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ABSTRACT

This paper explores how alternative assumptions about household portfolio behavior affect estimates of the revenue cost of excluding state and local government interest payments from the federal income tax base. Standard tax expenditure estimates assume that current holders of tax-exempt bonds would replace their holdings of tax-exempt bonds with taxable bonds if the tax exemption were eliminated. We consider a number of alternative possible portfolio responses. Because taxable bonds are among the most heavily taxed assets, assuming that investors holding tax-exempt bonds would otherwise hold taxable bonds yields a larger estimate of the revenue cost of tax exemption than many alternative assumptions. Based on data from the 2004 Survey of Consumer Finances, we estimate that the revenue cost of tax exemption under the "taxable bond substitution hypothesis" is $14.2 billion, compared with $10.1 billion if corporate stock replaces tax-exempt bonds in household portfolios, and $7.9 billion if investors distribute their tax-exempt bond holdings in proportion to the other assets currently in their portfolios. We also explore the revenue effects of capping the dollar amount of tax-exempt interest per tax return and of limiting tax-exempt interest as a fraction of AGI.

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Exempting the interest paid by state and local governments from federal income taxation is one of the largest tax expenditures. The U.S. Treasury Department (2006) suggests that the tax expenditure on public-purpose tax-exempt bonds was $23.6 billion for FY2007. The Joint Committee on Taxation's (2006) estimate is $20.1 billion. These estimates assume that if individual investors did not hold tax-exempt bonds, they would hold taxable bonds instead. In all likelihood, more complex portfolio adjustments would follow changes in the tax treatment of interest payments on state and local government bonds. Taxable bonds are among the most heavily taxed portfolio assets, so assuming that the high-marginal-tax rate household who own tax-exempt bonds would shift to holding highly-taxed taxable bonds if tax-exemption were repealed is likely to overstate the revenue cost of tax exemption. If repeal of tax exemption leads current holders of tax-exempt bonds to substitute into other lightly taxed assets, such as common stocks with low dividend yields, then the revenue gain from repeal could be much smaller than calculations based on the taxable bond substitution assumption suggest.

Several studies, most notably Galper and Toder (1981), Slemrod (1983), and Toder and Neubig (1985), have examined the tax exemption in general equilibrium models that endogenize household portfolio choices, the stock of state and local government capital, and the use of debt by states and localities. These studies make the important point that "taxable bond substitution" is likely to misstate the revenue cost of tax exemption. They also note that calibrating models of portfolio choice is difficult, because there are few empirical settings in which it is possible to identify how household portfolio decisions respond to tax policy.

This paper explores the revenue cost of exempting state and local interest payments from income taxation. It focuses on revenue estimates, which unlike tax expenditure calculations, can consider a range of taxpayer responses to tax provisions. Although we present new estimates of

how taxes affect portfolio structure, we conclude that existing empirical evidence admits a wide range of potential behavioral responses to the elimination of tax exemption. Rather than using such estimates to calibrate a general equilibrium model to examine the revenue cost of tax exemption, we therefore explore how alternative assumptions about portfolio response affect estimates of the aggregate revenue cost of the interest exemption as well as the distribution of its benefits. We limit our analysis to the household sector, although corporate ownership of tax-exempt bonds also has a substantial revenue cost. For FY2007, the Joint Committee on Taxation (2006) estimates that the corporate income tax expenditure for tax-exempt bonds is roughly one third as large as the individual income tax expenditure.

The paper is divided into six sections. The first summarizes the yield spread between taxable and tax-exempt bonds over the last two decades and the aggregate holdings of taxable and tax-exempt bonds by different classes of investors. The second section describes the data sources that we use to analyze tax-exempt bond holdings and reports on the current cross-sectional distribution of tax-exempt bond holdings. Section three briefly reviews the previous literature on how marginal income tax rates affect portfolio structure and then presents estimates of probit and tobit models for portfolio choice, emphasizing ownership of tax-exempt bonds, based on the 2004 Survey of Consumer Finances. The estimates of the link between a household's marginal tax rate on interest income, and the share of tax-exempt bonds in the portfolio, admit a wide range of possible behavioral responses to tax changes. The fourth section presents revenue estimates under the taxable bond substitution assumption as well as other assumptions about substitution patterns. It demonstrates the substantial range that can result from alternative assumptions about portfolio response. Section five considers the revenue and distributional effects of policies that would restrict

but not eliminate the income tax exclusion for state and local interest payments. The final section concludes and suggests several directions for further research.

1. The Taxable-Tax Exempt Yield Spread and Aggregate Bond Holdings

The yield spread between taxable and tax-exempt bonds has varied substantially over time, and in recent years has narrowed to levels that seem inconsistent with a simple interpretation of this yield spread as a reflection of the marginal tax rate at which an investor would be indifferent between investing in a taxable and a tax-exempt bond. Simple yield comparisons are valid only when the risk attributes of the taxable and tax-exempt bonds are similar. When the yield spread is narrow, some argue that the federal government is losing revenue while the state and local borrowers are not much better off than they would be without income tax exclusion of their interest payments. An alternative explanation of narrow yields is that they reflect periods when the perceived risk of tax-exempt bonds is particularly high.

1.1 The Yield Spread, 1990-2008

Table 1 shows annual average yields on AAA municipal, U.S. Treasury, and AAA corporate bonds with a ten-year maturity. These averages are based on daily yields provided by Bloomberg, which reports information on prices and yields for various tax-exempt and taxable securities. The data suggest two conclusions. First, the average yield differential between Treasury bonds and tax-exempt bonds corresponds to an "implicit tax rate" well below the top statutory marginal tax rate in the federal income tax code. The implicit tax rate θ is the value that satisfies $(1-\theta)R_T = R_M$, where R_T denotes a taxable interest rate and R_M denotes the interest rate on a tax-exempt bond. For 2007 this implicit tax rate averaged less than 24 percent, and for 2003 and 2005 it fell below 20 percent. For the first nine months of 2008, the implicit tax rate averaged only 10.7 percent. At the beginning of the 1990s, by comparison, the implicit tax rate was greater than 30 percent.

Second, the implicit tax rate computed by comparing corporate and municipal bond yields with similar ratings is higher than that computed by comparing Treasury bonds with municipals, and it has not fallen nearly as far as the Treasury-based implicit tax rate during the last twenty years. For 2007, the implicit tax rate based on corporate yields averaged 41.2 percent, suggesting that some of the narrowing of the Treasury-municipal bond yield spread is due to developments in the Treasury market rather than in the tax-exempt bond market.

The recent data in Table 1 are among the most striking. The implicit tax rate of 10.7 percent between Treasury bonds and tax-exempt bonds in the first nine months of 2008 is extraordinary by historical standards. During this period even the implicit tax rate with corporate bonds, 29.8 percent, fell well below its historic average. This reflects the impact of the financial turmoil of 2008. Yields on tax-exempt securities, particularly so-called "auction rate municipals" with short maturities, rose sharply and in many cases exceeded the yields on taxable securities with comparable maturities. Figure 1 shows the yield spreads for different maturities and credit ratings, including the period when the yield spread became negative and municipal bond yields exceeded the yields on Treasury bonds. The low yields on Treasury securities during this period were apparently driven in part by a flight to quality during particularly unstable times in the financial markets.

The entries in Table 1 show that the implicit tax rate fluctuates substantially over time. Various studies have developed frameworks for analyzing these differences. Green (1993) emphasizes the need to recognize that bonds may not be held to maturity, and demonstrates that this can affect the interpretation of the yield spread. Poterba (1986) argues that changes in the yield spread may be linked to changing expectations of future tax policy, although it is not clear that tax events can explain the narrowing of yield spreads in 2008. Changing risk factors are another

potential source of time series variation in yield spreads. Chalmers (2006), however, shows that risk considerations seem unable to explain the level of the taxable-tax exempt yield spread.

