The Municipal Bond Market, Part II: Problems and Policies

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Fifty years ago Henry C. Simons challenged the concept of tax exemption when he remarked (1938):

> The exemption of the interest payments on an enormous amount of government bonds . . . is a flaw of major importance. It opens the way to deliberate avoidance on a grand scale . . . the exemption not only undermines the program of progressive personal taxation but also introduces a large measure of differentiation in favor of those whose role in our economy is merely that of rentiers.

While the "program of progressive personal taxation" appears to have been left behind, Simons' criticism of the exemption is still widely held. The purpose of this article is to identify the problems posed by tax exemption, and to assess some alternatives. The analysis goes well beyond the issue of equity, which is the heart of Simons' complaint. This study asks whether the results of tax exemption represent an appropriate outcome, and questions whether tax exemption is really necessary to achieve the benefits stated in its favor.

This article is a companion to an earlier one (Fortune 1991) that examined the effects of the income tax code on the market for municipal bonds, concluding that the municipal bond market is a creature of tax policy. That article explored the history of the exemption, reviewed the relevant tax legislation, presented a theoretical model of the municipal bond market, and employed econometric methods to determine the role played by the tax code.

The first section of this article addresses three major problems of municipal bond market performance: market instability, vertical equity, and financial efficiency. These problems have driven the debate about reform of the market. The second section discusses several approaches to mitigating these problems. The third section focuses on an aspect of tax exemption that has received very little attention, its impact on resource allocation and economic efficiency. The section estimates the loss in economic output due to the exemption, concluding that while the loss is small relative to the size of the economy, it is, nevertheless, worthy of attention. The last section summarizes the article and its conclusions.

I. Municipal Bond Market Performance

Why does Congress allow municipal interest payments to be exempted from federal income taxes in the face of a very large chronic deficit in the federal budget, even though it is now clear that no constitutional provision requires that this tax policy continue? The rhetoric of tax exemption is philosophical, appealing to notions of appropriate intergovernmental relations and, in particular, to the doctrine of reciprocal immunity: no level of government should use its taxing authority to impose harm on another level. But the true force behind tax exemption is that it provides state and local governments with a valuable subsidy, which can be enjoyed at their discretion. Political support for the exemption is very strong, and it will continue unless a better way can be found to structure a subsidy to state and local governments.

An assessment of the economics of tax exemption, which is a subsidy of capital costs, suggests that the case for it is weak. The economic argument must rest on the view that, in the absence of a capital cost subsidy, state and local governments will produce an inadequate amount of public services with insufficient capital intensity. While the final word on this issue is not yet spoken, the debate continues in the current discussion about public infrastructure, such as highways, schools, and solid waste facilities. For example, Munnell (1990) finds a high marginal productivity of infrastructure, suggesting that an inadequate amount is available, while Hulten and Schwab (1991) find no indication of inadequate infrastructure.

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However, even if infrastructure is insufficient, it can be argued that better methods than tax exemption can be used to achieve these goals. Three fundamental criticisms of tax exemption have received the most attention. The first says that tax exemption induces unnecessary volatility into municipal bond yields. According to this "market instability" argument, tax exemption narrows the market for municipal bonds and makes that market more sensitive to changes in the distribution of investable funds between individuals and financial institutions, as well as to other factors that affect financial markets. The result is that municipal bond yields are more volatile than yields on comparable taxable bonds, introducing cyclical variations in the cost of capital for state and local governments. This also introduces variability into the value of the capital-cost subsidy enjoyed by municipalities.

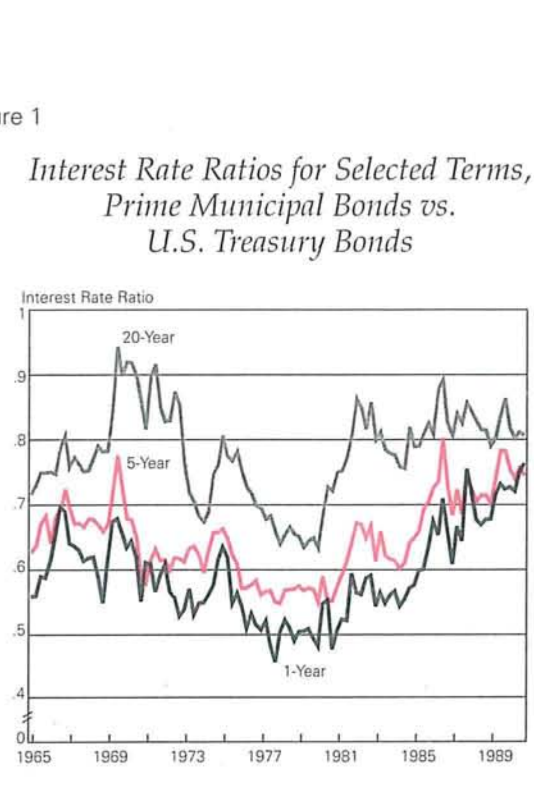
The second criticism, echoing Simons' complaint, is that tax exemption is inequitable; it confers upon the wealthy a valuable opportunity to increase their after-tax income, and it erodes the degree of vertical equity in our tax system by allowing the wealthy to avoid taxation in ways not available to the less affluent. This criticism is the most common in popular discussions of tax exemption.

The third criticism is that tax exemption is *financially* inefficient because it imposes greater costs on federal taxpayers than the benefits it confers upon state and local governments.[1] Still another criticism is that tax exemption fails to encourage *economic* efficiency. Instead, it is argued, tax exemption encourages overproduction of public services as well as overuse of capital by the public sector. A corollary is that the private sector has inadequate capital with which to produce goods and services. This view is based on the assumption that a competitive market economy, unfettered by government intervention in prices, will induce an appropriate allocation of resources. This issue will be discussed in the third section of the article.

[1] Note that the word "efficiency" in this context is used quite differently from the engineering context (getting the most for any given amount of inputs) or the economic context (Pareto-Optimality, or making each person as well off as possible given the positions of all other people). The focus of *financial* efficiency is on the very narrow question of how much benefit is received by lower levels of government per dollar of cost to the federal Treasury.

Figure 1

Interest Rate Ratios for Selected Terms, Prime Municipal Bonds vs. U.S. Treasury Bonds



Source: Salomon Brothers, Inc.

Market Instability

Figure 1 shows the interest rate ratio for municipal bonds of one-year, five-year, and 20-year maturities. For each maturity, this ratio is the yield to maturity on high-quality municipal bonds (R_m) (Salomon Brothers prime grade) over the yield on U.S. Treasury bonds (R_T) of the same maturity. Much of the movement in these interest rate ratios can be explained by changes in the income tax code (Fortune 1991).

It is clear that the interest rate ratio is highly variable for each maturity. From high ratios in the early 1970s, the ratios declined sharply until the early 1980s, after which they rose again. Thus, municipal bond yields are more volatile than are yields on U.S. Treasury bonds. It is interesting to note, however, that much of this volatility disappeared in the last half of the 1980s. The reduction in volatility in the 1980s was largely the result of the reduced progressivity of the tax system, as well as of tax policies that reduced commercial bank incentives to hold municipal bonds (Fortune 1991).

The interest rate ratio can be interpreted as determined by the tax rate of the marginal investor in tax-exempt bonds; indeed, this implicit tax rate can be inferred from interest rate data as $t_m = 1 - (R_M/R_T)$, or equal to one minus the interest rate ratio for municipal bonds. The implicit tax rate (t_m) is also the rate of subsidy of state and local capital costs as a result of tax exemption. For example, if the marginal investor's tax rate is 30 percent, then state and local governments face a cost of capital that is only 70 percent of the cost associated with issuing taxable bonds. Thus, the variation in the interest rate ratio (R_m/R_T) translates into variation in the rate of subsidy.

