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# Are individual investors tax savvy? Evidence from retail and discount brokerage accounts

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**Abstract**

Using brokerage account data, we analyze the tax awareness of individual investors. We find strong evidence that taxes matter: investors prefer to locate bonds and mutual funds in retirement accounts and, in December, harvest stock losses in their taxable accounts. However, investors also trade actively in their taxable accounts, realize gains more frequently than losses, and locate a material portion of their bonds in taxable accounts. Though taxes leave clear footprints in the data we analyze, many investors could improve their after-tax performance by fully capitalizing on the tax avoidance strategies available to equities, while optimally locating their assets.


*Keywords:* Asset location; Asset allocation; Portfolio choice; Taxation

*JEL classification:* G11; H2; H31

## 1. Introduction

Saving for retirement is a challenge. Investors must first choose how to allocate their assets—to stocks or bonds—and second, where to locate those investments—in a taxable account or a tax-deferred account. Bergstresser and Poterba (2001)

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document that more than seven million U.S. households hold over $50,000 in a taxable account, while holding at least an equal amount in a tax-deferred account. Several recent papers argue that the location decision materially affects investor welfare (Dammon et al., 2002; Huang, 2001; Shoven and Sialm, forthcoming). Generally, these papers argue that investors should first locate taxable bonds to tax-deferred accounts (TDAs). While it is difficult to avoid paying tax on the ordinary income generated by bonds, investors can defer the realization of capital gains on equity. Furthermore, capital gains are taxed at a lower rate than ordinary income.

In this paper, we determine the extent to which individual investors consider taxes when making asset location decisions. While our empirical analysis cannot test the normative validity of theoretical models, we can test their descriptive validity. We do so by analyzing the location decisions of households with accounts at a discount broker as of 1994 (discount households) and households with accounts at a full-service retail broker as of 1998 (retail households). Though we do not have complete portfolio holdings for the households we analyze, these data are appropriate for analyzing location decisions; location decisions—unlike asset allocation decisions—should be locally optimal.

The gains from optimal location are small if investors fail to fully capitalize on the tax-deferral strategies available on equity. Thus, we begin by analyzing equity trading in taxable accounts and TDAs. Many investors trade actively in their taxable accounts. The average household has a holding period of less than two years for individual stocks and less than four years for equity mutual funds. Turnover in taxable accounts generally exceeds turnover in TDAs. In taxable accounts, turnover generally reduces after-tax returns. While optimal tax management may require some trading of equities in taxable accounts (i.e., the harvesting of losses to shelter taxable income), investors can improve the after-tax returns on equity by deferring the realization of capital gains. Unfortunately, both discount and retail households realize gains at a faster rate than losses. Only in December do we observe clear evidence of tax-loss selling in taxable accounts. From a tax perspective, this active realization of gains is arguably the biggest mistake that many investors make.

We next consider the location of municipal bonds and taxable bonds. Tax-exempt municipal bonds are easy and investors get them right; virtually all municipal bonds are located in taxable accounts. Though both retail and discount households display an appropriate preference for locating bonds in TDAs, we document that roughly one-third of the average household's taxable bond holdings could replace equity in its TDA.

Finally, we consider the location of equity mutual funds and individual stocks. Investors can optimize the tax avoidance strategies available on equities by locating individual stocks in their taxable accounts, while locating mutual funds, which distribute a relatively high proportion of their capital gain return, in TDAs (assuming that there is space to do so after first locating taxable bonds in their

TDAs). For the retail and discount households that we analyze, more than two-thirds of their equity investments are held in individual stocks. Among both groups, there is a strong preference for holding equity mutual funds in TDAs (and individual stocks in taxable accounts). Among households with a material allocation to both individual stocks and equity mutual funds, the ratio of individual stocks to equity mutual funds in taxable accounts is roughly two to one, while the ratio is almost reversed in TDAs. Additional analyses cast some doubt on whether the preference for locating equity mutual funds in TDAs is primarily driven by tax considerations.

The plan of the paper is as follows. We describe the two datasets in Section 2. The asset allocation decisions of these households are presented in Section 3. We analyze the trading in taxable and retirement accounts in Section 4. The location of municipal bonds, taxable bonds, mutual funds, and individual stocks is discussed in Section 5. We analyze the distribution rates of individual stocks and equity mutual funds held in taxable and retirement accounts in Section 6. We assess the damage of trading and suboptimal location in Section 7 and make concluding remarks in Section 8.

## 2. Data

In this study, we analyze two snapshots of portfolio holdings: one from the position statements of a discount broker in 1994, the second from position statements of a full-service (retail) broker in 1998. The disadvantage of these data (as opposed to data from, for example, the Survey of Consumer Finance) is that we do not have the complete asset holdings of each household. Some households may hold substantial assets in other accounts. This will cause us to underestimate the total potential gains to households from optimal location. Location decisions—unlike asset allocation decisions—should be locally optimal. Thus, mislocations that we document cannot be corrected in accounts that we do not observe; they can only be exacerbated by additional mislocations. For example, we document that many households simultaneously hold bonds in taxable accounts and equity in tax-deferred accounts, but lack capacity to locate all of their bonds in their tax-deferred account. It is possible that these households hold equity in tax-deferred accounts that we do not observe (e.g., employer-sponsored retirement plans); thus, we unambiguously underestimate the potential gains from optimal location.

The tremendous advantage of these data is the detailed information on positions held, which allows us to analyze many issues that are simply impossible to address with existing survey data. For example, we are able to answer the following questions: Do investors locate high-yielding equity (mutual funds or stocks) in tax-deferred environments? Do investors trade less actively in taxable accounts, thus optimizing the deferral of capital gains on equity?

The first data set contains information from a large discount brokerage firm on the investments of households for the six years ending in December 1996. We arbitrarily chose February 1994 to calculate the asset allocation and location decisions for each household. Based on product codes provided by the discount broker, we categorize positions as equity (e.g., investment in individual common stocks or equity mutual funds), taxable bonds (e.g., bond mutual funds, government bonds, and corporate bonds), municipals bonds, and other (generally positions with no product codes).[1] We delete households with a portfolio value less than $10,000. We also exclude households with greater than a 10 percent allocation to assets other than stocks (i.e., individual stocks or equity mutual funds), taxable bonds, or municipals. These other assets include, for example, positions in options, limited partnerships, or unspecified assets. We then calculate allocations based on assets that we are able to categorize, leaving us with a final sample of 47,973 discount households.

The second data set contains information from a large retail brokerage firm on the investments of households for the 18 months ending in June 1999. Based on product codes provided by the retail broker, we categorize positions as equity, taxable bonds, municipal bonds, and other as of November 1998.[2] As was done for the discount households, we delete households with portfolio values less than $10,000 and greater than a 10 percent allocation to assets other than stocks, taxable bonds, or municipals, leaving us with a final sample of 418,332 retail households.

Of course, to analyze location decisions, a household must have both a taxable and tax-deferred account (TDA). Thus, in many subsequent analyses, we require that a household have between 10 and 90 percent of its assets invested in a TDA. Ten percent (41,281) of retail households and 24 percent (11,480) of discount households meet this criterion. Fifty-four percent of retail households and 49 percent of discount households hold only taxable accounts. Though many of these households face a material location decision, since they likely have TDAs elsewhere (e.g., through an employer), we are unable to observe their location decisions. Thirty-six percent of retail households and 27 percent of discount households hold only TDAs.

