Tax Exemption and State Capital Investment

Abstract *- Recent theoretical models have called into question whether the tax exemption on the interest on municipal bonds actually provides a marginal subsidy to state and local capital investment. This paper develops a framework for testing for the presence of a subsidy and uses a state level data set to estimate the model. The findings provide some evidence that tax exemption subsidizes capital spending, although the results are sensitive to model specification.*

INTRODUCTION

It has long been thought that the tax exemption on the interest on municipal bonds lowers the cost of capital for state and local governments and therefore subsidizes their capital investment. The implication is that spending on public capital is greater than it would be in the absence of tax exemption.

Subsidizing municipal capital is seen by some as good policy.[1] There are several reasons why it is thought that state and local governments may underinvest in capital. Much public capital is nonexcludable in that nonresidents cannot be prevented from consuming its services. Such capital therefore provides positive spillovers, implying that individual governments will underinvest in it. In addition, electoral pressures may lead to a bias for current expenditures, mobility of populations may lead to a reluctance to spend on long-lived assets, and people may suffer from capital services illusion; i.e., they are unaware of the services they are consuming and therefore undervalue them (Zimmerman, 1991). There is also an extensive empirical literature that debates whether public capital enhances the productivity of private industry. If this is indeed the case, state and local governments likely do not invest enough and a subsidy to capital investment is a good idea.[2]

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[1] For many years, tax exemption was not a matter of policy; rather it was established as a constitutional issue through a 1894 Supreme Court ruling. In 1988, however , the Supreme Court ruled that tax-exempt status rests in the hands of Congress, placing it firmly in the realm of policy (Zimmerman, 1991).

[2] Examples of this literature include Aschauer (1989), Munnell (1990), Hulten and Schwab (1993), Garcia-Mila and McGuire (1996), and Holtz-Eakin (1994).

Gordon and Metcalf (1991) present a model that challenges the traditional view of tax exemption. They claim that, while tax exemption lowers the average cost of capital, it does not lower the marginal cost of capital and therefore does not affect the level of investment undertaken. Fortune (1998) counters with another model that suggests that the Gordon and Metcalf model is a special case and that a subsidy does indeed exist at the margin.

The issue of whether tax exemption increases the amount of public capital investment is an empirical one. The theoretical models provide a simple prediction: if tax exemption provides a subsidy at the margin, the subsidy can be measured by the yield spread between the risk-free interest rate and the interest rate on municipal bonds. This spread should be a significant determinant of municipal capital investment. This paper tests this proposition using a state level data set. The results provide some evidence that capital spending is subsidized by tax exemption; however, this result is sensitive to model specification.

THEORETICAL MODELS

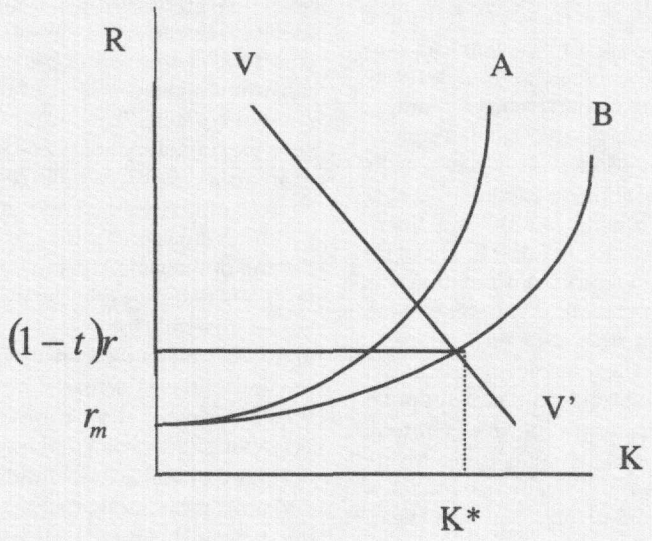
The traditional view of tax exemption holds that the yield on these bonds is the marginal cost of capital. Because tax exemption lowers the yield on municipal bonds, it is assumed that the exemption provides a subsidy that can be measured by the spread between the risk-free interest rate and the municipal interest rate.