The data in Table 1 correspond to bonds that generate fully tax-exempt interest. Some private-purpose bonds issued by state and local governments generate interest that is exempt from the federal income tax but that is subject to the Alternative Minimum Tax (AMT). Table 2 shows yield spreads at the one-, ten-, and thirty-year maturity for both fully tax-exempt and AMT-taxable bonds in 2003. We use daily yields for AMT-free tax-exempt bonds, AMT-subject private taxable bonds, and Treasury bonds to construct the entries. The implicit tax rate on AMT bonds is about twenty percentage points lower than that on fully tax-exempt bonds at the one-year maturity, ten percentage points lower at the 10-year maturity, and five percentage points lower at the 30-year maturity. These changes across maturities may reflect declining market beliefs about the probability of the AMT being in force in future years. The implicit tax rate differential between fully tax-exempt and AMT-taxable bonds at the short maturity, between 19 and 26 percentage points depending on the specific comparison, is close to the AMT tax rate. The yields on Treasury bonds with maturities of one year, and of thirty years, were below the yields of tax-exempt bonds that paid interest subject to the AMT.

1.2 Aggregate Holdings of Tax-Exempt and Taxable Bonds

The revenue cost of excluding interest paid by state and local governments from the federal income tax depends on who owns state and local government bonds and what those investors would do in the absence of tax exemption. Table 3 displays data on the ownership of both taxable and tax-exempt bonds in 2003. Households owned 36 percent of the outstanding debt of state and local governments directly. Another 29 percent was held by mutual funds, which are in turn owned primarily by households. In contrast, one quarter of outstanding U.S. Treasury bonds were held

abroad. Fourteen percent were held directly by households and another ten percent are held by mutual funds. In the Flow of Funds, the "household" sector includes untaxed nonprofit institutions as well as taxable households. Nonprofit institutions are much more likely to hold taxable bonds than are taxable households. The data in Table 3 are relevant for analyzing the change in portfolio structure that might follow the elimination of tax exemption, since if currently tax-exempt bonds became taxable, the ownership profile for these bonds might ultimately resemble that for currently taxable bonds rather than currently tax-exempt bonds.

2. Household Data: The 2004 Survey of Consumer Finances and TAXSIM

We rely on household-level data from the 2004 Survey of Consumer Finances to evaluate the potential revenue consequences of changing the tax exemption. We impute marginal tax rates to SCF households using the code provided by Moore (2004) to construct the twenty-two variables needed to run the NBER's Internet TAXSIM program, run the TAXSIM program, and then append the marginal tax rates to each household record. Feenberg and Coutts (1993) describe the basic structure of the TAXSIM program, which can be used to produce both first-dollar and last-dollar marginal tax rates on taxable interest income and other components of adjusted gross income. The difference between these tax rates arises from differences in the income components that households are assigned before the marginal tax rate calculation. The first dollar tax rate measures the tax rate on interest income, for example, if the household had no other interest income; the last dollar rate reflects the tax rate on the actual last dollar of such income, and consequently is affected by the household's portfolio holdings and income composition. The link between portfolio structure and the last-dollar tax rate makes this tax measure an endogenous variable in econometric models of household portfolio selection.

2.1 Aggregate Consistency Checks for SCF Data

The SCF is the most detailed and reliable source of data on household finances. We nevertheless performed some external validation tests for the data on tax-exempt bond holdings. In 2004, the SCF interviewed 4,519 households. The public use SCF data file includes 22,595 observations, which corresponds to five "replicates" for each underlying SCF observation. Because the SCF file includes imputed values for some data items that are missing in the household's actual responses, the replicates associated with a given underlying observation may have different values of some variables. Different observations have different sample weights, and the weighted sum of SCF households corresponds to 112 million U.S. households. Total financial assets of these households, defined following Poterba and Samwick (2002) as the sum of directly held equity, equity in mutual funds, tax deferred equity, tax deferred bonds, tax-exempt bonds, taxable bonds, interest bearing accounts and other financial assets, is $17.4 trillion. The tax-exempt bonds category includes tax-exempt bonds held through mutual funds that are identified as tax-exempt bond funds. Taxable bonds include government bonds, corporate bonds, foreign bonds, and mortgage bonds, once again including both direct holdings and holdings through mutual funds. Interest bearing accounts include checking and savings accounts, plus certificates of deposits. Other financial assets include annuities, trust funds, hedge funds with equity interest, and life insurance premiums.

The 2004 SCF reports aggregate direct household ownership of tax-exempt bonds of $756 billion. By comparison, the Federal Reserve Board of Governors (2007) Flow of Funds Accounts Table L.211 shows $704 billion of direct household-owned tax-exempt bonds. The "household sector" for this purpose includes nonprofit institutions, but since they are tax-exempt, they are unlikely to hold substantial amounts of tax-favored state and local debt. In addition, the Flow of

Funds show holdings of tax exempt bonds by mutual funds, money market mutual funds, and closed-end funds of $290 billion, $292 billion, and $89 billion, respectively, at year-end 2003. The household sector owned 62.3 percent of mutual fund shares and 48 percent of money market mutual fund shares. The SCF reports tax-exempt bonds in mutual funds, but it does not distinguish between money market mutual funds and regular mutual funds. The SCF total for these holdings is $300 billion, compared with $376 based on the ownership shares and aggregate values of the various funds from the Flow of Funds accounts. While these summary statistics suggest some differences between the Flow of Funds aggregates and the SCF, they also suggest that the SCF asset stocks are reasonably close to other information on the aggregates.

Shifting from stocks to flows, the amount of tax-exempt interest that SCF households reported for 2003, $57.5 billion, can be compared with information reported on tax returns. The U.S. Internal Revenue Service (2005) indicates that in 2003, households reported $53.7 billion of tax-exempt interest on their Forms 1040. This suggests reasonably close agreement between the survey and tax return information.

2.2 Consistency of Stocks and Flows in SCF

One potential difficulty with the SCF data is the imperfect matching between asset income and asset holdings. Table 4 illustrates the problem. Nearly three percent of SCF observations, corresponding to slightly less than two percent of the population, report holding tax-exempt bonds but receiving no tax-exempt interest. In addition, just over three percent of the observations, representing slightly more than one percent of the population, report tax-exempt interest but no holdings of tax-exempt bonds.

The mismatch problem can be further illustrated by calculating the distribution of the ratio of tax-exempt interest payments to tax-exempt bond holdings. Table 5 presents summary

information on this "implied interest rate." The median, computed for all households with tax-exempt bond holdings, is 4.9 percent. The interquartile range spans 3.2 to 12.7 percent. When implied interest rates for each household are weighted by the household's ownership of tax-exempt bonds, we find a median yield on tax-exempt bond holdings of 3.7 percent. The interquartile range when weighted is 2.0 to 5.4 percent. There are some extreme outliers in the data set. Nearly five percent of households reporting tax-exempt interest rates of less than one percent, and interest rates of more than ten percent reported by at least ten percent of the households with tax-exempt debt.

One potential explanation for the inconsistencies is that while households were interviewed in 2004, the questionnaire specifically asks about tax information for fiscal year 2003. The households with stock-flow inconsistencies might have bought or sold tax-exempt securities between 2003 and 2004. It is also possible that the differences are due to misreporting in either flows of income or stocks of assets – measurement error or failures of some households to understand their detailed financial affairs. Finally, it is possible that the errors arise because of the imputation algorithm used to construct the various SCF replicates. It imputes information on interest income separately from information on tax-exempt bond holdings, so it may generate outlying ratios of the two. The source of such stock-flow inconsistencies is a subject of ongoing SCF research. Some view the SCF's balance sheet data as more reliable than income flow variables. However, since computing marginal tax rates requires data on income flows from many different sources, such as dividends, taxable interest, and capital gains, we do not disregard SCF flow data but instead use both stock and flow data in our analysis.

