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MUNICIPAL DEBT: WHAT DOES IT BUY AND WHO BENEFITS?

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This paper examines the incidence of the federal income tax exemption of interest on state and local bonds, applying a fixed-savings, simplified general equilibrium approach to estimate incidence effects on both the sources and uses of income. In contrast to traditional empirical work that allocates the benefit of tax exemption only to current holders of tax-exempt bonds based on current interest rates, we incorporate the fact that the existence of tax exemption causes the taxable interest rate to rise and the tax-exempt rate to fall. As a consequence, on the sources side, tax exemption can increase after-tax income for holders of both taxable and tax-exempt bonds. On the uses side, consumers of both private and public goods are affected by the higher cost of funds to private and federal government borrowers, the lower cost of funds to state and local borrowers, and the lower cost of funds to private-sector entities with access to the proceeds of tax-exempt borrowing. Overall, higher income individuals remain the primary beneficiaries of tax exemption on the sources side with this new approach, but less so than under the traditional approach. On the uses side, households who consume a relatively large share of state and local public services, such as those with several school-age children, receive significant net benefits.

Keywords: tax incidence, tax-exempt bonds, implicit taxes and subsidies, distributional analysis, microsimulation models

JEL Codes: H2, H22, H7

I. INTRODUCTION

It is well recognized in public finance (Musgrave, 1959; Harberger, 1962) that the incidence of taxation should account for how both the sources and uses of income are affected by the tax system or particular elements of it. Nonetheless, traditional analyses

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of the incidence of exempting municipal bond interest from federal income taxation take account of only the direct reduction in taxes paid on the interest received by holders of municipal bonds. These analyses do not account for how interest rate changes induced by tax exemption affect incomes of holders of both tax-exempt bonds and other investments (sources of income) and how they affect relative prices of public and private goods and services (uses of income).[1] In an earlier paper written with two other co-authors, Galper et al. (2013), we estimated both of these effects. We showed how changes in investor returns, increases in the cost of funds for private sector borrowers and decreases in the cost of funds for state and local borrowers could affect estimates of net benefits from tax exemption for different income groups.

Of particular significance, the change in relative interest rates resulting from tax exemption gives rise to implicit taxes and subsidies that affect taxpayers throughout the income distribution. The reduction in the tax-exempt interest rate — below that which would have prevailed in that market in the absence of tax exemption — can be viewed as an implicit tax on the holders of such debt. At the same time, the increase in the interest rate on taxable bonds is an implicit subsidy to holders of such instruments.[2]

This paper expands the analysis of the earlier paper in three ways. First, we take account of the fact that some municipal bonds are used for private investments rather than for public purposes. Second, we recognize both the private sector and the federal government experience an increased cost of funds when the taxable interest rate rises. Third, we examine more carefully how states and localities are likely to respond to the lower cost of funds from issuing municipal bonds and how that response affects the distribution of benefits from tax exemption between state and local taxpayers and consumers of local public services.

II. CONCEPTUAL FRAMEWORK

As noted, this paper extends our earlier analysis of the tax incidence of exempting municipal bond interest from federal income taxation on both the sources and uses sides. We now include a third major issuer of debt — the federal government — and account for the use of both taxable and tax-exempt debt by the private sector. Accordingly, we now distinguish between four categories of bonds held in household portfolios: (1) taxable bonds issued by the private-sector, including mortgages; (2) taxable bonds issued by the federal government; (3) tax-exempt bonds issued by state and local governments for public purposes; and (4) tax-exempt bonds issued through the intermediation of state

[1] The staffs of the U.S. Department of the Treasury Office of Tax Analysis, the Congressional Joint Committee on Taxation, and the Congressional Budget Office all allocate the benefits of tax exemption to current holders of tax-exempt bonds without considering sources and uses effects that would arise from the use of a general equilibrium framework.

[2] For an earlier analysis along these lines, see Galper and Toder (1984).

and local governments for private use, known as qualified private activity bonds under Internal Revenue Code Section 141.[3]

The primary improvement from our earlier paper is a better estimate of the effects of tax exemption on the behavior of states and localities. We provide a single estimate of how state and local budgets are likely to respond to the lower cost of borrowed funds, rather than presenting polar cases of tax and spending responses. We estimate the specific kinds of spending likely to be affected by the interest cost reductions, distribute the benefits from the reduced costs of those expenditures across income groups, and apply a reasonable split between spending benefits and tax reductions, based on a review of the public finance literature on capital grants.

As in the prior paper, we focus solely on the effects of tax exemption, although we recognize that considerations of risk, liquidity, size of issue, and other factors affect household portfolio preferences and relative yields.[4] In addition, we examine long-run steady states and ignore transitional issues, abstract from the role of certain financial intermediaries (like banks and insurance companies), and combine direct and indirect holdings of debt by households where the tax-exempt character of the asset flows to the household as with mutual funds and other pass-through entities.[5] Further, we continue to assume a fixed supply of long-term debt and consider substitutions only between taxable and tax-exempt debt.

With a fixed supply of total debt, the tax preference induces households to switch their portfolios out of taxable bonds and into tax-exempt bonds, causing the tax-exempt interest rate to fall, and the taxable rate to rise. An equilibrium spread, R, between the tax-exempt rate, r_e, and the taxable rate, r_t, as a percentage of the taxable rate, where

[3] In our classification we have excluded both tax-exempt debt issued by non-profits and taxable debt issued by state and local governments. In our analysis, state and local debt (category 3 above) includes debt issued by non-profit 501(c)(3) organizations (named for the relevant tax code section) to finance hospitals and institutions of higher education. Such debt amounted to about 6 percent of total outstanding tax-exempt debt at the end of 2013. Since the issuing entities play something of a quasi-governmental role regarding education and health, with similar effects on the sources and uses of income, we consider them a part of the formal state and local sector in category (3) above. Finally, there is also taxable debt issued by state and local governments with interest subsidies from the federal government under programs authorized by the American Recovery and Reinvestment Act of 2009 and the Hiring Incentives to Restore Employment Act of 2010, as discussed by Barnes (2013). These programs were largely discontinued after 2010, and represent a small fraction of the over $3.6 trillion of outstanding tax-exempt debt, and will not be further considered in this paper.

