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by Peter Fortune

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DEBT CAPACITY, TAX-EXEMPTION, AND THE MUNICIPAL COST OF CAPITAL: A REASSESSMENT OF THE NEW VIEW

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Abstract

The Traditional View of municipal investment holds that the federal tax-exemption of interest payments by state and local (municipal) governments provides a capital cost subsidy to municipal investment. Recently a New View has emerged which argues that tax-exemption plays a minor role, if any, in shaping municipal investment decisions. In its simplest version (with municipal debt issued at a constant interest rate), the New View argues that tax-exemption plays a role only for municipalities in which the representative individual has an income tax rate lower than the implicit tax rate on municipal bonds. An extended version of the New View, in which municipal bonds are sold at interest rates which increase with leverage, predicts that all communities will choose tax finance at the margin. Thus, the New View holds that local taxes should be the dominant form of finance for municipal investment at the margin, except perhaps, in communities represented by people with income tax rates at or above the implicit tax rate on municipal bonds.

The New View rests on an assumption of unlimited borrowing power with constant interest rates in the taxable bond market. However, virtually all agents face debt capacity limits which prevent them from using taxable debt to finance all capital investment, both private and municipal. This paper examines the implications of debt capacity limits and concludes that when they are effective, *all* municipalities should treat the municipal bond rate as the marginal cost of funds *except* those very rare communities in which the representative citizen has both a high income tax rate *and* an extremely high capacity to borrow in the private debt market. This study also finds that leverage-related interest rates strengthen rather than weaken the case for the Traditional View.

In short, we conclude that the New View applies only to communities whose representative citizens are extremely affluent. If less-than-affluent commuities choose different mixes of tax and debt finance, the effect is not on the marginal cost of capital or on the volume of municipal investment. Rather, it is on the average cost of capital, and on the distribution of income.

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DEBT CAPACITY, TAX-EXEMPTION, AND THE MUNICIPAL COST OF CAPITAL: A REASSESSMENT OF THE NEW VIEW

A "traditional view" in municipal finance holds that tax-exemption of municipal interest creates a capital-cost subsidy for investment by state and local governments (see, for example, Fortune 1992). According to this view, tax-exemption reduces the interest rate on municipal bonds by a fraction equal to the tax rate of the marginal investor in municipal bonds. If that tax rate is τ, the municipal bond yield will be $r_m = (1 - \tau)r$, where r is the yield on taxable bonds with equivalent risk. The municipal capital-cost subsidy is τr. An implicit assumption of the Traditional View is that municipal investment is financed by municipal debt, at least at the margin.

In recent years a "new view" has emerged. Associated with Gordon and Metcalf (1991), who argue that tax-exemption does not affect the cost of funds for a community except, perhaps, for low-tax-rate communities, and then only when the tax-exempt bond yield is independent of debt supply. Thus, the New View argues, tax-exemption does not confer a subsidy to municipal investment because municipal debt is not the marginal source of funds for municipal investment. While the New View recognizes a tax subsidy for municipal investment, it comes through tax finance rather than debt finance.[1]

This paper concludes that the Traditional View remains intact as a description of the tax subsidy for municipal investment, and that the only case where the New View prevails is the very unusual case where the representative citizen (median voter) is extremely affluent, having both a high tax rate and very high debt capacity.

The next section of the paper summarizes the New View. The following section lays out a model for analyzing the issue at hand. This model assumes that interest rates are independent of

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[1] Southwick (1979) develops an alternative form of the New View, in which municipalities acting to maximize housing values make choices that lead to a Modigliani-Miller result: The cost of capital is independent of the means of finance.

the volume of borrowing, an assumption that is later relaxed. The fourth section draws out the implications of the analysis for the municipal cost of capital. The fifth section considers the effect of leverage-related interest rates, concluding that while this alters some of the analysis, it neither strengthens the New View nor undermines the Traditional View. The paper ends with a brief summary.

The New View of the Tax Subsidy

The Traditional View outlined above assumes that municipal investment will be financed at the margin by municipal bonds, and that the marginal cost of capital is $(1 - \tau)r$. The New View argues that the marginal source of funds for municipal investment is local taxes, and that the marginal cost of capital is the cost to the taxpayer who pays current taxes. That taxpayer can meet his tax obligations in several ways. He could borrow the funds, incurring an out-of-pocket cost of $(1-\theta)r$, where θ is his marginal personal income tax rate.[2] He can also forgo saving and reduce his acquisition of securities, thereby incurring an annual cost equal to the after-tax interest forgone. This opportunity cost is $(1-\theta)r$ if he would have bought taxable securities, or $(1 - \tau)r$ if he would have bought municipal securities.

A low-tax-rate person ($\theta < \tau$) would choose to buy taxable bonds, so for this person the cost of tax finance is $(1-\theta)r$ regardless of how he finances his tax payments. He would prefer that his community issue debt to finance municipal investment because the cost to him of the increase in tax payments for debt service is $(1- \tau)r$, which is less than his cost if current taxes are used to pay for the capital items.

A high-tax-rate person, with ($\theta > \tau$) would hold municipal bonds. He will prefer to finance the investment by current taxes rather than have his community issue municipal bonds. The reason is that he can borrow at an after-tax cost of $(1-\theta)r$ to pay current taxes, avoiding the higher after-tax cost of $(1-\tau)r$ required to pay for municipal debt service. He will not sacrifice saving to finance his

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[2] This assumes that the interest paid is deductible.

current taxes because he would give up $(1-\tau)r$, which we have seen is greater than his cost of borrowing. Thus, the high-tax-rate person will prefer tax finance to debt finance.

