

NBER WORKING PAPERS SERIES

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Working Paper No. 3900

NATIONAL BUREAU OF ECONOMIC RESEARCH  
1050 Massachusetts Avenue  
Cambridge, MA 02138  
November 1991

We are grateful to the Ford Foundation and the National Science Foundation for research support, and to Alan Auerbach, Bruce Davie, David Joulfaian, Daphne Kenyon, and Judy Ziobro for helpful comments or suggestions. This research is part of the NBER Program in Taxation. This paper is part of NBER's research program in Taxation. Any opinions expressed are those of the authors and not those of the National Bureau of Economic Research.

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ABSTRACT

This paper uses data from 1988 federal income tax returns, which asked taxpayers to report their tax-exempt interest income as an information item, to analyze the distribution of tax-exempt asset holdings. More than three quarters of the tax-exempt debt held by households was held by those with marginal tax rates of 28% or more. The paper reports two measures of the average marginal tax rate on tax-exempt debt. The first measures the increase in taxes if a small fraction of each taxpayer's exempt interest income were converted to taxable interest. This weighted average of "first-dollar" marginal tax rates was 25.8%. A second calculation finds that if all tax-exempt interest were reported as taxable interest, taxes would rise by 27.6% of the increase in taxable interest. Many taxpayers who have substantial tax-exempt interest receipts, but low first-dollar marginal tax rates, would be driven into higher tax brackets if the exemption were eliminated but their portfolios remained the same.

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The efficiency of the federal income tax exemption for interest paid by states and localities is a perennial point of controversy in public finance. A potential inefficiency arises because the interest saving to states and localities is determined by the tax rate of the "marginal" investor in tax-exempt securities, while the federal government's revenue loss depends on the average marginal tax rate of all municipal bond investors. If the marginal investor's tax rate is well below the average marginal tax rate of all holders of tax-exempt bonds, then interest exemption may be an inefficient way to subsidize state and local governments.

The disparity between the average and marginal tax rates on tax-exempt interest depends on the structure of the income tax schedule and the distribution of tax-exempt bond holdings across investors. This paper focuses on individual holdings of tax-exempt debt, which currently account for more than two thirds of the total. While wealth surveys show that tax-exempt asset holding is concentrated among wealthy households, some of these households may face low marginal tax rates, for example if they realize capital losses. This paper provides new evidence on the distribution of tax-exempt bond ownership across tax brackets.

The paper is divided into five sections. The first describes the changes during the last three decades in the role of households as owners of tax-exempt bonds. Recent tax reforms have made households increasingly important municipal bond investors. Section two compares the data from 1987 and 1988 federal income tax returns, which asked taxpayers to report their tax-exempt interest income as an information item, with other sources of information on household ownership of municipal debt. The tax return data are roughly consistent with recently-revised Federal Reserve Board data on tax-exempt asset ownership. The next section uses these data to analyze the distribution

of tax-exempt asset holdings by marginal tax rate, and to describe how much individual income tax revenue is lost as a result of interest exemption. If the interest exemption were repealed and there were no changes in portfolio holdings, federal income tax receipts in 1988 would have increased by 27.6% of the increase in taxable interest. Section four extrapolates the 1988 tax return data to 1991 to estimate how recent tax changes that have altered marginal tax rates on high-income households will affect the average marginal tax rate on tax-exempt bondholders. There is a brief conclusion.

#### 1. Trends and Previous Evidence on the Ownership of Municipal Debt

The three most important categories of municipal bond investors at the beginning of the 1980s were commercial banks (43% of outstanding debt), households (25%), and property/ casualty insurance companies (24%). The tax reforms of 1981, 1982, 1984, and 1986 altered the tax incentives for these investors, particularly banks and households, to hold municipal bonds, and their holdings have changed accordingly.