[4] In theory, if all other characteristics were the same, tax-exempt debt would be held solely by households with the highest marginal tax rate until the markets were equilibrated. In practice, as noted below in the discussion of actual asset holdings and responses to tax exemption, households across the income distribution are seen to hold tax-exempt debt. Thus, although there are tendencies toward tax-based asset specialization, other characteristics of assets clearly matter in the real world. Galper, Lucke, and Toder (1988) provide an analysis employing a more comprehensive approach to portfolio shifting.

[5] In the empirical work discussed more fully below, we do not directly measure household portfolios or shifts in their portfolios, but consider the income flows from various asset holdings as reflected in the microsimulation model of the Urban-Brookings Tax Policy Center (Rohaly, Carasso, and Saleem, 2005).

$R = (r_t - r_e)/r_t$, will then emerge to satisfy household portfolio preferences for both kinds of securities.

This new equilibrium interest rate spread will affect costs of capital for different issuers of securities. The cost of capital will fall for states and localities and for tax-exempt financed private sector activities and will rise for most private sector activities and for the federal government. Changes in the relative cost of funds will affect relative prices of goods and services offered by each sector, including the public sector, and through that channel will affect households at different income levels — depending on their spending patterns and the benefits they receive from public services.

We estimate the response of the state and local sector based on the previous estimates of the effects of federal grants on state and local budgets (with the lower interest rate on state and local bonds viewed as analogous to a capital grant).[6] Under a balanced budget constraint, a large share of a grant will increase spending on the particular public good or service for which the capital outlay is made (e.g., education and transportation), with the rest funding additional spending on other services or tax reductions. In turn, the distribution of the benefits from lower borrowing costs to states and localities will depend on the specific spending programs or tax cuts that the lower debt service costs finance.

The total distributional effects on the uses side will reflect the responses of state and local budgets, federal budgets, and the private sector. As in the earlier paper, we will use the Urban-Brookings Tax Policy Center (TPC) microsimulation model (Rohaly, Carasso, and Saleem, 2005) to estimate the results on the sources and uses sides independently and the combined results.

III. THE MUNICIPAL AND TAXABLE BOND MARKET

We begin with basic information on the four elements of the bond market for year-end 2013 from the Federal Reserve Board's (FRB) flow-of-funds accounts (Board of Governors of the Federal Reserve System, 2013).[7] For this analysis, we focus only on long-term debt issued by state and local governments, the federal government, and the private sector, as well as the share of each held by households (both directly and indirectly through mutual funds and other pass-through entities).

Table 1 shows the basic aspects of the supply and demand for tax-exempt bonds as indicated by the FRB's flow-of-funds accounts. Since these accounts do not distinguish in every case between long-term and short-term debt issues, the two are combined here,

[6] Hines and Thaler (1995) summarize earlier studies of the flypaper effect and find that "money sticks where it lands." Knight (2002) and Gordon (2004) dispute the effect, and Wang, Duncombe, and Yinger (2011) find variable effects across types of school districts in New York.

[7] It should also be noted that the FRB's flow-of-funds accounts defines municipal bonds as synonymous with tax-exempt bonds in general whether issued by state and local governments, non-profit organizations, or by or on behalf of private-sector firms although these three categories of tax-exempt debt are shown separately in the accounts.

Table 1

Outstanding Tax-Exempt Debt
(Year-end 2013)

Issued by	Volume ($Billion)	Percent of Total	Held by	Volume ($Billion)	Percent of Total
State and local governments	2,925[1]	79.7	Households directly	1,617	44.0
Private sector	518	14.1	Households indirectly[2]	1,016	27.7
Non-profits	228	6.2	Others	1,038[3]	28.3
Total	3,671	100.0	Total	3,671	100.0

Notes: These figures include short-term and long-term debt.
[1] Short-term debt outstanding is $45 million; short-term amounts are not available for other sectors.
[2] These figures include mutual funds, closed-end bond funds, and money-market funds.
[3] These figures include banks, insurance companies, and other smaller holders.
Source: Board of Governors of the Federal Reserve System, Flow-of-Funds Accounts, http://www.federalreserve.gov/apps/fof/FOFTables.aspx

although the outstanding supply of tax-exempt bonds by state and local governments is overwhelmingly long-term (over 98 percent). The three categories of issuers are state and local governments, the private sector, and non-profits, accounting respectively for 80 percent, 14 percent, and 6 percent of outstanding bonds. On the demand side, household holdings of tax-exempt bonds are divided into direct holdings and assumed indirect holdings through money market funds, mutual funds, closed-end funds, and exchange-traded funds.[8] Together these amount to 72 percent of the market with the remaining share held primarily by banks, insurance companies, and a small number of other entities. Thus, the tax-exempt market is dominated by the state and local sector on the supply side and the household sector on the demand side.