Financial Efficiency and Equity

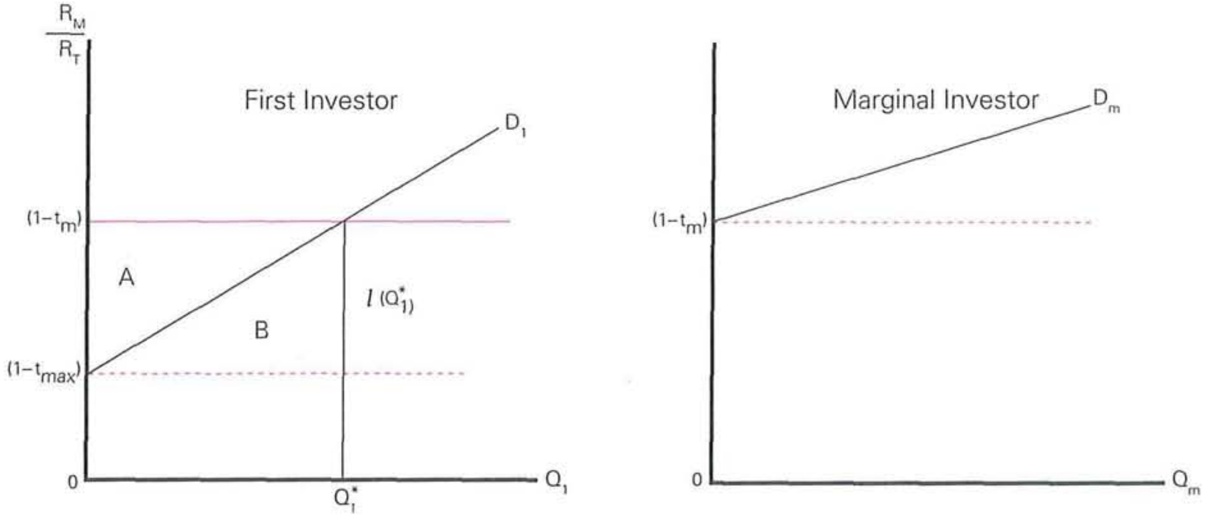
In order to assess the financial efficiency and equity problems, this study will use the model of the municipal bond market developed in Part I (Fortune 1991). Assuming that municipal bonds and taxable bonds are substitutes in investors' portfolios, each investor will choose an amount of municipal bonds based on her tax rate and on her assessments of the nonpecuniary advantages or disadvantages of municipal bonds. Among these nonpecuniary factors are differences in call features, tax rate uncertainty, duration, and liquidity. The optimal holding of municipal bonds will be that quantity for which $(R_M/R_T) = \ell + (1 - t)$, where t is her tax rate and ℓ is the "risk premium" required by the investor; the risk premium is the investor's compensation for nonpecuniary characteristics. While the tax rate is exogenous to the investor's decision, the risk premium is endogenous: as an investor contemplates increasing the amount she invests in municipal bonds, she will require a higher interest rate ratio to compensate for the increased risk of municipal bonds.

Assuming that the risk premium is zero for the first dollar of municipal bonds held by an investor, then if an investor holds no municipals, she considers the first dollar of municipals to be equivalent to a dollar of taxable bonds. This means that for inframarginal investors, the interest rate ratio will exceed the value $(1 - t)$ by the risk premium required to induce them to hold municipal bonds. But for the marginal investor, who holds a small amount of municipal bonds, the interest rate ratio is $(1 - t_m)$, where t_m is the marginal investor's tax rate.

Figure 2 shows the demand functions for municipal bonds of two investors: the "first investor," whose tax rate, t_{max}, is the highest, and the "marginal investor," with tax rate t_m. The quantity of municipal bonds acquired is along the horizontal axis, and the

Figure 2

Individual Investors in the Market for Municipal Bonds



vertical axis shows the interest rate ratio. The broken horizontal lines at $(1 - t_{max})$ and $(1 - t_m)$, respectively, show each investor's demand function for municipal bonds if tax-exempt and taxable bonds are perfect substitutes. The upward-sloping solid lines labeled D_1 and D_m are the actual demand functions, with the vertical distance to the broken line representing the risk premium required to induce the investor to hold each quantity of municipal bonds.

Figure 2 assumes that the bond markets have settled into an equilibrium in which the interest rate ratio is just sufficient to induce a marginal investor with tax rate t_m to buy a small amount of tax-exempt bonds. The equilibrium interest rate ratio is $(1 - t_m)$, which is high enough to induce the first investor to hold Q_1^* in tax-exempt bonds. For each investor, the interest rate ratio has two parts. The first is the ratio required to give tax-exempts the same after-tax return as taxable bonds; for the first investor this is $(1 - t_{max})$. The second part is the risk premium required to induce the first investor to hold the quantity of tax-exempts he chooses. For the first investor the risk component is $\ell(Q_1^*)$, but for the marginal investor the risk component is (by assumption) zero.

Following an unfortunate convention, the term "windfall income" will be used to designate any income from tax-exempts that is in excess of the income required to break even on an after-tax basis. Thus, for the first investor the amount of windfall income is given by the sum of areas A and B, multiplied by the taxable interest rate, or area $(A + B) * R_T$. However, (area B) $* R_T$ is not really a windfall, for it is the amount of extra income required to induce the investor to hold Q_1^*. The only true excess income is measured by (area A) $* R_T$; this is the "investor's surplus," which exists because the investor earns interest on his infra-marginal investment in excess of the amount required. Note that in the case of a linear demand function, the investor's surplus will be 50 percent of the investor's windfall income.

Figure 3 shows the municipal bond market. The vertical line labeled SS is the supply function, showing the quantity of municipal bonds outstanding at each interest rate ratio. In order to focus attention solely on the demand function, it is assumed that this is not interest-elastic.[2] The upward-sloping schedule

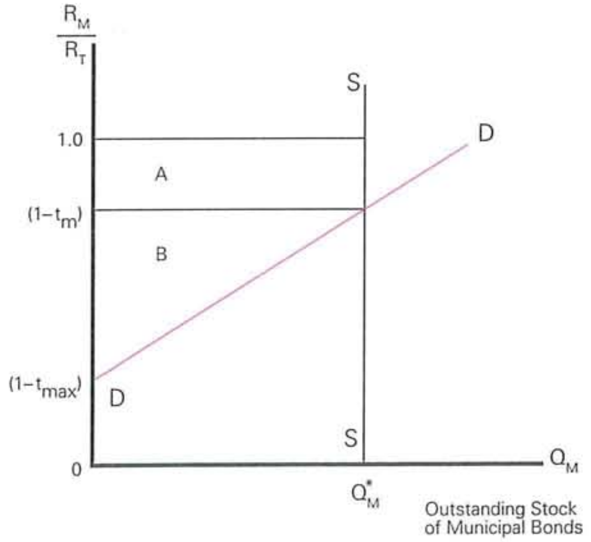
[2] Considerable evidence suggests that, in the long run, the amount of debt issued to finance capital outlays is not interest-sensitive, though the timing of debt issue is influenced by the interest rate cycle. Recent evidence does suggest, however, that arbitrage activity does induce some interest sensitivity to the supply of municipal bonds (Metcalf 1990, 1991).

DD shows the demand for municipal bonds as a function of the interest rate ratio; this is the horizontal summation of each investor's demand function.

DD rises because, as the amount of bonds outstanding increases, the interest rate ratio must rise by enough to induce infra-marginal investors to switch some portion of their portfolios from taxable to tax-exempt bonds, as well as to induce new marginal investors to enter the market as the original marginal investors become infra-marginal investors. For each quantity of municipal bonds outstanding, the vertical distance to DD is $(1 - t')$, where t' is the tax rate of the investor who buys the last dollar of municipal bonds. Thus, for the quantity actually outstanding (Q_M^*) the tax rate of the marginal investor is t_m and, recalling the assumption that $\ell = 0$ for the marginal investor, the equilibrium interest rate ratio is $RM/RT = (1 - t_{max})$. The marginal investor is receiving exactly the interest rate ratio he requires to be induced to hold municipal bonds. But all infra-marginal investors are receiving windfall income, a portion of which is investor's surplus.

Figure 3

Costs and Benefits of Tax Exemption



Consider the first few dollars of municipal bonds issued. These will be sold to the investors with the highest tax rate (t_{max}); these investors would be willing to buy municipal bonds if the interest rate ratio were as low as $(1 - t_{max})$, but because Q_M^* of municipal bonds are sold, the interest rate ratio must be $(1 - t_m)$. The windfall income for the highest-bracket investors—per unit of taxable interest paid—is, therefore, $[R_M/R_T - (1 - t_{max})] * Q_M^* = (t_{max} - t_m) * Q_M^*$; the dollar amount of the windfall is this times the taxable interest rate, or $(t_{max} - t_m) * (Q_M^* R_T)$. Note again that this "windfall" is not all unearned: some portion of it (approximately half) is a necessary reward for risk.