[1] We exclude cash and money-market mutual funds from our analysis, since these investments are often used in transaction accounts. Our results are qualitatively similar when we include these investments in our analysis and categorize them as taxable bonds.

[2] One of the product codes for the retail households is ‘mutual funds’ and does not distinguish between equity and bond mutual funds. For this category, we matched the individual holdings of mutual funds to the Center for Research in Security Prices (CRSP) mutual fund database and used the Investment Company Data, Inc., (ICDI) objectives to categorize holdings as equity, taxable bond, municipal or other. For balanced and total return funds, which are typically split between stock and bonds, we further used the percentage allocations from CRSP to categorize holdings.

## 3. Asset allocation

In Table 1, we present descriptive information on the allocation of the discount households (Panel A) and retail households (Panel B). In this analysis, we include all households, regardless of whether they have both taxable and tax-deferred accounts. (The results are similar when we restrict our analysis to households with both account types.) We consider three partitions of each data set: (1) households with a minimum balance of $10,000, (2) households with a minimum balance of $100,000, and (3) households with a minimum balance of $10,000 and less than a 99 percent allocation to stocks. In the remainder of the paper, for expositional ease we refer to households with a minimum balance of $10,000 as discount or retail households, while we refer to households with a minimum balance of $100,000 as wealthy discount or wealthy retail households.

Retail households hold more assets than discount households and a larger proportion of assets are allocated to taxable bonds and municipals. Among

Table 1
Mean asset allocation

| | Households with >$10,000 | Households with >$100,000 | Households with <99% stock |
|---|---|---|---|
| Panel A: Discount households | | | |
| No. of households | 47,973 | 9,177 | 11,041 |
| Mean portfolio value | $92,129 | $336,568 | $158,919 |
| % Assets in taxable accounts | 61.7 | 73.5 | 56.9 |
| % of Households with stock allocation >99% | 77.0 | 58.5 | n.a. |
| Mean asset allocation: | | | |
| % Stock | 90.1 | 86.3 | 56.9 |
| % Taxable bonds | 8.4 | 10.7 | 36.6 |
| % Municipals | 1.5 | 3.0 | 6.5 |
| | | | |
| Panel B: Retail households | | | |
| No. of households | 418,332 | 128,071 | 189,575 |
| Mean portfolio value | $173,182 | $482,796 | $232,969 |
| % Assets in taxable accounts | 59.6 | 63.4 | 59.7 |
| % of Households with stock allocation >99% | 54.7 | 41.0 | n.a. |
| Mean asset allocation: | | | |
| % Stock | 74.1 | 72.4 | 42.9 |
| % Taxable bonds | 16.8 | 15.4 | 37.0 |
| % Municipals | 9.1 | 12.2 | 20.0 |

Discount households (Panel A) hold accounts at a discount broker and asset allocations for these households are based on month-end position statements from January 1994. Holdings are categorized based on 40 product codes provided to us by the discount broker. Retail households (Panel B) hold accounts at a full-service broker and asset allocations for these households are based on month-end account summaries and positions from November 1998. Holdings are categorized based on 11 product codes provided to us by the retail broker.

discount households, 77 percent hold virtually all stock portfolios, while 55 percent of retail households hold virtually all stock portfolios. These differences are smaller, but still exist, between the wealthy discount and wealthy retail households. When we eliminate households with virtually all stock allocations, the average discount household has a slightly greater allocation to equity (57 percent) than the average retail household (43 percent).

Both retail and discount households hold the majority of their equity allocation in individual stocks rather than equity mutual funds. On average, discount households hold 75 percent of their stock allocation in individual stocks, while retail households hold 69 percent in individual stocks.

## 4. Turnover

Investors can improve their after-tax returns on equity investments by deferring the realization of capital gains, while harvesting losses on equity investments to shelter taxable income. Results presented in Huang (2001) and Dammon et al. (2002) assume investors take full advantage of the tax-deferral features available for equity. If they fail to do so, the gains from optimal location are substantially eroded.

We begin by analyzing the turnover rates of stocks and mutual funds in taxable accounts and TDAs. Consider the sales turnover rate for individual stocks held in taxable accounts. For each household, we calculate sales turnover in a household's taxable account as the sum of stock sales divided by the sum of month-end stock positions in the household's taxable account. Buy turnover rates are calculated analogously. We also calculate turnover rates in TDAs. Turnover rates are based on the six years of trade data ending in 1996 for discount households and 18 months of trade data ending in June 1999 for retail households.[3]

The results of this analysis are presented in Table 2. In panel A, we present results for all households—regardless of whether they hold both taxable accounts and TDAs. In panel B, we restrict the analysis to households that have both taxable accounts and TDAs; the results are qualitatively similar.

Mean stock turnover rates for discount households range from 72 to 82 percent annually in taxable accounts and 54 to 65 percent annually in tax-deferred accounts. Mean stock turnover rates for retail households range from 67 to 71 percent annually in taxable accounts and 55 to 71 percent annually in tax-deferred accounts. Though average turnover rates are high, roughly 40 percent of retail households did not buy or sell equity mutual funds or individual stocks during our 18 month (retail) sample period, while 20 percent of discount households did not buy or sell equity mutual funds or individual stocks during the 71 month

[3]To reduce the influence of outliers in the calculation of means, we winsorize turnover rates at 100 percent per month.

Table 2
Annual mean [median] percentage stock and equity mutual fund turnover in taxable and tax-deferred accounts

| | Discount households | | Retail households | |
|---|---|---|---|---|
| | Taxable | TDA | Taxable | TDA |
| Panel A: All households | | | | |
| Stock buy turnover | 72.1%/yr | 63.0%/yr | 70.9%/yr | 64.2%/yr |
| Stock sell turnover | 78.1%/yr | 54.0%/yr | 66.6%/yr | 49.5%/yr |
| No. of hses | 34,360 | 20,767 | 199,447 | 131,137 |
| Fund buy turnover | 70.2%/yr | 53.0%/yr | 53.6%/yr | 45.0%/yr |
| Fund sell turnover | 52.7%/yr | 34.9%/yr | 26.1%/yr | 22.6%/yr |
| No. of hses | 15,926 | 16,240 | 76,254 | 100,328 |
| Panel B: Households with both taxable and tax-deferred accounts | | | | |
| Stock buy turnover | 75.5%/yr | 65.1%/yr | 70.5%/yr | 70.8%/yr |
| Stock sell turnover | 82.1%/yr | 55.4%/yr | 67.6%/yr | 55.3%/yr |
| No. of hses | 10,065 | 8,869 | 33,592 | 28,591 |
| Fund buy turnover | 69.1%/yr | 52.0%/yr | 52.3%/yr | 48.2%/yr |
| Fund sell turnover | 54.1%/yr | 35.4%/yr | 33.0%/yr | 26.2%/yr |
| No. of hses | 5,630 | 7,067 | 12,262 | 19,493 |

Buy turnover is calculated as the sum of purchases divided by the sum of positions. Sell turnover is calculated analogously. Turnover for discount households is calculated from January 1991 through November 1996, while turnover for retail households is calculated from January 1998 through June 1999. Median values are in brackets.

(discount) sample period. (During a typical 18-month trading period, roughly 40 percent of discount households do not trade.)