With taxable bonds — corporate bonds, corporate commercial mortgages, non-corporate mortgages for residential and commercial property, home-owners mortgages, and Treasury long-term securities — this pattern of supply and demand is decidedly different. As shown in Table 2, households, directly and indirectly, hold about 21 percent of long-term debt issued by non-financial business, almost the complement of their share of the tax-exempt market. The major players in this market are financial

[8] The Federal Reserve Board's flow-of-funds accounts combine the asset holdings of households and the non-profit sector, but since there is little reason for non-profits to hold tax-exempt bonds (except for perhaps a desire to show no taxable income), we assume that the holdings are exclusively in the household sector. Similarly, we assume that tax-exempt securities held by pass-through vehicles such as mutual funds are held primarily for the benefit of individual taxpayers.

Table 2
Outstanding Long-term Marketable Taxable Debt
(Year-end 2013)

Issued by[1]	Taxable Bonds ($Billion)	Mortgages ($Billion)	Total ($Billion)
Non-financial corporations	6,436	632	7,068
Non-corporate business		2,873	2,873
Households[2]		9,550	9,550
Treasury	4,706[3]		4,706
Government-sponsored enterprises	5,478[4]		5,478
Total	16,620	13,055	29,675
Addendum: Held by households[5]			
Directly	3,679[6]	72	3,751
Indirectly[7]	—	—	2,452
Total	—	—	6,203
Share held by households (%)	—	—	20.9

Notes: Data include short-term and long-term debt.
[1] Data do not include securities issued by the financial sector, except for flow-through entities such as mutual funds. See footnote 7 below
[2] Data include the non-profit sector.
[3] Data include long-term bonds only, excluding savings bonds and excluidng official holdings by foreign and domestic monetary authorities (some estimation was required of official long-term holdings).
[4] Data exclude official holdings by foreign and domestic monetary authorities and other government entities.
[5] Data include holdings of non-profit organizations.
[6] Data exclude savings bonds.
[7] The allocation to households is based on the share of holdings by households of mutual funds, closed-end funds, and exchange-traded funds relative to other investors and shares of assets held by these pass-through entities in the form of long-term marketable securities (after adjusting for tax-exempt debt); for closed-end-funds and ETFs, all assets held in the form of these securities have been allocated to households, a total amounting to less than 10 percent of all indirect holdings attributable to households.
Source: Board of Governors of the Federal Reserve System, flow-of-funds accounts, http://www.federalreserve.gov/apps/fof/FOFTables.aspx

institutions such as insurance companies, financial holding companies and retirement funds, and foreign investors.[9]

A comparison of Tables 1 and 2 yields some other interesting results. Private sector use of tax-exempt financing is 14 percent of the value of all tax-exempt bonds issued but just 7 percent of the long-term debt of non-financial corporations (including tax-exempt financing). It is also only 5 percent of the total long-term debt of all non-financial

[9] It should be emphasized again that for the purposes of this paper we have abstracted as much as possible from the role of financial intermediaries of all kinds, especially banks and insurance companies, in the long-term debt market.

business, including non-corporate business, and a mere 2.6 percent of total private sector borrowing (including household mortgages). Thus, at least in the aggregate, the reduction in the overall private-sector cost of capital resulting from the sector's ability to access the tax-exempt bond market is quite small.[10] We will distribute the interest savings from issuing tax-exempt debt in proportion to its use, with adjustments in the same proportions to the relative price changes of private-sector and state and local government goods and services.

IV. HOUSEHOLD PORTFOLIO ADJUSTMENTS AND SOURCES-OF-INCOME EFFECTS

The data underlying Tables 1 and 2 suggest how households may shift the allocation of their portfolios among financial assets due to the availability of tax-exempt bonds. Under current conditions, these data show that households hold about 30 percent of their long-term debt portfolios in municipal bonds (directly and indirectly through mutual funds), 50 percent in private-sector taxable bonds, and 20 percent in federal government bonds. These aggregate holdings reflect varying portfolio allocations among households depending on their evaluation of risk, liquidity, other characteristics of individual assets, and the benefit from tax exemption of bond interest.

If all long-term fixed-income securities were truly regarded as perfect substitutes in household portfolios, and households were able to adjust their portfolios instantaneously as their tax circumstances change, we would expect that depending on the interest spread between taxable and tax-exempt bonds — or R (where $R = (r_t - r_e)/r_t$) — households in tax brackets above R would hold only tax-exempt bonds in their long-term debt portfolios, and households below R would hold only taxable bonds. Although we do observe higher concentrations of tax-exempt bonds in the portfolios of higher-tax bracket households, we do not see these pure tax clientele effects. Nonetheless, it is reasonable to expect that the desire to maximize after-tax interest income would induce significant portfolio shifting, starting from a base situation where all interest income is fully taxable.

In this paper we follow the same approach to portfolio shifting as in Galper et al. (2013) and start from a base case where, in the absence of tax exemption, and assuming no changes in asset supplies, the return to tax-exempt and taxable debt would be the same. Then, the introduction of tax exemption for a particular class of debt — that issued by state and local governments, non-profit organizations, and qualified private activity bonds issued by the private sector — will cause r_e to fall below r_t until supply and demand are equalized at R. Several studies of the yield spread between taxable and tax-exempt bonds find a central tendency for R of about 25 percent, an estimate that we use in this paper.[11]

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[10] In a more disaggregated study of tax-exempt debt, where different parts of the private sector are considered separately, the access to tax-exempt debt may be an important factor in specific financing decisions; for example, private activity bonds are used as a major source for healthcare and higher education infrastructure.

[11] See, for example, Liu and Denison (2014), Luby (2012), Scott and Shoven (2012), Ramírez Verdugo and Poterba (2011), and Zimmerman (1991).

However, in the simulations using the Urban-Brookings Tax Policy Center tax model, it is not the absolute values of taxable and tax-exempt interest rates but their relative returns combined with the assumption of a fixed supply of long-term debt, that determine incidence from the sources-of-income side.