These examples assume that the representative voter takes a standard deduction. However, the preference for one form of finance over another is not affected by the opportunity to itemize deductions for state-local tax payments. Itemizing reduces the cost of a dollar of taxes to $(1-\theta)$ dollars, but since the itemization is available both for taxes paid to buy capital items outright and for taxes paid to meet debt service obligations, the differential cost of tax finance relative to debt finance changes in magnitude but not in sign. Consider the low-tax-rate person who itemizes and who pays a dollar of taxes for municipal investment. That dollar costs him $(1-\theta)$ dollars, and for each of those dollars he pays $(1-\theta)r$ dollars in after-tax future annual interest payments (either out-of-pocket or as an opportunity cost) . Thus, his annual after-tax cost of paying taxes for municipal capital items is actually $(1-\theta)[(1-\theta)r]$. If, instead, municipal debt had been issued, it would carry an after-tax cost of $(1-\theta)[(1-\tau)r]$. The differential cost of tax finance over debt finance is $(1-\theta)[(1-\theta) - (1-\tau)]r = (1-\theta)(\theta-\tau)r$ for an itemizer, while for a person taking the standard deduction it is $(\theta-\tau)r$. Thus, itemization does not reverse the net financial advantage for one form of finance, it just reduces the magnitude of the advantage.

An extended version of the New View introduces leverage-related interest on municipal bonds. In this version, municipalities must pay higher interest rates if they want to sell larger volumes of debt. This can occur because of portfolio effects (municipal bond investors must be induced to hold a larger portion of their portfolio in one community's debt), or because of deteriorating quality of the debt as a larger share of the tax base becomes devoted to debt service. In this version, even the low-tax-rate people who preferred municipal debt finance with constant interest rates find that they prefer tax finance, at least at the margin.

The New View is illustrated in Figure 1. The schedule labeled K_mK_m shows the marginal benefit attached to each possible level of the municipal capital stock. The after-tax return on taxable bonds is $(1-\theta)r$ and the after-tax return on municipal bonds is $(1-\tau)r$. In the left-hand panel the personal income tax rate exceeds the implicit tax rate. Because taxable bonds are the least-cost

form of finance for this high-tax-rate person, the optimal municipal capital stock is that for which the marginal benefit equals $(1-\theta)r$; the level of investment will be K_m^*. Thus, the New View argues that in the case of a high-tax-rate individual *all* municipal capital will be tax financed and the representative citizen will not employ municipal bonds.

The right-hand panel of Figure 1 shows the choice for an individual whose personal income tax rate is below the implicit tax rate. If the municipal bond rate is constant, municipal debt will be the least-cost form of finance and the optimal municipal capital stock will be that for which the marginal benefit equals $(1-\tau)r$. This is shown as path ***a*** in Figure 1. However, if the municipal bond rate rises as more debt is issued, as in path ***b***, municipal bonds will be issued up to the point where the marginal interest cost of municipal bonds equals $(1-\theta)r$.[3] After this point (assuming that taxable debt is issued at a constant interest rate), tax finance will be preferred and the marginal municipal interest cost will be the after-tax rate on taxable bonds. Both debt finance and tax finance will be used, but debt finance will be intramarginal and tax finance will be the marginal source of funds. Thus, even for low-tax-rate individuals, tax finance will be the preferred method of finance at the margin, and the marginal cost of municipal investment will be $(1-\theta)r$.

According to the New View, the after-tax interest rate on taxable bonds is the marginal cost of funds for municipal investment except, perhaps, in the case of a representative citizen with a low tax rate and with constant (or slowly increasing) costs of issuing municipal bonds. Therefore, any financial benefits from tax-exemption are intramarginal and, with the exception noted, tax-exemption provides no subsidy at the margin to municipal investment. Its only effect is to reduce the average cost of capital for low-tax rate communities, thereby redistributing income from federal taxpayers to residents of those communities.

The fact that tax-exemption does not confer a subsidy to municipal capital costs does not mean that no subsidy exists. Rather, the subsidy is in the form of a deduction for taxable interest paid. Fortune (1995) has shown that this subsidy arises from *tax-exclusion*: Because the interest

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[3] The marginal interest cost of D_m in municipal debt is $r(D_m)(1 + \eta)$, where η is the elasticity of supply of funds.

payments to finance municipal taxes are deductible, while the services of municipal capital are not included in taxable income, municipal investment is placed in the same tax-advantaged status as owner-occupied housing.

A Choice-Theoretic Model of Investment and Portfolio Selection

The model describes a representative voter whose optimal allocation guides his municipality's financial choices. The model incorporates limits on an individual's ability to issue private (taxable) debt. Lenders require that businesses have some equity in their balance sheets, so the amount of debt outstanding is less than the value of the assets used as collateral. The owners can fill this equity requirement from other sources of funds, such as forgoing investments in financial assets or borrowing against home equity. Because of this equity requirement, the representative voter might find that even though taxable bonds have the lowest after-tax cost, his private debt capacity can be exhausted and his least-cost method of finance *at the margin* is municipal bonds. Whether that is true depends upon his tax rate and upon his personal balance sheet.

The voter inherits from past decisions an income of Y_1, a stock of financial assets (A_0), and housing equity (H). He chooses the utility-maximizing amounts of three goods: consumption in period 1 (C_1), consumption in period 2 (C_2), and municipal government services (S). The consumer's utility function is described by $U(C_1, C_2, S)$.

The consumer can produce income in the second period in several ways. First, he can accumulate business capital (K_b) in the first period, and, combining it with labor employed in the second period (L_b), produce future income (F) according to the technology $F(K_b, L_b)$, which is subject to diminishing returns with marginal products F_K and F_L. A partnership form of business is assumed, so that business income is taxable at the personal income tax rate θ. Interest is a deductible expense and business capital fully depreciates in the second period, generating tax savings of θK_b.

Private capital accumulation can be financed by issuing taxable debt (D_b) at the pretax interest rate (r). The amount of taxable debt is limited by the debt capacity restriction $D_b \leq q(K_b + H)$, with q ($0 < q < 1$) being the maximum debt/asset ratio and ($K_b + H$) being the assets available as

collateral. H is the amount of non-business assets (e.g. housing equity) which can used as collateral for private debt. Financial assets are not included in the borrowing base: If they are held as taxable bonds, there is no incentive to borrow to accumulate taxable bonds; if they are held as tax-exempt bonds, restrictions in the tax code eliminate the deductibility of interest paid for debt issued to carry municipal bonds, thereby eliminating any incentive to engage in tax arbitrage. The model also requires that debt be nonnegative ($D_b \geq 0$) because acquisition of financial assets is treated separately.

