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ARBITRAGE AND THE SAVINGS BEHAVIOR OF STATE GOVERNMENTS

Gilbert E. Metcalf*

Abstract—The federal tax code creates strong incentives for tax arbitrage activity on the part of state governments. This arbitrage activity is illegal and previous research has typically assumed that the constraint against arbitrage activity is binding. This paper explicitly tests this proposition by considering whether financial asset holdings increase as the yield spread between taxable and tax exempt securities rises. Using a data set on 40 state governments over a 7 year period, I find that there is a significant response to changes in the yield spread. One implication of these results is that the Tax Reform Act of 1986, which made even greater efforts to curb arbitrage activity, is likely to be ineffective.

I. Introduction

ONE by-product of the tax exemption granted to municipal bonds is the opportunity for arbitrage by state and local governments. A state government, for example, has clear incentives to issue a tax exempt bond at rate r_m, invest the proceeds at taxable rate r and earn the difference $r - r_m$, the yield spread between taxable and tax exempt bonds.

This practice is illegal and the Internal Revenue Service (IRS) has made vigorous efforts over the past 15 years to prevent state and local governments from earning arbitrage profits. Previous research on the financial behavior of state and local governments has assumed that the IRS limitations on arbitrage are binding. This paper considers that question directly by measuring the responsiveness of financial asset holdings to changes in the yield spread between taxable and tax exempt securities. As the yield spread increases, there are greater incentives to engage in activities which allow assets and debt to be accumulated while avoiding IRS penalties for arbitrage. To test this, I employ a panel data set on forty state governments over a seven year period prior to the Tax Reform Act of 1986 (TRA86).

State governments are studied for several reasons. First, they are significant holders of financial assets. In fiscal year 1987 they held two-thirds of the $1048 billion stock of state and local government financial assets. Second, to the extent that sophisticated accounting practices are required to engage in arbitrage successfully, state governments may be better able to carry out arbitrage.

The empirical evidence in this paper suggests that the IRS has not been very successful in its efforts to halt arbitrage. Thus, at the margin states respond to increases in the yield spread by holding greater amounts of financial assets. While TRA86 attempts to curtail arbitrage activity further, its basic approach is flawed and is likely to be ineffective.

It has become increasingly popular to place legal restrictions on governmental activities. In addition to the arbitrage regulations, examples include Propositions 13 and 2-1/2, and balanced budget laws at the state and local level, and the Gramm-Rudman-Hollings Law at the federal level. This paper provides additional evidence that these legal limitations are exceedingly difficult to enforce and suggests that some other approach to the problems underlying the limitations may be needed.

The next section of this paper gives some background on the financial assets held by state and local governments and explains some of the available arbitrage opportunities. A section follows which details an econometric model to test for the presence of arbitrage effects followed by a section of results. A brief conclusion ends the paper.

II. Arbitrage and Asset Accumulation

At the end of fiscal year 1987, state governments held $696 billion in cash and securities.[1] The build-up cannot be solely attributed to an effort to fund pension liabilities as assets held in non-insurance trust fund accounts also increased substantially—to $253 billion by the end of 1987.

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[1] All asset and debt figures are par value as reported in the U.S. Bureau of the Census, *Government Finance* publications for various years.

Over the period from 1977 through 1985, the stock of financial assets grew at an annual rate of 14.5%[2] while long-term debt grew at an annual rate of 11.6%. Over the same period, general expenditures grew at an annual rate of less than 9%.

There are two types of arbitrage that states can engage in which will lead to an increase in financial asset holdings.[3] First, states can borrow by issuing municipal bonds, paying interest rate r_m, and then invest the proceeds in higher yielding corporate or U.S. Treasury securities. This becomes more attractive the greater the yield spread between taxable and tax exempt securities. I will call this financial arbitrage. Alternatively, states can raise taxes and invest the proceeds in financial assets. The interest from the investment is returned to taxpayers through lower taxes in the future. In essence, states do the savings for their residents at the before-tax interest rate; the arbitrage gain to this activity is $r - (1 - \tau)r$ or $r\tau$ where τ is the marginal tax rate on interest income to taxpayers in the community. I will call this saving arbitrage. The state tuition prepayment programs which have recently become popular are clear examples of saving arbitrage and illustrate the difficulties inherent in developing a credible saving arbitrage program. To be credible, the current tax increases should be linked to future tax cuts. Yet it is just this linkage that raises the arbitrage flag for the federal government.[4]