The largest tax changes involved commercial banks, who Fama (1977) argued were the marginal holders of tax-exempt debt in the 1970s. Until 1982, commercial banks and other depository institutions could deduct interest payments to depositors when calculating taxable income, even if these deposits were invested in tax-exempt bonds. The Tax Equity and Fiscal Responsibility Act of 1982 restricted this tax arbitrage by limiting bank deductions to 85% of their interest payments on liabilities backed by tax-exempt assets. This limit was reduced to 80% in the 1984 tax reform. The 1986 Tax Reform Act further restricted the tax subsidy, allowing the 80% deduction only on bonds issued by governments that did not expect to issue more than \$10 million of

new debt in the issue year. The 1986 limits only affected debt acquired after August 1986. Banks have had little incentive to expand their holdings of municipal debt since then.<sup>1</sup>

For individuals, sweeping reductions in top bracket marginal tax rates, from 70% in 1980 to 28% in 1990, reduced the value of tax-exempt relative to taxable income for high-income taxpayers. The 1986 tax reform also included tax-exempt interest on some private-purpose tax-exempt bonds in the alternative minimum tax base, but the coincident expansion of the income tax base has reduced the number of minimum tax payers.

Table 1 shows the variation in the net holdings of tax-exempt debt by each type of investor since 1955. The table presents background data with five-year averages prior to 1975, as well as annual data for the last fifteen years. The table differs from previous estimates of tax-exempt debt ownership based on Federal Reserve Board data, for example in Poterba (1989), because it uses newly revised data for the period since 1975. The revisions have increased the estimate of tax-exempt debt held by the household sector by more than \$150 billion in the late 1980s.<sup>2</sup>

Table 1 shows that households held 30 percent of tax-exempt debt at the beginning of the 1980s, but their share more than doubled, to 69 percent, by 1990. An important institutional change during this period was the rise of tax-exempt money market funds and other mutual funds holding municipal bonds. These funds, held primarily by individuals, accounted for only 1.6 percent of municipal debt in 1980 but 18.3 percent by 1990.

The rise in household ownership of tax-exempt bonds coincided with declining commercial bank ownership. While bank holdings totalled 40 percent of the market in 1980, they declined to 28 percent in 1986, and to only 12% in

1990. The current tax environment makes it likely that households will become even more important holders of tax-exempt debt in the near future. Property and casualty insurance company holdings of tax-exempt bonds have declined slowly since the early 1980s. They currently hold 14 percent of tax-exempt debt, compared with 22 percent at the beginning of the decade.

The shift from bank to household ownership of municipal debt is consistent with the changes in the implied tax rates of "marginal investors," as reflected in tax-exempt yields during this period. The implicit tax rate is defined as  $\theta = (R_T - R_E)/R_T$ , where  $R_T$  and  $R_E$  are the taxable and tax-exempt nominal interest rate, respectively. In the short-term municipal market, the implied tax rate was very close to the statutory corporate tax rate until 1985. After 1986, however, the implied tax rate fell by more than the decline in the corporate tax rate, and since then it appears to track the top individual tax rate. Changes in the implicit tax rate on long-term bonds are more difficult to interpret, since they depend on current tax rules, expected future tax rules, and expected future interest rates.<sup>3</sup> Long-term implied tax rates fell in the years immediately following the 1986 tax reform but they increased again in the late 1980s.

## 2. Household Ownership of Municipal Debt

Of the three major holders of municipal bonds, the household sector probably exhibits the greatest intra-sector variation in marginal tax rates. Measuring the revenue cost of tax exemption therefore requires information not only on the holdings of municipal bonds across sectors, but also the distribution across different types of households. Prior research, for

example King and Leape (1984) and Mussa and Kormendi (1977), has established that most such debt is held by relatively high-wealth, high-income households. There has been little prior evidence, however, on the marginal tax rates of tax-exempt bond holders.

Most previous information on the cross-sectional distribution of tax-exempt bond holdings was derived from household wealth surveys or from estate tax return filings. Beginning in 1987, however, taxpayers were required to report their tax-exempt interest income as an information item on Form 1040. The tax return 1987 instructions explained:

... if you received any tax-exempt interest income (such as interest on certain state and municipal bonds), that interest must be reported on your return. Enter the total tax-exempt interest you received in 1987 on line 9. Also, report any exempt-interest dividends you received as a shareholder in a mutual fund or other regulated investment company. (Internal Revenue Service, Instructions for Form 1040, 1987, p. 10)

In 1988, when tax-exempt interest was reported on line 8b, the instructions were modified to include an additional comment:

NOTE: Interest earned on your IRA account is not tax-exempt interest for purposes of computing line 8b. Do not include this interest on line 8b. IRA interest is tax-deferred interest and is taxable when you receive IRA distributions. (Internal Revenue Service, Instructions for Form 1040, 1988, p.10)

One of the reasons we focus on the 1988 data is because of the more explicit directions on that year's tax form. Responses to this question should provide detailed the distribution of tax-exempt bond holdings across tax brackets.