Municipal capital is formed in period 1 but provides services in period 2. These services are related to the municipal capital stock and to labor employed through the technology $S(K_m, L_m)$, which exhibits diminishing returns with marginal products S_K and S_L. The consumer finances municipal investment either by paying current taxes or by issuing municipal bonds (D_m) at the tax-exempt bond rate of $(1-\tau)r$, where τ is the exogenously determined implicit tax rate on municipal bonds.

The tax deductibility of municipal taxes is reflected in the parameter δ, where $\delta = 1$ if the taxpayer takes a standard deduction and $\delta = (1-\theta)$ if he itemizes. This parameter is irrelevant to the main point of this paper but is introduced for two reasons. First, discussions of tax finance versus debt finance often raise questions about the effect of itemized deductions of state-local taxes; explicitly recognizing itemized deductions should assure readers that this is considered, and that it does not affect the choice between taxes and debt. Second, the possibility of itemizing deductions does play a role in determining the optimal amount of municipal investment, and therefore is not economically irrelevant.[4]

The volume of municipal debt issued is limited in several ways. First, a non-negative value for outstanding municipal debt ($D_m \geq 0$) is required because municipalities have no incentive to invest in municipal bonds. Second, most states require that municipalities issue long-term debt only to finance capital outlays, hence $D_m \leq K_m$. Finally, it is assumed that municipalities hold no long-term

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[4] Itemizers find the tax-price of municipal services smaller than do non-itemizers, because the federal government pays part of the municipal tax bill. This encourages higher production of municipal services, but it does not alter the capital intensity or capital structure decisions because all payments by municipalities (labor, debt service, etc.) are equally affected.

taxable debt as assets because arbitrage restrictions eliminate the incentive for municipalities to issue tax-exempt bonds to hold taxable debt.[5] Furthermore, even though it might be advantageous for taxpayers, municipalities do not levy taxes to build up endowments invested in taxable bonds.[6]

The rules for portfolio selection are simple. The voter can acquire a non-negative amount of financial assets ($A \geq 0$). The return on these assets depends upon a comparison of the individual's personal income tax rate with the implicit tax rate on municipal bonds: He will elect to hold his assets in municipal bonds If he has a high tax-rate ($\theta > \tau$), but if he has a low tax-rate ($\theta \leq \tau$) he will choose taxable bonds. The after-tax return on financial assets is, therefore, $[1\text{-}min(\tau, \theta)r]$.

At the outset, it is assumed interest rates are independent of the volume of borrowing, a restriction we relax in a later section. While increasing costs undoubtedly exist because lenders require higher rates as debt capacity is used, both debt finance and tax finance are subject to increasing costs. Because we do not know which has the most rapidly increasing costs, the introduction of this consideration at an early stage will reduce clarity while not promoting understanding.

The consumer's utility maximization problem is:

(1) a) **MAX** $U(C_1, C_2, S)$ **subject to**

b) $C_1 = Y_1 - K_b - \delta(K_m - D_m) - (A - A_0) + D_b$

c) $C_2 = (1-\theta)[F - wL_b] + \theta K_b - \delta[1 + (1-\tau)r]D_m - \delta wL_m$
$+ \{1 + [1-\min(\tau, \theta)]r\}A - [1 + (1-\theta)r]D_b$

d) $S = S(K_m, L_m) \qquad F = F(K_b, L_b)$

e) $K_m \geq D_m \qquad q(K_b + H) \geq D_b \qquad (0 < q < 1)$

f) $K_m \geq 0 \quad D_m \geq 0 \quad K_b \geq 0 \quad D_b \geq 0 \quad A \geq 0 \quad L_m \geq 0 \quad L_b \geq 0$

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[5] The effectiveness of arbitrage rules is controversial. Metcalf (1991) argues that they are not effective. However, arbitrage opportunities of the "back-door" variety do exist. For example, issuing municipal debt to finance municipal investment reduces the tax levy so that the funds can be invested in higher-return forms. These might be driving Metcalf's results, not the legally restricted forms of arbitrage.

[6] Taxes of $1/\delta$ dollars (after-tax cost, \$1) invested in taxable bonds by the municipality create income of $(1+r)$ dollars and future after-tax municipal tax savings $\delta(1+r)$. Thus, for a dollar the taxpayer earns $(1/\delta)[\delta(1+r)]=(1+r)$ on a municipal endowment. The after-tax cost opportunity cost of these tax payments is $[1+(1-\theta)r]$ or $[1+(1-\tau)r]$, depending on the portfolio choice. Thus, it is financially advantageous to create a tax-financed endowment to fund municipal government activities.

The solution involves a shadow price for each of the five financial constraints [$K_m \geq D_m$, $q(K_b + H) \geq D_b$, $D_m \geq 0$, $D_b \geq 0$, and $A \geq 0$]. Shadow prices μ and β apply to the non-negativity of municipal and business debt, respectively; each is positive if no debt is issued, zero otherwise. Shadow price κ is positive when private debt capacity is fully used, zero otherwise, while λ is positive if municipal investment is financed solely by debt, zero otherwise. Finally, α is the shadow price for financial assets, positive if none are held and zero otherwise.