If this analysis is extended to compute the total windfall income for investors with higher tax rates than the marginal investor, windfall income is then represented (per unit of R_T) in Figure 3 by area B; the dollar value of the total windfall is R_T * (area B). In practice, one can estimate the total windfall income using the following formula:

$$(1) \quad \text{Windfall Income} = (\bar{t} - t_m)R_T Q_M$$
$$= (\bar{t} - t_m)[R_M Q_M]/(R_M/R_T).$$

In this formula $\bar{t}$ is the "average marginal tax rate," the average of tax rates paid by all investors in municipal bonds,[3] and t_m is the marginal investor's tax rate, calculated from the observed interest rate ratio as $t_m = 1 - (R_M/R_T)$. Windfall income is the difference $(\bar{t} - t_m)$ multiplied by total interest paid on municipal bonds, $R_M Q_M$, and divided by the interest rate ratio; in Figure 3 this amount is shown as (area B) * R_T.

The equity problem is inextricably connected to the financial efficiency problem. In order to assess the degree of financial efficiency, the federal tax revenues lost because of tax exemption must be calculated and compared with the interest payments saved by state and local governments. Consider first the interest savings experienced by states and municipalities. In the absence of tax exemption, municipalities would pay an interest rate ratio of 1.0, but because of tax exemption they pay a rate ratio of $(1 - t_m)$, thereby reducing the rate ratio by $[1 - (1 - t_m)] = t_m$.[4] Interest

[3] The average marginal tax rate would be the sum of each investor's marginal tax rate weighted by the proportion of total municipal bonds outstanding that he holds, or $\bar{t} = \Sigma t_i s_i$ where i is an index over investors, s_i is the share of municipal bonds owned by the *ith* investor, and t_i is the *ith* investor's tax rate.

[4] For expository convenience, it is assumed that $\ell = 0$ if tax exemption is not allowed; that is, that all nonpecuniary factors that lead to different pricing of municipal and private bonds are due to the exemption. This is clearly not true, and as a result this analysis tends to understate the interest savings of state and local governments.

savings is, therefore, measured by (area A) $*$ R_T, which is

$$(2) \qquad \text{Interest Savings} = t_m R_T Q_M.$$

The revenue cost to the U.S. Treasury is the sum of two components: the windfall income received by high-bracket investors plus the interest savings of municipalities. The dollar value of revenue cost is (area A + area B) $*$ R_T. Thus,

$$(3) \quad \text{Revenue Cost} = R_T * [t_m + (\bar{t} - t_m)]Q_M$$

$$= \bar{t}R_T Q_M.$$

If, as has historically been true in the United States, taxation of income is progressive, then the *average* marginal tax rate exceeds the marginal tax rate ($\bar{t} > t_m$) and area (A + B) > area A. Therefore the revenue cost to the federal government must exceed the interest savings enjoyed by states and local governments by an amount known as "windfall income."

Thus, the financial inefficiency of tax exemption exists because of the equity problem, and reduction of the equity problem implies progress on the efficiency problem. The degree of financial efficiency can be measured by an "efficiency index," defined as the proportion of the revenue costs that accrues to states and local governments as interest savings. This efficiency index is the ratio of area A to area (A + B), or

$$(4) \qquad \text{Efficiency Index} = t_m/\bar{t}.$$

Estimates of the Revenue Costs, Interest Savings, and Efficiency

Several studies have attempted to measure the revenue costs and efficiency of tax exemption. One approach, the Meltzer-Ott method (Ott and Meltzer 1963), is to estimate the marginal tax rates from the interest rate ratio, estimate the average marginal tax rate from data on ownership of municipal bonds and on the tax rates of each sector, and use U.S. Treasury or Federal Reserve Board flow-of-funds data on the outstanding stock of tax-exempt bonds. The second approach, called here the OMB method, is to use the Tax Expenditure Budget, reported annually by the U.S. Office of Management and Budget (1990).

The Meltzer-Ott method is used here to estimate revenue losses and interest savings for 1990. (See the Appendix, Measuring the Cost of Tax Exemption.) The year 1990 was chosen for two reasons: it is the most recent year for which data are available, and it is sufficiently long after the Tax Reform Act of 1986 to allow a new equilibrium in the ownership of municipal bonds to be reached. As discussed in Part I of this study (Fortune 1991), the Tax Reform Act of 1986 created dramatic changes in the municipal bond market. First, the ownership of municipal bonds shifted sharply from financial institutions, particularly commercial banks, to households: while financial institutions and households each held about 50 percent of municipal bonds in 1985, the household share of outstanding tax-exempts rose to about 65 percent by the end of 1990. Second, the corporate income tax rate declined dramatically, from 46 percent to 34 percent, as did the maximum personal income tax rate, from 50 percent to 33 percent. Both acted to increase the interest rate ratio.

Poterba and Feenburg (1991) estimate that in 1988, after the Tax Reform Act was fully implemented, the average marginal income tax rate for households was 28 percent. For financial institutions, which held about 35 percent of outstanding municipals, the tax rate was 34 percent. The weighted average of those tax rates is 30.1 percent; this will be used to derive estimates of the average marginal tax rate for 1990.

The marginal tax rate for 1990 is assumed to be 23 percent, based on 1985–90 average interest rates of 8.77 percent for 10-year Treasury bonds and 6.78 percent for 10-year prime municipal bonds. At year end 1990, the outstanding stock of municipal bonds was $837 billion. Combined with the previous assumptions, the Meltzer-Ott estimate of 1990 interest savings for state and local governments is $16.9 billion, with a revenue cost to the Treasury of $22.0 billion. The efficiency index is 77 percent.

The OMB method is based on the Tax Expenditure Budget, developed in 1968 by the Treasury Department under the direction of Stanley Surrey (1973). The Tax Expenditure Budget reports the estimated cost to federal taxpayers of the "loopholes" in the Internal Revenue Code during each fiscal year. Table 1 reports the revenue costs in the Tax Expenditure Budget for FY1990 at $21.5 billion, very close to the $22.0 billion derived from the Meltzer-Ott method. Thus it can be concluded that the costs to the federal taxpayer of tax exemption for state and local bonds were about $22 billion. Applying the 77 percent efficiency index found by the Meltzer-Ott method, interest savings for states and local governments were $16.9 billion.

It is important to note that in 1990 a large amount

Table 1
Tax Expenditures in the Federal Income Tax: Revenue Losses from Exclusion of Interest on State and Local Debt, Fiscal Year 1990
Billions of Dollars

Total			$21.515
Public Purpose Debt		$10.730	
Private Purpose Debt		10.785	
IDBs for Businesses[a]	$4.310		
IDBs for Authorities[b]	.720		
Mortgage Revenue Bonds	1.570		
Rental Housing	1.180		
Student Loans	.345		
Nonprofit Education	.235		
Nonprofit Health	2.190		
Veterans' Housing	.235		

[a]Industrial development bonds for energy facilities, pollution control, sewage and water facilities, small-issue IDBs.
[b]Industrial development bonds for airports, docks, sports and convention facilities, mass commuting.
Source: U.S. Office of Management and Budget (1990).

of private-purpose bonds received tax exemption, and only about 47 percent of these revenue losses were for public-purpose bonds. The use of tax-exempt bonds for private-activity purposes, particularly businesses, housing, and nonprofit hospitals, had been curtailed by the 1986 Tax Reform Act, but still involves significant revenue losses on bonds issued prior to August 1986.

II. Proposals for Municipal Bond Market Reform

Several reforms of the municipal bond market have been proposed, but as this section explains, none of them have been adopted. Instead, the market performance problems have been mitigated by a policy change that could not have been predicted 15 years ago: a dramatic reduction in the progressivity of personal income tax rates.

Elimination of Tax Exemption

One approach, which has little political support, would eliminate tax exemption and force municipalities to issue only taxable bonds. If this were done without grandfathering outstanding bonds, the U.S. Treasury could recoup approximately $22 billion to $24 billion of tax revenues.

Because the efficiency, equity, and volatility problems all are due to the difference between yields of taxable and tax-exempt bonds, this approach would entirely eliminate those problems. It also would increase the cost of capital faced by states and local governments, as well as eliminate the human capital invested in the underwriting of tax-exempt bonds. The political power of the financial community and that of state and local government officials are reasons to doubt that this proposal will be implemented.

Substitution of a Direct Subsidy

A more moderate proposal would substitute a direct subsidy for tax exemption. In order to do this, Congress might eliminate tax exemption entirely, restricting states and local governments to issuing taxable bonds. Congress could then restore a capital cost subsidy by committing the U.S. Treasury to pay each state or local government a direct subsidy related to the size of its interest payments. If the Treasury wrote checks to states and local governments in amounts equal to the proportion σ of their interest payments on taxable bonds, the net interest cost of municipal borrowing would be $(1 - \sigma)R_T$.