2.3 Holdings of Tax-Exempt Debt by Marginal Tax Rate

Table 6 presents information on the percentage of tax-exempt debt that is held by households in various marginal tax rate categories for 2003. The table shows that 53 percent of tax-

exempt bonds are held by households with marginal tax rates in excess of 30 percent, and that 49 percent of tax-exempt interest is reported by households in these tax brackets. As in Feenberg and Poterba (1991), households with very low marginal tax rates hold close to ten percent of tax-exempt debt. For these households, holding tax-exempt debt would appear to be a tax-inefficient decision, although it is possible that data errors or specialized financial circumstances explain these outcomes. It is possible that our algorithm has assigned these households incorrectly low marginal tax rates, either because the SCF has omitted or understated some components of income, or because we have over-stated deductions. It is also possible that the tax rates for these households may be lower than their long-run average. We cannot evaluate transitory movements in marginal tax rates using our data, which is confined to a single cross-section.

3. Tax Rates and Household Portfolio Structure

The data on tax-exempt bond holdings by household marginal tax rate suggest that tax clienteles form to at least some degree. The central empirical issue for analyzing the revenue impact of changes in the tax exemption for state and local interest payments is how households with current holdings of tax-exempt bonds would modify their portfolios in the absence of tax exemption. The studies that most directly address this issue are Galper and Toder (1981), Slemrod (1983), and Toder and Neubig (1985). All of these studies rely on general equilibrium models of household portfolio choice to model how changes in the institutional setting for state and local bonds, such as repeal of tax exemption or expansion of the set of borrowers who are granted tax exemption, would affect portfolio holdings and yield spreads. These studies note that there is remarkably little empirical evidence on the way household portfolios might evolve following a change in the tax exemption. In the more than two decades since these studies were published, there have been several studies of taxes and portfolio behavior, including Scholz (1994), Bakija

(2000), and Poterba and Samwick (2003), but they do not deliver clear guidance on how portfolios would adjust if tax exemption were eliminated. Each of these studies estimates the relationship between household marginal tax rates and portfolio structure. The results, however, typically offer relatively wide bands of potential household response.

The wide range of empirical findings on portfolio behavior is not surprising, and may arise from two challenges in modeling portfolio choices. One is conceptual: studies such as Auerbach and King (1983) suggest that clientele equilibria are a realistic possibility, even though factors beside taxes such as demand for diversification play an important role in portfolio choice. Because clientele equilibria involve households choosing to locate at corner solutions, they do not generate the smooth changes in individual behavior as a function of tax rates – the type of behavior that we typically model in household-level empirical work.

The other challenge arises from the complexity of the economic environment in which portfolio decisions are made. The effect of taxes on the demand for one asset is likely to depend on the menu of other assets available, on the tax treatment of the other assets, and on the availability of short-selling opportunities in some asset classes. It can be difficult to fully characterize all of these constraints in household-level data sets, particularly because different households may have access to different financial opportunities. In spite of these difficulties, each of the three studies mentioned above suggest that households with higher marginal tax rates on taxable bonds are more likely to invest in tax-exempt bonds than their less-heavily-taxed counterparts.

To provide new empirical evidence on how taxes affect portfolio structure, we follow Poterba and Samwick (2003) by estimating probit and tobit models for household portfolio holdings. We focus on tax-exempt bond holdings, with household income, net worth, marginal tax rate, and demographic variables as explanatory variables. We estimate models using the 2004

Survey of Consumer Finances data that we use throughout this study. Unlike the 1998 SCF data set that was used in that earlier study, the 2004 SCF does not include location identifiers so it is not possible to impute even an imprecise measure of state marginal income tax rates. We also use TAXSIM and Moore's (2003) interface between SCF data records and TAXSIM to compute marginal tax rates; Poterba and Samwick (2003) used a tax rate calculator written specifically for the 1998 SCF. They also computed a variant of a first-dollar marginal tax rate as their key explanatory variable, by calculated a measure of the increase in the household's tax burden associated with a hypothetical increment to their capital income, relative to that income increment. To assess how the differences in this component of our methodology may affect our findings, we also present estimates using our tax rate calculation and the 1998 SCF data.

The baseline specification for the latent variable (S^*_i) that determines household i's notional portfolio share in tax exempt bonds is

$$S^*_i = X_i\beta + \varepsilon_i \, . \qquad (1)$$

The set of explanatory variables, X_i, includes six categorical variables for the household's income excluding income from portfolio assets. This income measure is defined as the sum of wages, business income, rent, unemployment insurance, alimony, and Social Security and pension income. The specification also includes five categorical variables for household net worth, four indicators for educational attainment, and several variables that proxy for household risk tolerance. The explanatory variable of primary interest is the household's last-dollar marginal tax rate on interest income. Because last-dollar tax rates are potentially endogenous, we follow an instrumental variable estimation strategy that relies on first-dollar marginal tax rates or state-level marginal tax rates as instruments. The latter strategy is only possible in the 1998 data, which has some information on geographic location.

Table 7 presents our estimates. The table is divided into two panels, each of which presents four specifications. The left-hand panel shows probit models for the ownership of tax-exempt debt, while the right-hand panel reports tobit models for the share of tax-exempt debt in the household's portfolio. The first specification in each panel uses the 2004 SCF data, with a last-dollar marginal tax rate variable based only on federal taxes, and the first-dollar federal marginal tax rate used as the instrumental variable. The second specification uses the 1998 SCF data, with a last-dollar marginal tax rate based on both federal and an estimate of state income taxes, instrumented in this case using the first-dollar state and federal marginal tax rate. The third specification uses the estimate of state marginal tax rate as the instrumental variable for the combined federal and state last-dollar marginal tax rate. This specification again uses 1998 data. Finally, the last specification, also for 1998, uses two instruments: the state marginal tax rate and the first-dollar federal marginal tax rate.

The results suggest substantial variation in the marginal tax rate coefficient across specifications, and relatively imprecise estimates in all cases. The 2004 data, in the first columns, yields a negative point estimate for the marginal tax rate effect, but the standard error is roughly the same size as the coefficient. The 1998 data yield positive coefficients on the marginal tax rate in all cases, suggesting that a higher marginal tax rate is associated with higher tax-exempt bond holdings, but the standard errors are again large. The findings differ from those in Poterba and Samwick (2003), who found positive and statistically significant effects of marginal tax rates on tax-exempt bond holdings using something similar to a first-dollar marginal tax rate. When we replaced our last-dollar marginal tax rates in the specifications in Table 7 with first-dollar rates, and re-estimated without instrumental variables, our coefficients for the 1998 SCF were negative but statistically indistinguishable from zero. This suggests that the difference between our findings and

those in Poterba and Samwick (2003) may arise from differences in the marginal tax rate calculation or other aspects of the estimation sample. The disparities suggest that whatever links between marginal tax rates and holdings of tax-exempt bonds may emerge in these data, they are not particularly robust.

The right-hand panel of Table 7 reports tobit models for the portfolio share devoted to tax-exempt bonds. The tobit coefficients display the same pattern as the probit coefficients, and once again fail to differ from zero at standard levels of statistical significance. The large standard errors associated with our estimates of how tax rates on interest income affect holdings of tax-exempt bonds make us reluctant to use these estimates as a basis for evaluating how portfolios might shift in response to the end of tax exemption. Instead, we devote the balance of this paper to considering a range of possible revenue effects under different assumptions about portfolio adjustment.

4. Revenue Cost of Tax Exemption

This section computes a baseline estimate of the revenue cost of the individual income tax exemption for state and local interest payments assuming that neither investors nor tax-exempt borrowers change their behaviors in response to the repeal of tax exemption, and then explores several alternative calculations.