The first order conditions are:

(2) (a) K_b: $U_2[(1-\theta)F_K + \theta] - U_1 + q\kappa \leq 0$ *and* $K_b\{U_2[(1-\theta)F_K + \theta] - U_1 + q\kappa\} = 0$

(b) K_m: $U_S S_K - \delta U_1 + \lambda \leq 0$ *and* $K_m\{U_S S_K - \delta U_1 + \lambda\} = 0$

(c) D_m: $-U_2\delta[1 + (1-\tau)r] + \delta U_1 - \lambda + \mu = 0$

(d) D_b: $-U_2[1 + (1-\theta)r] + U_1 - \kappa + \beta = 0$

(e) A: $U_2\{1 + [1-\min(\tau,\theta)]r\} - U_1 + \alpha = 0$

(f) L_b: $U_2(1-\delta)(F_L - w) \leq 0$ *and* $L_b[U_2(1-\delta)(F_L - w)] = 0$

(g) L_m: $-U_2\delta w + U_S S_K \leq 0$ *and* $L_m(-U_2\delta w + U_S S_K) = 0$

(h) κ: $q(K_b + H) - D_b \geq 0$ *and* $\kappa[q(K_b + H) - D_b] = 0$

λ: $K_m - D_m \geq 0$ *and* $\lambda(K_m - D_m) = 0$

α: $A \geq 0$ $\alpha A = 0$ β: $D_m \geq 0$ $\beta D_m = 0$ β : $D_b \geq 0$ $\beta D_b = 0$

$\alpha, \beta, \kappa, \lambda, \mu \geq 0$

For expositional convenience it is assumed that some capital will be employed in both sectors, allowing equations (2a) and (2b) to be treated as equalities. This does not affect the results because questions of finance are irrelevant if no capital is employed. However, it does ensure that some business debt will be issued (hence β=0). Defining the marginal value of municipal services in terms of period-2 goods as v ($v = U_S / U_2$), an analysis of shadow prices reveals that

(3) (a) $(1-q)\kappa = U_2(1-\theta)[F_K - (1+ r)]$ $(\kappa \geq 0, \beta \geq 0, \kappa\beta = 0)$

(b) $\alpha = q\kappa + U_2(1-\theta)[F_K - (1+q_1 r)]$, $q_1 = [1-\min(\tau, \theta)] /(1-\theta)$ $(\alpha \geq 0)$

(c) $\lambda - \mu = \delta q\kappa + \delta U_2 (1-\theta)[F_K - (1+q_2 r)]$, $q_2 = [(1-\tau)/(1-\theta)]$ $(\lambda \geq 0, \mu \geq 0, \lambda\mu = 0)$

(d) $\mu = -U_2\{vS_K - \delta[1 + (1-\tau)r]\}$ $(\mu \geq 0)$

Equations (3a)-(3c) express shadow prices as functions of differences between the marginal product of business capital and several "hurdle rates." For equation (3a) the hurdle rate is simply the taxable interest rate. This equation says that the debt limit is not binding ($\kappa = 0$) if capital is employed up to its marginal cost, but that when business capital is restricted, so that the marginal product exceeds the cost of capital, debt capacity will be exhausted and $\kappa > 0$. In short, if you can't borrow enough to finance the optimal investment, you will exhaust your debt capacity and business investment will be suboptimal.

In equation (3b) the hurdle rate for business capital's marginal product is $q_1 r$, which is the pre-tax rate of return on financial assets. Note that $q_1 = 1$ for a low-tax-rate person (with $\theta < \tau$), indicating that for this person the pre-tax return on financial assets is simply the taxable bond rate. However, for a high-tax-rate person (with $\theta > \tau$) we see that $q_1 > 1$. This means that the person holds financial assets in municipal bonds and that the municipal bond rate is the marginal cost of business capital. The marginal product of capital has a higher hurdle rate for a high-tax-rate person because of the tax advantages of municipal bonds. Equation (3b) says that financial assets will not be accumulated ($\alpha > 0$) if either debt capacity is exhausted ($\kappa > 0$) or if the return on capital exceeds the return on financial assets: If you are at your debt limit, you will forgo saving and divert funds to for business investment; if business capital has a return greater than financial assets, you also will have no incentive to save. However, financial assets will be accumulated ($\alpha = 0$) when debt capacity is binding or the return on business capital is below the return on financial assets.

In equation (3c) the after-tax return on municipal bonds is $q_2 r$, so the municipality will finance all investment with debt ($\lambda - \mu > 0$) when the after-tax marginal product of business capital exceeds

the after-tax rate of interest on municipal bonds. The municipality will use some mix of debt and taxes ($\lambda - \mu = 0$) when business capital's return is equal to the cost of municipal bonds, and it will use only current taxes ($\lambda - \mu < 0$) if business capital earns less than the municipal bond rate. This equation says that when the return on business capital is sufficiently high, one should use municipal bonds to pay for municipal capital items, thereby saving one's debt capacity to be used for financing business capital. This is an arbitrage-type relationship because, in effect, municipal bonds are being used to finance private investment.

Implications for the Municipal Marginal Cost of Capital

First consider the case of a low-tax-rate voter. For this person, $q_1 = 1$ and $q_2 < 1$. From (3a) it can be determined that if his debt capacity is sufficient to finance his desired business investment ($\kappa = 0$), he will invest in business capital up to the point $F_K = (1+ r)$. If debt capacity is not sufficient, his business investment will be limited and both $\kappa > 0$ and $F_K > (1+ r)$.

From (3b) it can be seen that the low-tax-rate voter will hold no financial assets. If his debt capacity is binding, that is, if $F_K > (1+ r)$ and $\kappa > 0$, equation (3b) states that $\alpha > 0$: No financial assets will be held because the opportunity cost, business investment, has a return exceeding the after-tax return on taxable bonds. If debt capacity is not binding, that is, if $F_K = (1+ r)$ and $\kappa = 0$, equation (3b) indicates $\alpha = 0$ so financial assets will be accumulated. But this is really a situation of indifference: Any financial assets will be invested in taxable bonds and the earnings will just cover their cost, so there is no incentive--or disincentive--to hold them.