Of particular interest is sales turnover, since it is sales that generate the realization of capital gains. For both discount and retail households, stock sales turnover is higher in taxable rather than tax-deferred accounts. A similar pattern emerges for fund turnover, though turnover rates for equity mutual funds are generally lower than turnover rates for individual stocks. These results suggest that many investors do not fully capitalize on the tax deferral feature available on equity.

It is possible that the higher sales turnover rates in taxable accounts are a result of tax-loss sales or liquidity needs. While we cannot completely rule out liquidity needs as an explanation of the differences in stock turnover, we can address whether tax-loss sales are a likely explanation. To do so, we follow the methodology outlined in Odean (1998).

Specifically, by going through each household's trading records in chronological order, we construct a portfolio of individual stocks for which the purchase date and price are known. For each day that a sale took place in a portfolio of two or more stocks, we compare the selling price for each stock sold to its average purchase price to determine whether that stock was sold for a gain or a loss. Each stock that was in that portfolio at the beginning of that day but was not sold is considered to

be a paper (unrealized) gain or loss. We determine whether it was a paper gain or loss by comparing its closing price for that day (as obtained from CRSP) with its average purchase price. On days when no sales took place in an account, no gains or losses, realized or paper, are counted. We sum realized gains, paper gains, realized losses, and paper losses for each account and across accounts. Then, we calculate two ratios:

$$\text{Proportion of gains realized (PGR)} = \frac{\text{Realized gains}}{\text{Realized gains} + \text{Paper gains}},$$

$$\text{Proportion of losses realized (PLR)} = \frac{\text{Realized losses}}{\text{Realized losses} + \text{Paper losses}}.$$

A large difference in the proportion of gains realized (PGR) and the proportion of losses realized (PLR) indicates that investors are more willing to realize either gains or losses.

In Fig. 1, we graph the ratio of PGR to PLR by month for taxable accounts and TDAs. Panel A presents results for discount households, Panel B for retail households. The patterns are quite similar. Both discount and retail households prefer to sell winners, rather than losers, relative to their opportunity to sell each.[4] These results confirm those in Odean (1998), who argues that prospect theory can explain investors' preference for selling winners. (See Odean, 1998; Shefrin and Statman, 1985 for a discussion of the disposition effect.) There is clear evidence of some tax-loss sales. For taxable accounts only, the proportion of losses realized in December exceeds the proportion of gains realized. However, generally investors prefer to sell winners rather than losers in both their taxable and tax-deferred accounts. Thus, most of the trading in taxable accounts is not motivated by a desire to harvest losses.

In summary, our primary point is simple. Many investors trade too frequently to fully capitalize on the tax-deferral feature available on equity. Trading hurts the pre-tax performance of individual investors (see Odean, 1999; Barber and Odean, 2000, 2001). Since investors are predominantly realizing gains, trading also imparts a tax penalty when done in a taxable account. Though investors can improve their after-tax portfolio performance by optimally locating their assets, the gains documented by Huang (2001) and Dammon et al. (2002) assume investors fully capitalize on the tax-deferral feature available on equity. Many investors do not do so.

[4]We can reject the null hypothesis that PGR and PLR are equal at less than the 1 percent significance level. The details of these statistical tests are outlined in Odean (1998).

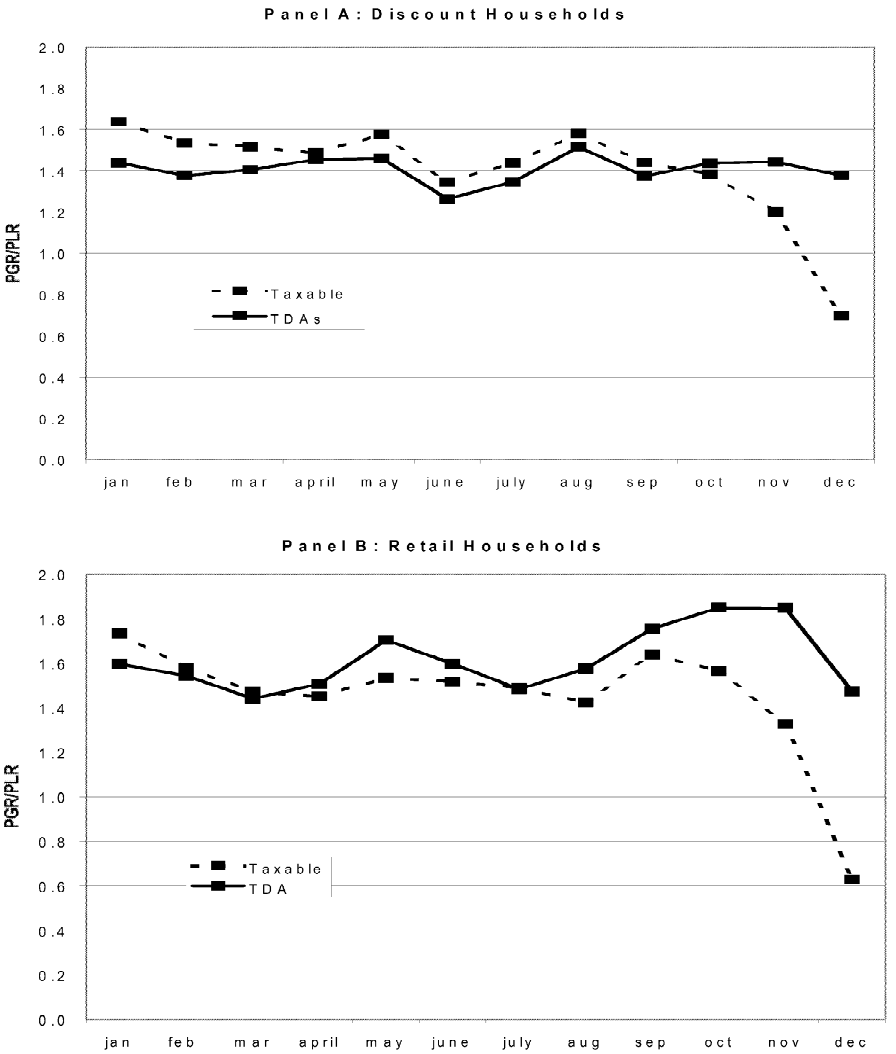


Fig. 1. Ratio of the proportion of gains realized (PGR) to the proportion of losses realized (PLR) for individual stock trades by month. The proportion of gains realized (PGR) and the proportion of losses realized (PLR) are calculated separately for taxable and tax-deferred accounts. The proportion of gains realized (PGR) is the number of realized gains divided by the number of realized gains plus the number of paper (unrealized) gains, and PLR is the number of realized losses divided by the number of realized losses plus the number of paper (unrealized) losses. Realized gains, paper gains, losses, and paper losses are aggregated over time (1991 to 1996 for discount households and 1998 to 1999 for retail households) and across accounts.

## 5. Asset location

In this section, we present descriptive information on the location of municipal bonds, taxable bonds, mutual funds, and individual stocks. We restrict our analysis to households with between 10 and 90 percent of their assets invested in a TDA.