4.1 Baseline Estimates: Taxable Bond Substitution

Our baseline analysis, which corresponds to the standard tax expenditure calculation, assumes that households who hold tax-exempt bonds replace their holdings with taxable bonds, an assumption that is consistent with tax-exempt borrowers continuing to borrow whatever they did when their interest was tax-exempt, although now with taxable debt, and with the same investors who held tax-exempt bonds holding these newly-taxable bonds. Moreover, this calculation assumes that the interest rate on these now-taxable bonds is the same as the current taxable interest rates to

which we have compared tax-exempt bond yields. If the current comparison is not capturing like-risk bonds, then the actual interest rate if tax-exempt bonds became taxable might differ from the rate that we assume.

We compute the revenue cost by multiplying each household's reported tax-exempt interest, $R_{j,2003}$, by 1.2182, the ratio of the taxable and the tax-exempt interest rate in 2003, and by the TAXSIM estimate of the household's federal marginal income tax rate on interest income ($\tau_{j,2003}$). We sum this over all households using SCF weights:

$$\Delta Revenue_{2003} = \sum_j w_j \left(\tau_{j,2003} \times R_{j,2003} \times \frac{i_{2003}^{taxable}}{i_{2003}^{exempt}} \right). \quad (2)$$

In this expression, *i* denotes the average interest rate in 2003 on either taxable and tax-exempt securities; *w* is the SCF weight; the subscript *j* corresponds to households. This calculation yields an estimated revenue cost of $19.5 billion for 2003.

A parallel estimate could be developed using data from the Statistics of Income Public Use File, by calculating a marginal tax rate on interest income for each tax filer using TAXSIM and then applying the interest rate gross-up factor described above. A key feature of this calculation is the assumption that a constant marginal tax rate applies to all of the interest income received by the household. In practice, the progressive nature of the tax code implies that the last dollar of interest income may face a higher tax rate than the first dollar – so the foregoing calculation may overstate the revenue yield from taxing state and local interest payments.

We also estimate the revenue cost of the tax exemption using SCF balance sheet data on holdings of tax-exempt bonds rather than reported tax-exempt interest income. In this case, we multiply the tax-exempt bond holdings of each investor ($B_{j,2004}$) by the average 2004 return on taxable bonds (4.495%), which we calculate as the equal-weighted average of 4.24%, the yield on

Treasury bonds, and 4.75%, the yield on AAA corporate bonds. We then multiply the resulting product by the household's marginal income tax rate on taxable interest income.

$$\Delta Revenue_{2004} = \sum_j w_j \left(\tau_{j,2003} \times B_{j,2004} \times i_{2003} \right), \quad (3)$$

This approach generates an estimated 2004 revenue cost of $12.7 billion for the interest exemption.

The difference in the estimated revenue costs using the flow-based and stock-based approaches could arise from an error in the assumed interest rate on taxable bonds in (3), or from an error in the gross up factor in (2). Our analysis uses the yields on AAA bonds, but if investors hold lower quality bonds, the yield spread and the corresponding gross-up factor may be smaller and the $19.5 billion estimate may be too high. If we assume, very conservatively, that taxable state and local bonds would yield the same interest rate that these bonds paid when tax-exempt, the revenue estimate is $16.0 billion. The stock-flow difference could also arise from the mismatch between stocks and flows noted above. If stocks are measured better than flows, then the balance-sheet based approach may provide better revenue estimates, and vice versa.

4.2 Alternative Portfolio Adjustments

The average marginal interest income tax rate of tax-exempt bond holders is 26.8 percent, weighted by bond holdings. Assuming that these investors would replace tax-exempt bonds in their portfolios with taxable bonds therefore generates substantial revenue – but this assumption is open to question, since existing portfolio patterns suggest that highly-taxed investors tilt their portfolios toward lightly-taxed assets.

Table 8 describes the aggregate portfolio shares of various assets in the portfolio of all SCF respondents with and without positive holdings of tax-exempt bonds. For the latter group, taxable bonds account for four percent of their portfolio while interest-bearing accounts represent 24 percent. For those with tax-exempt bonds, taxable bonds represent six percent, and interest bearing

accounts nine percent, of the total. Tax-exempt bonds, in contrast, represent 18 percent of the portfolio for these households. Taxable interest-bearing assets are a smaller share of the portfolios of households with tax-exempt bonds than of households without such bonds. Equity, held directly or through mutual funds, accounts for 44 percent of the portfolio of those who hold tax-exempt bonds and 35 percent of those who do not. If the households who currently hold tax-exempt bonds were to sell these bonds and allocate the proceeds in proportion to their holdings of all other assets in their portfolios, only 18.2 percent (=15/(1-.18)) of the current holdings of tax-exempt bonds would be replaced by taxable bonds – much less than the foregoing revenue calculations assumed. Other more lightly taxed assets, such as equities, and assets that generate low rates of return, such as holdings in transaction accounts, would account for the remainder of the portfolio. The tax increase for current holders of tax-exempt bonds would be smaller in this case than if they substituted toward taxable bonds.

Table 9 presents information on the degree of clientele specialization in portfolio structure. Direct asset holdings are combined with holdings through mutual funds. Sixty-nine million of the 112 million SCF households hold no stocks in taxable accounts, no taxable bonds, and no tax-exempt bonds either directly or in mutual funds. Some of these households (4.5 million) hold stocks or bonds through tax-deferred accounts such as IRAs and 401(k)s, but such holdings do not bear on tax-induced portfolio specialization. Just over ten million households have only taxable interest-bearing assets, almost 19 million have only corporate equity, and 0.24 million have only tax-exempt bonds. Those who specialize in equities hold 31 percent of all financial assets, while those who have both equities and taxable bonds represent 20 percent of the total.

To illustrate how various degrees of portfolio adjustment affect estimates of the revenue cost of tax exemption, we consider four potential portfolio adjustment strategies. These are (i) taxable

bond substitution; (ii) "proportional substitution," which assumes that investors replace tax-exempt bonds with all other assets in the same proportion as they were found in their original taxable portfolio; (iii) "equity substitution," which assumes that investors substitute tax-exempt bonds with direct equity holdings; and (iv) "tax efficient substitution," which assumes that investors substitute direct equity holdings for tax-exempt bonds if their marginal tax rate on other income is lower than 20 percent and with taxable bonds otherwise. In each case, we assume that the taxable households who are changing their portfolios are trading with tax-exempt institutions: foundations, endowments, or foreign investors who are not subject to U.S. income taxes. In the absence of such an assumption, our calculations would need to recognize the revenue consequences of portfolio adjustment for the other investors whose portfolios also change as households rebalance their holdings. Our substitution assumptions rule out any transfers of assets between tax-deferred retirement accounts, such as 401(k)s and IRAs, and taxable portfolios, on the grounds that many households view these as distinct sub-portfolios. We regard the "proportional" and "equity substitution" cases as invoking simple rules of thumb for portfolio change that may provide some indication of how households might respond to a change in tax rules.

Table 10 shows how household portfolios would change if investors responded in each of these ways to elimination of tax exemption. We compute the taxable income for each household in the SCF under each of the alternative portfolio substitution scenarios. We assume an interest rate of 3.69 percent on tax-exempt bonds -- the average of daily yields on AAA municipal bond indices with 10 year maturities for 2003. For taxable bonds we assume an interest rate of 4.495 percent, the simple average of the mean of daily yields on Treasury bonds (4.24) and AAA Corporate bonds (4.75) in 2003, both for 10 year maturities. We assume an average return on interest bearing accounts equal to one-quarter of the interest rate on taxable bonds: 1.124 percent. Equities are

assumed to generate realized capital gains equal to 2.75 percent of their market value. This value, which is one-quarter of the historical total return on large-cap stocks that Morningstar (2007) reports for the period 1926-2006, minus the corresponding dividend yield of 2.0 percent, reflects underlying assumptions both about the appreciation rate for stocks and the gain realization rate. We assume that only one quarter of unrealized capital gains are taxed in a given year. For equity held through mutual funds we assume that half of accruing gains are realized, which translates into a correspondingly higher tax burden on capital gains. We assume the same dividend yield for directly-held equity and for stocks held through mutual funds.