From the above, it is known that all voters will choose a position with $F_K \geq (1+ r)$, the inequality applying when private debt capacity is exhausted. But for a low-tax-rate person we have $q_2 < 1$. From equation (3c) we see that this implies $\lambda - \mu > 0$, hence $\lambda > 0$ and $\mu = 0$. Thus, regardless of the state of debt capacity, the low-tax-rate voter will use debt finance for all municipal investment. The same reasoning allows us to conclude that the low-tax-rate voter will always choose a position with the marginal value of municipal capital equaling the marginal after-tax cost of municipal bonds. Hence, because some municipal bonds will be issued, we have $\mu = 0$.

The case of the low-tax-rate voter is shown in Figure 2, in which the left-hand panel addresses the business decision while the right-hand panel shows the municipal decision. Figure 2 assumes a "moderate" debt capacity, defined as a level of H sufficient to finance part, but not all, of optimal business investment. The schedule K_bK_b shows the after-tax net marginal product of capital, defined as the after-tax excess of marginal product over the price of capital, or $F_K^* = (1-\theta)[F_K - 1]$. The schedule labeled qK_b shows the amount of business debt that can be issued to finance business investment if H=0: At each after-tax interest rate, the amount of business investment that can be debt financed if H=0 is the proportion q of the horizontal distance to the K_bK_b schedule. Thus, at an after-tax interest rate of $(1-\theta)r$ the voter's optimal business capital is Oc, but his debt capacity only allows OK of business capital, of which Oa is business debt issued with business capital as collateral (that is, $Oa = qK^*$) and (OK-Oa) is debt issued against other assets (H). At investment OK we see that $F_K^* > (1-\theta)r$, indicating that business investment is suboptimal. Thus, the low-tax-rate voter will use business debt to finance his business investment up to the point where debt capacity is binding. If his debt capacity is not sufficient to finance all desired business investment, the amount of business investment will be suboptimal. Municipal investment, shown in the right-hand panel, will conform to the Traditional View, that is, municipal investment will be debt financed with a cost of capital of $(1-\tau)r$.

The high-tax-rate voter's situation, shown in Figure 3, is more complex because he has an incentive to hold financial assets in the form of municipal bonds, earning an after-tax return of $(1-\tau)r$, which exceeds the after-tax cost of business debt. Suppose that debt capacity is "moderate," as in Figure 2. Investment in business capital proceeds up to the level Oa in Figure 3. At this point, debt capacity is binding ($\kappa > 0$) and the net marginal product of capital exceeds both $(1-\tau)r$ and $(1-\theta)r$. Because $q_1 = (1-\tau)/(1-\theta)$ exceeds 1, business investment Oa is suboptimal. Once this point has been reached, the marginal cost of capital for business investment jumps from $(1-\theta)r$ to $(1-\tau)r$ because the marginal source of capital is forgone investments in municipal bonds. If there were no initial financial assets, business investment must remain at this point and the after-tax net marginal product of capital would be the after-tax municipal bond rate plus a factor representing the shadow

price of business debt capacity. However, if the voter has sufficient initial financial assets, he will invest in (OK* - Oa) of additional business investment, up to the point where $F_K^* = (1-\tau)r$. As before, municipal investment will still be fully debt financed. In sharp contrast to the New View, the marginal cost of capital for *both* business and municipal investment is determined in the tax-exempt bond market.

Figure 4 shows the case of a high-tax-rate voter with "high" debt capacity, defined as having H sufficient to allow private bonds to finance some municipal investment as well as all business investment. In this case, the level of business investment will satisfy the normal optimality condition that the after-tax net marginal product equal the after-tax interest rate on business debt. But the marginal municipal cost of capital is set by the tax-exempt bond market. The New View's emphasis on the after-tax interest rate $(1-\theta)r$ is confined solely to intramarginal municipal investment.

This analysis indicates that the only voter who will view $(1-\theta)r$ as the marginal cost of capital for municipal investment is one who has a high tax rate *and* whose debt capacity is sufficient to allow issue of private debt to finance all desired business and municipal investment. In short, he must have a great deal of income and an exceptionally high amount of collateralizable assets. There cannot be many communities with this New View representative voter, leaving the New View with little explanatory power.

The Effect of Leverage-Related Interest Rates

Recall that the New View with leverage-related interest rates yields the conclusion that no voter will choose debt finance for municipal investment at the margin. Any debt issued will be for intramarginal investment and once the marginal interest cost has risen to match the (constant) cost of private debt, all further municipal investment will be tax financed. The irrelevance of tax-exemption to municipal investment *at the margin* applies to all voters, not just the high-tax-rate voters of the constant cost case. Thus, it appears that leverage-related interest rates favor the New View.

This analysis of debt capacity suggests the opposite: Leverage-related interest rates do not weaken the Traditional View, and they do not buttress the New View. Even in the case of a "high"

debt capacity with a high tax rate (Figure 4), it has been shown that if private debt capacity is exhausted before both business and municipal investment can be tax financed, the marginal source of funds in the municipal sector will be tax-exempt debt.

This is shown in Figure 5, which assumes that *both* business and municipal debt are issued subject to increasing interest rates. The upward-sloping schedule MIC_b shows the marginal interest cost in the business sector. This will always be above the actual interest rate paid because of the monopsony aspect of leverage-related interest rates. The optimal solution will be to invest OK* in business capital. Because the marginal interest cost of business debt remains below the municipal bond rate, business debt will be used to finance the early units of municipal investment, up to the amount Oh of municipal capital. At that point, business debt capacity is exhausted and municipal debt finances the last (OK_m* - Oh) units of municipal capital. Thus, even with leverage-related interest rates, the tax-exempt bond market provides the marginal source of finance for municipal investment.

While the introduction of increasing costs does not alter the Traditional View's conclusion that municipal debt is the marginal source of funds, with tax finance used only for intramarginal investment, increasing costs do alter the municipal investment equilibrium. Suppose that municipal debt is issued according to a constant supply elasticity, η. The marginal interest cost will be $MIC_m(D_m) = r_m(D_m)(1+\eta)$, which exceeds the municipal bond rate by the proportion $(1+\eta)$. The optimal marginal benefit of municipal services will satisfy $vSK = r_m(D_m)(1+\eta)$. Thus, increasing costs will result in a marginal value of municipal services greater than the municipal bond rate paid. This indicates a suboptimality of the representative voter's desired municipal investment.