Section 103(c) of the Federal Tax Code specifically prohibits financial arbitrage.[5] A fundamental problem with regulation of this form of arbitrage is the need to link bonds with specific assets. Consider a state which historically has paid for bridge construction through tax revenues and raises a certain amount of taxes each year for "capital improvements." Then one year, it issues a bond for bridge repair and uses the bond proceeds to fix the bridge. The additional tax revenues that would have been used for bridge repair can now be invested in an unrestricted fashion. Clearly, with sufficiently sophisticated bookkeeping, it will be difficult for the IRS to prove that arbitrage is occurring.

There exist additional reasons for states to hold financial assets beyond arbitrage considerations. A major source of financial assets is the Permanent Funds—proceeds from severance taxes (the two largest being Alaska and Texas). While these funds are important for helping to explain the growth in financial assets in the late 1970s during a period of high oil prices, they are less helpful in explaining the growth of asset holdings in the 1980s.

It is generally perceived that TRA86 contains the strongest language yet to control and curb arbitrage activity.[6] New arbitrage rules limit the amount of legal arbitrage that can be earned and more stringent penalties are imposed for arbitrage violations. The effect of these restrictions should be to reduce the amount of debt issue as a result of increases in the yield spread. But the new rules do not affect incentives to issue "governmental purpose" debt (which in 1984 accounted for nearly 40% of new issues using the post-TRA86 definitions) to replace taxes as a source of revenue for projects. Hence, it is not clear that arbitrage activities as typified by the bridge example will be eliminated.

III. Econometric Model and Data

The financial data for state governments used in this study are from the Annual Survey of Government Finances conducted by the Census Bureau. All financial variables are in per capita, real dollars (1982 dollars using the CPI). For the taxable interest rate, I use the rate on 20 year Treasury bonds as of the beginning of the fiscal year. I compute municipal interest rates (r_m) based on Moody's credit ratings for each state's general obligation (G.O.) debt (where applicable) as published monthly in *Moody's Bond Record*. I use the rating that held at the beginning of the fiscal year. Moody assigns credit ratings to many outstanding debt issues and also for most states

[2] Financial assets less the insurance trust assets grew at an annual rate of 14%. These are all nominal growth rates.

[3] Gordon and Slemrod (1986) present a detailed explanation of the various types of arbitrage activities in which communities can engage. Steuerle (1985) also discusses tax and financial arbitrage at some length.

[4] This clearly happened with the tuition prepayment plans. The IRS has moved to tax the income accruing to these funds to the individuals participating in these programs (*New York Times*, Aug. 29, 1988, p. D2).

[5] After Tax Reform, the arbitrage rules are mainly collected into section 148. Metcalf (1989) describes the evolution of the arbitrage regulations in detail.

[6] See Petersen (1987) for a thorough discussion of the effect of the Tax Reform Act of 1986 on the municipal bond market.

TABLE 1.—SUMMARY STATISTICS ON TAX-EXEMPT INTEREST RATES

Fiscal Year	Mean	Std. Dev.	Minimum	Maximum	Average Yield Spread	Average Implicit Municipal Tax Rate
1980	5.74	0.15	5.58	5.95	3.04	34.6
1981	7.53	0.19	7.35	7.99	2.48	24.8
1982	10.52	0.27	10.21	11.04	3.12	22.9
1983	12.02	0.42	11.47	12.99	2.04	14.5
1984	9.10	0.33	8.68	9.90	2.05	18.4
1985	10.21	0.12	10.10	10.55	3.56	25.9
1986	8.53	0.17	8.34	9.18	2.02	19.2

Note: The yield spread and implicit municipal tax rate are based on the mean value of the municipal rate and the rate on 20 year Treasury bonds. $N = 40$.

assigns a rating to apply to G.O. debt in general. However, not every state is assigned a rating, many because they do not issue G.O. debt (e.g., Colorado). In the econometric analysis, I exclude states which have no outstanding G.O. debt as well as Alaska.[7] After determining ratings for each state in each year, I assigned an interest rate based on the average rate for municipal bonds of that credit rating for the month coinciding with the beginning of the fiscal year, which Moody's also publishes.