In practice, there are two potential difficulties with these tax return data. First, since tax-exempt interest is only an information item, there are few incentives for households to report accurately.<sup>4</sup> Second, in 1987 some households may have been confused and reported IRA or other tax-deferred

interest as tax-exempt interest. This would bias the distribution of reported interest toward lower tax brackets. We suspect this problem is not substantial, however, since total tax-exempt interest reported in 1988 (\$34.6 billion) exceeded that in 1987 (\$30.5 billion). Our analysis nevertheless focuses on the 1988 tax return information.

Table 2 reports simple tabulations from five different sources of information on tax-exempt bond holdings: the 1962 and 1983 Surveys of Consumer Finances (SCF), and 1987, 1988, and (preliminary) 1989 federal individual income tax filings.<sup>5</sup> The high concentration of tax-exempt debt holdings is clear in each survey. In the 1982 wealth survey, for example, more than half of all tax-exempt debt was reported by households with expanded adjusted gross incomes (AGIs) of \$200,000 or more in 1989 dollars. Less than one third of the municipal debt was held by households with AGIs below \$100,000. The distribution from the 1962 wealth survey is even more unequal, with only 12% of tax-exempt debt held by households with 1989 incomes of less than \$200,000.

Tax return data on interest receipts are shown in the last three columns of Table 2. These data suggest a different distribution of bond holdings than the 1982 Survey of Consumer Finances, with more debt held at low income levels. For example, 49% of all tax-exempt interest accrues to taxpayers with expanded AGIs of less than \$100,000 in the 1987 tax return data, while this group held only 32% of the tax-exempt assets in 1982. Differences between these data sources are probably due to differences in their income measures, rather than to a shift in debt ownership patterns between 1982 and 1987. The Survey of Consumer Finances does not include all of the income items that are included in AGI, particularly some deductions



from federal taxable income such as passive losses. This may lead us to overstate adjusted gross income for some households.

One way to assess the quality of the data reported on tax returns is to compare total tax-exempt interest receipts with estimates based on household debt holdings.<sup>6</sup> In 1988, 3.54 million taxpayers reported total tax-exempt interest receipts of \$34.6 billion.<sup>7</sup> The Federal Reserve Board estimates that at the end of June, 1988, households held \$421.2 billion of tax-exempt bonds. In addition, the tax-exempt debt held by money market mutual funds totalled \$65.7 billion, and that by other mutual funds \$74.5 billion. Not all of these funds are held by households, but assuming that they are, total household holdings of municipal debt equal \$561 billion in mid-1988. Davie (1991) computes the average interest rate — 7.17% — paid by state and local governments on their outstanding debt in fiscal year 1988. Applying this interest rate to total household holdings would imply interest receipts of \$40.2 billion, or fifteen percent more than the amount actually reported on tax returns. This disparity may reflect some under-reporting by taxpayers, but the comparison suggests that tax return data are capturing a large fraction of household tax-exempt interest income.

### 3. Household Tax-Exempt Asset Ownership by Tax Bracket

Our data source for 1988 tax-exempt interest reports is the Treasury Individual Tax Model data file, a stratified random sample of 95,713 tax returns. This data set oversamples high-income tax returns and returns from small states, as well as returns with particular characteristics such as schedule C income. A typical tax return with an adjusted gross income of \$15,000, for example, has a 1 in 5000 chance of being included in the sample,