### *5.1. Municipal bonds*

Investors should hold municipal bonds, which are exempt from federal and often state taxation, in their taxable account. Shoven and Sialm (forthcoming) calculate optimal locations when investors have a choice between investing in stocks, taxable bonds, and municipals. In addition to always locating municipal bonds in one's taxable account, the optimal locations rarely leave an investor simultaneously locating taxable bonds and municipal bonds in a taxable account.[5]

To investigate how investors locate their municipal bonds, we analyze households with a minimum allocation of 10 percent to municipal bonds. The results of this analysis are presented in Table 3. Among those with accounts at the discount broker, municipals are not widely held; only 4 percent of discount households hold municipals. Those with accounts at the retail broker are more likely to hold municipals, but still less than one in six retail households do so. For both the discount and retail households, the ownership of municipals is more prevalent among wealthy households, but certainly not pervasive. Thus, consistent with prior evidence (Feenberg and Poterba, 1991), the wealthy are more likely to hold municipals. (Based on logistic regressions, we estimate the probability of holding municipal bonds nearly triples if one holds a portfolio value in excess of $250,000.)

Consistent with the common sense notion that investors should locate municipals in taxable accounts, virtually all (greater than 98 percent) of the retail and discount households do so. However, many investors who hold municipals also hold taxable bonds in their taxable accounts.[6] Thirty percent of discount households and 25 percent of the retail households that hold municipal bonds also hold taxable bonds in their taxable accounts. The proportion of households that simultaneously hold taxable and municipal bonds in their taxable accounts is greater for the wealthy discount and retail households.

Many households that simultaneously hold municipals and taxable bonds in their taxable accounts hold substantial amounts of both. For example among

[5] At very high levels of risk aversion, the optimal location has some taxable bonds in a taxable account because the after-tax returns of taxable bonds are assumed to be less variable than the returns of municipal bonds.

[6] We require a minimum holding of $1,000 in taxable bonds for a household to be categorized as simultaneously holding taxable bonds and municipals.

Table 3
Asset allocation and location for municipal bond holders

| | Discount households with | | | | Retail households with | | | |
|---|---|---|---|---|---|---|---|---|
| | >$10,000 | | >$100,000 | | >$10,000 | | >$100,000 | |
| No. of Households with municipals >10% | 428 | | 216 | | 6,247 | | 4,391 | |
| % of Households with municipals >10% | 3.7 | | 7.1 | | 15.1 | | 20.8 | |
| Mean portfolio value | $236,710 | | $418,270 | | $463,376 | | $635,312 | |
| % Assets in taxable account | 62.6 | | 65.7 | | 60.8 | | 62.8 | |
| % of Households with municipals >10% that: | | | | | | | | |
| Hold municipals in taxable account | 98.6 | | 98.1 | | 99.4 | | 99.3 | |
| Hold taxable bonds | 60.0 | | 73.6 | | 64.2 | | 70.1 | |
| Hold taxable bonds in taxable account | 29.7 | | 42.1 | | 24.8 | | 29.8 | |
| % Municipals to total bonds in taxable account for households with both | 63.0 | | 63.7 | | 68.7 | | 70.6 | |
| Mean asset allocation: | Tax | TDA | Tax | TDA | Tax | TDA | Tax | TDA |
| % Stock | 38.2 | 73.9 | 41.0 | 70.6 | 32.8 | 69.2 | 36.4 | 68.2 |
| % Taxable bonds | 7.8 | 25.7 | 10.5 | 29.2 | 5.3 | 30.6 | 5.8 | 31.6 |
| % Municipals | 54.0 | 0.4 | 48.5 | 0.2 | 61.9 | 0.2 | 57.8 | 0.2 |

The sample consists of households with a minimum allocation of 10 percent to municipal bonds and taxable account value between 10 and 90 percent of total portfolio value.

discount households that simultaneously hold municipals and taxable bonds in their taxable account, municipals represent 63 percent of their total bond allocation in their taxable accounts; for roughly half of these households, this proportion falls between 50 and 80 percent. These ratios are substantively similar for the other partitions that we analyze, though the retail households tend to have a higher proportion municipals.

In summary, households appear to optimally locate their municipal bonds in their taxable account, though many simultaneously hold taxable bonds in their taxable accounts. There are two plausible financial explanations for the latter finding. First, investors might simultaneously hold taxable bonds and municipals for diversification benefits.[7] Second, the implicit tax rates of municipal bonds depends on the maturity of the bond and are generally higher for short-term

[7]Making reasonable assumptions about the volatility and correlation of the returns on taxable and municipal bonds, and levels of risk aversion, Shoven and Sialm (forthcoming) find no optimally located portfolios that simultaneously hold municipals and taxable bonds in an investor's taxable account. However, they do not explicitly consider municipals that are exempt from *both* state and federal taxation. Investors might reasonably hold state municipal bonds, particularly in states with high tax rates, while holding taxable bonds to diversify the idiosyncratic state-specific risk.

municipals (Green, 1993). Thus, investors who wish to hold bonds of different maturities might hold a mix of taxable and municipal bonds.

### *5.2. Taxable bonds*

#### *5.2.1. Location evidence*

In the absence of short-term liquidity needs, Huang (2001) and Dammon et al. (2002) document that investors should optimally locate their taxable bonds in their tax-deferred accounts. Though Shoven and Sialm (forthcoming) reach a qualitatively similar conclusion, they document that investors might hold equity mutual funds that distribute high levels of capital gains and dividends in their TDA, while holding municipal bonds in their taxable account.

To investigate how investors locate their taxable bonds, we analyze the allocation and location decisions of households with a minimum allocation of 10 percent to taxable bonds and 10 percent to stock. The results of this analysis are presented in Table 4. Among discount households facing a location decision, 20 percent have at least a 10 percent taxable bond allocation and a 10 percent equity allocation, while 29 percent of retail households meet these minimums.

The majority of households that own taxable bonds hold at least a proportion of these bonds in their taxable account. Among discount households, 40 percent hold their taxable bonds solely in their TDAs, while 34 percent hold taxable bonds in both accounts. These proportions are slightly higher for retail households.

To determine if there is a preference for holding taxable bonds in TDAs, we first calculate the proportion of the household's taxable bonds that are placed in the taxable account and subtract from this the proportion of the household's total assets that are placed in the taxable account. If investors have a preference for holding taxable bonds in TDAs, the difference between these two proportions will be negative. For both retail and discount households, the difference between these two ratios is reliably negative—indicating a preference for holding taxable bonds in TDAs.

These results are supported by the mean asset allocations in taxable accounts and TDAs (presented in the last three rows of Table 4). The average discount household allocates 37 percent of its TDA and 28 percent of its taxable account to taxable bonds; these allocations are roughly similar for the retail households.