Elimination of tax exemption cuts the connection between tax rates and the demand for municipal bonds. In effect, the demand schedule for municipal bonds becomes horizontal at an interest rate ratio of 1.0: the interest rate ratio will be unity or, stated differently, the municipal bond yield, R_M, will always equal the taxable bond rate. The total interest paid by municipalities will be R_TQ_M.

The payment of a direct subsidy equal to the proportion σ of interest payments reduces the net interest paid by state and local governments on taxable bonds from R_T to $R_T(1 - \sigma)$. Whether municipalities are better off under the direct subsidy plan than under tax exemption depends on the subsidy rate: if $\sigma > t_m$, the direct subsidy will reduce interest costs by more than the value of tax exemption. If, in addition, $\sigma < \bar{t}$, the direct subsidy will also reduce the costs to the Treasury. Thus, any value of the subsidy rate between $\bar{t}$ and t_m will make both levels of government better off while also eliminating the equity and efficiency problems.

Why has this reform not received much support? This seems especially surprising since the subsidy rate could be set high enough to increase the capital cost subsidy to state and local governments *and* still reduce the costs to federal taxpayers. The opposition comes from several sources. First, high-income investors do not want to see their windfalls eliminated; this has been particularly true since the 1986 Tax Reform Act, which eliminated many other tax shelters. Second, state and local governments fear that a direct subsidy is the first step toward elimination of any subsidy: after adopting a direct subsidy, Congress might either eliminate it or drastically reduce the subsidy rate, leaving states and municipalities with a much-reduced subsidy in the future. Finally, the securities industry—particularly that portion involved in underwriting and trading municipal bonds—has lobbied vigorously against any changes in tax exemption because municipal bond underwriters, traders, and attorneys do not eagerly accept the consequences.

The Taxable Bond Option

A complete elimination of tax exemption, whether or not accompanied by a direct subsidy, is not in the political cards. This leads to consideration of a reform that combines aspects of the current system and of taxable bonds with a direct subsidy. This is the taxable bond option, which was initially proposed in the 1940s as a method of eliminating tax-exempt securities (Seltzer 1941) and received considerable attention in the early 1970s (Galper and Petersen 1971, Fortune 1973a and 1973b, Huefner 1971).

The taxable bond option would give state and local governments the *option* to issue either taxable or tax-exempt bonds. In order to provide an incentive to issue bonds in the taxable form, a direct subsidy linked to the interest costs of taxable municipal bonds would be paid to the issuing government. In order to induce municipalities to issue taxable bonds, the subsidy rate must exceed the tax rate of the marginal investor in tax-exempts in the current regime: if $\sigma < t_m$, the taxable bond option would not be chosen, because municipalities would be better off issuing tax-exempt bonds at a rate of $R_T(1 - t_m)$ than taxable bonds at a net rate of $R_T(1 - \sigma)$. Only if σ exceeded t_m would municipalities have an incentive to issue taxable bonds at the margin. But as municipalities substituted taxable bonds for tax-exempts, the volume of tax-exempt bonds would decline and the tax rate of the marginal investor in tax-exempts would increase. If the subsidy rate is less than the maximum tax rate (t_{max}), the market will settle down to a new equilibrium with municipal bonds issued in *both* taxable and tax-exempt forms. In this new equilibrium, the new marginal investor's tax rate will be equal to the subsidy rate ($t_m = \sigma$) because municipalities will adjust the composition of their debt so that, at the margin, taxable and tax-exempt bonds carry equal net interest costs.

Consider Figure 4, a replica of Figure 3 with an important reinterpretation. The DD schedule is now the demand schedule for *tax-exempt* bonds, so the horizontal distance from the vertical axis to DD shows the amount of tax-exempt bonds that will be demanded at each interest rate ratio. The supply schedule SS shows the amount of total municipal debt—taxable *and* tax-exempt—that will be outstanding. Thus, at each rate ratio, the horizontal distance from DD to SS represents the amount of *taxable* bonds issued.

Figure 4 assumes a subsidy rate on taxable bonds exceeding the subsidy via tax exemption ($\sigma > t_m$). The introduction of the taxable bond option results in a kinked supply schedule for tax-exempt bonds. At any interest rate ratio less than $(1 - \sigma)$, municipalities will issue only tax-exempts, so that SS is the supply schedule for tax-exempts when $R_M < (1 - \sigma)R_T$. For

Figure 4

The Taxable Bond Option

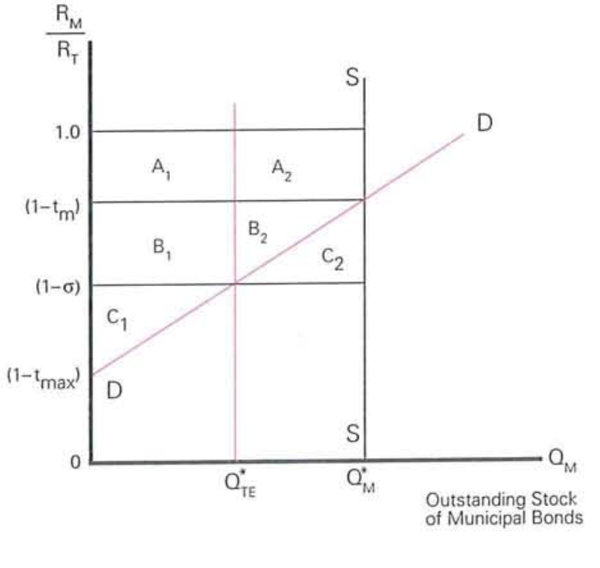


Table 2
Measurement of the Equity and Efficiency Effects of a Taxable Bond Option (TBO)

Item	Before TBO	After TBO	Increment
Cost to U.S. Treasury	$A_1 + A_2 + B_1 + B_2 + C_1$	$A_1 + A_2 + B_1 + B_2 + C_1 + C_2$	C_2
on Tax-Exempts	$A_1 + A_2 + B_1 + B_2 + C_1$	$A_1 + B_1 + C_1$	$-(A_2 + B_2)$
on Taxables	none	$A_2 + B_2 + C_2$	$A_2 + B_2 + C_2$
Interest Savings of State and Local Governments.	$A_1 + A_2$	$A_1 + A_2 + B_1 + B_2 + C_2$	$B_1 + B_2 + C_2$
on Tax-Exempts	$A_1 + A_2$	$A_1 + B_1$	$B_1 - A_2$
on Taxables	none	$A_2 + B_2 + C_2$	$A_2 + B_2 + C_2$
Windfall Income of Investors	$B_1 + B_2 + C_1$	C_1	$-(B_1 + B_2)$
on Tax-Exempts	$B_1 + B_2 + C_1$	C_1	$-(B_1 + B_2)$
on Taxables	none	none	none

Note: The areas in this table are defined in units of the taxable bond rate. To convert them to dollar values, each area should be multiplied by R_T. See Figure 4 for a visual presentation.

any rate ratio greater than $(1 - \sigma)$ no tax-exempts will be issued, so when $R_M > (1 - \sigma)R_T$ the supply schedule coincides with the vertical axis. Finally, at $R_M = (1 - \sigma)R_T$ the supply schedule is horizontal between the vertical axis and SS. Thus, with a taxable bond option the equilibrium interest rate ratio will be $(1 - \sigma)$, the amount of tax-exempt bonds outstanding will be Q^*_{TE}, and the amount of taxable bonds will be $(Q^*_M - Q^*_{TE})$.

The taxable bond option will eliminate the volatility problem because the equilibrium ratio of tax-exempt to taxable interest rates will be set at $(1 - \sigma)$: any shifts in DD or SS will alter the composition of municipal debt, but will not affect the equilibrium interest rate ratio. For example, a rightward shift in SS in Figure 4 will lead to an increase in municipal bonds outstanding, all of which will be in the taxable form issued at the net cost of $R_T(1 - \sigma)$. Thus, the interest rate ratio is unaffected by either supply or demand shifts because taxable bonds are the marginal form of debt.

The equity and efficiency problems are only partially eliminated by the taxable bond option: they are totally eliminated for all taxable bonds issued, but they continue (though at a lower level) for tax-exempt bonds. To show this, Figure 4 has been decomposed into six areas: A_1, B_1 and C_1 apply to the tax-exempt bonds sold, while A_2, B_2 and C_2 apply to taxable bonds. Table 2 shows the interpretation of each of these areas.