Since data based on tax returns capture observed flows of taxable and tax-exempt interest income in the presence of tax exemption, in the simulations below we "back cast" to the base case where the ratio of tax-exempt to taxable interest is one-third higher and aggregate interest income is unchanged. We then compare the pre- and post-tax-exemption results for taxpayers throughout the income distribution to determine the sources-side effects of allowing a specified class of long-term borrowing to be tax-exempt.

V. MARKET EFFECTS OF TAX EXEMPTION: USES SIDE

Tax exemption affects households in their role as consumers of both public sector and private sector goods (uses-of-income effects). The increase in yields on taxable bonds raises the costs of both private-sector goods and services and federal government borrowing, while the decrease in yields on tax-exempt bonds reduces the cost of state and local goods and services and, to the extent such debt is issued by the private sector, offsets a portion of the increase in the taxable interest rate. The total (net) increase in the cost of private goods and federal borrowing equals the total reduction in the cost of state and local public goods. Thus, the net change in the tax burden from all three uses-side effects (private, federal, and state and local) across all households is zero. However, individual households may have net burdens or benefits depending on whether they lose or gain from an increase in the costs of private goods and federal borrowing relative to the decrease in the cost of state and local public goods.

We allocate the burden of higher private prices among income groups in proportion to the shares of private consumption in each income group. Distributing the benefit from lower costs of state and local public goods is more complicated as who benefits depends on whether states and localities increase spending or reduce taxes when their borrowing costs decline. The types of spending that are increased and how any tax cut is structured further determines the distributional effects. In our previous work we examined two polar cases — one in which the tax exemption led to a decline in taxes that was distributed in proportion to household income, and another in which the benefit of tax exemption led to increased public spending that was distributed in proportion to persons per household (including children). In this paper we provide our best estimate of how the benefits of lower costs of state and local debt are likely to be distributed among households with different incomes.

The treatment of the higher cost of federal borrowing on the uses side requires further discussion. Estimating what these effects might be — less spending, higher taxes, or simply larger deficits — would involve a high degree of speculation and, depending on the assumptions made, would affect the distributional effects. Nonetheless, the arithmetic of incidence requires that all uses-side effects net to zero since only relative prices are affected.

Our solution is to treat the effects of higher interest rates on federal long-term debt in a "neutral" manner. By this we mean that the burden of higher interest costs on federal government borrowing will not affect the overall distribution of the net burden or benefit from tax exemption on the uses of income. More precisely, a "neutral" effect on the uses-side from an increase in federal interest rates means that the distribution of this burden across income groups, when combined with the burden of higher private-sector borrowing costs and the benefit of lower state-local borrowing costs, yields the same distributional result that would be obtained as if there were no federal interest cost burden at all but the private sector burden and the state and local sector benefit were each reduced in proportion to yield a zero net aggregate effect.[12]

We turn now to a more detailed analysis of the uses-side effects of the reduced costs of state and local borrowing. For this purpose, we are interested in determining the relationship between the outstanding supply of state and local bonds and the specific functional components of the state and local physical capital stock, that is, the extent to which schools, hospitals, roads, bridges, public utilities and the like have been financed by debt issues as opposed to federal grants and other sources of funding. While no data source allows a perfect reconciliation, we use data from two sources — the flow of capital expenditure over time using information from the Census of Governments (COG) and a study of infrastructure financing from the Congressional Budget Office (CBO) and Joint Committee on Taxation (JCT) (2009). The COG Annual Survey of State and Local Government Finance provides data on capital expenditures but not whether the spending was financed from municipal bonds or other sources, while CBO/JCT shows spending on capital goods by the federal, state and local, and private sectors, but does not break down spending into as many disaggregated categories.[13] Table 3 displays the average spending on capital from the COG from 2000–2008 as a proxy for the stock of capital financed by outstanding borrowing. While by no means definitive, these shares are similar to those derived using a larger set of years from COG and the CBO/JCT information for comparable categories (once federal grants are controlled for). Our estimates are a first step in examining these results. Future research and better data are needed to produce less stylized results.

Table 3 also lists the variables we will use to allocate the benefits from that share of tax-exempt debt across households. All distributional variables appear, by taxpaying unit, on the Tax Policy Center's microsimulation model. Fourteen percent of tax-exempt debt constitutes private activity bonds that finance private-sector investment. This use of tax-exempt financing will offset a small portion of the relative price increase

[12] Note that this is not the same as the results reported in our previous paper where we simply considered taxable and tax-exempt debt in the aggregate, ignored federal borrowing, and attributed the entire increase in the cost of taxable debt to the private sector. If we had followed this latter approach, the uses-side results would be more heavily influenced by the higher costs of private sector borrowing and the implicit effect of higher federal government borrowing costs would not be neutral.

[13] For example while COG data differentiate between capital spending on K-12 education and post-secondary education, the CBO/JCT estimates combine both categories.

Table 3
Purpose of Tax-Exempt Debt

Spending Type	Percentage of Total Debt	Distributional Variables
Private activity	14	Private consumption
State and local (including non-profit)	86	
K-12 education	17	Number of children age 17 and younger
Higher education	6	Number of people in college
Transportation	26	Spending on transportation
Utilities	11	Spending on utilities
Other uses	26	Population

Notes: Data reflect the distribution of tax-exempt debt from Table 1. State and local government debt is allocated by function equal to the average share of direct capital spending by function from Census of Governments, "State and Local Government Finances," 2000–2008.

attributable to the higher taxable bond rate, with the net effect allocated according to private consumption.

