results in the first column show that neither gasoline tax revenue nor vehicle registration revenue earmarked for this category have any effect on highway spending. The second and third columns, however, show that earmarking vehicle registration revenue for highways does lead to increases in nonhighway spending as well as in the overall size of government.

Taken together, these results indicate that the majority of these earmarks (eight out of fifteen) have no effect on their targeted expenditures, while two actually have a negative effect, implying that spending from the general fund

is reduced by an amount greater than the earmarked revenue. Furthermore, the results presented in tables 2, 3, and 4 provide evidence that earmarked revenues do increase expenditures in categories other than those targeted, as well as the overall amount of government spending. Specifically, sales tax revenue earmarked for education has no effect on education expenditures, but nearly 73 cents of every earmarked dollar is used to increase expenditures in categories other than education, and total government expenditure increases by 96 cents for every dollar earmarked. The result is compounded for education-earmarked corporate income tax revenues, for which the earmark allows general fund expenditures on education to be reduced by roughly \$1.83 for every \$1 of earmarked revenue, leading to an associated increase in expenditures on noneducation programs. Other notable results include tobacco tax revenue, personal income tax revenue, and corporate income tax revenue earmarked for local government spending, none of which has any statistically significant effect on the targeted expenditure category. Each of these, however, is associated with increases in nonlocal government spending, and earmarking tobacco and personal income tax revenue leads to increases in the overall size of government. A similar result is found with vehicle registration revenue earmarked for highway spending, which does nothing for spending on highways but increases nonhighway expenditure and overall government spending. Even in some cases where the earmark partially sticks, the portion that does not get spent on the targeted category is spent on other programs (e.g., see the table entries for personal income tax revenues earmarked for education).

The results in tables 5–7 show our specifications with the $OTH REV_{it}$ variable replaced by individual non earmarked revenue from each of the earmarked revenue sources, allowing us to test for differences in earmarked and non earmarked revenues from the same sources. The results are largely identical. Table 5 shows revenue sources earmarked for education expenditure. As before, sales tax revenue earmarked for education has no significant effect on the level of education expenditures. Non earmarked sales tax revenue, however, does increase education spending, further illustrating the ineffectiveness of the earmark. Earmarked alcohol tax revenue has lost its significance from the previous specification, though earmarked personal income tax revenue is associated with increases in education expenditure. Non earmarked personal and corporate income tax revenue positively affect education expenditures. Turning to a comparison of earmarked and non earmarked revenues' effect on education spending, we observe no statistically significant difference in the effects of sales, tobacco, or alcohol taxes; the effect of earmarked personal income tax revenue is statistically significantly

Table 5. Effect on Spending of Earmarked and Non earmarked Revenue (Education)

	<i>Dependent Variable</i>		
	Education Expenditure	Noneducation Expenditure	Total Expenditure
Earmarked general sales tax revenue per capita	0.181 (0.193)	0.364* (0.191)	0.545** (0.274)
Non earmarked general sales tax revenue per capita	0.347*** (0.102)	0.210 (0.138)	0.557*** (0.214)
Earmarked tobacco tax revenue per capita	2.999* (1.678)	-1.853 (2.636)	1.146 (3.428)
Non earmarked tobacco tax revenue per capita	2.563 (1.993)	5.563** (2.390)	8.126** (3.790)
Earmarked alcohol tax revenue per capita	8.384 (8.163)	-25.779*** (8.820)	-17.395 (13.517)
Non earmarked alcohol tax revenue per capita	0.660 (1.400)	-3.100** (1.260)	-2.439 (1.993)
Earmarked personal income tax revenue per capita	0.757*** (0.121)	0.231 (0.179)	0.988*** (0.241)
Non earmarked personal income tax revenue per capita	0.249*** (0.058)	0.335*** (0.081)	0.583*** (0.112)
Earmarked corporate income tax revenue per capita	-2.721** (1.264)	2.890* (1.501)	0.168 (1.520)
Non earmarked corporate income tax revenue per capita	0.636* (0.343)	1.457*** (0.536)	2.093*** (0.768)
Observations	146	146	146
R-squared	0.70	0.89	0.88

Source: Authors' estimates based on data from Fabricius and Snell 1990; Pérez and Snell 1995; Pérez 2008; US Census Bureau, *Annual Survey of State Government Finances* (<https://www.census.gov/econ/overview/go1500.html>) and other data; and Council of State Governments, *Book of the States* (<http://knowledgecenter.csg.org/kc/category/content-type/bos-archive>).