Gordon and Metcalf (1991) challenge that view. They develop a decisive voter model in which only communities where the marginal voter is in a very low tax bracket will be subsidized by the tax exemption. Consider a city that wishes to undertake a capital project. The city's residents can withdraw their savings or borrow in private markets and pay for the project through higher taxes, or they can have the city borrow the funds in public markets. The cost to residents for the first dollar of funds raised will be $(1 - t)r$ per dollar if the project is tax financed and r_m if it is bond financed. A city will likely issue a bond if $r_m < (1 - t)r$ for the median voter. This will be true in communities where the median voter faces a relatively low marginal tax rate.[3] However, there are leverage-related costs to municipal borrowing so that r_m will rise with the amount borrowed. Communities will borrow until $r_m = (1 - t)r$ for the median voter.

Figure 1 illustrates the financing options in the Gordon–Metcalf model for a community for whom $r_m < (1 - t)r$ for the median voter. The marginal value of municipal capital is represented by VV′. They face an upward sloping cost schedule for municipal borrowing. If the schedule is represented by A, the municipality will borrow until $r_m = (1 - t)r$ and then finance the remainder of capital spending through taxes. In this case, the municipality benefits from a lower cost of capital, but it does not affect the cost at the margin and therefore will not affect the amount of capital spending undertaken. If the cost schedule for borrowing is represented by B, the community will never reach the point where $r_m = (1 - t)r$. In this case, tax exemption does reduce the marginal cost of capital and therefore provides a subsidy for capital investment. However, the implication is that these municipalities will finance all capital expenditures through borrowing. Gordon and Metcalf conclude that tax exemption generally results in intramarginal income transfers

[3] Those who hold municipal bonds as investments will be those people in relatively high marginal tax brackets for whom $r_m > (1 - t)r$. Gordon and Metcalf (1991) make the point that the municipality serves as a financial intermediary that raises funds from high tax individuals and lends them to low tax individuals. Those individuals in extreme tax brackets benefit from the arrangement.

Figure 1. The Gordon–Metcalf Model



but rarely increases state and local capital investment.

Fortune (1998) also uses a decisive voter framework. He adds two key features to his model. The first is that he assumes that the decisive voter does not have savings to tap for tax-financed capital projects and would therefore have to borrow in private markets to pay the higher taxes. In addition, he assumes that there are leverage-related costs associated with private borrowing as well as public borrowing. Equilibrium in his model implies that municipalities will finance capital projects with a mix of public borrowing and taxes until the marginal rates of public and private borrowing, including leverage-related costs, are equal. Because r_m is the marginal cost of capital, and because tax exemption shifts the cost schedule for municipal capital from r to r_m, there is indeed a marginal subsidy to public capital investment that is measured by the yield spread, $r - r_m$.[4]

LOOKING FOR A SUBSIDY EMPIRICALLY

The models provide simple, empirically testable predictions. The Gordon–Metcalf model predicts that only very low marginal tax rate communities will be subsidized by the tax exemption and that these communities will finance all capital expenditures through debt. Fortune's model holds that most communities will have a lower marginal cost of capital because of tax exemption and will therefore receive a subsidy to capital investment. For each municipality, the subsidy is measured by the spread between the risk-free interest rate and the interest rate on the bonds they issue. If capital spending is affected at the margin, it should be sensitive to the amount of the subsidy. The greater is the spread between the risk-free interest rate and the municipal borrowing rate, the greater is the subsidy and the greater should be the level of capital investment.

[4] Corner solutions are possible in Fortune's model in which the costs of private and public borrowing are not equal and there may not be a subsidy. This does not affect the empirical implication that, if there is a subsidy, capital spending should be sensitive to the yield spread.

Data

State level data are used to test these predictions. Data on capital spending, borrowing, and other financial variables were taken from the Comprehensive Annual Financial Reports (CAFRs) of a sample of states for the period 1990–8. The CAFRs provide information on capital and other spending, borrowing, tax revenue, financial asset holdings, and other financial information. Demographic information was gathered from statistical supplements to the CAFRs and from the Census Bureau. For each state, there is information on total population, proportion of the population under 18, proportion over 65, total personal income, percent living inside metropolitan areas, homeownership rates, and unemployment rates. State- and year-specific bond yields on general obligation bonds were obtained from Muller Data Corporation, New York, NY.

Most studies that have looked at the spending behavior of state and local governments have used data collected by the Census Bureau or, more recently, survey data from the National Association of State Budget Officers (NASBO). It was decided that the CAFRs would be a more appropriate source of data for three reasons. The first is consistency. After several incarnations, the Government Accounting Standards Board was established in 1984 and laid out a set of generally accepted accounting principals for government. Since that time, more and more state and local governments have sought to publish CAFRs that comply with these principals. Each state that publishes a CAFR uses the same definitions for the variables of interest, and these reports are all audited so we can be reasonably sure that the data are consistent across states.