The taxable bond option must cost the federal taxpayer more than reliance on tax exemption alone. This incremental cost arises because the taxable bond option has an effect only if $\sigma > t_m$, that is, if at the margin the direct subsidy exceeds the indirect subsidy of tax exemption. Because the federal costs of any tax-exempts issued will not change (being determined by the tax rates of the investors in tax-exempts), the total costs to the federal taxpayer must rise. The size of this additional cost is measured by $R_T *$ (area C_2).

The interest savings enjoyed by state and local governments will increase by $R_T *$ area $(B_1 + B_2 + C_2)$: $R_T *$ area B_1 is the value of increased interest savings on tax-exempt bonds that are still issued, while $R_T *$ area $(B_2 + C_2)$ is the increased savings on the volume of debt that shifts from the tax-exempt to the taxable form. Thus, a taxable bond option will increase the interest savings enjoyed by state and local governments.

In summary, a taxable bond option will eliminate the volatility problem and mitigate the equity and efficiency problems. The magnitude of the reduction in the equity and efficiency problems will depend upon the subsidy rate on taxable bond interest: the higher the subsidy rate the greater will be the share of municipal bonds issued in the taxable form, and the lower will be the equity and efficiency problems. Indeed, if the subsidy rate were set at t_{max}, all municipal debt would be issued in the taxable form, and equity and efficiency problems would be eliminated. This case would replicate the results achieved by legislative elimination of tax exemption and a direct subsidy rate of t_{max}.

The taxable bond option is clearly a compromise, which maintains tax exemption but also induces municipalities to issue taxable bonds. It has been opposed by the same groups that have opposed the more extreme reform of completely eliminating tax exemption and replacing it with a direct subsidy on taxable municipal bonds. While the opposition has been a bit less monolithic—with, for example, less concerted opposition among municipal finance officials—it has been sufficiently vigorous to prevent adoption of the taxable bond option.

A Flat Income Tax

A fourth approach to reforming the municipal bond market adopts a flat rate schedule for personal income taxes. Recall that the upward slope of the demand schedule in Figure 2 occurs for two reasons. First, the progressivity of the income tax rate schedule means that additional bonds outstanding must induce a higher rate ratio to compensate investors with tax brackets lower than that of the initial marginal investor. Second, each investor requires a risk premium, which increases with his holding of municipal bonds. With a flat tax-rate schedule the progressivity component disappears, and the market demand function depends solely on the risk premium schedules of individual investors. The market demand schedule will, therefore, be flatter. This will reduce the instability, efficiency, and equity problems.

Another approach to reforming the municipal bond market would adopt a flat rate schedule for personal income taxes.

The Tax Reform Act of 1986 introduced a two-bracket personal tax rate schedule (15% and 28%), initiating a major step toward a flat rate system.[5] The 1990 Revenue Reconciliation Act, which adopted a 15 percent, 28 percent, 31 percent schedule, was an additional step in this direction. While the move toward a flat-rate system was not due to any effort to mitigate the problems of tax exemption, it has had that effect. The major appeal of this approach is political. High-income investors are happy to trade the value of municipal bonds as a tax shelter for lower tax rates; state and local governments still receive a subsidy (though it is smaller) and do not face the uncertainty about continued payment of a direct subsidy; and municipal bond underwriters do not find the demand for their services dramatically threatened.

III. Resource Allocation and Economic Efficiency

The equity and financial efficiency problems of the municipal bond market are not "social costs." Rather, they are "zero sum" costs in the sense that one sector's gain is matched by another sector's loss. For example, the financial efficiency problem is zero sum because it affects the distribution of income, not the aggregate amount of income received: the gains enjoyed by state and local government taxpayers through lower interest costs, and by affluent investors through windfall income, are matched by costs to federal taxpayers.

This section focuses on the social costs of tax exemption. The problem of social costs, or *economic* inefficiency, is inherent in any capital-cost subsidy; it will occur even in the absence of market instability or efficiency and equity problems.

The core of the social cost problem is the resource allocation effect of tax exemption. Because the exemption reduces the net interest cost paid by municipalities, it alters the relative amounts of capital and labor that states and local governments use to produce public goods. In addition, by affecting the relative prices of public and private goods, it induces economic agents to demand more public goods and fewer private goods, thereby shifting the composition of aggregate production. The ultimate effect of a capital cost subsidy enjoyed by the public sector (but not by the private sector) is to increase the share of output produced by the public sector, and to increase the relative capital intensity of public sector production.

[5] In effect, however, this two-bracket schedule became a four-bracket one (15%, 28%, 33%, 28%) as the phasing-out of the 15% bracket and personal exemptions took effect at certain income levels only.

The Microeconomics of Economic Efficiency

The effects of tax exemption on resource allocation can be examined using standard microeconomic analysis. Figure 5 shows an Edgeworth-Bowley Box designed to illustrate this problem. The economy has two sectors: the private sector, designated by the subscript "p", and the state and local government sector, designated by the subscript "g". The two factors of production are capital, designated by K, and labor, designated by L. The box assumes that the total amount of each factor is fixed: the width of the box shows the total amount of capital ($\bar{K}$) and the height of the box is the total amount of labor ($\bar{L}$). Eastward movements represent a shift in capital from the private to the government sector (a rise in K_g and an equal decline in K_p), while northward movements represent a shift in labor allocation from the private to the government sector (a rise in L_g and an equal decline in L_p).

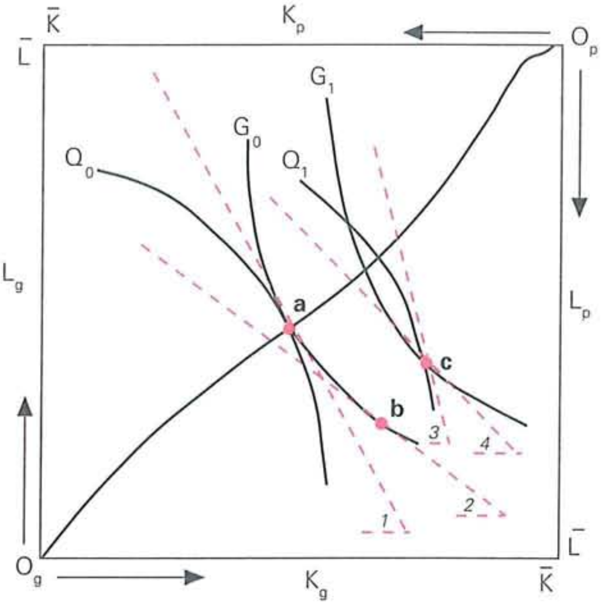
The economy's allocation problem is to determine how each factor will be allocated between the private and public sectors. This also determines how much of each good is produced. The Pareto-Optimal allocation of resources will place the economy on the curve connecting the southwest corner of the box, labeled O_g, to the northeast corner, labeled O_p. Any allocation of resources that moves the economy off this curve is an inefficient allocation, because it reduces the output of one sector without increasing the output of the other.

The southwest corner of the box is the origin from the vantage point of the government sector. At O_g the government sector uses no capital or labor and produces no output, while the private sector employs $K_p = \bar{K}$ and $L_p = \bar{L}$, producing the largest possible private output consistent with the economy's factor supplies. The number of government-sector "isoquants" is infinite; each isoquant is convex to this origin, and each shows the amounts of K_g and L_g that produce a given amount of public goods. For example, the curve labeled G_0 shows the combinations of government capital and labor that produce the amount G_0 of public goods, and the curve G_1 is the isoquant for a higher level of public goods. We know that $G_1 > G_0$ because some points on G_1 employ more of one factor while employing the same amount of the other factor, hence G_1 must represent higher output. Thus, the further northeast a government sector isoquant is, the higher the public good output that it represents.

The northeast corner, O_p, is the origin for the private sector, where no factors are employed by the

Figure 5

Tax Exemption and Resource Allocation



private sector and no private output is produced. At O_p all of the economy's capital and labor is employed by the government sector, and public good output is maximized. An infinite number of private sector isoquants, each convex to the origin O_p, represent the amounts of capital and labor necessary to produce a given level of private goods. Two of these isoquants are shown as Q_0 and Q_1, with Q_0 representing the higher level of private output.