We then focus on state and local spending categories that we expect will disparately benefit different households.[14] For example, public school construction will benefit households with children rather than childless households. About one-quarter of tax-exempt debt is used for education (17 percent for K-12 and 65 percent for higher education), one-quarter for roads and mass transit, 11 percent for utilities (including sewer and water), and about one quarter for other capital expenditures. Thus, we are making the strong assumption that the marginal propensity to spend on capital goods is equal to the average amount spent. We describe our allocation strategy in more detail below.

The next question to consider is how much of the benefit of tax exemption will translate into additional spending versus a reduction in taxes. If tax exemption lowers the price of specific public goods, then we would expect the implicit price reduction to translate

[14] We are breaking out major categories of debt where we can assign benefits to households according to consumption patterns currently available on the TPC tax model, in turn based on the Consumer Expenditure Survey from the Bureau of Labor Statistics; for a discussion of these allocations see Toder, Nunns, and Rosenberg (2012). Other kinds of spending that are debt financed may also benefit some households more than others, but if we cannot distinguish the beneficiaries from data currently available, we do not differentiate the use of the bond proceeds. For example, we could potentially distribute the benefits of tax-exempt financing for some water infrastructure projects more heavily to consumers of goods whose cost of production are reduced as a result of these projects but do not have the detailed data to do so.

into higher spending on these goods. This amplifies any "flypaper effect" where money "sticks where it hits." Instead, if tax exemption lowers the cost of government services generally, then we would expect a broader increase in spending or a reduction in taxes. Understanding these relationships is difficult, but we can learn from the extensive literature on state and local governments' responses to federal grants. Unfortunately, the results present a wide array of responses, ranging from a one-for-one increase in spending to newer studies that show little if any flypaper effect. Stickiness is more likely to be found in the short-run and if state and local governments are uncertain about the likely continuation of grant funding.[15] In this paper, we assume 75 percent of the interest savings from the tax exemption benefits direct users of the facilities financed with municipal bonds. We further assume the remainder is distributed equally between general public spending that benefits households on a per capita basis and tax reduction that benefits households in proportion to their income.

VI. TAX MODEL SIMULATIONS OF THE INCIDENCE OF TAX-EXEMPT BONDS

In this section, we display the results of applying the conceptual framework described above using the Urban-Brookings Tax Policy Center microsimulation model. Specifically, we assume that starting from a base case where all household holdings of debt earn the same pre-tax return, the introduction of a tax-preference for municipal bonds gives rise to a 25 percent spread between the interest rates on taxable and tax-exempt bonds as a percent of the taxable rate — what we refer to as the implied equilibrating marginal tax rate.[16] This spread occurs through a decrease in r_e below the base-case rate of return and an increase in r_t above it as households adjust their portfolios. Further, as noted earlier, we are examining in this analysis the household portfolio choice only between taxable and tax-exempt debt so that with savings fixed total pre-tax interest income is unchanged.

A. Sources of Income Effects

Table 4 displays the tax model simulation of the incidence of tax exemption strictly on the sources of income — that is, how pre-tax and post-tax income flows are directly affected by the introduction of the tax exemption. A key result here is that, although the benefit is small relative to an expanded measure of income, every income group up through the fourth quintile receives a net benefit (change in income minus change

[15] Survey papers by Hines and Thaler (1995) and Fisher and Papke (2000) present evidence of some stickiness of funds. In contrast, Knight (2002) and Gordon (2004) find no or little effect, or one that dissipates over time.

[16] It is an implied tax rate in the sense that taxpayers below that tax rate would maximize after-tax interest income by holding taxable bonds, and those above it, by holding tax-exempts. As we have pointed out, for various reasons we do not observe such pure clientele effects, but simply tendencies in that direction. Nevertheless, we continue to use the terminology of an equilibrating marginal tax rate.

Table 4

Distributional Effects of Tax-Exemption of State and Local Bonds
Sources Method: Allocate Burden to Recipients of All Interest Income;
Implied Equilibrating Tax Rate is 25 Percent
(All Tax Units Excluding Dependents)

Expanded Cash Income Percentile	Adjusted Pre-Tax Income ($)	Average Change in Pre-Tax Income ($)	Average Change in Federal Tax ($)	Net Benefit from Exemption ($)	Net Benefit from Exemption (Percent of Income)	Share of Net Benefit (Percent of Total)
Lowest quintile	14,996	10	0	10	0.07	2.2
Second quintile	37,098	22	–1	23	0.06	4.3
Middle quintile	66,156	23	–11	34	0.05	5.6
Fourth quintile	111,219	26	–47	73	0.07	9.9
Top quintile	325,207	–115	–767	652	0.20	77.4
All	89,403	0	–120	120	0.13	100.0
Addendum						
80%–90%	165,072	52	–76	128	0.08	7.6
90%–95%	232,872	62	–207	269	0.12	7.9
95%–99%	383,846	–140	–932	792	0.21	18.9
Top 1 percent	2,112,460	–2,516	–9,620	7,104	0.34	43.0
Top 0.1 percent	9,687,832	–9,479	–42,288	32,809	0.34	20.4

in taxes) from tax exemption roughly proportional to income (0.05 to 0.07 percent). Only for the top quintile, and increasingly at higher levels of income within the top quintile, does the benefit increase significantly as a percentage of income. The result for higher-income taxpayers is to be expected since they benefit considerably from the implied tax rate of 25 percent on tax-exempt interest compared to what they would otherwise pay if such interest were taxable. However, the point to be emphasized here is that lower- and middle-income taxpayers also benefit as a result of the increase in the interest rate on taxable bonds.