Table 1 reports some summary statistics on interest rates. The mean municipal rate rose from a low of 5.74% in 1980 to a peak of 12.02% in 1982. The implicit municipal tax rate series, $\tau_m = (r - r_m)/r$, for the mean municipal rate is close to the one reported by Poterba (1986).[8] The key statistic however is not the implicit municipal tax rate but the yield spread itself since the return to financial arbitrage depends directly on the yield spread between the taxable and non-taxable interest rates. As the table shows, they can move in opposite directions (viz 1981–1982).

Based on the discussion of the previous section, I estimated a model of the form:

$$A_{it} = \beta_1(r_t - r_{m(it)}) + \beta_2 r_t \tau_{it} + \beta_3 X_{it} + \theta_i + \phi_t + \epsilon_{it}, \quad (1)$$

where i runs from 1 to N and t from 1 to T. Real financial assets per capita (A_{it}) in state i in year t depend on the yield spread ($r_t - r_{m(it)}$), a measure of saving arbitrage, and a vector of demographic and fiscal variables (X_{it}). State-specific effects (θ_i) are included to control for unobserved "taste" variables. They are likely correlated with right-hand-side variables (viz. Holtz-Eakin (1986)). Year effects control for macroeconomic influences not specific to any one state (ϕ_t).

The tax variable (as well as other tax variables discussed below) are calculated using individual tax returns and the National Bureau of Economic Research's TAXSIM model for the years 1979 through 1985.[9] The tax variable is a weighted average of the additional taxes paid per additional $100 of interest income. A weighted average of itemization status in each state (computed from TAXSIM) is included in the equation. The itemization probability is important in the saving arbitrage story. If taxpayers all itemize (for simplicity), then taxes can be raised $1/(1 - \tau)$, which only costs the taxpayer 1 after deducting state taxes on her federal return. In future years, $r/(1 - \tau)$ is returned through lower taxes which is only worth r, again because of the federal deduction on state taxes. Itemization leads to greater amounts of asset holdings.[10] No attempt is made in this paper to identify rigorously a "decisive" voter and whether she is an itemizer or not. Rather, I assume that decisions are made through

[7] The excluded states are Alaska, Arizona, Arkansas, Colorado, Indiana, Iowa, Kansas, Nebraska, South Dakota, and Wyoming. Alaska has financial asset holdings per capita which are some 14 times the national average.

[8] The implicit municipal tax rate is the tax rate which equates the after-tax yield on tax-exempt and taxable securities of equal riskiness. That is, the tax rate is defined by equating $(1 - \tau_m)r = r_m$.

[9] The TAXSIM generated data are available upon request from the author.

[10] Note that itemization does not alter the return to an itemizer versus a non-itemizer. Rather, it allows a state to raise taxes (and increase asset holdings) by $1/(1 - \tau) > 1$ per dollar of *net* tax collections (net of federal taxes) from an itemizer. Thus if a taxpayer is in a 28% bracket, the state can increase taxes and assets by $1.39 for every dollar of net state taxes paid by an itemizing resident.

TABLE 2.—SAMPLE STATISTICS ON REGRESSION DATA

	Mean	Std. Dev.	Minimum	Maximum
Financial Assets (less Insurance Trust)	801.20	559.69	174.74	3633.00
Insurance Trust Assets	925.19	425.94	314.59	2337.10
Municipal Rate	9.09	1.94	5.58	12.99
Taxable Rate	11.71	1.95	8.78	14.06
Yield Spread	2.61	0.63	1.07	3.67
Severance Taxes	32.46	67.49	0.00	277.81
Other Taxes	707.67	183.95	304.34	1235.66
Interest Tax Wedge	1.98	0.51	0.72	3.28
Proportion of Itemizers	33.04	7.27	13.81	50.04
Percentage Aged 18–44	42.25	1.76	36.80	46.90
Percentage Aged 65 +	11.45	1.76	7.50	17.60
Unemployment Rate	7.85	2.36	2.80	18.00
State and Local Public Employees per 1000 residents	44.67	3.88	35.64	56.35
Per capita Income ($\times 1000$)	10.64	1.59	7.23	15.93
Largest Tax as Percentage of Taxes	39.37	9.58	20.45	66.30
Tax Capacity	97.82	16.02	68.00	154.00
Tax Effort	96.95	19.18	60.00	171.00
Number of Observations: 280				

some voting/bargaining framework and that itemizers and non-itemizers are both important. Therefore the proportion of itemizers in each state should be positively correlated with asset and debt holdings.