In addition, the data in the CAFRs are presented by fund type. State and local governments follow a system of fund accounting. There are four basic fund types: governmental, proprietary, fiduciary, and component units. The focus of this analysis is the capital spending behavior of governmental funds, which receive most sources of tax revenue and make the expenditures necessary for the basic functioning of the state.[5] It is the governmental funds that invest in the infrastructure we are generally interested in. The survey data collected by the Census and NASBO are consolidated across fund types and therefore do not allow for a focus on the behavior of governmental funds.

Finally, governmental funds issue general obligation bonds that are backed by the full faith and credit of the state, whereas other funds generally issue revenue bonds backed by a designated revenue stream. We therefore collect bond yields for only general obligation bonds. Concentrating on governmental funds allows a greater level of precision in matching capital spending of the governmental fund of a state with the appropriate bond yield.

Only states are included in the current analysis, mainly because almost all states publish CAFRs and have been doing so for more than a decade and because collecting data for a reasonable sample of the more than 18,000 local governments is a daunting task. Focusing on states, however, means that the analysis is being carried out on only a partially disaggregated basis. Much of the variation in the variables of interest occurs across local governments within a state. The states and years in the sample, as well as the means and standard errors of some variables of interest, are shown in Table 1. Construc-

[5] Proprietary funds account for operations that provide goods or services either internally or to the general public on a user charge basis, i.e., a turnpike authority or a state motor pool. Fiduciary funds include trust and agency funds such as state employee pension funds or worker compensation funds. Component units include semi-independent entities such as state universities or transportation authorities.

TABLE 1
SUMMARY OF STATE LEVEL DATA SET

State	Years	Capital Spending[a]	Borrowing[a]	Yield Spread	Personal Income[a]
California	90–8	26.80 (9.68)	79.80 (33.94)	1.50 (0.441)	23,827 (2,188)
Connecticut	90–8	274.35 (44.33)	374.08 (120.97)	1.27 (0.427)	31,353 (4,032)
Florida	90, 92–7	132.62 (31.80)	69.22 (28.49)	1.61 (0.341)	22,045 (2,023)
Georgia	91–7	48.79 (10.85)	94.66 (34.48)	1.70 (0.333)	20,902 (2,203)
Illinois	90–8	27.46 (4.36)	52.76 (9.45)	1.53 (0.426)	24,565 (3,057)
Massachusetts	90–8	287.42 (83.56)	180.76 (97.63)	1.38 (0.381)	27,339 (3,484)
Maryland	90–8	200.55 (33.31)	96.89 (17.16)	1.82 (0.404)	25,782 (2,683)
Michigan	92, 95	68.06 (7.61)	77.53 (26.60)	1.47 (0.187)	21,852 (2,712)
New Jersey	92, 94, 96–8	169.59 (9.87)	189.85 (132.88)	1.23 (0.572)	30,432 (2,728)
New York	90–8	146.26 (18.86)	29.63 (11.62)	1.43 (0.461)	27,013 (3,093)
Ohio	90–8	75.25 (19.75)	76.50 (34.18)	1.45 (0.431)	21,561 (2,580)
Oklahoma	93, 96, 97	143.79 (30.45)	29.28 (41.28)	0.88 (1.15)	19,030 (1,396)
Pennsylvania	90–8	23.13 (6.61)	44.47 (18.10)	1.55 (0.432)	22,912 (2,637)
Tennessee	91, 92, 94–8	22.32 (5.19)	44.69 (22.32)	1.61 (0.476)	20,772 (2,474)
Texas	90–7	32.89 (14.84)	47.54 (29.06)	1.17 (0.464)	20,185 (2,147)
Utah	91–8	70.84 (23.98)	98.60 (150.50)	1.72 (0.539)	18,147 (2,158)
Washington	90–8	194.23 (21.64)	104.62 (21.08)	1.44 (0.493)	23,378 (2,815)
Wisconsin	90–8	28.12 (9.30)	54.02 (23.97)	1.34 (0.594)	18,474 (7,254)

[a]Dollars per capita.
Standard errors are in parentheses.

tion of the database used here is ongoing. Larger states were selected first as their behavior dominates what we observe in the aggregate. Smaller states have then been included based on availability.