It is possible that households allocate taxable bonds to their taxable account because there is simply no room left in their tax-deferred account. To investigate this possibility, we calculate the dollar value of taxable bonds that can replace stock in each household's TDA. The average discount household can move $14,872 (or 33 percent of their total taxable bonds holding) to its TDA, though this average includes households with no taxable bonds in their taxable account. For discount households with taxable bonds in their taxable account, the average household can move $24,816 (or 55 percent of their total taxable bond holding). For the wealthy discount households, the dollar values are higher, though the

Table 4
Asset allocation and location for taxable bond holders

| | Discount households with | | Retail households with | |
|---|---|---|---|---|
| | >$10,000 | >$100,000 | >$10,000 | >$100,000 |
| No. of Households with taxable bonds >10% | 2,325 | 872 | 11,924 | 7,044 |
| % of Households with taxable bonds >10% | 20.2 | 28.8 | 28.9 | 33.4 |
| Mean portfolio value | $151,651 | $327,964 | $289,310 | $453,409 |
| % Assets in taxable account | 49.8 | 54.9 | 50.1 | 51.4 |
| % of Households with taxable bonds that hold taxable bonds: | | | | |
| Solely in taxable account | 26.0 | 22.2 | 18.2 | 15.0 |
| Solely in tax-deferred account (TDA) | 40.1 | 24.9 | 44.5 | 39.4 |
| In both accounts | 33.9 | 52.9 | 37.2 | 45.6 |
| Mean value of taxable bonds in taxable account that can be moved to TDA (replacing equity) | | | | |
| All households | $14,872 | $32,338 | $18,275 | $27,835 |
| Households with taxable bonds in taxable account | $24,816 | $43,047 | $32,947 | $45,894 |
| [Taxable bonds in taxable account/total taxable bonds] less [Taxable account value/total portfolio value]: | | | | |
| Mean | −7.2 | −6.2 | −13.7 | −14.6 |
| | (<0.01)*** | (<0.01)*** | (<0.01)*** | (<0.01)*** |
| Median | −11.5 | −5.3 | −14.7 | −13.9 |
| | (<0.01)*** | (<0.01)*** | (<0.01)*** | (<0.01)*** |

| Mean Asset Allocation: | Tax | TDA | Tax | TDA | Tax | TDA | Tax | TDA |
|---|---|---|---|---|---|---|---|---|
| % Stock | 68.2 | 62.7 | 65.7 | 64.9 | 63.6 | 58.4 | 60.8 | 59.4 |
| % Taxable Bonds | 27.8 | 37.3 | 28.2 | 35.0 | 24.7 | 41.6 | 31.9 | 40.6 |
| % Municipals | 4.0 | 0.0 | 6.1 | 0.0 | 11.7 | 0.0 | 7.3 | 0.0 |

The sample consists of households with a minimum allocation of 10 percent to taxable bonds and 10 percent to stock, and taxable account value between 10 and 90 percent of total portfolio value. ***,**: significant at the 1 or 5 percent level, respectively (two-tailed test).

percentages are roughly similar. We also find qualitatively similar results for the retail households.

Our results for taxable bonds are consistent with those in Poterba and Samwick (2000) and Bodie and Crane (1997). Using data from the 1995 Survey of Consumer Finances, Poterba and Samwick (2000) document that 48 percent of investors who own taxable bonds in taxable accounts also own equity in tax-deferred accounts and that 42 percent of investors who own equity in TDAs also own taxable bonds in taxable accounts. Similarly, using data from TIAA-CREF, Bodie and Crane (1997) document that most investors hold equity and taxable bonds in both their taxable accounts and TDAs.

In summary, both discount and retail households have a preference for locating taxable bonds in their TDAs. Nonetheless, if one accepts the advice that investors

should allocate taxable bonds to TDAs, the average household mislocates one-third of its taxable bonds to taxable accounts.

*5.2.2. Liquidity considerations*

Huang (2001) argues that investors might allocate low-risk assets, such as taxable bonds, to taxable accounts when faced with liquidity needs (see also Dammon et al., 2002). Investors are penalized for early withdrawals from TDAs and garner significant benefits from tax-deductible contributions to retirement accounts. Thus, when faced with short-term liquidity needs, they might locate taxable bonds to their taxable account to reduce the probability of early withdrawal from their TDA and to ensure sufficient resources to fully capitalize on the tax-deductibility of contributions to retirement accounts. To assess whether liquidity considerations cause investors to hold taxable bonds in their taxable account, we conduct two auxiliary analyses.

First, we condition on taxable bonds being held in a household's taxable account and analyze withdrawals subsequent to the observed location decision. To do so, we partition households with material allocations to taxable bonds (i.e., greater than 10 percent) into three groups based on the percentage of their taxable account that is held in taxable bonds. (For comparison purposes, we also present results for households that have taxable bond allocations less than 10 percent.) We then analyze net deposits to (or withdrawals from) the taxable accounts subsequent to the observed location decision. Net deposits are defined as the sum of buys less the sum of sells in all securities after the observed location decision (2/94 for the discount households and 11/98 for the retail households) divided by the total value of the taxable account in the month of the observed location decision. Thus, deposits are represented by positive values. For discount households, buys and sells are summed over 33 months (3/94 to 11/96); for retail households, buys and sells are summed over 7 months (12/98 to 6/99).[8] The liquidity hypothesis predicts that households which locate their taxable bonds in a taxable account will make greater withdrawals than households which locate their taxable bonds in a TDA.

The results of this analysis are presented in Table 5. Contrary to the predictions of the liquidity hypothesis, households that locate taxable bonds in their taxable account are less likely to make large withdrawals and, on average, make greater

[8]While one might be concerned about the short horizon over which we calculate net deposits, particularly for the sample of retail households, two points bear consideration. First, Huang (2001) and Dammon et al. (2002) document that the location of taxable bonds in a taxable account is optimal only in the few years preceding the liquidity need. Second, we observe a snapshot of each household's location decision. In unreported results, we find these location decisions change little over time. Thus, it is likely that households which locate a large proportion of taxable bonds in their taxable account have done so for some time.

Table 5
Taxable bond location and liquidity needs

| | Discount households with taxable bonds allocation | | | | Retail households with taxable bonds allocation | | | |
|---|---|---|---|---|---|---|---|---|
| | <10% | >10% and Taxable bonds in taxable account: | | | <10% | >10% and Taxable bonds in taxable account: | | |
| | | =0 | Between 0 and 40% | >40% | | =0 | Between 0 and 40% | >40% |
| No. of Households | 9,029 | 914 | 743 | 668 | 27,826 | 5,214 | 3,691 | 3,019 |
| Taxable account value | $54,507 [$21,676] | $38,949 [$16,510] | $135,236 [$68,743] | $80,139 [$30,431] | $140,714 [$44,592] | $114,902 [$39,085] | $228,050 [$117,227] | $100,615 [$50,748] |
| % Taxable bonds in taxable account | 0.5 [0.0] | 0.0 [0.0] | 21.7 [21.6] | 72.8 [71.7] | 0.5 [0.0] | 0.0 [0.0] | 21.0 [20.8] | 71.9 [68.9] |
| % Taxable bonds in all accounts | 0.5 [0.0] | 31.5 [25.3] | 24.6 [21.5] | 48.5 [45.8] | 0.8 [0.0] | 29.2 [23.7] | 26.1 [22.7] | 51.6 [50.5] |
| Net deposit (% of taxable account value) | 10.2 [0.0] | 3.6 [0.0] | 3.8 [0.0] | 16.4 [0.0] | 5.2 [0.0] | 3.2 [0.0] | 1.7 [0.0] | 4.8 [0.0] |
| % of Households withdrawals >50% | 28.4 | 25.6 | 17.8 | 18.0 | 7.3 | 5.4 | 3.3 | 5.2 |

This table presents net deposits to (withdrawals from) taxable accounts for households partitioned on the proportion of their taxable account invested in taxable bonds. Withdrawals are defined as the sum of buys less the sum of sells in all securities after the observed location decision (2/94 for the discount households and 11/98 for the retail households) divided by the total value of the taxable account in the month of the observed location decision. Deposits are positive. For discount households, buys and sells are summed over 33 months (3/94 to 11/96); for retail households, buys and sells are summed over 7 months (12/98 to 6/99). The sample consists of households with taxable account value between 10 and 90 percent of total portfolio value. Medians are in brackets.

net deposits than the other partitions that we analyze. For example, among discount households, those with at least 40 percent of their taxable account held in taxable bonds make mean net deposits of 16.4 percent. Only 18 percent of these households make large withdrawals (defined as greater than 50 percent of their taxable account value). In contrast, mean net deposits for households with no taxable bonds in their taxable account are 3.6 percent, while 25.6 percent of these households make large withdrawals. These patterns are similar for the retail households that we analyze.