Each sector is assumed to minimize its production costs. It does this by equating the marginal value product of each factor to its price. If P_g and P_p are the prices of government and private goods, P_K and P_L are the prices of capital and labor, R is the interest rate, and δ is the depreciation rate on capital, cost minimization requires the satisfaction of the following conditions:

Government
Sector: $P_g MP_{K,g} = P_K(R + \delta)$ and $P_g MP_{L,g} = P_L$

(5)

Private
Sector: $P_p MP_{K,p} = P_K(R + \delta)$ and $P_p MP_{L,p} = P_L$

The equilibrium ratios of marginal products are

Government Sector: $MP_{K,g}/MP_{L,g} = [P_K(R + \delta)]/P_L$

(6)

Private Sector: $MP_{K,p}/MP_{L,p} = [P_K(R + \delta)]/P_L$

The marginal product ratios for each sector are represented by the slope of the isoquant for that sector. Because both sectors face the same factor prices, each sector will be induced to choose factor combinations that have the same marginal product ratios, that is, the same isoquant slopes. As noted above, the line connecting O_g and O_p is composed of all the points that represent an efficient allocation of resources. This line also turns out to be all the points at which the isoquants are tangent and, therefore, have equal slopes.

For example, consider point a, assumed to be the point at which the economy rests before introduction of tax exemption. At point a the isoquant G_0 is tangent to the isoquant Q_0. Any other point on G_0 will, because of the shapes of the isoquants, be on a lower (more northeasterly) private-sector isoquant than Q_0. Thus, any movement away from a gives lower private output for the same level of government output. The result is economic inefficiency, because the level of private output is lower than necessary to produce G_0 of public output.

In order to investigate the effects of tax exemption, assume that the economy is initially in a general equilibrium at point a, and that both sectors pay the same user cost of capital and wage rate. At this initial general equilibrium, the economy is Pareto-Efficient. If tax exemption is introduced, and the interest rate paid by the government sector, R_M, is below the rate paid by the private sector, R_T, then the relative factor costs for governments will be $P_K(R_M + \delta)/W$, measured on the box by the angle $\angle 2$. The private sector still faces the same factor price ratio, measured by $\angle 1$, so it wishes to remain at point a. But the government sector would want to move to point b, which minimizes the cost of producing G_0 of output under the new factor cost ratio.

Tax exemption has thrown the economy into disequilibrium: the private sector wants to use the amount of capital and labor represented by point a, leaving the government sector only $\bar{K} - K_p$ of capital and $\bar{L} - L_g$ of labor. In the initial equilibrium that was precisely the amount of capital and labor that the government sector wanted to use. But now the government wants to use more capital and less labor. In short, the introduction of tax exemption creates an excess demand for capital and an excess supply of labor. Furthermore, tax exemption has driven a permanent wedge between the factor prices faced by the private and public sectors: as long as R_M is less than R_T, the private sector faces a higher cost of capital relative to the cost of labor than does the government sector. Because of this wedge, the economy can never come to an equilibrium on the line O_gO_p: it can never be Pareto-Efficient.

Where is the new general equilibrium? Clearly the excess demand for capital must lead to a rise in the user cost of capital in the private sector; $P_K(R_T + \delta)$ must rise. Also, the excess supply of labor must lead to a fall in the wage rate, W, as labor becomes unemployed in the government sector and seeks employment in the private sector. The migration of capital to the government sector and of labor to the private sector, and the rise in the cost of capital combined with a decline in the cost of labor, will continue until the economy reaches a new point, like point c.

At point c the factor choices of the two sectors are consistent: the private sector wants to employ factors in exactly the amounts necessary to maintain full employment. Also, each sector is once again minimizing its production costs because it is once again equating the relative marginal products (slope of isoquant) to the relative factor costs. However, the relative factor costs, which were equal at a, are not equal at c: at point c $\angle 3$ is the factor price ratio for the private sector, while $\angle 4$ is the price ratio for the public sector. Because $\angle 4 < \angle 3$, the government sector has a marginal product of capital less than that in the private sector and a marginal product of labor greater than that in the private sector.

Tax exemption can drive a permanent wedge between the factor prices faced by the private and public sectors.

The public sector is now producing with a higher level of capital intensity, while the private sector is producing at a lower capital-labor ratio. Clearly, point c is not Pareto-Efficient because a Pareto improvement would occur if resources were reallocated to reach a point on O_gO_p: this would allow production of more of one good with no sacrifice in the production of the other good. But the price system will not induce that movement; the government has a permanent incentive to produce with too much capital and too little labor.

How far apart will be points a and c? Will c be to the southeast of a (more capital employed but less labor in the public sector) or to the northeast of a (more capital and more labor in the government sector)? The answers depend on two important considerations: technology, which fixes the substitutability between factors and thereby affects the curvature of the isoquants, and preferences, which determine the consumers' willingness to substitute private goods for public goods. So far as technology is concerned, the higher is the "elasticity of substitution" between capital and labor in each sector, the more each sector will alter its capital-labor ratio in response to the change in relative factor prices. For each sector, the elasticity of substitution has a minimum of zero, which corresponds to a fixed-coefficients technology. If both sectors have a zero elasticity, the curve O_gO_p would represent the only possible points of equilibrium. Thus, if no factor substitutions can be made, no misallocation of factors between sectors can occur.

At the other extreme, the elasticities can be extremely high, approaching straight-line isoquants. In that case, very small changes in relative factor prices will induce extremely large changes in factor proportions, and the resource allocation effects of tax exemption will be large.

The final equilibrium will also be affected by preferences, which affect the substitutability between government and private goods. This is measured by the price elasticity of demand for government goods. Tax exemption will induce a fall in the relative price of government goods. If relative product prices have a very small effect on demand, tax exemption will have little effect on the relative quantities of each good; point c will be very close to point a. If, on the other hand, private and public goods are close substitutes, larger shifts in the mix of products will occur.

Except in the extreme case of zero substitution between factors and zero price elasticity of demand, it will always be the case that a capital-cost subsidy for the government sector will induce capital to move from the private sector to the public sector. However, the direction of labor movements will depend upon the price elasticity of demand for public goods. If this is sufficiently high, the capital-cost subsidy will induce consumers to switch from private to public goods so much that the public sector increases its employment of both capital and labor.

Measuring the Resource Allocation Effects of Tax Exemption

Arnold Harberger (1962) developed a simple general equilibrium analysis of the effects of taxation on the allocation of resources. In the intervening 30 years, a number of extensions and refinements of the basic model have been developed, but the Harberger model has become the standard for analyzing the resource allocation effects of a wide range of taxes. This section outlines the Harberger model. In the next section, the model is employed to derive estimates of the resource allocation effects of tax exemption.

The Harberger model is a formalization of the insights in Figure 5. The model assumes two producing sectors in the economy, a public sector, producing a "public" good in the quantity G, and a private sector, producing a "private" good in quantity Q. Each sector employs two factors of production, capital (K) and labor (L). The total amount of each factor is fixed in quantity, so that the factor allocation problem is restricted to the allocation of the total quantity of each factor between the two sectors. It is assumed that full employment of both factors prevails, so that no factor units fail to be allocated to production in the economy. Thus, if K_g and L_g are the capital and labor employed in the untaxed (government) sector that produces G, and $\bar{K}$ and $\bar{L}$ are the total amounts of capital and labor, then $K_p = \bar{K} - K_g$ and $L_p = \bar{L} - L_g$ are the capital and labor employed by the taxed (private) sector to produce.

Each sector has a production function, designated $Q = F(K_p, L_p)$ and $G = G(K_g, L_g)$, respectively. Each sector employs each factor up to the point where the marginal product value is equal to the factor price. The factor price of capital in the untaxed (government) sector is C_K, while the factor price of capital in the taxed (private) sector is $C_K + \Theta$, where Θ is the capital-income tax per unit of capital. The model assumes competitive factor markets, so that each factor is paid its marginal product value. Also, production functions exhibit constant returns to scale.

Three primary parameters affect the size of resource allocations resulting from a tax on capital in one sector. The first two are the elasticity of substitution between capital and labor in the two sectors, denoted by σ_p and σ_g: the greater is either σ_p or σ_g, the larger will be the changes in the capital labor ratios in the associated sector when factor prices change, and the smaller will be the changes in the relative factor prices associated with changes in factor composition. This follows the general principle that the closer the substitutability between any two commodities, the larger will be the response in the ratio of the quantities used to any relative price change. Thus, a given change in relative quantities can be achieved by a smaller relative price change when two commodities are close substitutes.