We compute the revenue consequences of eliminating the interest tax exemption under each of these alternative behavioral assumptions in several steps. First, we construct each household's portfolio under the corresponding assumption about portfolio adjustment. Then, we impute the capital income flows that would be associated with this portfolio, under the rate of return assumptions described above. Finally, we compute the household's federal tax liabilities in this setting by using TAXSIM to compute the income tax liability of a taxpayer with the household's modified income components. Finally, we estimate the revenue cost of the tax-exemption as:

$$\Delta Revenue^{k}_{2003} = \sum_{j} w_j \left(FTL^{k}_{j,2003} - FTL^{*}_{j,2003} \right), \qquad (4)$$

where, *FTL*: are the Federal Tax Liabilities of investor *j* obtained through TAXSIM when portfolio substitution pattern *k* is assumed, *FTL**: are the Federal Tax Liabilities of investor *j* obtained through TAXSIM using original data from the SCF for fiscal year 2003. The sum over *j* with weight w_j indicates a weighted sum over all SCF households using the sampling weights. Comparing federal tax liabilities with and without tax exempt debt in the portfolio, subject to our portfolio adjustment rules, yields estimates of the revenue cost that recognize that the marginal tax rate applicable to the household's portfolio income is not constant.

Table 11 presents our revenue estimates under different portfolio adjustment scenarios. The highest revenue effect of repealing tax exemption corresponds to the taxable bonds adjustment ($14.20 billion), since tax exempt bonds are replaced with the most heavily taxed asset in taxable portfolios. When we assume that households replace tax-exempt debt with equity, or that they choose between equity and other assets in a tax-efficient way, we find smaller estimates of the revenue cost of the tax expenditure: $10.1 billion and $10.9 billion, respectively. The proportional substitution case produces the lowest estimate of the tax cost ($7.9 billion), in part because some tax-exempt bonds are replaced with low-interest assets such as balances in transaction accounts. Since investors who hold tax-exempt bonds are unlikely to use them for liquidity purposes, this does not seem like a very plausible substitution pattern.

While we focus on revenue estimates rather than tax expenditures, we should note that each of the alternative adjustment strategies we consider would result in changes to the tax expenditure budget because they would affect household ownership of securities that generate dividends and capital gains, both of which are currently the subject of distinct tax expenditures. The tax expenditure for capital gains would increase, for example, in our equity substitution case. This underscores the limited nature of the calculations we present: we are not describing the net effect of eliminating tax exemption on the tax expenditure budget, but rather the revenue effect of one aspect of behavioral change.

4.3 Distributional Effects of Repealing Tax Exemption

The last five columns of Table 11 present information on the distributional burden of eliminating the tax exemption. Each column reports the share of the revenue increase that corresponds to households in a particular income range: below $40K, $40-75K, $75-125K, $125-250K and $250K+. Because the ownership of tax-exempt bonds is highly skewed, the highest

income group bears roughly eighty percent of the tax increase when the tax exemption is repealed. Households with incomes below $40,000, in contrast, bear less than one percent of the burden.

Table 12 reports the weighted mean change in federal tax liabilities due to the repeal of the tax exemption. For households with incomes below $40,000 but some holdings of tax-exempt bonds, the mean and median changes are close to zero. For those with incomes above $250,000, the average tax increase exceeds $10,000, while the median tax increase is around $2,200.

5. Alternatives to the Elimination of Tax Exemption

While elimination is the most frequently proposed change to the current tax exemption for state and local interest payments, there are also other proposals that are sometimes discussed by tax-writing committees. One involves limiting the amount of exempt interest to a fixed fraction of AGI, and the other involves capping the amount of exempt interest per tax return. Tables 13 and 14 report the distribution of tax-exempt interest as a share of AGI, and the distribution of the total amount of tax-exempt interest, respectively. Table 13 shows that without any behavioral changes, limiting exempt interest to ten percent of AGI would affect households who hold approximately sixty percent tax-exempt bonds. Limiting tax-exempt interest to thirty percent of AGI would affect households owning 37 percent of tax-exempt bonds. Table 14 shows that limiting the amount of tax-exempt interest to $10,000 per tax return would affect households that own 78 percent of tax-exempt bonds, while increasing this limit to $100,000 would reduce the impact to households that own 39 percent of tax-exempt bonds.

To compute the revenue effects of various limits on tax-exempt interest, we use the procedure outlined in conjunction with equation (4), along with our four portfolio adjustment assumptions. For a given exempt interest threshold, if a household's exempt interest in 2004 would place half of this interest above the limit, then we assume that this investor would adjust half of her

tax-exempt bond holdings in accordance with the assumed adjustment strategy. Table 15 reports our estimates of the revenue effects of various limits on tax-exempt interest. We estimate that limiting tax-exempt interest to $100,000 per tax return would raise $3.9 billion if households substitute taxable bonds for tax-exempt bonds, and $2.7 billion if they substitute with equity. For a $50,000 limit, the corresponding values are $6.2 and $4.3 billion. Limiting tax-exempt interest to 30 percent of AGI would raise $1.4 billion in the taxable bond substitution case, and $0.9 billion in the equity substitution case.

6. Conclusion

This paper suggests that the revenue cost of exempting state and local government interest payments from the federal income tax may be smaller than standard tax expenditure estimates indicate. If high-tax-bracket individual investors react to restrictions on or elimination of tax exemption by selling their previously tax-exempt bonds and shifting their portfolios toward lightly-taxed assets such as low-yield corporate equities, the revenue gain from curtailing the exemption is likely to be substantially smaller than standard analyses suggest. The standard assumption is that households will continue to hold their tax-exempt bonds, even when their interest becomes taxable and their yields rise accordingly. Under plausible assumptions about the degree of portfolio substitution, the revenue cost might be as little as half the standard estimate. These results echo other recent studies of portfolio adjustment in response to tax deductions, such as Gervais and Pandey's (2008) analysis of the home mortgage interest deduction.

Our analysis has relied on illustrative examples of portfolio adjustment strategies, rather than a model of portfolio adjustment estimated on household data, because the estimates of such models do not appear precise enough for use in detailed revenue estimation. Better estimates of these responses are an important future need. Such research might begin by comparing the findings

of previous studies and seeking to explain the sensitivity of those results to alternative measures of the household tax rate. A second critical need is for estimates of the potential behavioral response by state and local governments if tax exemption were eliminated or restricted. Our revenue estimates assume that the stock of tax-exempt bonds does not change when the income tax rules governing tax exemption are modified. This is unlikely; Gordon and Slemrod (1983, 1985) and Gordon and Metcalf (1991), among others, emphasize that some shift toward tax finance would be likely if tax exemption were eliminated. Their analysis focuses on the choice between borrowing through a state or local government, or borrowing on personal account and financing public spending with taxes. The choice between borrowing options is affected by the tax-exemption rules as well as other parameters of the tax code. Recognizing the potential changes in borrowing by states and localities could affect the equilibrium interest rate on their bonds, as well as the other deductions claimed by households who pay property taxes and state income taxes.

We have stopped short of exploring many interesting issues related to the current tax exemption. For example, we do not consider whether the tax exclusion for interest payments by state and local governments is a cost-effective policy for supporting these governments. Addressing this issue requires resolving the extent to which the yield spread between taxable and tax-exempt bonds is attributable to risk differentials, and the extent to which it is due to the fiscal subsidy. Several decades of active research notwithstanding, this is still an open issue on which progress is likely to require insights from both public finance and financial economics. We have also avoided any analysis of the holdings of tax-exempt bonds by corporations, and their potential response to a change in tax rules. Because corporate holders of tax-exempt bonds may be engaged in a range of complex financing transactions, described for example in Erikson, Goolsbee and Maydew (2003),

tracking the range of potential responses to a tax change may be even more difficult for this group than for households.