However, the essence of the Traditional View is supported. The marginal cost of capital is determined by the tax-exempt bond rate, hence by the implicit tax rate on municipal bonds, and variations in that rate relative to the taxable bond rate will alter the municipal cost of capital. These variations can occur because of changes in the personal and corporate income tax structure, which affects τ, or because of changes in the elasticity of municipal debt supply, η.

Summary

A Traditional View of municipal investment holds that the federal tax-exemption of interest payments by state and local (municipal) governments provides a capital cost subsidy to municipal investment. Recently a New View has emerged, which argues that tax-exemption plays a minor role, if any, in shaping municipal investment decisions because the marginal source of finance for municipal investment will be current taxes rather than debt. As a result, any tax subsidy for municipal investment is independent of the tax-exempt bond market and arises from the deductibility of interest paid on taxable bonds. Hence, the tax subsidy will be determined by the personal income tax rate.

This paper reinstates the Traditional View. The New View assumes that interest rates are independent of the amount of borrowing, or that only tax-exempt bonds are sold at leverage-dependent interest rates; taxable bonds are issued in unlimited amounts at a constant interest rate. In our representative-voter model of municipal finance, agents face debt capacity limits that prevent them from using taxable debt to finance all capital investment, both private and municipal. Because of these debt capacity limitations, *all* municipalities should treat the municipal bond rate as the marginal cost of funds *except* those very rare communities in which the representative citizen has both a *high* income tax rate and an extremely high capacity to borrow in the private debt market, through business loans or home equity loans with deductible interest.

While the New View does introduce the implications of tax finance as an alternative to municipal debt finance, we conclude that the primary implications are for *intra*marginal capital costs and that marginal capital costs are described accurately by the Traditional View.

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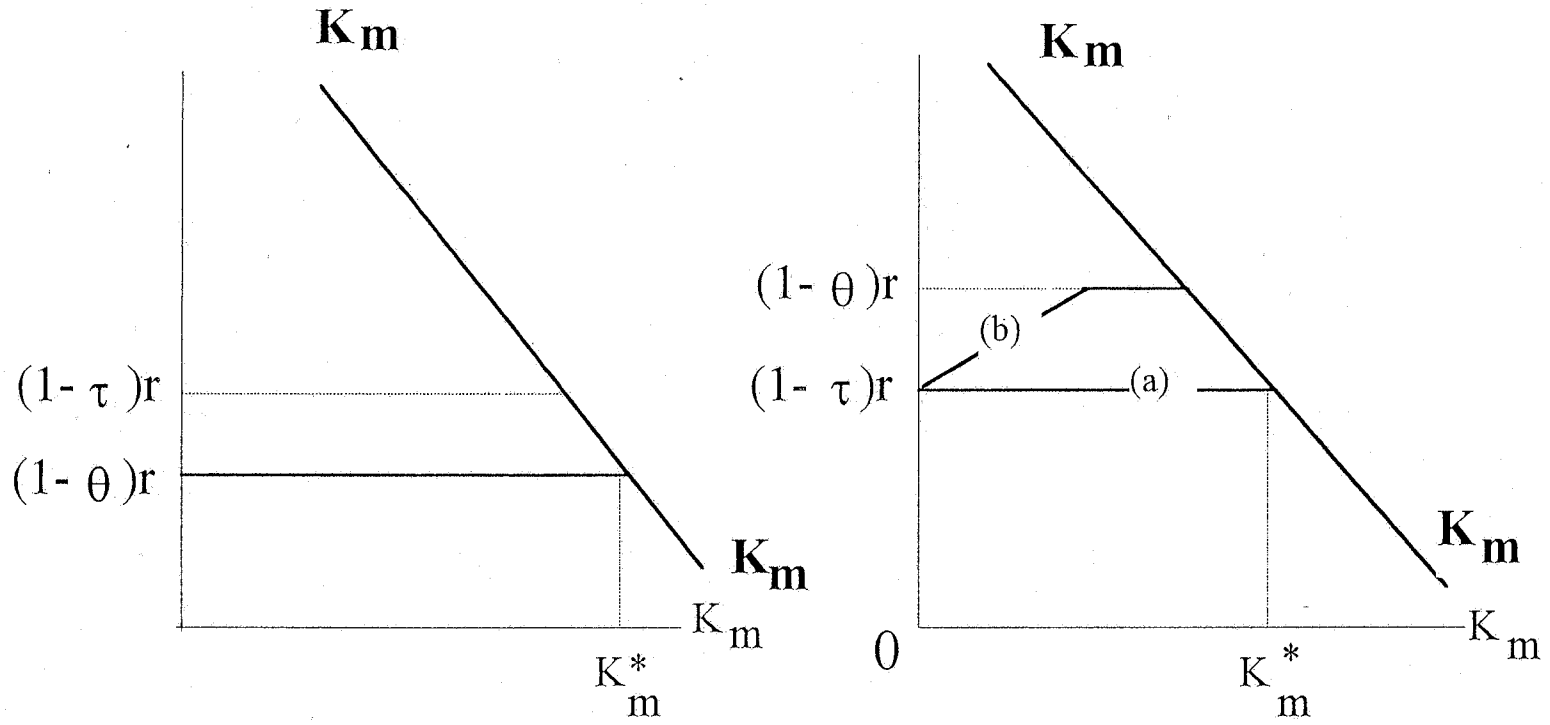
FIGURE 1
THE NEW VIEW OF THE TAX SUBSIDY FOR MUNICIPAL INVESTMENT