The third primary parameter is the price elasticity of demand for the public good, E_g. The higher this price elasticity, the larger will be the shift in the allocation of the consumers' consumption bundle in response to any change in relative prices; for any given change in relative prices, the shift in demand between the taxed and untaxed sectors is greater when the goods are closer substitutes.

Estimates of the Effects of Tax Exemption

To estimate the resource allocation effects of tax exemption, it is necessary to assume values for the primary parameters, discussed above, which describe the response of economic agents to changes in relative prices. In addition, values must be assigned to several secondary parameters, which describe the allocation of resources in the economy. Among these are the capital income shares in each sector (f_K and g_K), the initial ratio of government sector capital to private sector capital (λ_K) and the initial ratio of government labor to private labor (λ_L).

The appropriate values of these secondary parameters will depend upon the definition of the private sector. Is it defined as nonfinancial corporations, all corporations, or all businesses including unincorporated enterprises? Does it include production of housing services? of farm output? The private sector has no single definition; here it has been defined to include all private nonagricultural production of goods and services except housing.

The U.S. Bureau of Labor Statistics establishment surveys of nonagricultural payrolls show that in the 1980–85 period there were 17.4 state and local sector employees for every 100 private sector employees; hence $\lambda_L = 0.174$. The U.S. Commerce Department's capital stock estimates (Musgrave 1990) indicate that in the 1982–89 period there was an average of $40.50 of state and local sector capital for every $100 of fixed nonresidential capital stock; hence, $\lambda_K = 0.405$.

According to Hulten and Schwab (1987), in the 1980–85 period about 24 percent of the value added in the state and local government sector was due to the services of the capital stock, hence $g_K = 0.24$. The National Income Accounts indicate that over the same period about 60 percent of private sector value added was attributable to labor compensation, thus $f_K = 0.40$.

A great deal of work has been done on the elasticity of substitution between capital and labor in the private sector. The consensus appears to put this at somewhat less than unity; this study has chosen $\sigma_p = 0.90$ (Beckmann and Sato 1969). Considerably less agreement can be found about the elasticity of substitution in the state and local sector. Fortune (1983) reports results consistent with a Cobb-Douglas technology, implying $\sigma_g = 1.0$, a result supported by several studies cited in Blackley and DeBoer (1991).

However, one long-standing position argues that public sector activities are labor-driven and that the public sector does not have the same flexibility in the capital-labor ratio that the private sector enjoys (Baumol 1967; Baumol, Blackman, and Wolff 1985). This, it is argued, means that new capital-intensive technologies are not easily introduced and that the ability to substitute between capital and labor when relative prices change is weak. The result is low productivity growth and rising production costs in the state and local sector. A recent paper by Blackley and DeBoer (1991) supports the Baumol hypothesis, finding that capital and labor are weak *complements*. In order to allow for a wide range of estimates, this study has assumed two possible values of the state and local elasticity of substitution: $\sigma_g = 1.0$ and $\sigma_g = 0.25$.

The final parameter whose value must be assumed is the price elasticity of demand for state-local goods, E_g. A survey of the literature by Inman (1979) reported an average value of 0.50 for the uncompensated elasticity. DeBartolo and Fortune (1982) estimated the compensated elasticity at 0.15.[6] Both values will be used here.

The Harberger model calculates the effect of a tax imposed on each unit of capital in the private sector. The value of Θ must be derived from an analysis of the impact of tax exemption on the cost of capital for the private sector. The optimality condition for the capital stock is given below in Equation (7), where $MP_{K,p}$ is the marginal physical product of capital, τ is the tax rate, Z is the present value of depreciation allowances, C_K is the nominal after-tax rate of return required on capital goods, π is the anticipated inflation rate, δ is the depreciation rate for private capital

[6] The uncompensated price elasticity of demand includes the income effect of a relative price change, and is typically larger than the compensated elasticity, which is the substitution effect.

Table 3
Parameter Values Used in the Economic Efficiency Model

Parameter	Definition		Values
f_K	Capital Share of Value Added, Private	1980–85	.40
g_K	Capital Share of Value Added, Public	1980–85	.24
λ_K	Ratio of Public/Private Employment	1980–85	.174
λ_L	Ratio of Public/Private Capital Stock	1982–89	.405
σ_p	Elasticity of Substitution, Private	—	.90
σ_g	Elasticity of Substitution, Public	—	.25, 1.00
E_g	Price Elasticity of Demand, Public Goods	—	.15, .50
θ	Added User Cost of Private Capital	1980–85	.03

Note: The private sector is non-farm. The public sector is all state and local governments.

and γ is the rate of change in the relative price of capital goods.

(7) $$(1-\tau)P_pMP_{K,p} = P_K(1-\tau Z)[C_K - \pi + \delta + \gamma].$$

This can be converted to the following condition for the marginal product of capital:

(8)

$$MP_{K,p} = (P_K/P_p)(1-\tau Z)\{[C_K - (\pi - \delta - \gamma)]/(1-\tau)\}.$$

The right-hand side of Equation (8) is the appropriate definition of the user cost of capital for the purposes of this study. Following Miller (1977) this study adopts the view that, in security market equilibrium, the after-tax required return on capital, C_K, is $R_T(1-\tau)$, so the "grossed up" pre-tax return required on capital is simply R_T.[7] If issuance of tax-exempt bonds were extended to the private sector, the before-tax interest rate would be R_M rather than the higher rate R_T.[8] Thus, the additional cost of capital paid by private businesses because they are not allowed to issue tax-exempt debt, assuming that π, δ and γ are independent of the existence of tax exemption for private debt, is:

(9) $$\Theta = (P_K/P_p)(1-\tau Z)[R_T - R_M].$$

During the period 1980–85, the corporate tax rate was 0.46 and the present value of depreciation for $100 of investment was about $40 for equipment and $28 for structures (Kopcke 1981).[9] Because the private fixed nonresidential capital stock was split almost equally between equipment and structures, the average value of Z for the 1980s was 0.34. Assuming $(P_K/P_p) = 1.0$ and employing the 1980–85 average for Aaa corporate bond yields and Standard & Poor's high-grade municipal bond yields ($R_T = 0.1267$ and $R_M = 0.1002$), then $\Theta = 0.0265$: tax exemption is equivalent to imposing a tax of 2.65 cents per unit of private sector capital. This analysis uses $\Theta = 0.03$.

The assumed parameter values are reported in Table 3. The results of the analysis are reported in Table 4. As expected, tax exemption reduces the net cost of capital for the public sector and raises the private sector cost of capital. It also creates a rise in the public sector's capital-labor ratio ranging from 0.66 percent (if $\sigma_g = 0.25$) to 2.13 percent (if $\sigma_g = 1.00$). Furthermore, aggregate output is reduced by 0.07 to 0.23 percent, with private output falling and public output increasing. The magnitude of the decline in aggregate output depends upon the elasticity of substitution between capital and labor in the public sector: the greater is σ_g, the larger the reallocation of

[7] Miller argues that firms will use the lowest-cost form of finance. Let R_T $(1-\tau)$ be the interest rate paid by businesses on long-term debt (with deductibility of corporate interest), and R_E be the return required by investors on equity. Furthermore, apart from risk differentials, investors will require that equity generate a yield equal to the yield on municipal bonds, so $R_E = R_M$. In this case, $C_K = \min[R_T(1-\tau), R_M]$. Because equity and debt are very close substitutes, firms will issue one or the other until a security market equilibrium is achieved in which $R_T(1-\tau) = R_M$. In this case, one can use either R_T or $R_M/(1-\tau)$ as the required *pre-corporate* tax return on capital.

[8] Following the logic of the previous footnote, extension of tax-exempt bonds to private businesses would mean that the interest cost of capital is $C_K = \min[R_M(1-\tau), R_M]$. In this case, debt is always cheaper than equity, so $C_K = R_M(1-\tau)$. As a result, the pre-tax interest cost is R_M.

[9] This assumes: a pre-tax discount rate of 10 percent, service lives of five and 20 years for equipment and structures, respectively, and sum-of-years digits depreciation.