A handful of states shown in Table 1 do not have continuous information for the sample period 1990–8. For most, this was either because the CAFR for that year could not be located or because one or more of the key variables of interest were not published in that year. For Michigan, however, the reason only two years were included was that those were the only two years in which the state issued bonds and the necessary bond yields could be obtained. Similarly, Colorado and Nebraska were eliminated from the sample because they did not issue any general obligation bonds during the sample period. Both states face strict constitutional restrictions on issuance of general obligation debt (McGranahan, 1999). This raises the issue of sample selection. To the extent that we only include those states that issue debt, and to the extent that both models predict that governments that are subsidized will issue more debt, the empirical results will be biased toward finding evidence of a subsidy.

Econometric Framework

To test for a subsidy to municipal capital investment, I test whether the yield spread between a Treasury bond and a municipal bond is a significant predictor of capital spending. The dependent variable is per-capita capital spending for each state in each year. The explanatory variable of interest is the spread between the yield on a five year Treasury bond and the yield on a five year state general obligation bond.[6] Each state in the sample issued at least 1 five year general obligation bond in each year. Because we have the month in which the bond was issued, I use the average yield on the five year Treasury bond for that month to calculate the spread. If the state issued more than 1 five year bond during a given year, the average annual spread is used.

Both models presented above are models that maximize the utility of a median voter, where utility is an increasing function of the services flowing from government capital. Holtz-Eakin and Rosen (1989) rigorously tested the implications of a similar model using panel data at the state and local level. Using a Euler equation approach, they find that capital spending by communities appears to be well characterized by the joint hypothesis of rationally formed expectations and no borrowing constraints.

The models are analogous to a life-cycle model for consumers and predict that capital spending will be governed by changes in wealth, or permanent resources, and unanticipated resource flows. To measure the change in wealth of a state, I use changes in the value of the capital stock plus changes in the value of their financial assets. To measure unanticipated resource flows, I use the surplus or deficit because every state in the sample has a balanced budget rule. The results of the first regression are shown in the first column of Table 2. Per-capita capital expenditures are regressed on the yield spread, the change in per-capita wealth, and the surplus or deficit using ordinary least squares. The yield spread, while positive, is statistically insignificant. Changes in wealth have a positive and significant effect on capital spending. However, unanticipated changes in resources, as measured by the surplus or deficit, have no significant effect.

Column 2 of Table 2 shows the results of estimating the model with state fixed effects and a set of year dummies. The fit of the model as measured by the adjusted R squared improves dramatically. While

[6] The five year maturity was chosen because it was more frequently issued and therefore provided more data.

TABLE 2
RESULTS OF CAPITAL REGRESSIONS[a]

Explanatory Variable	OLS	Fixed Effects	Fixed Effects	Fixed Effects	Fixed Effects	Fixed Effects	Instrumental Variables
Yield spread	5.56	24.99	32.39	33.19	21.80	—	6.48
	(20.17)	(10.90)	(14.03)	(14.77)	(17.13)		(236.06)
Change in wealth	0.185	0.004	0.002	0.003	–0.044	–0.047	–0.045
	(0.090)	(0.033)	(0.033)	(0.033)	(0.033)	(0.035)	(0.039)
Surplus (deficit)	–0.055	–0.015	–0.014	–0.014	–0.004	–0.002	–0.004
	(0.037)	(0.014)	(0.014)	(0.014)	(0.018)	(0.018)	(0.018)
Treasury bond yield	—	—	–11.51	–11.81	–17.66	–7.61	–9.40
			(13.70)	(13.87)	(13.90)	(10.73)	(127.67)
Per-capita income	—	—	—	–0.234	–27.74	–26.32	–26.17
				(1.28)	(9.10)	(9.21)	(25.81)
Population under 18	—	—	—	—	–0.024	–0.050	–0.027
					(0.109)	(0.114)	(0.121)
Population over 65	—	—	—	—	–0.169	–0.035	–0.158
					(0.254)	(0.282)	(0.308)
Urbanization rate	—	—	—	—	0.086	0.106	0.118
					(0.245)	(0.249)	(0.547)
Homeownership	—	—	—	—	0.440	0.262	0.448
					(2.64)	(2.82)	(2.66)
Unemployment rate	—	—	—	—	–26.39	–30.85	–27.99
					(6.56)	(6.69)	(25.67)
Lagged yield spread	—	—	—	—	—	5.54	—
						(6.93)	
Constant	92.87	–12.65	50.58	56.60	1805.68	1445.15	—
	(30.45)	(22.64)	(62.68)	(71.12)	(618.42)	(616.85)	
R squared	0.06	0.93	0.94	0.94	0.96	0.96	0.96

[a]Standard errors in parentheses

they are not shown in the table, most of the state effects are also highly significant on an individual basis, while the year dummies are not. The wealth variable becomes small and insignificant. What is of interest in column 2, however, is that the coefficient on the spread variable is larger and significant. The implication is that municipal capital spending is subsidized and that an increase in the spread of ten basis points will lead to an increase in capital spending of $2.49 per capita, or $42.6 billion for our sample of states in 1997.