Note: All specifications include the following controls: the percentage of the state's population that is white, the percentage that is under the age of 15, the percentage over 65, the percentage over 25 with a high school education, real personal income per capita, real federal grants per capita, an indicator variable for the political party of the state's governor, and year and census region fixed effects. Coefficient estimates for these variables are available on request. Robust standard errors in parentheses: *** indicates statistical significance at the 1 percent level, ** at the 5 percent level, and * at the 10 percent level.

larger than the effect of non earmarked personal income tax revenue. Also as before, earmarked general sales tax revenue has a positive and significant effect on non education spending and total government size. The results for all other earmarks remain similar as well, the only exception being earmarked corporate income tax revenue, which now has a positive and significant effect on total government spending.

Results from our second look at local government earmarks are shown in table 6. The results are nearly identical to the previous specification (shown

Table 6. Effect on Spending of Earmarked and Nonearmarked Revenue (Local Governments)

	<i>Dependent Variable</i>		
	Local Government Expenditure	Nonlocal Government Expenditure	Total Expenditure
Earmarked general sales tax revenue per capita	0.795** (0.331)	-0.020 (0.508)	0.775** (0.390)
Nonearmarked general sales tax revenue per capita	0.296** (0.130)	0.286 (0.265)	0.582** (0.253)
Earmarked tobacco tax revenue per capita	-0.036 (2.350)	6.968* (4.256)	6.932* (3.985)
Nonearmarked tobacco tax revenue per capita	0.290 (2.064)	5.680 (3.847)	5.970* (3.531)
Earmarked alcohol tax revenue per capita	-0.387 (6.692)	-12.334 (10.131)	-12.721 (9.480)
Nonearmarked alcohol tax revenue per capita	-3.299* (1.998)	1.832 (2.653)	-1.466 (2.221)
Earmarked personal income tax revenue per capita	0.106 (0.222)	0.836*** (0.303)	0.942*** (0.246)
Nonearmarked personal income tax revenue per capita	0.154* (0.089)	0.494*** (0.122)	0.647*** (0.111)
Earmarked corporate income tax revenue per capita	-2.360 (1.886)	2.409 (2.592)	0.049 (2.167)
Nonearmarked corporate income tax revenue per capita	0.812* (0.428)	1.107 (0.775)	1.918*** (0.696)
Earmarked gambling tax revenue per capita	35.777 (40.112)	-83.492 (66.979)	-47.715 (55.171)
Nonearmarked gambling tax revenue per capita	-7.975 (5.889)	-0.022 (11.051)	-7.997 (8.905)
Earmarked gasoline tax revenue per capita	-5.632*** (1.716)	1.907 (3.019)	-3.725 (3.033)
Nonearmarked gasoline tax revenue per capita	-3.271*** (1.130)	3.321** (1.645)	0.050 (1.564)
Earmarked vehicle registration revenue per capita	8.836*** (2.591)	-4.034 (5.132)	4.802 (4.868)
Nonearmarked vehicle registration revenue per capita	2.058** (0.980)	1.532 (1.537)	3.590** (1.726)
Observations	146	146	146
R-squared	0.59	0.81	0.88

Source: Authors' estimates based on data from Fabricius and Snell 1990; Pérez and Snell 1995; Pérez 2008; US Census Bureau, *Annual Survey of State Government Finances* (<https://www.census.gov/econ/overview/go1500.html>) and other data; and Council of State Governments, *Book of the States* (<http://knowledgecenter.csg.org/kc/category/content-type/bos-archive>).

Note: All specifications include the following controls: the percentage of the state's population that is white, the percentage that is under the age of 15, the percentage over 65, the percentage over 25 with a high school education, real personal income per capita, real federal grants per capita, an indicator variable for the political party of the state's governor, and year and census region fixed effects. Coefficient estimates for these variables are available on request. Robust standard errors in parentheses: *** indicates statistical significance at the 1 percent level, ** at the 5 percent level, and * at the 10 percent level.