In our second analysis, we condition on liquidity constraints and analyze location decisions. To do so, we partition households on the basis of the size of their taxable account. While we do not have a perfect proxy for liquidity, it seems reasonable that investors with a sizable taxable account are less liquidity constrained than investors with meager taxable account values. The liquidity hypothesis predicts that liquidity-constrained households will locate more taxable bonds in their taxable accounts. Thus, we would predict that households with little

money in their taxable accounts are more likely to locate taxable bonds in their taxable account. To analyze location decisions, we calculate the ratio of taxable bonds in a household's taxable account to the total value of taxable bonds held by the household (the taxable bond ratio) and subtract from it the ratio of taxable account value to total assets for each household (the taxable account ratio).

The results of this analysis are presented in Table 6, panel A. The evidence that the bond location decision is related to liquidity needs is mixed. For discount households, there is no discernible relationship between taxable account value and the difference between the taxable bond ratio and taxable account ratio. For retail households, the difference grows with the size of taxable accounts—consistent with the liquidity hypothesis. Nonetheless, the average retail household with a taxable account value in excess of $250,000 still locates 42 percent of its taxable bonds in taxable accounts.

Table 6
Taxable bond location partitioned by taxable account value, capacity constraints, and equity turnover

| | Discount households | | | | Retail households | | | |
|---|---|---|---|---|---|---|---|---|
| | No. of Hses | Taxable bond ratio | Taxable account ratio | Diff. | No. of Hses | Taxable bond ratio | Taxable account ratio | Diff. |
| Panel A: Households with taxable account value: | | | | | | | | |
| <$10,000 | 415 | 22.5 | 26.2 | −3.7** | 1,104 | 18.7 | 27.2 | −8.6*** |
| $10,000 to $50,000 | 1,055 | 39.4 | 48.1 | −8.7*** | 4,238 | 31.5 | 43.2 | −11.7*** |
| $50,000 to $100,000 | 361 | 52.0 | 59.0 | −7.0*** | 2,350 | 39.6 | 52.7 | −13.1*** |
| $100,000 to $250,000 | 321 | 57.8 | 65.7 | −7.8*** | 2,560 | 45.3 | 59.9 | −14.6*** |
| >$250,000 | 173 | 63.2 | 68.5 | −5.2*** | 1,672 | 42.2 | 64.1 | −21.9*** |
| Panel B: Households with TDA/bonds: | | | | | | | | |
| >100% | 1,599 | 34.6 | 42.3 | −7.7*** | 8,146 | 26.5 | 41.3 | −14.7*** |
| 50 to 100% | 521 | 48.5 | 60.4 | −12.0*** | 2,703 | 46.0 | 64.3 | −18.3*** |
| 25 to 50% | 153 | 89.0 | 80.1 | 8.9** | 822 | 84.5 | 79.8 | 4.7*** |
| <25% | 52 | 94.8 | 85.8 | 9.0** | 253 | 93.9 | 86.2 | 7.7** |
| Panel C: Households with equity sales turnover: | | | | | | | | |
| T <10% | 546 | 36.0 | 48.0 | −11.9*** | 7,809 | 37.2 | 49.6 | −12.4*** |
| 10–30 | 514 | 40.3 | 52.0 | −11.9*** | 1,386 | 33.7 | 53.7 | −20.0*** |
| 30–50 | 349 | 41.1 | 52.2 | −11.0*** | 756 | 32.6 | 53.1 | −20.5*** |
| 30–100 | 453 | 44.1 | 50.9 | −6.8*** | 875 | 36.0 | 50.5 | −14.5*** |
| >100 | 391 | 48.1 | 48.2 | −0.1 | 1,098 | 36.4 | 46.7 | −10.3*** |

Households are partitioned on the basis of taxable account value (Panel A), the ratio of TDA value to total bonds (Panel B), and equity sales turnover (Panel C). The taxable bond ratio is the percentage of taxable bonds held in a household's taxable account. The taxable account ratio is the percentage of assets held in a household's taxable account. The sample consists of households with a minimum allocation of 10 percent to taxable bonds and 10 percent to stock, and taxable account value between 10 and 90 percent of total portfolio value. ***,**: significant at the 1 or 5 percent level, respectively (two-tailed test).

*5.2.3. Capacity constraints*

Perhaps households locate taxable bonds in their taxable accounts because there is simply insufficient capacity in their TDA. To investigate this possibility, we partition on the basis of capacity constraints to determine whether the location decisions that we have analyzed are largely a function of households with no capacity to locate bonds in their TDAs (i.e., their total bond holding exceeds the value of their TDA). The results of this analysis are presented in Table 6, panel B. Though capacity considerations clearly matter, few households face serious capacity constraints. Nearly 70 percent of discount and retail households could locate all of their bonds in TDAs, while 91 percent of discount and retail households could locate at least half of their bonds to TDAs.

*5.2.4. Equity turnover*

Since the gains from optimal location require that an investor capitalize on the tax-deferral feature available on equity, perhaps households with high equity turnover ignore optimal location because they stand little to gain. To analyze this possibility, we partition on equity sales turnover in taxable accounts, defined as the sum of equity mutual fund and individual stock sales divided by the sum of positions in funds and stock.

The results of this analysis are presented in Table 6, panel C. The evidence that bond location is related to taxable equity sales turnover is mixed. For discount households, the difference between the taxable bond ratio and taxable account ratio is greatest for households with taxable equity sales turnover less than 30 percent; among high turnover households there is virtually no difference between the two ratios. However, there is no such pattern for retail households. Furthermore, though discount households with low turnover locate a higher proportion of their bonds to TDAs, these households have a material allocation to bonds in their taxable accounts.

In summary, the bond location decision appears largely idiosyncratic. Though there are statistically significant relationships between turnover and bond location for discount households and taxable account value and bond location for retail households, the ability of these relationships to explain the cross-sectional variation in bond location is weak.[9]

*5.3. Individual stocks and mutual funds*

Mutual funds distribute a substantial portion of total returns as taxable capital gains. For example, Barclay et al. (1998) document that the average open-end equity mutual fund earned 15.2 percent annually from 1976 to 1992. Annually,

[9]This is confirmed by auxiliary regression analyses. For both discount and retail households, we find less than 10 percent of the cross-sectional variation in the bond location decision can be explained by the taxable account ratio, turnover, and taxable account value.

about one-third (5 percent) of this total return was distributed as capital gains and about one-sixth (2.3 percent) as ordinary income. When realized in a taxable account, these distributions represent a drag on the after-tax returns earned by investors. In contrast, those who hold individual stocks can avoid annual capital gain realizations (and also harvest losses).