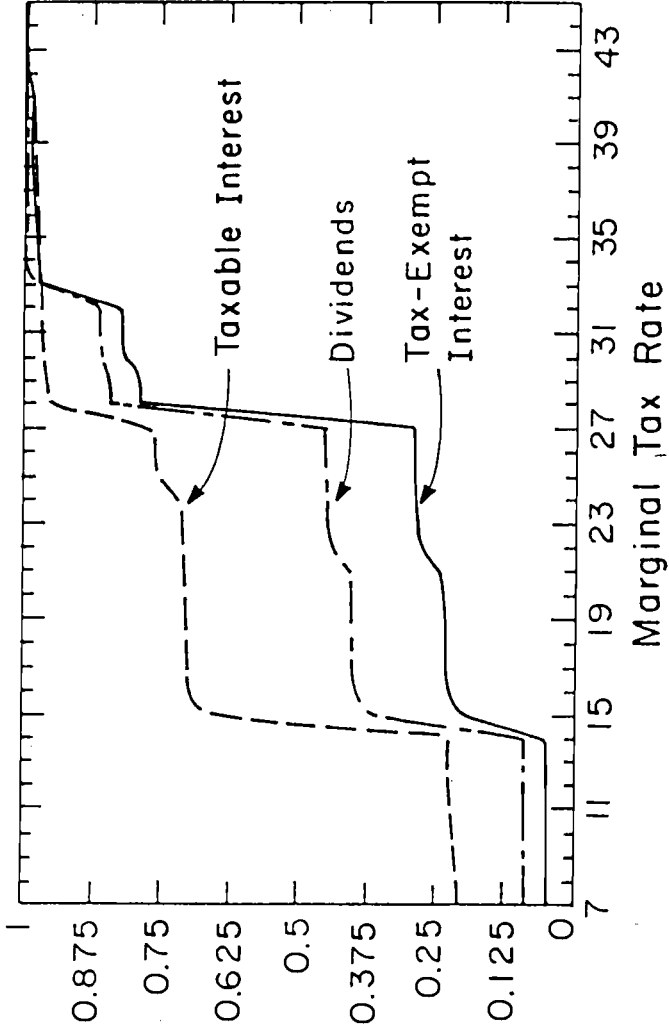
while a return with an AGI of \$200,000 has a 1 in 4 chance of inclusion. The data file includes all of the information on Form 1040 and much of the detail on other schedules. These data are processed using the NBER's TAXSIM program, which computes marginal tax rates for all taxpayers. This program also enables us to compute marginal tax rates for slight perturbations of various income items.

We compute the "first-dollar" marginal tax rate facing each taxpayer with tax-exempt interest by computing their change in tax payments if they received a small amount (the larger of \$100 or one percent of AGI) of additional taxable interest income. In 1988, the marginal tax rate on joint filers with taxable incomes of between \$29,750 and \$71,900, or more than \$171,090 was 28%. Those with taxable incomes between \$71,900 and \$171,090 faced a marginal tax rate of 33%, and those with taxable income below \$29,750, 15%. In practice, taxpayers could face a variety of other tax rates as a result of the alternative minimum tax, the tax on Social Security benefits, phase-out of the deductions for IRAs, and the floors on deductions for charitable contributions and other deductions. Since these provisions could overlap, we observe a wide range of different tax rates.<sup>8</sup>

Before analyzing the detailed pattern of tax-exempt interest receipts, we compare the size distribution of various capital income flows as reported on 1988 tax returns. Figure 1 shows the distribution across first-dollar marginal tax rates for taxable interest, dividends, and capital gains. Tax-exempt assets are distributed less equally than stocks, which are in turn less equally distributed than interest-bearing assets.

Table 3 presents two different measures of the distribution of tax-exempt interest by 1988 tax rate. The first column reports the percentage of tax-