High Income Tax Rate

Low Income Tax Rate

(a) Constant Interest Rate

(b) Leverage-Related Interest Rate

FIGURE 2
LOW INCOME TAX RATE, MODERATE DEBT CAPACITY

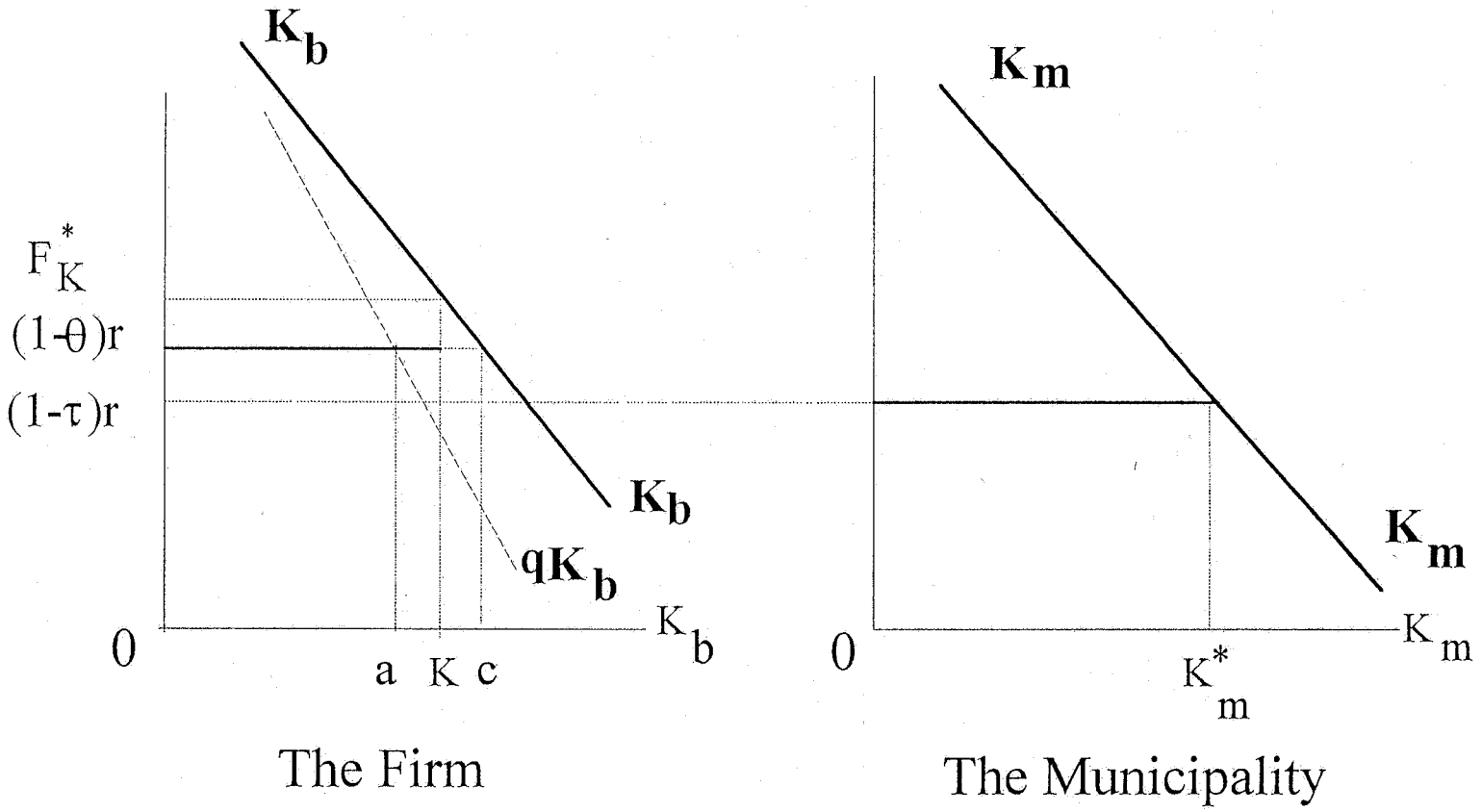
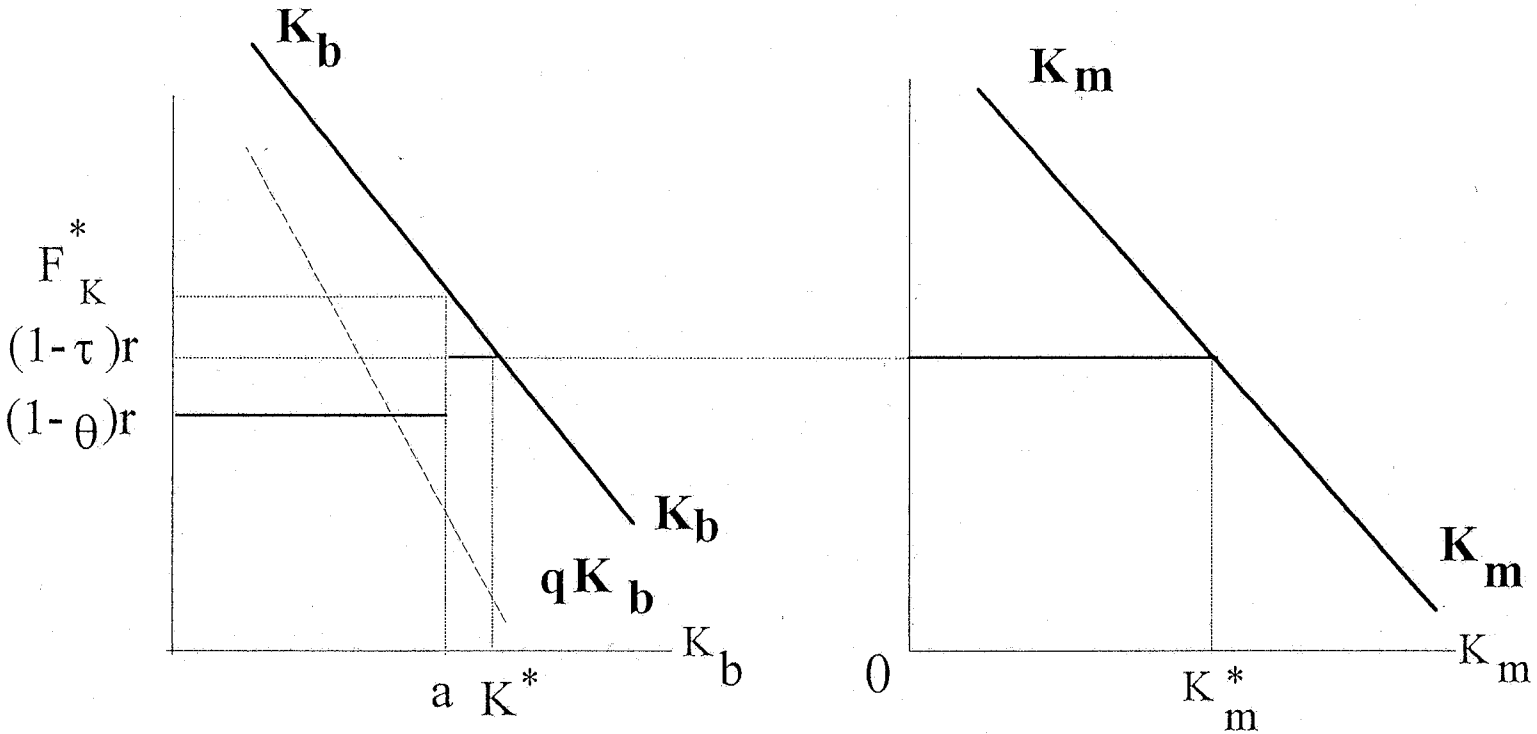