There is a growing literature that links the effects of fiscal institutions such as separate capital budgets, balanced budget rules, supermajority requirements, and rainy day funds to the observed tax and spending behavior of state and local governments.[7] Although we do not control for these institutions explicitly in the model presented here, their effects are being captured. Fixed effects capture both the presence of these institutions and the underlying preferences of a population that give rise to these institutions. This is sufficient for the purposes of the current

[7] Knight and Levinson (1998) provide an excellent summary of this literature, while providing their own important contributions.

study as the focus is not on identifying the effects of these institutions.

Because I am essentially estimating a capital demand function, it can be argued that some absolute measure of the price of capital should be included. The yield spread measures the amount of the subsidy but not the actual cost of capital. The year dummies will capture macroeconomic conditions and so will capture some variation in the general price level. Column three shows the results of including the yield on the five year Treasury bond as an explanatory variable. While the bond yield has the expected inverse relationship with capital spending, it is not significant. The coefficient on the yield spread increases in magnitude and remains significant.

In the fourth column of Table 2, personal income per capita is added as a regressor. Income has a negative but insignificant effect on capital spending. The spread variable becomes slightly larger and is still significant.

The proportion of the population under 18, the proportion over 65, the proportion living inside a metropolitan area, the proportion owning a home, and the unemployment rate are added as explanatory variables. The results are shown in column 5. These variables are included to capture the effects of differences in communities in addition to economic resources that might affect their demand for capital services. The coefficient on per-capita income becomes large, negative, and statistically significant. A negative relationship between income and capital spending is somewhat puzzling. The coefficient on the unemployment rate is also large, negative, and significant, indicating strong cyclicality in capital spending. The coefficient on the yield spread becomes smaller and statistically insignificant.

There is likely to be an endogeneity problem with the spread. Capital spending can be financed with taxes or borrowing. Capital spending therefore plays a role in determining residents' tax rate, and the tax rate has a role in determining the yield spread. In addition, as predicted by both models discussed earlier, there are leverage-related costs to public borrowing. Many of these costs are incorporated into the bond yield, so that the more a state borrows, the higher are its borrowing costs represented by the yield. However, current capital spending does not affect the past spread, yet past spreads may be the relevant variable in explaining capital spending as it may take time to translate bond market conditions into policy. Accordingly, the yield spread lagged one year is included as the regressor of interest in column 6. Not much changes, except that the coefficient on the lagged yield spread is smaller and insignificant.

I next address the endogeneity issue using instrumental variables. A variable is needed that is correlated with the municipal bond yield yet is exogenous to state capital spending. We use the results of Mankiw and Poterba (1996) that show that the balancing of capital markets implies that the dividend yield on corporate equities will be correlated with the municipal yield spread. They found evidence of this correlation empirically. Column 7 of Table 2 shows the results of estimating the model with fixed effects and using the dividend yield from the S&P 500 to instrument for the yield spread. The coefficient on the spread is small and insignificant. The problem with using the dividend yield as an instrument, however, is that there is variation over time but not across states.

CONCLUSIONS

The empirical evidence presented here suggests that, at the state level, there is some evidence that tax exemption provides a subsidy to municipal capital. However, this evidence is sensitive to the specification of the empirical model. It seems too soon to draw conclusions one way or the other.

There are several factors that might limit the empirical analysis in this paper. One is that the analysis was conducted only at a semi-disaggregated level. In focusing on capital spending at the state level, we lose some of the variation in pertinent explanatory variables that occurs at the local level.[8] More evidence of a subsidy might be found if the unit of analysis were local governments. The size of the sample is also small, which may lead to weakness in the econometric estimates. The coefficient on the spread is consistently positive and could be found to be more robust if the sample included more states and more years.

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[8] Using national time series, Holtz-Eakin (1991) found no effect of bond market conditions on state and local spending.