This result contrasts significantly with the traditional approach to estimating the incidence of tax-exempt bonds. The traditional approach simply ignores the portfolio shifting that causes taxable and tax-exempt interest rates to diverge, and distributes the benefits of tax exemption in proportion to the tax benefit of reported tax-exempt income. Table 5 displays the standard distribution of the benefits of tax-exempt bonds.[17] Although the benefits in both Tables 4 and 5 are concentrated in the top income quintile, these benefits appear more skewed to the top when the implicit effects on all interest returns are ignored.

B. Uses of Income Effects

While sources-of-income effects are generally improperly specified in the traditional approach to distributing the benefits of tax exemption, uses-of-income effects are ignored completely. These effects arise because relative costs and prices of providing goods and services from various economic sectors are affected by the interest changes resulting from portfolio shifting. As a result, (1) the cost of capital rises in the private sector due to the increase in the interest rate on taxable bonds; (2) the cost of borrowing similarly rises for the federal government for both Treasury and agency issues; and (3) the cost of providing capital-intensive services by state and local governments falls. In this section we first quantify these effects and then distribute these relative price effects across income groups, again using the Urban-Brookings Tax Policy Center tax model.

For this exercise, we distribute the higher relative prices for private goods and services in proportion to the private consumption by income group, and the lower relative costs for providing state and local services according to the consumption by income group of the specific services financed. For the case of higher federal government borrowing costs, where consumption or benefit patterns are not easily specified, we assume a neutral distribution of uses-side effects so that these effects do not change overall distributional patterns regarding the uses of income. We also take account of the fact that the private sector can access the tax-exempt bond market for a small share of its total financing (2.6 percent according to our calculations), thereby offsetting some of the increase in the taxable interest rate. In addition, the non-profit sector, which uses

[17] These are similar to the distributions of tax expenditures by the JCT (2013) or those reported using the Urban-Brookings Tax Policy Center tax model at www.taxpolicycenter.org.

Table 5

Distributional Effects of Tax-Exemption of State and Local Bonds
Sources Method: Allocate Burden to Recipients of Tax-Exempt Interest
(All Tax Units Excluding Dependents)

Expanded Cash Income Percentile	Average Pre-Tax Income ($)	Average Federal Tax Rate (Percent)	Average Benefit ($)	Benefit from Exemption (Percent of Income)	Share of Benefit (Percent of Total)
Lowest quintile	15,006	3.1	0	0.00	0.02
Second quintile	37,120	8.34	2	0.01	0.48
Middle quintile	66,179	13.93	12	0.02	2.36
Fourth quintile	111,245	17.01	46	0.04	7.11
Top quintile	325,092	25.69	656	0.20	89.55
All	89,403	19.69	104	0.12	100.00
Addendum					
80%–90%	165,124	19.15	72	0.04	4.90
90%–95%	232,934	20.96	180	0.08	6.10
95%–99%	383,706	24.31	788	0.21	21.60
Top 1 percent	2,109,944	34.24	8,182	0.39	56.94
Top 0.1 percent	9,678,353	36.6	36,517	0.38	26.13

the tax-exempt market to finance primarily capital outlays for hospitals and higher education, is considered here to be part of the state and local sector.

As shown in Table 1, 14 percent of tax-exempt debt is private activity debt. Thus, in allocating the uses-side effects of tax exemption to state and local government activity, we need to account for only 86 percent of the change in tax-exempt bond income. Given the state and local share, we follow our interpretation of the flypaper effect literature and distribute three-quarters of capital spending to state and local programs. The benefits of these tax-exempt-financed public programs are then distributed to tax units based on characteristics of their households or based on imputed spending amounts. We allocate funds spent on K-12 education to households based on the number of children in the household who are ages 17 and younger, while the higher education funds are allocated based on households' expenses from attending college or graduate school. These measures abstract from any consideration of capitalization into property values that might occur from increased school spending, but allow us to take a first pass at allocating the benefit of public goods across households. Similarly, we use measures of household spending on transportation and utilities to allocate benefits from capital spending on transportation and utility facilities. For other capital expenditures we allocate the benefit on a per capita basis. Finally, we allocate the 25 percent of the tax-exempt benefits that do not "stick" to their program equally to tax units based on income (as a proxy for tax reduction) and on a per capita basis (as a proxy for other spending).

Table 6 shows the distribution of the uses-side effects for each of the three sectors — private, federal, and state and local — along with the combined effects, which as noted sum to zero in the aggregate but vary across income classes and household types. For tax units in the bottom two income quintiles the benefit from the additional public spending offsets the increase in private-sector prices. In contrast, tax units in the top two quintiles face higher burdens than the value of the additional public goods. Interestingly, for tax units in the top 0.1 percent, our estimates show that the value of the public benefit offsets the higher prices in the private sector. This result is likely due to the decrease in state and local taxes that we allocate based on income.

Table 7 and Figure 1 combine these effects and contrast the distribution of the benefit from introducing tax-exempt debt using the standard allocation method with our preferred allocation. Using our proposed allocation of the benefits on the uses side, we find that while there is an average benefit of 0.13 percent of income from introducing tax-exempt debt throughout the distribution, the benefits are largest as a share of income for tax units in the lowest and highest income quintiles. As we found in our earlier work, our preferred allocation finds that tax units at the very top of the income distribution benefit the most from the availability of tax-exempt bonds, but their benefit is smaller than what would be estimated if we ignored the shift in interest rates and uses-side effects, while the benefit for the lowest 40 percent of households is higher once expanded public-sector spending is taken into account.