Table 7. Effect on Spending of Earmarked and Non earmarked Revenue (Highways)

	<i>Dependent Variable</i>		
	Highway Expenditure	Nonhighway Expenditure	Total Expenditure
Earmarked gasoline tax revenue per capita	1.198*** (0.307)	-1.009 (1.546)	0.189 (1.577)
Non earmarked gasoline tax revenue per capita	1.435*** (0.321)	-0.518 (2.178)	0.917 (2.227)
Earmarked vehicle registration revenue per capita	0.803** (0.362)	1.873 (1.920)	2.676 (2.015)
Non earmarked vehicle registration revenue per capita	0.794** (0.346)	1.890 (1.516)	2.685 (1.644)
Observations	146	146	146
R-squared	0.61	0.82	0.82

Source: Authors' estimates based on data from Fabricius and Snell 1990; Pérez and Snell 1995; Pérez 2008; US Census Bureau, *Annual Survey of State Government Finances* (<https://www.census.gov/econ/overview/go1500.html>) and other data; and Council of State Governments, *Book of the States* (<http://knowledgecenter.csg.org/kc/category/content-type/bos-archive>).

Note: All specifications include the following controls: the percentage of the state's population that is white, the percentage that is under the age of 15, the percentage over 65, the percentage over 25 with a high school education, real personal income per capita, real federal grants per capita, an indicator variable for the political party of the state's governor, and year and census region fixed effects. Coefficient estimates for these variables are available on request. Robust standard errors in parentheses: *** indicates statistical significance at the 1 percent level, ** at the 5 percent level, and * at the 10 percent level.

in table 3). Non earmarked sales tax, personal income tax, corporate income tax, and motor vehicle registration revenue all positively affect expenditures on local governments. Statistical tests for differences in the coefficients on the earmarked and non earmarked revenue sources once again show there is little evidence of earmarked revenue having any different impact on spending.¹⁴ In contrast, non-earmarked alcohol tax and gasoline tax revenues have a negative effect on expenditures on local governments. Our results for the statistical tests also remain largely unchanged. Earmarked tobacco tax revenue and personal income tax revenue both increase nonlocal government spending and the overall size of government, while earmarked sales tax revenue increases total spending as well.

Table 7 displays results for the expanded model of earmarks targeting highway expenditures. In this case, gasoline taxes and vehicle registration revenue earmarked for highway spending have a positive and significant effect on expenditures—a result contrary to our previous look at highway spending, perhaps driven by controlling for only these specific sources of revenue in this specification. The same is true for non earmarked revenue from these sources. Importantly, we observe no statistically significant difference in the effect on highway spending between an earmarked and non earmarked dollar for these

revenue sources—unsurprising, given the similarity in their coefficients. The magnitude also indicates that nearly the entire earmarked dollar sticks to highway expenditures. To the extent gasoline taxes are justified under the Pigouvian criteria discussed previously, this result is not surprising, though it does differ from the findings presented in table 4. The final two columns of table 7 show no evidence that these earmarks increase nonhighway spending, which is to be expected, given the results shown in the first column, though again different from the previous findings. Unlike earmarks for education or local governments, specifically controlling for non earmarked taxes is important for the analysis of highway expenditures.

In general, these estimates show that earmarking is not an effective method of increasing expenditures on specific programs, and typically some (or all) of the increase in revenues dedicated to a program is compensated for by associated decreases in spending from the general fund (resulting in a statistically insignificant effect of the earmark). Of the fifteen earmarks explored, only tobacco tax revenue and personal income tax revenue earmarked for education and sales tax revenue and vehicle registration revenue earmarked for local governments unambiguously lead to increases in expenditures on the targeted category. In some cases, such as the corporate income tax revenue earmarked for education, our results suggest that the associated decrease in general fund spending overcompensates, and the earmark has a negative effect on spending in the targeted category. Furthermore, when we compare the effects of earmarked and non earmarked revenue from the same sources, we find very little statistical evidence that an earmark is any more effective at increasing spending.

In nearly every case where an earmark failed to stick (either partially or at all) to its targeted expenditure, however, nontargeted spending increased, suggesting that earmarks make for an effective means of indirectly increasing general fund revenue. General sales tax revenue and corporate income tax revenue earmarked for education spending; tobacco tax revenue, personal income tax revenue, and corporate income tax revenue earmarked for local governments; and vehicle registration revenue earmarked for highway spending all lead to increases in nontargeted expenditures in at least one of the specifications considered here. Furthermore, in seven of the fifteen cases analyzed, earmarks led to increases in total government expenditure. These results lend credence to the hypothesis presented above; they provide evidence that the fungible nature of earmarks is used to increase general fund revenue and the overall size of government and not solely to increase spending in the targeted expenditure category. At the very least, the results call into question the effectiveness of using earmarked revenue to meaningfully influence the composition of spending.