Figure 1  
Distributions of Capital Income, 1988



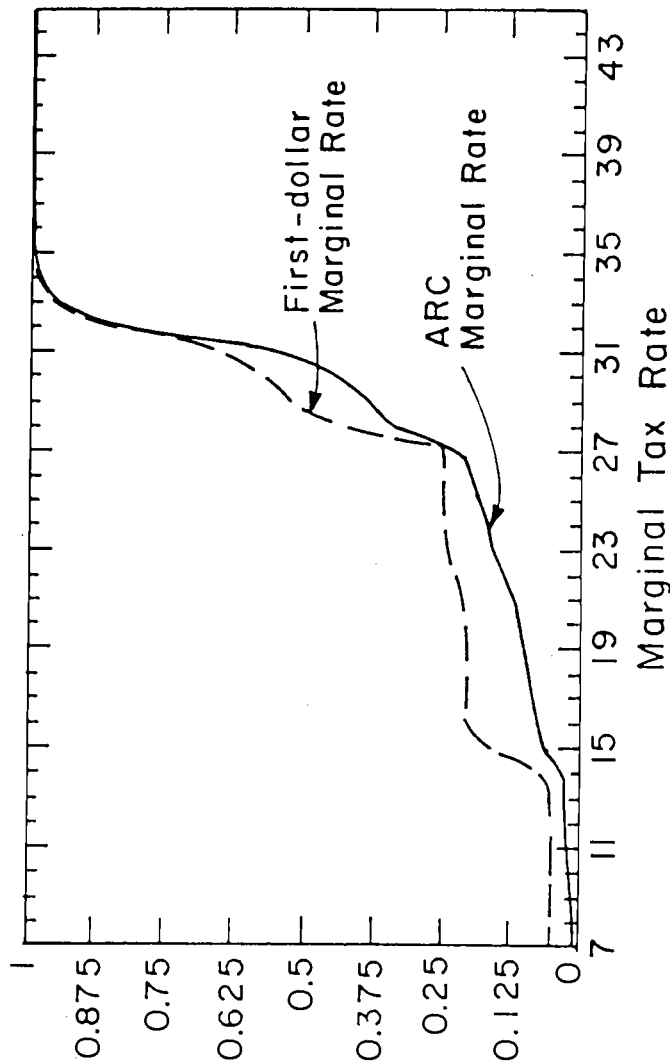
Source: 1988 Tax Model and TAXSIM

exempt interest reported at various first-dollar marginal tax rates. It shows that 23.4% of all tax-exempt interest was reported on tax returns with first-dollar marginal tax rates of 27% or less. Only 11.4% of tax-exempt interest accrued to taxpayers in the "bubble" marginal tax bracket, 33%. The dashed line in Figure 2 shows the distribution of tax-exempt interest receipts according to first-dollar marginal rates. The weighted average first-dollar marginal tax rate, weighting each return by tax-exempt interest, is 25.8%.

The data on tax-exempt interest receipts show non-trivial receipts by taxpayers with first-dollar marginal tax rates well below the top marginal rate. Nearly one fifth of all tax-exempt interest accrued to taxpayers with marginal rates below 20%.<sup>9</sup> Why do low tax bracket investors hold tax-exempt bonds? The answer probably involves sluggish portfolio adjustment and the illiquid market for many municipal securities. Some taxpayers may have purchased municipal bonds when their tax rates were high, and then failed to sell them when their rates declined. Other taxpayers may expect to be in high tax brackets in most years, and choose not to adjust their portfolio when they experience a transitory reduction in their marginal tax rate. Some households may have inherited tax-exempt bonds. Still other households may simply want to avoid paying taxes, even if it is not optimal for them to hold tax-exempt securities.<sup>10</sup>

First-dollar marginal tax rates may be a poor guide to the revenue loss from tax exemption if some households receive substantial amounts of tax-exempt interest, and if their marginal tax rates would be affected by converting this income into taxable interest income. To explore this issue, we compute "arc marginal tax rates." We gross up the tax-exempt yield to the equivalent taxable yield by multiplying by 1.29, and adding the total to each

Figure 2  
Tax - Exempt Interest by Tax Rate, 1988



Source: 1988 Tax Model and TAXSIM

tax return's taxable interest.<sup>11</sup> We then compute each taxpayer's total tax payments before and after this change. The arc marginal tax rate is then:

$$(1) \quad r_{\text{arc}} = \Delta \text{ Tax Payments} / \Delta \text{ Taxable Interest Receipts.}$$

The second column in Table 3 reports the distribution of tax-exempt interest receipts by  $r_{\text{arc}}$ . This distribution, which is also shown as the solid line in Figure 2, is significantly different from the distribution by first-dollar marginal rate. The most important difference is that much less tax exempt interest accrues to low tax rate investors. Many of the investors with low first-dollar marginal rates have large tax-exempt interest receipts, so they are "near" higher marginal rates. While the first-dollar marginal rate calculation suggested that 19.4% of tax-exempt interest was received by households with marginal rates of 20% or below, the analogous estimate using arc marginal tax rates is only 9.4%. Using the "arc" marginal tax rates also implies an increase in the weighted average marginal tax rate on tax-exempt interest from 25.8% to 27.6%.<sup>12</sup>

#### 4. Tax Exempt Interest Receipts by Tax Bracket in 1991

The Omnibus Budget Reconciliation Act of 1990 changes the tax treatment of high-income taxpayers. The first important change is a revised rate structure. Instead of the 15, 28, 33 (bubble), 28% bracket structure adopted in the 1986 Tax Reform Act, the recent legislation implements a three-bracket system with rates of 15, 28, and 31%. For joint filers, these rates apply at taxable incomes of \$0-34,000, \$34,000-82,150, and \$82,150+. The new 31% bracket could increase the marginal tax rate on many tax-exempt bond holders, while for those facing the bubble rate of 33% in earlier years, the reform might actually lower their marginal rate.