Demographic variables include the percentage of population aged 18 to 44, and the percentage aged 65 and older. Fiscal variables include per capita tax collections (less severance tax collections) and per capita severance tax collections. Also included is the change in the state's average unemployment rate to control for possible lags in tax law changes as state economies emerge from recessions (viz. Gramlich (1978)). In summary, I have data on 40 states covering the fiscal years 1980 through 1986. Table 2 presents some sample statistics describing the data.

Before discussing regression estimates, there are important simultaneity issues which need to be considered which may impart bias to coefficient estimates. First, the credit rating of a community is endogenous and responsive (among other things) to changes in debt and asset levels. Also there may be unobserved determinants of asset levels which also determine credit ratings. Events or propensities which induce a community to hold greater amounts of assets will likely lead to a higher credit rating and hence lower borrowing costs. Or more directly, higher asset levels may lead to a higher credit rating and lower borrowing cost. This is less likely. Credit ratings depend on a measure of net debt rather than any measure that includes asset holdings. Moreover, this definition of net debt is simply debt that must be repaid out of the General Fund (as opposed to having an earmarked revenue source). In either case, the coefficient on the yield spread is biased upward and it will be difficult to distinguish whether a positive coefficient on this variable is due to arbitrage activity or to simultaneity bias.

A more likely and important source of bias follows from the opportunities for legal arbitrage and the endogeneity of debt. Prior to TRA86, it was possible to hold roughly 15% of the bond proceeds in a debt reserve fund. Therefore states with large amounts of debt may be able to hold larger amounts of assets. However, the larger debt is likely to lower the government's credit rating. This effect will bias the estimates downward.

Because of these problems, I employ an instrumental variables estimation procedure to estimate consistent values of the coefficients, relying for identification on the excluded variables from the unspecified credit rating determination and debt equations. I employ as instruments per capita income in the state, tax capacity and tax effort indices as measured by the Advisory Commission on Intergovernmental Relations (ACIR)[11] and the

[11] Tax capacity is the amount of taxes a state could collect if it applied an average set of rates to its tax base. Tax effort is the ratio of actual tax collections to tax capacity.

TABLE 3.—REGRESSION ESTIMATES
DEPENDENT VARIABLE: PER CAPITA FINANCIAL ASSETS

Regression:	(1) OLS	(2) IV	(3) IV	(4) IV	(5) IV	(6) IV
Dependent Variable[a]	NIFA	NIFA	NIFA	NIFA	TFA	IFA
Yield Spread	108.33	570.42	507.64	537.55	528.29	21.99
	(2.18)	(2.39)	(2.65)	(2.28)	(1.74)	(0.11)
Severance Taxes	0.60	0.36	—	−1.58	0.92	0.23
	(1.19)	(0.61)		(1.02)	(1.18)	(0.45)
Other Taxes	0.12	0.16	—	−0.22	0.30	0.02
	(0.64)	(0.73)		(0.34)	(1.04)	(0.11)
Interest Tax Wedge	−0.77	−1.03	—	0.52	−3.57	−2.45
	(0.79)	(0.89)		(1.04)	(2.41)	(2.48)
Proportion of Itemizers	−0.39	1.46	—	−15.25	1.66	0.49
	(0.10)	(0.32)		(1.11)	(0.28)	(0.12)
Percentage Aged 18–44	−53.38	−48.94	—	185.13	−180.68	−122.38
	(1.57)	(1.22)		(1.85)	(3.50)	(3.57)
Percentage Aged 65 +	−6.94	41.09	—	254.50	120.23	135.94
	(0.15)	(0.69)		(1.91)	(1.53)	(2.58)
Change in Unemployment Rate	11.50	9.93	—	−69.67	17.88	10.47
	(1.35)	(0.99)		(1.82)	(1.38)	(1.20)
Public Employment per 1000 residents	—	—	—	—	−8.38	20.58
					(0.68)	(2.52)
Year Dummies:	Yes	Yes	Yes	No	Yes	Yes
Adjusted R^2	0.96	0.95	0.95	0.71	0.64	0.93