Huang (2001) documents that the payout ratio, defined as the ratio of returns distributed to shareholders to the total asset return, determines optimal asset location. Assuming the payout ratio of taxable bonds is greater than that of individual stocks or mutual funds, investors would prefer to first locate taxable bonds in their TDAs. Assuming space remains in their TDA, investors would next locate equity mutual funds, since they have high payout ratios relative to individual stocks. Shoven and Sialm (forthcoming) argue that investors might be better off by investing in municipal bonds in their taxable account thereby creating space in their TDA for mutual funds with high payout ratios.

To investigate how investors locate their mutual funds, we analyze the allocation and location decisions of households with a minimum allocation of 5 percent to mutual funds and 5 percent to individual stocks. The results of this analysis are presented in Table 7. Roughly half of discount households facing a location decision meet these minimum allocation requirements, while roughly one-third of retail households meet these minimums. Both groups display a strong preference for holding mutual funds in their TDAs. Thirty-seven percent of discount households and 52 percent of retail households hold mutual funds exclusively in their TDAs, while only 12 percent of each hold mutual funds exclusively in their taxable accounts.

To determine if there is a preference for holding mutual funds in TDAs, we calculate the proportion of mutual funds held in each household's taxable account (the taxable fund ratio) and subtract from this the proportion of total assets held in its taxable account. If investors have a preference for holding mutual funds in TDAs, the difference between these two ratios will be negative. For both discount and retail households, the difference between these two ratios is large and reliably negative—indicating a preference for holding mutual funds in TDAs.

These results are supported by the mean asset allocations in taxable accounts and TDAs (presented in the last four rows of Table 7). The average discount household allocates 64 percent of its taxable account to individual stocks and 29 percent to mutual funds; in contrast, these same households allocate 38 percent of their TDA to individual stocks and 54 percent to mutual funds. The same pattern emerges for the remaining sample partitions that we analyze.

We calculate the dollar value of mutual funds that can replace individual stocks in each household's TDA. The average discount household can move $6,615 (or 21 percent of their total mutual fund holding) to its TDA, though this average includes households with no mutual funds in their taxable account. For discount households with mutual funds in their taxable account, the average household can move $10,425 (or 33 percent of their total mutual fund holding). For the wealthy

Table 7
Asset allocation and location for mutual fund and individual stock holders

| | Discount households with | | Retail households with | |
|---|---|---|---|---|
| | >$10,000 | >$100,000 | >$10,000 | >$100,000 |
| No. of Households (mut. funds >5% and ind. stocks >5%) | 5,417 | 1,554 | 14,370 | 6,984 |
| % of Households (mut. funds >5% and ind. stocks >5%) | 47.2 | 51.3 | 34.8 | 33.1 |
| Mean portfolio value | $112,593 | $284,638 | $188,122 | $336,207 |
| % Taxable assets | 50.8 | 56.7 | 53.0 | 56.1 |
| % of Households with MF >5% and IS >5% that hold mutual funds: | | | | |
| Solely in taxable account | 12.4 | 10.0 | 12.3 | 12.5 |
| Solely in tax-deferred account (TDA) | 36.5 | 19.6 | 52.3 | 45.5 |
| In both accounts | 51.1 | 70.4 | 35.4 | 42.0 |
| Mean value of mutual funds in taxable account that can replace individual stock in the TDA | | | | |
| All households | $6,615 | $16,561 | $7,651 | $13,683 |
| Households with mutual funds in taxable account | $10,425 | $20,600 | $16,062 | $25,100 |
| [TAX mutual funds/(TAX mutual funds +TDA mutual funds)] less [TAX value/(TAX value+TDA value)]: | | | | |
| mean | −14.9 (<0.01)*** | −13.0 (<0.01)*** | −24.0 (<0.01)*** | −24.0 (<0.01)*** |
| median | −14.7 (<0.01)*** | −10.9 (<0.01)*** | −23.3 (<0.01)*** | −22.5 (<0.01)*** |

| Mean asset allocation: | Tax | TDA | Tax | TDA | Tax | TDA | Tax | TDA |
|---|---|---|---|---|---|---|---|---|
| % Individual stocks | 63.8 | 38.4 | 58.3 | 39.2 | 65.3 | 30.6 | 61.3 | 34.0 |
| % Mutual funds | 28.8 | 53.9 | 29.2 | 48.9 | 21.6 | 57.9 | 20.6 | 51.6 |
| % Taxable bonds | 5.4 | 7.7 | 8.6 | 11.9 | 6.2 | 11.5 | 8.0 | 14.4 |
| % Municipals | 2.0 | 0.0 | 3.9 | 0.0 | 6.9 | 0.0 | 10.1 | 0.0 |

The sample consists of households with a minimum allocation of 5 percent to mutual funds and 5 percent to individual stock, and taxable account value between 10 and 90 percent of total portfolio value. ***: significant at the 1 percent level (two-tailed test).

discount households, the dollar values are higher, though the percentages are roughly similar. We also find qualitatively similar results for the retail households.

The preference for locating mutual funds in TDAs is slightly stronger than the preference for locating bonds in TDAs. We analyze households with a minimum allocation of 10 percent to taxable bonds and 10 percent to equity mutual funds. The average discount household meeting these criteria locates 53 percent of bonds in TDAs and 59 percent of equity mutual funds in TDAs, while the average retail

household locates 60 percent of bonds in TDAs and 65 percent of equity mutual funds in TDAs.

Perhaps investors are following the prescription of Shoven and Sialm (forthcoming) by locating mutual funds in TDAs, while locating municipal bonds in their taxable accounts. This does not appear to be the case. As discussed previously, few households hold municipal bonds. Among discount households with material allocations to mutual funds, 4 percent hold municipals, while 12 percent of retail households with material allocations to mutual funds also hold municipal bonds. When we exclude households that hold municipal bonds from our analysis, the remaining households also have strong preferences for locating mutual funds in TDAs.

Do investors locate mutual funds in their TDAs to shelter the capital gains distributions that are typical of actively managed funds? If this is the primary motivation for mutual fund location, we would expect the preference for locating mutual funds to TDAs to be greatest for investors who trade the least; those who trade little stand to benefit most from the deferral of capital gains on equity. To investigate this possibility, we partition households on equity sales turnover in taxable accounts (as was done for the analysis of the bond location decision). The results of this analysis are presented in Table 8. For both discount and retail households, there is no discernable relationship between equity sales turnover and mutual fund location. It does not appear that the desire to shelter fund distributions is the primary motivation for the preference for locating mutual funds in TDAs. This conclusion is bolstered by analyses presented in the next section, where we

Table 8
Percentage of equity mutual funds in taxable account by turnover level

| | Discount households | | | | Retail households | | | |
|---|---|---|---|---|---|---|---|---|
| | No. of hses | Taxable fund ratio | Taxable account ratio | Diff. | No. of hses | Taxable fund ratio | Taxable account ratio | Diff. |
| Households with taxable equity sales turnover: | | | | | | | | |
| <10% | 1,289 | 32.2 | 51.0 | −18.7*** | 7,926 | 28.3 | 52.0 | −23.8*** |
| 10 to 30% | 1,231 | 37.1 | 52.0 | −14.9*** | 2,167 | 35.8 | 58.5 | −22.7*** |
| 30 to 50% | 912 | 39.3 | 52.0 | −12.7*** | 1,249 | 32.2 | 56.1 | −23.8*** |
| 50 to 100% | 1,095 | 37.0 | 50.1 | −13.1*** | 1,453 | 28.0 | 52.5 | −24.5*** |
| >100 | 883 | 35.0 | 48.7 | −13.7*** | 1,575 | 21.4 | 48.6 | −27.2*** |

Households are partitioned into five groups based on annual equity (mutual fund and stock) sales turnover in taxable accounts. The taxable fund ratio is the percentage of equity mutual funds held in a household's taxable account. The taxable account ratio is the percentage of assets held in a household's taxable account. The sample consists of households with a minimum allocation of 5 percent to taxable bonds and 5 percent to stock, and taxable account value between 10 and 90 percent of total portfolio value. ***: significant at the 1 percent level (two-tailed test).