The second component of the recent tax change is a set of phase-outs for itemized deductions and personal exemptions. Taxpayers whose AGI exceeds \$100,000 experience a reduction of itemized deductions of  $.03*(AGI - 100,000)$ . This raises the 31% bracket to 31.93% ( $= 31*1.03$ ). In addition, personal exemptions are phased out for married joint filers with AGI above \$150,000. This raises the effective marginal tax rate by .5% per dependent. For a family of four with an adjusted gross income of \$200,000, the marginal tax rate in 1991 would therefore be 33.93%.

To analyze how the 1991 tax reform affected the distribution of tax-exempt interest across tax brackets, we "age" the 1988 tax return data file to 1991 by multiplying all income flows by 1.124, our estimate of the growth in nominal per capita personal income between the two years. We then compute each taxpayer's 1991 tax liability using the new rate schedule.

Table 4 presents the distribution of tax-exempt interest by both first-dollar and arc marginal tax rates in 1991. Although 39.9% of tax-exempt interest accrued to households with first-dollar marginal tax rates of 28% in 1988, the analogous percentage is 17.3% in 1991. More than one third of tax-exempt interest is now received by taxpayers with first dollar marginal rates of 32% or more; this is more than double the fraction in 1988. The weighted average first-dollar marginal tax rate rises from 25.8% to 26.8% between 1988 and 1991, and the weighted average arc marginal rate increases slightly more, from 27.6% to 28.7%. These results suggest that the 1990 law has raised the marginal tax rates of taxpayers receiving tax-exempt interest.

### 5. On Revenue Estimation

The efficiency of tax exemption hinges on the revenue cost of this tax expenditure relative to the benefits accruing to state and local borrowers. We estimate the revenue cost of tax-exemption for several values of  $\theta$ , the implied tax rate reflected in taxable and tax-exempt bond yields. We multiply tax-exempt interest by  $1/(1-\theta)$  and add this amount to each taxpayer's taxable interest income. We find the taxpayer's tax liability before and after this increment to interest, and sum this difference across taxpayers to find the total revenue cost of tax exemption.

The results suggest lost federal individual income tax revenues in 1988 of \$11.2 billion if the implied tax rate in the municipal bond market equals .20, and \$12.9 billion if  $\theta = .30$ . These values of  $\theta$  span the plausible range, since in 1988, the implied tax rate on short-term municipal bonds was 31.5%, while that on long-term bonds was 15.5%. The long-term implied tax rate is likely to understate actual tax differences as a result of the risk premium in the tax-exempt bonds relative to Treasury securities.

The Office of Management and Budget estimates the individual income tax revenue loss from excluding state and local debt at \$13.3 billion for fiscal 1988. This is slightly greater than our estimate.<sup>13</sup> Both our estimate and theirs assume that individual taxpayers would hold heavily-taxed debt, rather than lightly-taxed equity, if they did not hold tax exempt bonds. This assumption is unlikely to be satisfied in practice, however. As Auerbach and King (1983) and Gordon and Metcalf (1991) note, individual investors might substitute lightly-taxed equity for tax-exempt debt if the tax-exemption was eliminated, rather than holding their now-taxable state and local bonds. This



would imply a much smaller revenue increase than standard calculations suggest.<sup>14</sup>

Our estimate of the revenue cost of tax exemption depends on the arc marginal tax rate on tax-exempt interest, since we transform all of a taxpayer's tax-exempt interest into taxable interest. For some purposes, for example when evaluating the revenue effects of eliminating tax-exemption for only a small part of the existing stock of tax-exempt debt taxable, it could be appropriate to use the "first-dollar" average marginal tax rate in revenue estimation.

## 6. Conclusion

Our results provide the first direct evidence on the distribution of tax-exempt debt ownership across marginal tax brackets. They suggest that most tax-exempt debt is held by taxpayers with high marginal rates, but that there are non-trivial holdings by taxpayers with low marginal rates. The weighted average marginal tax rate on household holdings of tax-exempt debt in 1988 was 27.6%, compared with an (estimated) 28.7% in 1991.