CONCLUSION

The practice of earmarking tax revenues for specific expenditure categories remains popular with state governments, despite its lack of firm theoretical justification and empirical evidence showing that only cents on the dollar actually stick to intended expenditures. In this chapter, we propose that Leviathan governments are aware of earmarked revenues' fungibility and they exploit it to increase total government size.

Our empirical analysis provides two main results: (1) most earmarks are ineffective at increasing spending on their targeted expenditure category, and (2) most earmarks that fail to stick are in fact very effective at increasing overall government size and spending on other categories unrelated to their intended target. These results are consistent with a theory of Leviathan government and imply that policymakers use tax revenues dedicated to politically popular programs (e.g., education) or prominent public goods (e.g., roads) to increase overall government size.

The policy implications of this research are straightforward. As our hypothesis suggests, the practice of earmarking can be used to increase the total size of government without the implementation of unpopular general tax rate increases. Our findings show that with some exceptions, the revenue raised from earmarks primarily does not go to its intended expenditure category, but rather it is used as fungible revenue to be spent at the government's discretion. From a voter's perspective, these increases in total expenditures may be inefficient, and therefore the elimination of earmarking—at the very least in those cases where it cannot be shown to benefit its intended target—would likely be in the public interest. While it may seem counterintuitive to give more discretion to policymakers, the research presented here shows that dedicating tax revenues already gives them that discretion but does so covertly. If policymakers choose to raise taxes to increase the overall size of government, it must be done as transparently as possible so that voters can respond as necessary.

NOTES

1. This does not include the state of New Jersey. These data are from a National Conference of State Legislatures survey, to which New Jersey did not respond. See Pérez (2008). In 1993, New Jersey earmarked 37.6 percent of its gasoline tax revenue to spending on roads.
2. A discussion of possible explanations for this downward trend in the amount of revenue earmarked on average across states—especially given our findings in this chapter—remains an area ripe for future research.
3. Doug Walker (chap. 17, this volume) provides additional discussion of the tax treatment of gambling and of lotteries in particular.

4. Justin Ross (chap. 2, this volume) discusses several tax principles, including benefits-received taxation.
5. While the gas tax does not perfectly match costs and benefits, one of its primary justifications is its simplicity. The administrative costs associated with the implementation of a perfectly monitored and executed toll system could easily exceed the welfare gain.
6. See Pérez (2008). The median state (at 95.9 percent) in 2005 was North Dakota.
7. Buchanan (1963) refers to this circumstance as “full equilibrium,” where the proposed general fund composition of spending matches the mix that would be preferred by a median voter if he or she were able to vote on spending programs separately.
8. Technically, the size of this expected increase in government can be thought of as the average citizen-voter’s marginal propensity to consume government, which reflects the percentage of an additional dollar in income that would be used to purchase additional government goods and services.
9. Educational attainment may be endogenous especially to the specifications including spending on education. Dropping the educational attainment control did not meaningfully affect the results.
10. New Jersey did not provide data for 2005, so our panel is made up of 146 observations.
11. Specifically, states in our sample on average collected roughly \$19 per capita (real 2005 dollars) in alcoholic beverage tax revenue, compared to more than \$600 per capita in general sales tax revenue.
12. The F -test statistic is 10.28, associated with a p -value of 0.00.
13. Specifically, the F -test statistic is 10.44 (p -value of 0.00).
14. The only statistically significant difference observed was for corporate income tax revenue, where non earmarked revenue had a larger effect on spending than did earmarked revenue. In all other tests, we were unable to reject the null hypothesis that the coefficients on each earmarked and non earmarked revenue source were equivalent.

REFERENCES

- Bailey, Stephen J., and Stephen Connolly. 1998. “The Flypaper Effect: Identifying Areas for Further Research.” *Public Choice* 95 (3/4): 335–61.
- Brennan, Geoffrey, and James M. Buchanan. 1977. “Towards a Tax Constitution for Leviathan.” *Journal of Public Economics* 8: 255–74.
- . 1978. “Tax Instruments as Constraints on the Disposition of Public Revenues.” *Journal of Public Economics* 9: 301–18.
- . 1980. *The Power to Tax: Analytical Foundations of a Fiscal Constitution*. Cambridge: Cambridge University Press.
- Buchanan, James M. 1963. “The Economics of Earmarked Taxes.” *Journal of Political Economy* 71 (5): 457–569.
- Deller, Steven C., and Craig Maher. 2009. “Is the Treatment of Intergovernmental Aid Symmetric?” *Applied Economics Letters* 16: 331–35.
- Dye, Richard F., and Therese J. McGuire. 1992. “The Effect of Earmarked Revenues on the Level and Composition of Expenditures.” *Public Finance Quarterly* 20 (4): 543–56.
- Erekson, O. Homer, Kimberly M. Deshano, Glenn Platt, and Andrea L. Ziegert. 2002. “Fungibility of Lottery Revenues and Support of Public Education.” *Journal of Education Finance* 28: 301–12.
- Evans, William, and Ping Zhang. 2003. “The Impact of Earmarked Lottery Revenue on State Educational Expenditures.” University of Maryland mimeo, July.