Estimates of how individual tax units benefit from the tax-exemption of state and local bond interest vary significantly between the current method and an approach that accounts for sources and uses effects. Table 8 examines the benefit of tax exemption

Table 6

Exemption of State and Local Bonds
Average Uses-Side Adjustments (All Tax Units Excluding Dependents)

	State and Local Taxes and Spending			Private Consumption		
Expanded Cash Income Percentile	Average Benefit ($)	Average Benefit (Percent of Income)	Share of Total Benefit (Percent)	Average Burden ($)	Average Burden (Percent of Income)	Share of Total Burden (Percent)
Lowest quintile	54	0.36	14.6	28	0.18	10.7
Second quintile	74	0.20	16.9	45	0.12	14.5
Middle quintile	94	0.14	19.0	63	0.10	18.3
Fourth quintile	125	0.11	20.9	91	0.08	21.6
Top quintile	192	0.06	28.0	165	0.05	34.2
All	98	0.11	100.0	68	0.08	100.0
Addendum						
80%–90%	156	0.09	11.3	125	0.08	12.9
90%–95%	177	0.08	6.4	157	0.07	8.1
95%–99%	208	0.05	6.1	204	0.05	8.5
Top 1 percent	566	0.03	4.2	440	0.02	4.7
Top 0.1 percent	2004	0.02	1.5	1076	0.01	1.2

Table 6, Continued

Expanded Cash Income Percentile	Federal			Net Uses Side Effect	
	Average Benefit ($)	Average Burden (Percent of Income)	Share of Total Burden (Percent)	Average Adjustment ($)	Average Adjustment (Percent of Income)
Lowest quintile	14	0.10	13.0	12	0.08
Second quintile	21	0.06	15.9	9	0.02
Middle quintile	28	0.04	18.7	3	0.00
Fourth quintile	38	0.03	21.2	–4	0.00
Top quintile	63	0.02	30.5	–35	–0.01
All	29	0.03	100.0	0	0.00
Addendum					
80%–90%	49	0.03	12.0	–18	–0.01
90%–95%	59	0.03	7.1	–39	–0.02
95%–99%	72	0.02	7.1	–68	–0.02
Top 1 percent	177	0.01	4.4	–51	0.00
Top 0.1 percent	541	0.01	1.4	386	0.00

Note: Amounts listed for Private Consumption and Federal are burdens and thus bear the opposite sign as the benefits listed for State and Local Taxes and Spending.

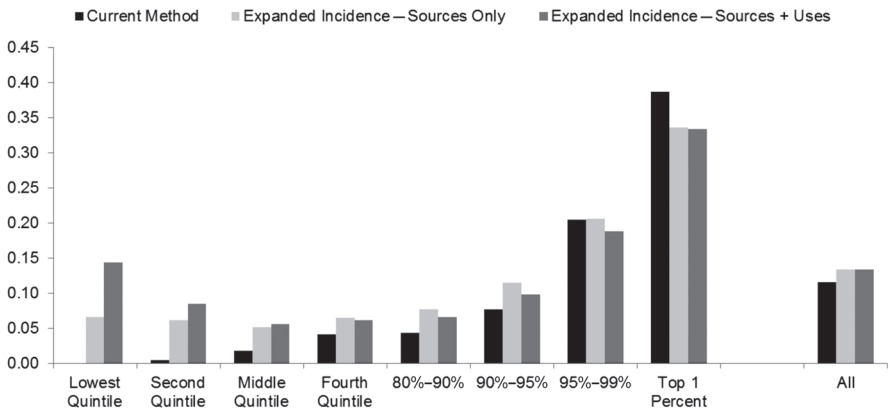
Table 7

Summary of Benefit of Tax-Exemption of State and Local Bonds
Sources Method: Allocate Burden to Recipients of All Interest Income; Implied Equilibrating Tax Rate is 25 Percent
(All Tax Units Excluding Dependents)

	Current Distribution Method		Sources Only		Net Uses	Sources + Uses	
Expanded Cash Income Percentile	(Percent of Income)	(Share of Total Benefit)	(Percent of Income)	(Share of Total Benefit)	(Percent of Income)	(Percent of Income)	(Share of Total Benefit)
Lowest quintile	0.00	0.0	0.07	2.2	0.08	0.14	4.8
Second quintile	0.01	0.4	0.06	4.3	0.02	0.09	5.9
Middle quintile	0.02	2.3	0.05	5.6	0.00	0.06	6.1
Fourth quintile	0.04	7.2	0.07	9.9	0.00	0.06	9.4
Top quintile	0.20	89.5	0.20	77.4	–0.01	0.19	73.2
All	0.12	100.0	0.13	100.0	0.00	0.13	100.0
Addendum							
80%–90%	0.04	4.9	0.08	7.6	–0.01	0.07	6.5
90%–95%	0.08	6.1	0.12	7.9	–0.02	0.10	6.8
95%–99%	0.21	21.6	0.21	18.9	–0.02	0.19	17.2
Top 1 percent	0.39	56.9	0.34	43.0	0.00	0.33	42.7
Second quintile	0.38	26.1	0.34	20.4	0.00	0.34	20.7

Figure 1

Benefit of Tax-Exemption of State and Local Bond Interest
(As Percentage of Income)



across households with different demographic characteristics. Due to our consideration of the benefits of capital spending for schools, tax units throughout the income scale with children benefit far more (except for the top 1 percent) under the general equilibrium approach than under the current method. In contrast, elderly tax units (those with a filer age 65 or older) receive a greater benefit in income classes through the middle quintile under our sources-plus-uses approach than under the current method but a smaller benefit at higher income levels. As do taxpayers generally, the elderly benefit from the increase in the return to holding taxable debt but do not realize as large a benefit from public services as do households with children.