FIGURE 3
HIGH INCOME TAX RATE, MODERATE DEBT CAPACITY



The Firm

The Municipality

FIGURE 4
HIGH INCOME TAX RATE, HIGH DEBT CAPACITY
AND CONSTANT INTEREST RATES

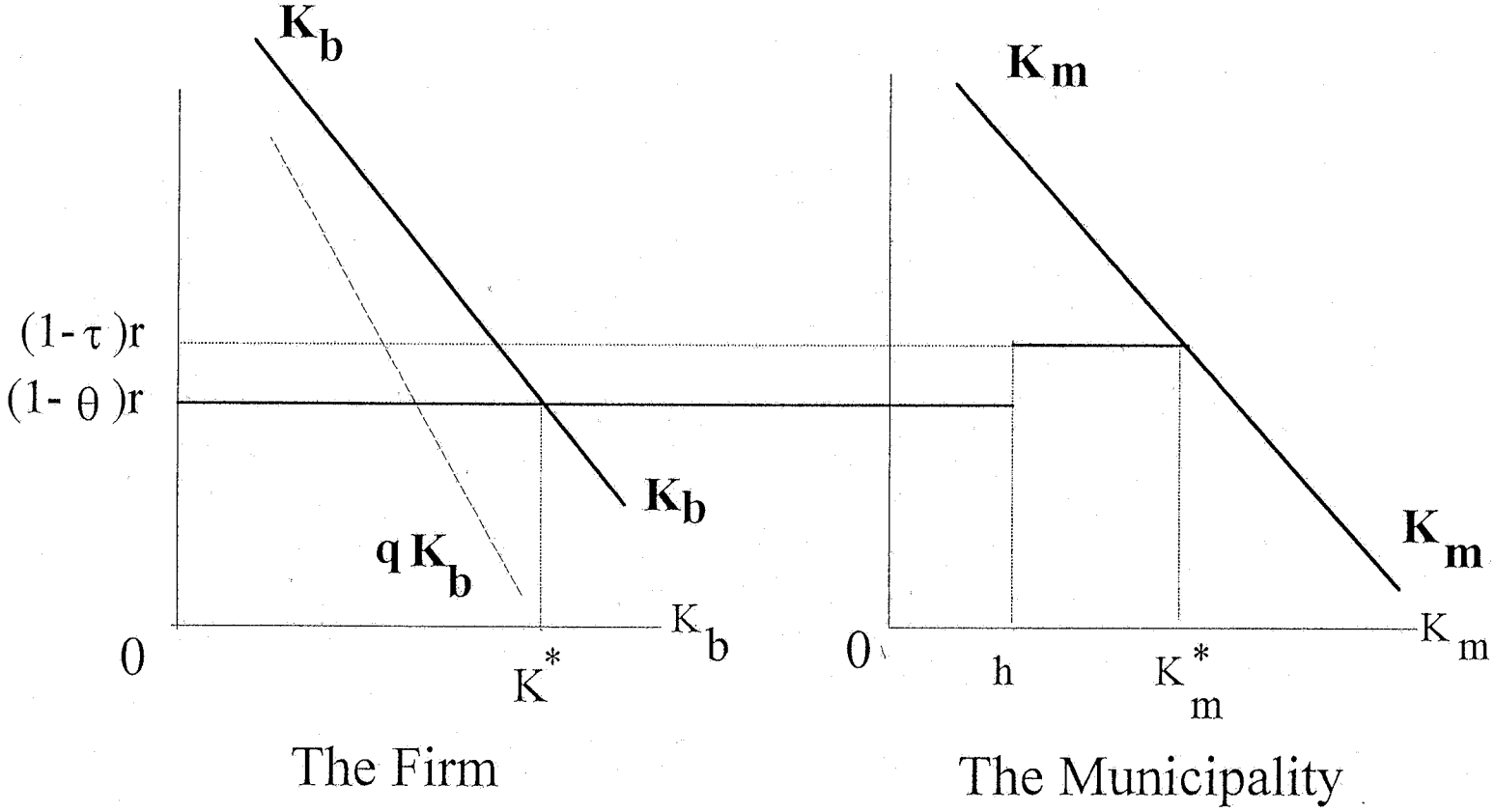


FIGURE 5
HIGH INCOME TAX RATE, HIGH DEBT CAPACITY
AND LEVERAGE-RELATED INTEREST RATES