Note: Absolute values of t-statistics are reported in parentheses. All regressions include fixed state effects. Number of Observations: 280.
[a]Dependent Variable: NIFA—non-insurance trust financial assets. TFA—total financial assets. IFA—insurance trust financial assets.

percentage of taxes raised by the largest tax. The first three instruments are reasonable measures of the fiscal well-being of a state and the last instrument measures the extent to which a state diversifies its tax collections. I assume here that the tax variables, while endogenous, are uncorrelated with the error term in the asset equations. Since unanticipated tax collections lead directly to higher financial asset holding, this is not an unreasonable assumption.

IV. Results

Table 3 presents estimation results for the model in equation (1) above. The dependent variable in the first four regressions is real financial assets per capita less insurance trust assets. The last two regressions consider the insurance trust assets.[12] Arbitrage opportunities certainly exist in pension funds. In fact, prior to the Tax Reform Act of 1986, state and local governments could issue tax exempt bonds and use the proceeds to purchase annuities for their pension funds. However, if the pension funds are used to shift wage payments across generations (i.e., through unfunded pension liabilities), then we may not observe changes in insurance trust asset holdings due to changes in the yield spread.

The first regression in table 3 ignores the endogeneity in the determination of the state's credit rating. The coefficient on the yield spread variable is positive and significant at the 95% level suggesting the responsiveness of financial assets to movements in the yield spread. The effect of changes in the yield spread is important. A one standard deviation move in the yield spread implies an increase in financial assets of $68 per capita, 9% of the mean holdings across the 40 states over the seven year period.

None of the other variables in the regression is significant (other than year and state dummies). The data provide no support for savings arbitrage. The coefficients on the interest tax wedge variable ($r\tau$) and fraction itemizers variable are actually negative, contrary to theory, and entirely insignificant. The change in unemployment rate was included in the regression to test for Gramlich's hypothesis that surpluses accumulate as

[12] These are assets net of unemployment compensation trust holdings. The latter funds are held and managed by the U.S. Treasury and are unlikely to be available for arbitrage activity. In fiscal year 1986, they accounted for less than 2% of total financial assets for the states.

states emerge from recessions due to lags in state law tax changes. While this hypothesis suggests that the coefficient on this variable should be negative, the estimated coefficient is positive, albeit with a t-statistic of one.[13]

The remaining regressions in table 3 are instrumental variable regressions to control for the endogeneity in the credit rating (and hence the yield spread variable). The second regression is the full model. Nothing qualitatively changes from the OLS regressions except for the magnitude of the coefficient on the yield spread variable. It increases to 570.42 and while the standard error increases, it is still significant. The positive coefficient on the yield spread variable is not due to credit rating agencies giving higher ratings to states with large amounts of financial assets.[14] There is still no evidence in support of saving arbitrage. The third regression drops all of the variables from the regression except the yield spread variable and the year dummies. The magnitude of the yield spread effects drops somewhat but is now significant at the 99% level.[15]

The fourth regression drops the year dummies from the regression. While these coefficients are jointly significant, eliminating them from the regression tests for the sensitivity of the tax and yield spread coefficient estimates to the reduction in variance from eliminating across time variance with the time dummies.[16] Changes in these two variables are closely linked to changes in the federal tax code. Much of the variation in these data is likely to be captured in the year effects. The coefficient on the yield spread is slightly reduced though still significant at the 95% level. The saving arbitrage coefficient is now positive although insignificant; however, the itemization probability coefficient is negative. There is still no evidence in favor of saving arbitrage. The age demographic variables are both positive and strongly significant. Both of these variables trend upward during this time period and are likely proxying for a time trend. Similarly the change in unemployment variable trends downward in the sample.