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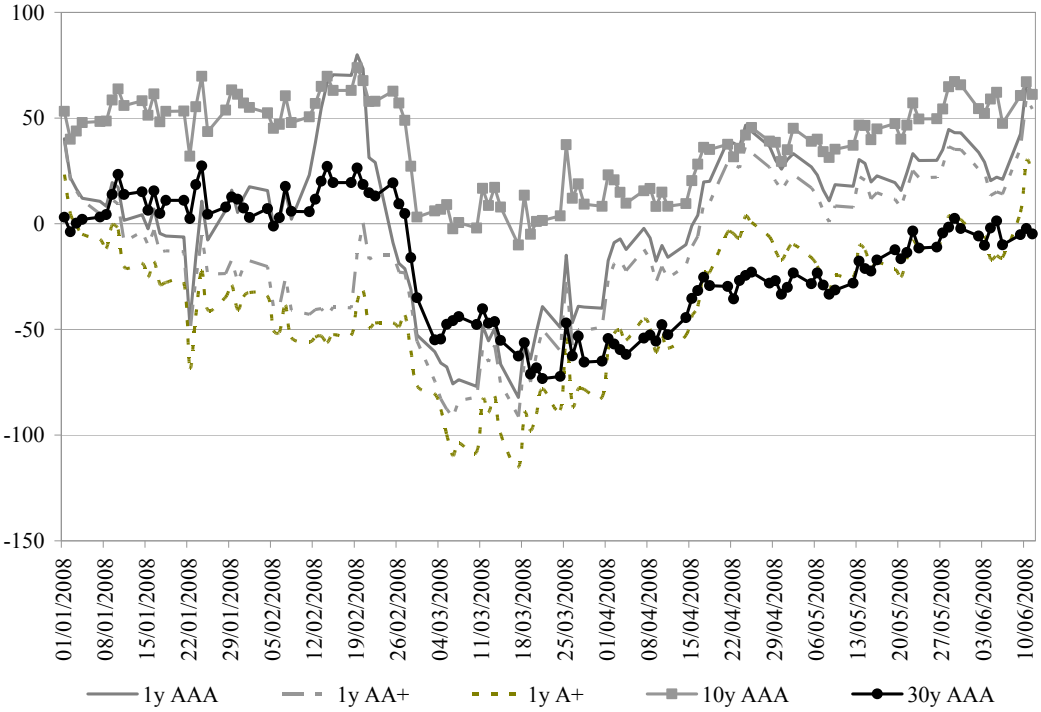

Figure 1: Yield Spreads (in Basis Points) Between Tax-Exempt and Treasury Bonds in First Six Months of 2008, Various Maturities and Credit Ratings

Table 1: Implicit Tax Rates on Prime-Grade Municipal Bonds Relative to Taxable Treasury and Corporate Bonds, 1991-2007

	Yields			Spreads		Implicit tax rates	
Year	Munis	Treasury	Corporate	Treasury – Muni	Corporate – Muni	Treasuries	Corporates
1991	6.02%	8.17%	8.39%	2.14%	2.4%	35.59%	39.2%
1992	5.58	7.25	7.43	1.68	1.8	30.03	33.2
1993	4.74	6.19	6.32	1.45	1.6	30.62	33.2
1994	5.28	7.21	7.49	1.93	2.2	36.47	41.8
1995	5.04	6.71	6.97	1.67	1.9	33.01	38.2
1996	4.92	6.55	6.82	1.63	1.9	33.24	38.7
1997	4.75	6.48	6.73	1.73	2.0	36.40	41.7
1998	4.31	5.49	5.83	1.17	1.5	27.17	35.2
1999	4.62	6.00	6.46	1.39	1.8	29.99	39.8
2000	4.97	6.25	7.14	1.28	2.2	25.85	43.8
2001	4.28	5.23	6.00	0.95	1.7	22.22	40.2
2002	4.05	4.91	5.57	0.86	1.5	21.24	37.3
2003	3.69	4.24	4.75	0.55	1.1	14.92	28.6
2004	3.66	4.45	4.91	0.78	1.2	21.32	34.0
2005	3.72	4.40	4.90	0.68	1.2	18.13	31.7
2006	3.93	4.88	5.51	0.96	1.6	24.34	40.4
2007	3.89	4.76	5.48	0.86	1.59	22.20	29.0
2008 (Jan-Sep)	3.74	4.14	5.33	0.40	1.59	10.69	29.8
Average	4.51	5.74	6.22	1.23	1.71	26.30	36.4

Source: Authors' calculations using data from Bloomberg

Table 2: Yield Spread (Basis Points) on AMT Bonds and Fully Tax Exempt Bonds, 2003

	Maturity		
	1 Year	10 Year	30 Year
Fully-Tax-Exempt Bonds:			
Treasury vs Municipal AAA	11.62	14.63	5.84
Corporate AAA vs Municipal AAA	32.54	28.06	21.58
Corporate AA vs Municipal AA+/AA-	44.36	30.56	25.71
Corporate A vs Municipal A+/A-	37.17	28.46	25.56
Bonds with Interest Subject to AMT:			
Treasury vs AMT AAA	-10.01	4.70	-1.35
Corporate AAA vs AMT AAA	6.85	16.96	13.32
Corporate AA vs AMT AA-	19.19	21.17	19.12
Corporate A vs AMT A+/A-	17.90	22.38	20.37

Source: Authors' calculations using data from Bloomberg.

Table 3: Ownership of Tax-Exempt and Taxable Bonds, 2004

	Tax-exempt bonds		Taxable bonds	
	$ Billions	Percentage	$ Billions	Percentage
Household sector	743	37	1,351	11
Money market mutual funds	314	15	359	3
Mutual funds	294	14	772	6
Property-casualty insurance companies	268	13	317	3
Commercial banking	141	7	671	5
Closed-end funds	89	4	74	1
Government-sponsored enterprises	45	2	428	3
Brokers and dealers	32	2	208	2
Nonfinancial corporate business	32	2	33	0
Rest of the world	26	1	3,875	32
Life insurance companies	30	1	1,847	15
Private pension funds	0	0	377	3
State and local govt. retirement funds	2	0	365	3
State and local governments	5	0	507	4
Monetary authority	0	0	718	6
Other	11	0	341	0
Total assets	2,031	100	12,241	100

Notes: Data are drawn from the Flow of Funds, Tables L.209, L.211 and L.212. The outstanding value of tax-exempt bonds was $2.031 trillion, while the outstanding stock of taxable bonds was $12.241 trillion. "Other" includes credit unions, ABS issuers, REITs, nonfarm noncorporate business, saving institutions, federal government retirement funds, exchange traded funds, and funding companies).

Table 4: Stock-Flow Inconsistency in Tax-Exempt Bond Holdings and Tax-Exempt Interest, 2004 Survey of Consumer Finances

	Households		Observations		Financial Assets	
	Millions	Percentage	Thousands	Percentage	Trillions	Percentage
Neither bonds nor interest	106.7	95.2%	19.1	84.6%	10.0	57.6%
Bonds and interest	2.1	1.8	2.1	9.3	4.8	27.3
No bonds but interest	1.2	1.1	0.7	3.3	1.5	8.6
Bonds but no interest	2.1	1.8	0.6	2.8	1.1	6.5
Total	112.1	100.0	22.6	100.0	17.4	100.0

Source: Authors' calculations using the 2004 SCF.

Table 5: Distribution of Implied Interest Rates on Tax-Exempt Bond Holdings in 2004 Survey of Consumer Finances (Percentage Points)

	Weighting Variable			
	Households	Observations	Financial Assets	Tax-exempt bond holdings
Minimum	0.0	0.0	0.0	0.0
10th percentile	1.8	1.6	1.7	1.5
25th percentile	3.2	2.7	2.5	2.0
Median	4.9	4.7	4.5	3.7
75th percentile	12.7	9.0	8.4	5.4
90th percentile	45.5	23.4	20.0	8.4
Maximum	320,000.0	320,000.0	320,000.0	320,000.0

Source: Authors' calculations using the 2004 SCF.