Table 9 and Figure 2 further illustrate that households are not always maximizing after-tax returns and that other considerations may influence their portfolio decisions. For this purpose, we consider three categories of households: (1) those receiving tax-exempt interest income; (2) those receiving only taxable-interest income; and (3) those earning no interest income. Although in all cases both sources and uses of income affect the results reported here, the impact of interest rate changes and portfolio choices can be clearly seen. For tax units in the bottom two income quintiles holding tax-exempt debt (a very small share of households), the introduction of tax exemption actually leads to a decline in income due to the reduction in interest earned on state and local and private activity bonds. As noted above, this is largely due to these households having marginal tax rates below 25 percent, the assumed yield spread. Again, an analysis of the circumstances of households and how they are affected by changes in the sources and uses of income due to the allowance of tax-exempt financing can yield markedly different results from the standard distributional tables.

Table 8

Benefit of Tax-Exemption: Current Method versus Allowing Sources and Uses Effects, By Household

Household	Current Method (Percent of income)	Expanded Sources and Uses Method (Percent of income)
All tax units (all)	0.12	0.13
Lowest quintile	0.00	0.14
Second quintile	0.01	0.09
Middle quintile	0.02	0.06
Fourth quintile	0.04	0.06
80%–90%	0.04	0.07
90%–95%	0.08	0.10
95%–99%	0.21	0.19
Top 1%	0.39	0.33
Units with children (all)	0.05	0.11
Lowest quintile	0.00	0.36
Second quintile	0.00	0.16
Middle quintile	0.00	0.10
Fourth quintile	0.00	0.07
80%–90%	0.00	0.06
90%–95%	0.01	0.06
95%–99%	0.06	0.10
Top 1%	0.20	0.21
Elderly tax units (all)	0.34	0.29
Lowest quintile	0.00	0.16
Second quintile	0.02	0.16
Middle quintile	0.07	0.10
Fourth quintile	0.17	0.12
80%–90%	0.27	0.17
90%–95%	0.37	0.27
95%–99%	0.78	0.56
Top 1%	0.90	0.69

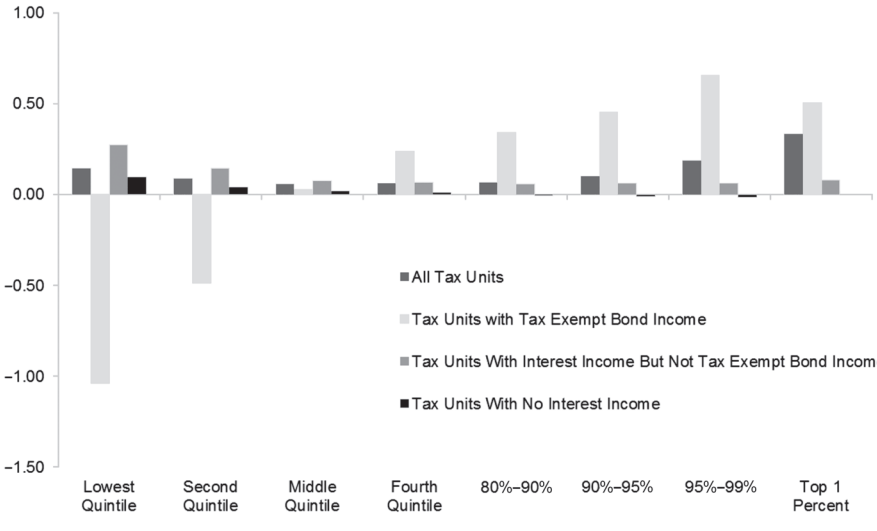
Table 9

Benefit of Tax-Exemption Including Sources and Uses of Effects
By Tax Units with Different Types of Interest Earned
(As Percentage of Income)

Household	All Tax Units	Tax Units with Tax Exempt Bond Income	Tax Units with Only Taxable Interest Income	Tax Units with No Interest Income
Lowest quintile	0.14	–1.04	0.27	0.09
Second quintile	0.09	–0.49	0.14	0.04
Middle quintile	0.06	0.03	0.08	0.02
Fourth quintile	0.06	0.24	0.06	0.01
80%–90%	0.07	0.34	0.06	–0.01
90%–95%	0.10	0.45	0.06	–0.01
95%–99%	0.19	0.66	0.06	–0.01
Top 1%	0.33	0.51	0.08	0.00
All	0.13	0.48	0.08	0.03

Figure 2

Benefit of Tax-Exemption of State and Local Bond Interest
(As Percentage of Income)



VII. CONCLUSIONS

In this paper, we expand on our previous work examining how tax exemption affects interest rates once implicit and explicit changes in interest rates and prices for public and private goods are taken into account. We find different distributional results than standard modeling methods that assume interest rates are unchanged and the benefit of exemption equals the tax savings on reported tax-exempt interest. We examine how the incidence of the exemption of state and local government bond interest varies based on a number of key assumptions. These include assumptions on how broadly adjustments in returns on assets spread the subsidy across sources of income and how state and local governments respond to lower costs of financing. We further examine how this state and local government response affects individuals based on their consumption patterns, the benefits they receive from state and local government services, and the state and local taxes they pay. We also note that not all tax-exempt debt is for state and local government public goods. We find that our improved approach to measure incidence still distributes the majority of the benefit of the tax-exempt municipal debt to higher income households, but that accounting for changes in taxable and tax-exempt interest rates and the relative consumption by households of state and local and private goods and services spreads the benefit more widely across the income distribution. In particular, tax-exempt municipal debt is also shown to also benefit low-income households with children by reducing the cost of public education.

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DISCLOSURES

The authors do not have any competing interests to disclose.

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