Table 4
Estimated Social Costs of Tax Exemption: Selected Values of σ_g and E_g
Percent except where noted

	$E_g = .15$		$E_g = .50$	
	$\sigma_g = .25$	$\sigma_g = 1.00$	$\sigma_g = .25$	$\sigma_g = 1.00$
User Cost of Capital				
Private Sector	+.29%	+.86%	+.36%	+.92%
Public Sector	−2.71	−2.14	−2.64	−2.08
Product Prices				
Private Sector	+.12	+.35	+.14	+.37
Public Sector	−.65	−.51	−.63	−.50
Aggregate	+.03	+.25	+.05	+.27
Output				
Private Sector	−.10	−.24	−.17	−.32
Public Sector	+.12	+.13	+.39	+.43
Aggregate	−.07	−.20	−.11	−.23
Capital Employed				
Private Sector	−.26	−.71	−.36	−.82
Public Sector	+.63	+1.75	+.89	+2.01
Labor Employed				
Private Sector	+.00	+.07	−.04	+.01
Public Sector	−.05	−.38	+.23	−.07
Capital per Employee				
Private Sector	−.26	−.78	−.32	−.83
Public Sector	+.68	+2.13	+.66	+2.08
Aggregate Output				
Aggregate ($ billions)	−$2.38b	−$6.56b	−$3.43b	−$7.63b
Per Capita ($)	−$10.18	−$28.15	−$14.66	−$32.67

Note: The calculations are based on 1980–85 data. The aggregate output index is a Divisia index of the proportional changes in public and private output, with a 12 percent share of value added in the public sector.

capital and labor and the greater the decline in aggregate output.

The last two rows of Table 4 translate the proportional change in aggregate output to dollar values, using the 1980–85 average level of nonfarm, nonfederal value added. The decrease in aggregate output ranges from $2.38 billion, for low values of E_g and σ_g, to $7.63 billion for high values of those parameters. Translated to per capita values, tax exemption costs from $10.18 to $32.67 per person. The estimate using the preferred parameter values ($E_g = 0.50$, $\sigma_g = 0.25$) is a total of $3.43 billion or $14.66 per capita.

These estimates indicate that tax exemption creates mild social costs in the form of output forgone. The amounts are not so dramatic as to make the exemption a serious problem on this score, but they are also not so small as to make the analysis of social costs irrelevant. The reader should be aware that these costs are measured against the alternative of a perfectly competitive economy without subsidies; for the imperfect world we face, the introduction of tax exemption could, in fact, improve resource allocation. Indeed, those who believe that public infrastructure is insufficient in the U.S. economy argue that market outcomes do not efficiently allocate resources and that government should intervene to increase public infrastructure.

IV. Summary and Conclusions

This article addresses the policy issues created by the exemption of municipal coupon payments from the federal income tax base. The four fundamental problems are the trio of market instability, equity, and financial efficiency, which are "zero-sum" problems that have their primary effect on the distribution of income; and the problem of economic efficiency, which addresses social costs.

The market instability problem arises because tax exemption creates greater variability in the interest rates paid by state and local governments, hence it provides a capital-cost subsidy that varies according to financial market conditions. The equity problem is that tax exemption provides an opportunity for affluent taxpayers to increase their after-tax income, thereby forcing less affluent taxpayers to take on a greater tax burden. The financial efficiency problem is the mirror image of the equity problem: the cost to the federal taxpayer exceeds the interest savings of state and local governments by the amount of windfall income enjoyed by affluent investors.

This study has calculated the magnitude of these three problems in 1990, concluding that tax exemption cost the U.S. Treasury about $22 billion to $24 billion in that year, in exchange for which states and local governments reduced their interest payments by $16.9 billion to $18.5 billion. The "missing" amount, $5.1 billion to $5.7 billion, was received by affluent investors as "windfall income." Only a portion of the windfall income enjoyed by affluent investors is really excess income, or "investor's surplus," however; the remainder is required by investors to compensate them for the risk and illiquidity of municipal bonds. If, as is speculated here, about 50 percent of windfall income is investor's surplus, the excess income of affluent investors from tax exemption was about $2.5 billion in 1990.

This article also discusses several possible reforms of the municipal bond market that would eliminate or mitigate the zero-sum problems. The first is elimination of the exemption. The second is a direct subsidy, which would eliminate the exemption but replace it with federal payment of a portion of state and local government interest costs. The third is a taxable bond option, a combination of tax exemption and a direct subsidy. None of these reforms have received sufficient political support, but the problems have been mitigated by the major changes in the tax code under the Tax Reform Act of 1986. The move toward a flat income tax system has reduced the magnitude of these problems.

Finally, the article discusses the social costs of tax exemption, which arise from the loss of output as resources are reallocated from the private sector to the public sector in response to lower public sector capital costs. Using the period 1980–85 as the basis for estimates, this study concludes that in the 1980–85 period the tax exemption reduced the annual aggregate output (value added) of the nonfarm, nonfederal government sector by $2.4 billion to $7.6 billion, depending on the assumptions. The preferred estimate is $3.4 billion, which translated to per capita amounts equals $14.66 per person.

Appendix: Measuring the Cost of Tax Exemption

The U.S. Treasury Department used the Meltzer-Ott method in 1965 (Joint Economic Committee 1966) to calculate the interest savings and revenue costs on state and local bonds sold in 1965, over the lifetime of those bonds. The Treasury Department estimated an average marginal tax rate of 42 percent and a marginal tax rate of 28 percent. The interest savings over the lifetime of gross state and local bonds newly issued in 1965 were $1.9 billion, with a revenue cost of $2.9 billion. Using formula (4) above in the text, these estimates imply an efficiency index of about 65 percent.

These early Treasury estimates are incorrect because they rest on a confusion between average and marginal analysis. The bonds sold in 1965 were incremental to the stock of outstanding municipal bonds, and the likely purchasers were the near-marginal investors in tax-exempts, whose windfall income would be very small. But the 1965 application of the Meltzer-Ott method assumes that the incremental supply of bonds is bought by the *average* investor, whose tax rate is measured by the average marginal tax rate. The result is a potentially serious exaggeration of the costs of new bond issues. The method employed is, therefore, more suitable to estimation of the costs of eliminating tax exemption for all outstanding bonds; in this case the average marginal tax rate is relevant.

The Meltzer-Ott method also makes some strong assumptions about market adjustments that occur in response to tax exemption. First, the method infers tax rates from the existing pattern of ownership of municipal bonds, and assumes that in the absence of tax exemption those owners would simply have bought taxable bonds (including, of course, taxable municipals) to replace the no-longer-available tax-exempt bonds. Second, it assumes that the general level of interest rates on taxable securities is not affected by the existence of tax exemption. However, the adjustments that would occur if tax exemption did not exist are far more complex than these assumptions suggest.

Consider the second point first. The effect of tax exemption on the taxable bond rate depends on the elasticity of the supply of both taxable and tax-exempt bonds. The Meltzer-Ott method assumes that either the outstanding stock of municipal debt is independent of interest rates (as, for convenience, is assumed in the text) or the private sector supply of debt is infinitely interest-elastic. In the first case, the introduction of tax exemption would induce governments to switch their issues from taxable to tax-exempt form, but investors would switch exactly that amount of their portfolios to tax-exempts and out of taxable bonds. Because the shift in demand for taxable bonds (as investors switch from taxables to tax-exempts) is exactly matched by the shift in the supply function (as governments issue tax-exempts rather than taxable bonds), the net result is no change in the taxable bond yield. In the second case, increased issues of municipal bonds in response to tax exemption "crowd out" an equal amount of taxable bonds, leaving the taxable bond yield unchanged.

If, in contrast to the assumption of the previous section, state and local governments respond to lower interest costs by issuing more bonds, the introduction of tax exemption will increase the quantity of loanable funds demanded and push up the general level of interest rates. As this happens, private borrowers will reduce their bond issues in response to the higher costs. Only if the supply of private taxable bonds is infinitely interest-sensitive will the taxable bond rate remain unchanged; if not, the taxable bond rate must go up.

Now consider the first point. The Meltzer-Ott method assumes that investors simply switch from tax-exempts to taxable bonds, so that the pattern of ownership of outstanding tax-exempt bonds indicates the relevant tax rates of those who would otherwise invest in taxable bonds. However, this need not be true. For example, suppose that tax exemption were eliminated for all outstanding municipal bonds and that current holders of tax-exempt bonds try to shift into the next best tax shelter—common stocks. In this case, portfolio changes might create no additional taxes apart from temporary capital gains tax revenues. The net effect on tax revenues will depend not on the tax rates of investors who switch from tax-exempts to equities, but upon the tax rates of those who sold the equities and switched into taxable bonds. Presumably these tax rates are lower than the rates of the former tax-exempt bondholders because the equity sellers gave up the tax shelter of municipal bonds. Thus, the method tends to overstate the relevant average marginal tax rate.