- Fabricius, Martha A., and Ronald K. Snell. 1990. *Earmarking State Taxes*, 2nd ed. Washington, DC: National Conference of State Legislatures.
- Gamkhar, S. 2000. "Is the Response of State and Local Highway Spending Symmetric to Increases and Decreases in Federal Highway Grants?" *Public Finance Review* 28: 3–25.
- Gamkhar, S., and W. Oates. 1996. "Asymmetries in the Response to Increases and Decreases in Intergovernmental Grants: Some Empirical Findings." *National Tax Journal* 49: 501–12.
- Garrett, Thomas A. 2001. "Earmarked Lottery Revenues for Education: A New Test of Fungibility." *Journal of Education Finance* 26: 219–38.
- Goel, R. K., and M. A. Nelson. 2003. "Use or Abuse of Highway Tax Revenues? An Economic Analysis of Highway Spending." *Applied Economics Letters* 10: 813–19.
- Goodspeed, T. J. 1998. "The Relationship between State Income Taxes and Local Property Taxes: Education Finance in New Jersey." *National Tax Journal* 51: 219–38.
- Gramlich, Edward M. 1977. "Intergovernmental Grants: A Review of the Empirical Literature." In *The Political Economy of Fiscal Federalism*, edited by Wallace E. Oates, 219–40. Lexington, MA: D.C. Heath.
- Gramlich, Edward M., and Harvey Galper. 1973. "State and Local Fiscal Behavior and Federal Grant Policy." *Brookings Papers on Fiscal Activity* 1: 15–58.
- Heyndels, B. 2001. "Asymmetries in the Flypaper Effect: Empirical Evidence for the Flemish Municipalities." *Applied Economics* 33: 1329–34.
- Hines, James R., Jr., and Richard H. Thaler. 1995. "Anomalies: The Flypaper Effect." *Journal of Economic Perspectives* 9 (4): 217–26.
- Inman, Robert P. 1971. "Toward an Econometric Model of Local Budgeting." In *Proceedings of the 64th Annual Conference on Taxation*, 699–719. Lexington, KY: National Tax Association.
- . 2008. "The Flypaper Effect." NBER Working Paper 14579, National Bureau of Economic Research, Cambridge, MA.
- Levaggi, R., and R. Zanola. 2003. "Flypaper Effect and Sluggishness: Evidence from Regional Health Expenditures in Italy." *International Tax and Public Finance* 10: 535–47.
- Nesbit, Todd M., and Steven F. Krefl. 2009. "Federal Grants, Earmarked Revenues, and Budget Crowd-Out: State Highway Funding." *Public Budgeting and Finance* 29 (2): 94–110.
- Novarro, Neva Kerbeshian. 2002. "Does Earmarking Matter? The Case of State Lottery Profits and Educational Spending." Discussion Paper 02-19. Stanford Institute for Economic Policy Research, Stanford, CA.
- Pantuosco, Louis, William Seyfried, and Robert Stonebraker. 2007. "The Impact of Lotteries on State Education: Does Earmarking Matter?" *Review of Regional Studies* 37 (2): 169–85.
- Pérez, Arturo. 2008. *Earmarking State Taxes*, 4th ed. Washington, DC: National Conference of State Legislatures.
- Pérez, Arturo, and Ronald Snell. 1995. *Earmarking State Taxes*, 3rd ed. Washington, DC: National Conference of State Legislatures.
- Sobel, Russell S., and George R. Crowley. 2014. "Do Intergovernmental Grants Create Ratchets in State and Local Taxes?" *Public Choice* 158 (1): 167–87.
- Stratmann, Thomas, and William Bruntrager. 2011. "Excise Taxes in the States." Working Paper 11–27. Mercatus Center at George Mason University, Arlington, VA.
- Volden, C. 1999. "Asymmetric Effects of Intergovernmental Grants: Analysis and Implications for U.S. Welfare Policy." *Publius* 29 (3): 51–73.