The fifth regression pools insurance trust and non-insurance trust financial assets as the dependent variable. I add to the regression a variable measuring the number of full-time state and local government employees per 1000 residents.[17] I include local employees since the bulk of local employee pension funds are managed at the state level and show up in state asset holdings. While the yield spread coefficient is still quite large, it is no longer significant at the 95% level. Surprisingly, the level of public employment in the state does not explain asset holdings. These two facts suggest that insurance trust and non-insurance trust holdings cannot be pooled into a single regression. It may be that pension funds are being used to shift public employee wages forward in time and that arbitrage is less important in explaining the growth in these funds.[18] The last regression in table 3 considers this directly. The dependent variable is now cash and security holdings of the insurance trust systems only (real per capita). The estimated coefficient on the yield spread variable drops dramatically and is completely insignificant. The public employee coefficient is now significantly positive and the age demographic variables are significant. The negative coefficient on the variable measuring the fraction of the population between 18 and 44 suggests that this group seeks to defer wage payments through unfunded pension liabilities.[19]

[13] The regression was run with variants on which unemployment variables are included in the regression. The results do not change appreciably.

[14] This raises the issue though of the proper treatment of debt. As a first effort to control for the legal arbitrage opportunities, I ran a regression in which I assumed that states always invest 15% of their debt proceeds for the life of the bond. The dependent variable then is financial assets less 15% of outstanding debt. While the regression estimate falls by $100 per capita, it is still quite substantial and still significant at the 95% level.

[15] A Wald test for dropping the eight variables from the regression is not rejected. The test statistic is 5.59 and is distributed as a Chi Square random variable with 7 degrees of freedom (see Engle (1984) for a derivation of this test).

[16] I am indebted to a referee for this suggestion.

[17] This is reported annually in the Bureau of the Census Public Employment Series (GE-1).

[18] Note that the success of the effort to shift wage payments forward in time depends on incomplete capitalization of unfunded pension liabilities in property values and wages. See Inman (1986) for a discussion of the degree of underfunding of pension systems in the 1970s.

[19] One might argue that the tax effort variable is correlated with the error in equation (1). A shock to the local economy which drives down asset holdings might also be related to the effort that a community makes to raise taxes as well as its tax capacity. I compute a variant on a Hausman Specification Test (Hausman and Taylor (1981)) to test for the validity of my instruments under the assumption that the variable measuring the proportion of taxes raised by the largest tax is an admissible instrument for the municipal rate. Whether testing instruments individually or as a group, I fail to reject that the instruments are exogenous at the 90% significance level.

V. Conclusion

This paper has shown that there may be significant marginal arbitrage effects due to the yield spread between taxable and tax-exempt interest rates. For fiscal year 1986, the standard deviation of the yield spread across the forty state sample was 0.17. Based on the IV regression estimates from table 3, this implies a difference in financial asset holdings of $96 per capita, 12% of the mean non-insurance trust financial asset holdings across the states in the seven year sample. There is no evidence of savings arbitrage. Clearly one area for further research would be to replicate this analysis for a large panel of local governments from the *Annual Survey of Government Finances*. Besides the greater number of observations, this would provide opportunities to contrast state level behavior to local government behavior.

The regression results suggest that the Tax Reform Act will not eliminate arbitrage activity by municipal governments. We should expect that the trend toward private activity tax-exempt bonds will be reversed with greater reliance now on governmental activity municipals.[20] These bonds will still provide opportunities for arbitrage.

If financial arbitrage is to be eliminated, some other approach will have to be taken. The obvious approach, to tax municipal bond interest, is unlikely to be taken given the political support for the exemption. Another approach that deserves consideration is a first dollar arbitrage rule. Here, unrestricted yields could only be earned on an amount of assets equal to the net financial holdings of a community. This rule, in effect, broadens the concept of replacement and eliminates the need to create a link between specific debt obligations and asset holdings.[21] While a more detailed analysis of this proposal would be necessary, one effect of this approach to arbitrage might be to induce state and local governments to fund more of their unfunded pension liabilities.

[20] This is borne out by the evidence on new debt issues in calendar year 1986. Issues of private activity municipal bonds fell dramatically while new issues of public purpose debt rose. As in previous years, a large amount of borrowing occurs toward the end of the calendar year and is reflected in fiscal year 1987 totals, not in the data employed in this study (*Statistics of Income*, Summer 1988).

[21] Simons (1938) notes that Andrew Mellon proposed this idea in 1923 to curtail individual arbitrage activity (investing borrowed funds for which a tax deduction has been taken in municipal bonds).

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