One intriguing issue which our data cannot address concerns how households have adjusted their portfolios in response to recent tax reforms. Some households with high marginal tax rates at the beginning of the 1980s faced much lower marginal rates later in the decade. As additional waves of tax returns with information reports of tax-exempt debt holdings become available, it should be possible to study the dynamics of portfolio choice in much greater detail. This research may also answer the outstanding puzzle of why taxpayers in relatively low marginal tax brackets hold tax-exempt debt.

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Table 1  
Ownership of Tax-Exempt Bonds, 1955-1990

Year	Households		Commercial Banks	P&C Insur- ance Firms	Implicit Tax Rates	
	Direct	Funds			1-Year	20-Year
1955-59	42.3	0.0	27.4	9.9	41.1	20.6
1960-64	40.0	0.0	29.9	11.8	45.4	24.0
1965-69	34.6	0.0	42.4	11.6	37.6	21.8
1970-74	29.8	0.0	49.4	13.3	42.1	19.0
1975	30.3	0.0	47.2	14.9	40.8	21.7
1976	30.9	0.1	43.8	15.3	47.5	27.6
1977	29.6	0.6	42.6	17.2	50.7	32.2
1978	29.8	0.9	40.5	19.5	49.3	34.6
1979	30.4	1.1	39.7	20.8	49.8	35.5
1980	28.8	1.6	40.1	21.9	48.5	30.8
1981	30.0	2.2	39.2	21.6	46.3	22.9
1982	33.6	3.8	35.8	20.0	42.4	15.4
1983	37.5	5.8	32.3	17.9	44.5	20.6
1984	40.3	7.3	30.7	15.8	44.1	22.2
1985	41.7	9.8	29.5	13.5	39.7	19.7
1986	40.0	14.5	27.7	12.6	32.5	14.8
1987	42.7	16.6	21.9	13.9	33.4	19.0
1988	47.8	15.6	17.6	14.5	31.5	15.5
1989	51.1	16.2	14.6	14.0	29.0	17.9
1990	50.9	18.3	12.4	13.7	26.1	19.0

Source: Federal Reserve Board, Flow of Funds Accounts. Household sector includes tax-exempt debt held through mutual funds. Final two columns were calculated from Salomon Brothers, Analytical Record of Yields and Yield Spreads, and authors' calculations.

Table 2  
Municipal Bond Holdings (Cumulative Percentage) by Income Class, 1962-1988

Expanded AGI Category (\$1989, x1000)	Tax-Exempt Assets		Tax-Exempt Interest			
	1962	1982	1962	1987	1988	1989
0	0.0%	0.0%	0.0%	2.2%	2.3%	1.6%
0 - 10	0.0	1.3	0.0	4.2	3.3	3.5
10 - 20	5.2	5.6	4.6	6.9	9.7	6.6
20 - 30	5.2	10.5	4.6	12.0	14.2	11.9
30 - 50	5.2	17.3	4.6	24.4	27.5	26.6
50 - 75	7.3	25.2	6.7	36.6	40.1	38.4
75 - 100	7.3	31.5	6.9	49.0	48.7	48.2
100 - 200	12.0	45.8	21.1	65.3	64.0	63.9
200 +	100.0	100.0	100.0	100.0	100.0	100.0

Source: Authors' tabulations from 1962 Survey of Consumer Finances and 1987 and 1988 Individual Tax Models. Data for 1989 were provided by David Joulefaian of the Office of Tax Analysis. Expanded AGI is defined as adjusted gross income plus any capital gains deductions plus IRA and Keogh contributions.

**Table 3**  
**Distribution of Tax-Exempt Interest by Tax Rate, 1988**

Tax Rate	First-Dollar Marginal Rate	Arc Marginal Rate
< 15	5.2%	2.7%
15	9.1	2.9
16	4.2	1.7
17	0.0	0.2
18	0.1	1.0
19	0.0	0.2
20	0.8	0.7
21	0.4	1.8
22	2.5	2.1
23	0.2	1.5
24	0.6	0.8
25	0.2	1.0
26	0.1	2.1
27	0.0	1.4
28	39.9	35.5
29	13.6	13.7
30	2.4	4.0
31	1.9	6.2
32	0.2	4.5
33	11.4	11.7
34	5.7	2.9
35	0.5	0.8
36	0.4	0.2
> 36	0.6	0.4
Weighted Average Tax Rate	25.8%	27.6%

Source: Authors' tabulations using 1988 Individual Tax Model data and NBER TAXSIM program. All tax returns with marginal rates between  $x - .50\%$  and  $x + .50\%$  are allocated to integer tax rate  $x$ . First dollar and arc marginal tax rates are defined in the text.