Table 6: Tax-exempt Bonds and Tax-exempt Interest by TAXSIM Estimate of Federal Marginal Tax Rate

	Tax-exempt bond holdings		Tax-exempt interest	
Federal MTR:	$ Billions	Percentage	$ Billions	Percentage
<0%	1.0	0.1%	0.0	0.0%
0%	95.3	9.0	5.0	8.8
0-10%	21.2	2.0	0.9	1.6
10-15%	89.7	8.5	6.0	10.5
15-25%	153.0	14.4	8.0	13.9
25-30%	133.0	12.5	9.4	16.3
30%+	562.0	53.0	28.1	48.9
Total	1,060.0	100.0	57.5	100.0

Source: Authors' calculations using the 2004 SCF.

Table 7: Portfolio Holdings of Tax-exempt Bonds: Probit and Tobit Estimates Instrumenting for Last-Dollar MTRs																
	Probit Models								**Tobit Models**							
Instrument Set:	**"First-dollar" MTR**				**State average MTR**		**"First-dollar" & State Average MTR**		**"First-dollar" MTR**				**State average MTR**		**"First-dollar" & State Average MTR**	
	2004		1998		1998		1998		2004		1998		1998		1998	
Parameter	Coeff.	SE	Coeff.	SE	Coeff.	SE	Coeff	SE	Coeff	SE	Coeff	SE	Coeff	SE	Coeff	SE
Constant	-3.4168	0.8525	-6.9355	0.5758	-7.2275	1.1565	-6.9712	0.5924	0.3371	0.0133	0.3475	0.0131	0.2217	0.5305	0.3479	0.0132
MTR	**-0.6716**	**0.6861**	**0.4697**	**0.5614**	**9.9768**	**38.408**	**0.4711**	**0.5611**	**-0.3403**	**0.2236**	**0.1139**	**0.1635**	**2.6404**	**10.566**	**0.1141**	**0.1634**
Income (excluding capital income)																
15-25	-0.0937	0.2203	-0.1181	0.1691	-1.3187	5.1073	-0.1181	0.1691	-0.0337	0.0689	-0.0348	0.0532	-0.3609	1.4345	-0.0348	0.0532
25-50	0.1838	0.1960	-0.1546	0.1541	-1.7012	6.1512	-0.1547	0.1541	0.0419	0.0610	-0.0236	0.0488	-0.4409	1.7173	-0.0236	0.0488
50-75	0.2200	0.2223	0.1043	0.1870	-1.9022	7.8898	0.1040	0.1869	0.0710	0.0689	0.0543	0.0576	-0.4896	2.2014	0.0542	0.0576
75-100	0.1875	0.2516	0.0990	0.2054	-2.1888	9.0554	0.0986	0.2052	0.0606	0.0785	0.0529	0.0653	-0.5639	2.5148	0.0528	0.0653
100-250	0.4493	0.2448	0.2311	0.2062	-2.4309	10.543	0.2306	0.2060	0.1566	0.0778	0.1044	0.0622	-0.6102	2.9171	0.1043	0.0622
250+	0.9662	0.2732	0.6630	0.2276	-2.5363	12.715	0.6624	0.2275	0.3258	0.0870	0.2538	0.0676	-0.6025	3.5121	0.2536	0.0675
Net worth																
50-100	0.3328	0.3224	0.4759	0.2028	0.4138	0.3907	0.4758	0.2028	0.1353	0.1066	0.2032	0.0666	0.1819	0.1396	0.2032	0.0666
100-250	0.5429	0.2028	0.8319	0.1627	0.7117	0.5408	0.8317	0.1627	0.1845	0.0669	0.3142	0.0577	0.2798	0.1827	0.3142	0.0577
250-1000	0.9577	0.1731	0.8831	0.1601	0.6409	1.1188	0.8829	0.1601	0.3165	0.0564	0.3342	0.0536	0.2663	0.3386	0.3341	0.0536
1000+	1.3037	0.1493	1.2113	0.1257	0.9044	1.3451	1.2112	0.1257	0.4470	0.0496	0.4298	0.0430	0.3454	0.4089	0.4297	0.0431
Education																
High Schl	0.0834	0.1996	0.0679	0.1594	-0.1523	1.0257	0.0680	0.1594	0.0323	0.0621	-0.0044	0.0501	-0.0597	0.2642	-0.0043	0.0501
Some Col	0.4157	0.1930	0.2683	0.1635	0.0904	0.8571	0.2685	0.1635	0.1429	0.0604	0.0712	0.0523	0.0329	0.1971	0.0713	0.0523
Col Deg	0.5387	0.1893	0.2880	0.1523	-0.0704	1.6320	0.2881	0.1523	0.1525	0.0602	0.0647	0.0476	-0.0198	0.4019	0.0647	0.0476
Post Col	0.6611	0.1904	0.5003	0.1592	0.1306	1.6740	0.5004	0.1592	0.1967	0.0596	0.1116	0.0503	0.0260	0.4097	0.1116	0.0503
Age 25-34	-0.7419	0.4449	4.7362	0.4453	4.7507	0.5829	4.7722	0.4421	-0.1910	0.1545	-0.0828	0.0493	-0.0428	0.2029	-0.0828	0.0493
35-44	-0.2918	0.3484	4.5585	0.4412	4.4790	0.9438	4.5946	0.4382	-0.0554	0.1167	-0.1615	0.0378	-0.1423	0.0944	-0.1615	0.0378
45-54	-0.1134	0.3439	4.5566	0.4368	4.4576	1.0039	4.5926	0.4350	-0.0139	0.1157	-0.1507	0.0329	-0.1344	0.0915	-0.1508	0.0329
55-64	0.0531	0.3459	4.6240	0.4361	4.4903	1.1242	4.6601	0.4344	0.0552	0.1166	-0.1325	0.0328	-0.1204	0.0779	-0.1325	0.0328
65+*	0.2187	0.3475	5.1264	0.4375	4.8736	1.6262	5.1624	0.4353	na	na	na	na	na	na	na	na
Risk averse	-0.1527	0.0989	-0.2503	0.0993	-0.1015	0.6974	-0.2504	0.0993	-0.0216	0.0312	-0.0333	0.0334	-0.0005	0.1660	-0.0333	0.0334
Female	0.0251	0.1391	0.1611	0.1180	0.2635	0.5204	0.1610	0.1180	0.0058	0.0445	0.0438	0.0376	0.0722	0.1445	0.0437	0.0377
Married	0.0098	0.1082	-0.0367	0.1048	0.1405	0.6867	-0.0367	0.1048	-0.0111	0.0341	-0.0061	0.0323	0.0346	0.1560	-0.0061	0.0323
HH size	0.0366	0.0314	-0.0561	0.0317	0.0253	0.3699	-0.0561	0.0317	0.0101	0.0102	-0.0232	0.0102	0.0001	0.1115	-0.0232	0.0102
Observations	4,519		4,305		4,305		4,305		4,519		4,305		4,305		4,305	

Robust standard errors in parentheses. All equations include industry and occupation indicator variables (except as noted), and weight all SCF observations equally. STATA was not able to achieve convergence with and indicator for 65+.

Table 8: Portfolio Composition of Households with and without Tax-Exempt Bonds

	Households without tax-exempt bonds	Households with tax-exempt bonds
Directly held equity	25%	29%
Equity in mutual funds	10	15
Tax deferred equity	8	5
Tax deferred bonds	15	8
Tax-exempt bonds	0	18
Taxable bonds	4	6
Interest bearing accounts	24	9
Other financial assets	14	10

Source: Authors' calculations using the 2004 SCF.