Table 4  
 Projected Distribution of Tax Exempt Interest by Tax Rate, 1991

Tax Rate	First-Dollar Marginal Tax Rate	"Arc" Marginal Tax Rate
< 15	5.2%	2.7%
15	9.4	3.7
16	4.2	0.8
16 - 27	4.7	12.7
28	17.3	12.3
29	9.0	5.1
30	3.3	4.8
31	6.8	11.1
32	22.9	29.6
33	12.5	12.6
34	2.5	2.4
35	1.6	1.6
35 +	0.6	0.2
Weighted Average Tax Rate	26.8%	28.7%

Source: Author's estimates based on "aging" of 1988 Individual Tax Model tax returns to 1991. All income items on the 1988 returns were multiplied by 1.124, our estimate of the growth in nominal personal income per capita between 1988 and 1991. The resulting psuedo-returns were processed using a stylized version of the 1991 federal income tax code.

#### ENDNOTES

1. The tax changes affecting non-life insurance companies are less significant than those for banks. The reduction in the corporate tax rate from 46 to 34 percent reduced the marginal value of tax-exempt interest, but the 1986 Tax Reform Act also restricted other means by which these firms had traditionally sheltered their earnings from taxation.
2. We are grateful to Judy Ziobro for providing us with data on the upcoming revision in the estimate of tax-exempt debt holdings. The increase in the estimate of household sector holdings is based on information from the Depository Trust Corporation that raises the estimate of total tax-exempt debt outstanding.
3. Long-term municipal bonds typically have different call provisions than long-term Treasury bonds. The call premium in municipal yields, which will lead to errors in the implied tax rate, varies depending on expectations and expected variance of future interest rates. Poterba (1986) explores whether implied tax rates can be related in any simple way to investors' tax rates.
4. For some taxpayers with Social Security income, who were subject to the rules phasing one half of Social Security income into AGI, tax exempt interest income could affect tax liability. For these taxpayers, misreporting could also trigger penalties.
5. A third source of data on municipal bond ownership is the 1978 Stanford Research Institute survey of wealth-holdings. King and Leape (1984) analyze this data set, and report findings on the concentration of municipal bond holdings similar to those from the Survey of Consumer Finances.
6. This is a weak test, since over-reporting of IRA income could partly offset under-reporting of actual tax-exempt income. The aggregate value of tax-exempt interest received might therefore seem consistent with the aggregate stock, even if the distribution was quite erroneous.
7. This estimate is based on the IRS' preliminary Statistics of Income tabulations in Strudler and Ring (1990). The estimate of tax-exempt interest from the 1988 Individual Tax Model is \$32.4 billion.
8. We have not included state and local income tax rates in our analysis, because the Individual Tax Model data do not identify the state of residence for taxpayers with incomes above \$200,000.
9. Taxpayers could fall in this range if they faced the statutory marginal rate of 28%, or if they faced the AMT, or in other ways.
10. In future work we hope to analyze panel data on tax returns to shed some light on the relative merits of these different explanations.
11. The 1.29 factor is the difference (in 1987) between the average of the yield on BAA and AAA corporate bonds and the average yield on long-term municipal bonds, divided by the municipal yield.

12. To address the possibility that reported tax-exempt interest erroneously includes income from IRA or Keogh accounts, even in 1988, we also tabulated the distribution of marginal tax rates on tax-exempt interest receipts of more than \$2500. This interest floor is designed to exclude the tax exempt interest which is most likely to be the result of spurious reporting. The resulting distribution looks similar to that for the arc marginal tax rates.

13. This is the sum of the revenue loss estimates for IDBs for certain energy facilities, state and local housing bonds, student loan bonds, nonprofit educational and health facility bonds, and veterans housing bonds, as well as public purpose debt. These estimates are drawn from Office of Management and Budget (1988).

14. Toder and Neubig (1985) provide a comprehensive discussion of the difficulties of measuring the revenue cost of tax-exempt debt.