Table 9: Household Portfolio Holdings of Equity, Taxable Bonds, and Tax-Exempt Bonds, Including Mutual Fund Holdings

	Households			Financial assets		
	Millions	Percent	Average Federal Marginal Tax Rate	$ Trillions	Percent	Average Federal Marginal Tax Rate
No holdings of equity, taxable bonds, or tax-exempt bonds (including mutual funds)	69.16	62%	11%	2.06	12%	19%
Specialized in taxable bonds	10.30	9	17	0.62	4	20
Specialized in equity	18.59	17	19	5.41	31	22
Specialized in tax-exempt bonds	0.24	0	14	0.10	1	10
Mixed (taxable bonds & equity)	9.91	9	21	3.43	20	23
Mixed (equity & tax-exempt bonds)	1.46	1	21	1.67	10	24
Mixed (taxable & tax-exempt bonds)	0.13	0	12	0.05	0	21
Holdings of all three asset classes	2.31	2	24	4.07	23	25
Total	112.11	100	14	17.42	100	23

Source: Author's calculation using 2004 SCF.

Table 10: Structure of Household Portfolios, After Repealing Tax Exemption, Assuming Various Portfolio Substitutions

	Assumption About Portfolio Substitution				
	Original	Taxable Bonds Replace Tax-Exempt Bonds	Proportional	Equity Replaces Tax-Exempt Bonds	Tax efficient
	Share of Aggregate Household Portfolio				
Directly held equity	0.290	0.290	0.373	0.469	0.424
Equity in mutual funds	0.149	0.149	0.175	0.150	0.149
Tax deferred equity	0.045	0.045	0.046	0.045	0.045
Tax deferred bonds	0.085	0.085	0.087	0.085	0.085
Tax-exempt bonds	0.180	0	0	0	0
Taxable bonds	0.060	0.239	0.078	0.060	0.105
Interest bearing accounts	0.088	0.088	0.114	0.088	0.088
Other financial assets	0.104	0.104	0.126	0.104	0.104
	Average Portfolio Share (Households Weighted Equally)				
Directly held equity	0.167	0.167	0.193	0.316	0.258
Equity in mutual funds	0.202	0.202	0.237	0.202	0.202
Tax deferred equity	0.062	0.062	0.062	0.062	0.062
Tax deferred bonds	0.117	0.117	0.117	0.117	0.117
Tax-exempt bonds	0.149	0	0	0	0
Taxable bonds	0.043	0.192	0.051	0.043	0.102
Interest bearing accounts	0.151	0.151	0.191	0.151	0.151
Other financial assets	0.109	0.109	0.122	0.109	0.109

Source: Author's calculation using 2004 SCF, Internet TAXSIM and Kevin B. Moore's Code.
In Column 2, investors substitute taxable bonds for tax-exempt bonds. In Column 3, investors replace tax-exempt bonds with all other assets in proportion to the initial holdings of those other assets in their taxable portfolios. In Column 4, taxable equity replaces tax-exempt bonds. In Column 5, tax exempt bonds are replaced with equity or taxable bonds depending on each investor's first-dollar marginal tax rate on capital income.

Table 11: Revenue Cost and Distributional Effects of Eliminating Tax Exemption Under Different Portfolio Substitution Assumptions

Portfolio Substitution Assumption	Estimated Revenue Effect ($B)	Percentage of Tax Increase Allocated to Households in Different Income Groups				
		0-40 K	40-75 K	75-125 K	125-250 K	250+
Taxable bonds	14.20	0.4	2.8	3.4	11.5	81.7
Proportional	7.91	0.4	3.8	2.2	12.6	81.0
Equity	10.10	0.4	2.9	3.3	12.5	80.5
Tax efficient	10.90	0.4	3.1	3.3	12.6	80.3

Source: Authors' calculations using 2004 SCF, Internet TAXSIM and Kevin B. Moore's Code. See Table 11 for further details. . Taxable bonds: substitute tax-exempt bonds with taxable bonds in investor's portfolio. Proportional: substitute tax-exempt bonds with a portfolio of assets (excluding tax deferred accounts) that is proportional to each investor's original portfolio. Equity: substitute tax-exempt bonds with direclty held equity. Tax efficient: substitute tax exempt bonds with equity or taxable bonds depending on each investor marginal tax rate on the first dollar of capital income. Households with income between 125-250K paid 22.9% of federal income tax liabilities in 2003, and those in the 250K+ category paid 42.9% income taxes.

Table 12: Increase in Federal Income Tax Liabilities From Repeal of Tax Exemption, Stratifying Households by Household Income

Portfolio Substitution Assumption	Income level					
	0-40 K	40-75 K	75-125 K	125-250 K	250+	Total
	Mean for All Households					
Taxable bonds	1	13	25	178	4,176	127
Proportional	1	10	9	108	2,300	71
Equity	1	9	17	137	2,919	90
Tax efficient	1	11	19	148	3,141	97
	Mean for All Households with Tax-Exempt Bond Holdings					
Taxable bonds	144	366	536	1,798	14,146	3,434
Proportional	81	274	203	1,089	7,791	1,912
Equity	105	264	366	1,386	9,887	2,429
Tax efficient	127	309	396	1,499	10,639	2,624
	Median for All Households with Tax-Exempt Bond Holdings					
Taxable bonds	27	108	225	315	3,147	243
Proportional	8	38	54	179	1,288	81
Equity	18	68	182	235	2,164	189
Tax efficient	27	108	182	235	2,164	225

Source: Authors' calculations using 2004 SCF, Internet TAXSIM and Kevin B. Moore's Code. See Table 11 for details of substitution assumptions. Taxable bonds: substitute tax-exempt bonds with taxable bonds in investor's portfolio. Proportional: substitute tax-exempt bonds with a portfolio of assets (excluding tax deferred accounts) that is proportional to each investor's original portfolio. Equity: substitute tax-exempt bonds with directly held equity. Tax efficient: substitute tax exempt bonds with equity or taxable bonds depending on each investor marginal tax rate on the first dollar of capital income.

Table 13: Distribution of Ratio of Tax-Exempt Interest to AGI

	Holdings of Tax Exempt Bonds		Household-weighted Marginal Tax Rate on Interest Income for Households with this Ratio
	$ Billions	Share of total	
0%	107	10.2%	14.5%
0 - 10%	313	29.7	25.3
10 - 30%	241	22.8	24.3
30 - 50%	127	12.0	16.9
50 - 100%	124	11.7	12.0
100% +	144	13.6	12.2
Total	1,056	100.0	14.8

Source: Authors' calculations using the 2004 SCF.

Table 14: Distribution of Amount of Tax-Exempt Interest Received

	Holdings of Tax Exempt bonds		Household-weighted Marginal Tax Rate on Interest Income
	$ Billions	Share of total	
$0	100	9.5%	14.5
0 - 10K	130	12.3	23.5
10 - 50K	160	15.1	24.8
50 - 100K	251	23.7	26.5
100 - 250K	135	12.8	28.7
250 - 500K	121	11.5	31.8
500K - 1M	101	9.6	22.3
1M +	58	5.5	29.9
Total	1,056	100.00	14.8

Source: Authors' calculations using the 2004 SCF.

Table 15: Revenue Effects ($ billion) of Limiting Tax Exemption

Substitution Assumption:		
	Limit to 10% of AGI	Limit to 10K
Taxable Bond Substitution	5.45	9.79
Equity Substitution	3.84	6.87
	Limit to 20% of AGI	Limit to 50K
Taxable Bond Substitution	2.38	6.21
Equity Substitution	1.66	4.30
	Limit to 30% of AGI	Limit to 100K
Taxable Bond Substitution	1.36	3.92
Equity Substitution	0.91	2.66

Source: Authors' calculations using 2004 SCF, Internet TAXSIM and Moore's Code. See Table 11 for further details and explanation of substitution assumptions.