Table 9
Percentage of individual stocks in taxable account by turnover level

| | Discount households | | | | Retail Households | | | |
|---|---|---|---|---|---|---|---|---|
| | No. of hses | Taxable stock ratio | Taxable account ratio | Diff. | No. of hses | Taxable stock ratio | Taxable account ratio | Diff. |
| Households with stock sales turnover: | | | | | | | | |
| <10% | 1,225 | 64.85 | 50.93 | 13.91*** | 7,236 | 70.38 | 53.10 | 17.28*** |
| 10 to 30% | 1,283 | 63.28 | 50.56 | 12.71*** | 2,255 | 68.97 | 55.12 | 13.85*** |
| 30 to 50% | 915 | 61.45 | 50.60 | 10.86*** | 1,342 | 67.78 | 53.19 | 14.59*** |
| 50 to 100% | 1,085 | 62.37 | 51.04 | 11.33*** | 1,705 | 67.78 | 52.01 | 15.78*** |
| >100 | 888 | 64.54 | 51.16 | 13.38*** | 1,832 | 69.47 | 51.04 | 18.43*** |

Households are partitioned into five groups based on annual individual stock sales turnover in all accounts. The stock ratio is the percentage of individual stocks held in a household's taxable account. The taxable account ratio is the percentage of assets held in a household's taxable account. The sample consists of households with a minimum allocation of 5 percent to taxable bonds and 5 percent to stock, and taxable account value between 10 and 90 percent of total portfolio value. ***: significant at the 1 percent level (two-tailed test).

document the distributions of equity funds held in taxable accounts are only slightly less than the distributions of equity funds held in TDAs.

We also investigate whether households that trade individual stocks actively prefer to locate individual stocks in TDAs. To do so, we partition households on the level of their individual stock sales turnover. For each partition, we calculate the mean proportion of the households' individual stocks that are placed in the taxable account and the mean proportion of the households' total assets that are placed in the taxable account. The results of this analysis are presented in Table 9. There is no evidence that the preference for locating individual stocks in taxable accounts varies across the turnover partitions.

In summary, the investors that we analyze have a strong preference for locating mutual funds in their TDAs and this preference is stronger than that for bonds. Nonetheless, if one accepts the advice that investors should locate mutual funds with high distributions in their TDAs rather than individual stock, the average household mislocates 20 percent of its mutual funds to taxable accounts.

## 6. Equity distributions

Though discount and retail households have a preference for locating taxable bonds and mutual funds in TDAs, many households hold significant amounts of mutual funds or taxable bonds in taxable accounts. In this section, we analyze whether investors consider the distribution rates of stocks or mutual funds when

making these location decisions. To shelter taxable income, investors might locate individual stocks with high dividend yields in TDAs. They might also locate volatile stocks to taxable accounts—so as to maximize the value of the tax-timing option available on equity. Similarly, investors might locate mutual funds with high dividend and capital gains distributions in TDAs, while locating tax-efficient funds (e.g., index funds) with low distributions in their taxable accounts.

For each household, we calculate the dividend yield of individual stocks held in taxable accounts and TDAs, weighted by the position values. For individual stocks, we calculate the dividend yield for all publicly traded stocks in 1994 and 1998 by summing all regular dividend payments and dividing by beginning-of-year price. The 1994 yields are used to calculate the dividend yields for discount households, while the 1998 yields are used for retail households. There is a similar calculation for the monthly return standard deviation of stocks held in taxable accounts and TDAs, for which we calculate the monthly standard deviation of returns based on data for 1993–1994 (for discount households) and 1997–1998 (for retail households).

For each household, we calculate the dividend yield and capital gain yield of equity mutual funds held in taxable accounts and TDAs, weighted by position values. For mutual funds, we calculate the dividend yield for all mutual funds in 1994 and 1998 by summing all distributions of ordinary income and dividing by beginning-of-year price. Capital gain yields are calculated similarly. The 1994 distributions are used to calculate the capital gain and dividend yields for discount households, while the 1998 yields are used for retail households.

There is considerable variation in dividend yields and capital gain yields across funds. The interquartile range of capital gain yields is 7.8 percent in 1998 and 5.0 percent in 1994, while the interquartile range of dividend yields is 2.2 percent in 1994 and 1.4 percent in 1998.

The results of this analysis are presented in Table 10. In Panel A, we present means across all households, regardless of whether they hold both taxable and TDAs. In Panel B, we present means across households that hold both taxable and TDAs.

First, consider the characteristics of individual stocks held in taxable accounts versus TDAs. Both discount and retail households have a preference for holding high dividend yield stocks in TDAs, though the difference in yields is not economically large (ranging from 4 to 14 basis points depending on the sample partition). Discount households have a preference for holding more volatile stocks in taxable accounts, while retail households do not. Even for discount households, this preference is not economically large; the volatility of stocks held in taxable accounts is less than three percent greater than that of stocks held in TDAs.

Second, consider the characteristics of mutual funds held in taxable accounts versus TDAs. The differences in the dividend yields of funds held in taxable accounts and TDAs is less than four basis points, though these differences are statistically significant. The differences in the capital gain yields are larger—ranging from 23 to 42 basis points. Nonetheless, these differences appear

Table 10
Characteristics of stocks and funds in taxable and tax-deferred accounts

| | Discount households | | | Retail households | | |
|---|---|---|---|---|---|---|
| | Taxable | TDA | Diff. | Taxable | TDA | Diff. |
| Panel A: All households | | | | | | |
| *Stocks* | | | | | | |
| Dividend yield (%) | 1.79 | 1.93 | −0.14[a] | 1.74 | 1.83 | −0.11[a] |
| Monthly std. dev. (%) | 9.26 | 9.11 | 0.15 | 10.71 | 10.68 | 0.03 |
| *Equity funds* | | | | | | |
| Dividend yield (%) | 1.22 | 1.20 | 0.02[a] | 0.86 | 0.89 | −0.03[a] |
| Cap. gain yield (%) | 2.49 | 2.91 | −0.42[a] | 6.30 | 6.72 | −0.42[a] |
| Panel B: Households with both taxable and tax-deferred accounts | | | | | | |
| *Stocks* | | | | | | |
| Dividend yield (%) | 1.68 | 1.85 | −0.17[a] | 1.58 | 1.62 | −0.04[a] |
| Monthly std. dev. (%) | 9.60 | 9.40 | 0.20[a] | 11.23 | 11.28 | −0.04 |
| *Equity Funds* | | | | | | |
| Dividend yield (%) | 1.19 | 1.20 | −0.01[a] | 0.86 | 0.89 | −0.03[a] |
| Cap. gain yield (%) | 2.59 | 2.82 | −0.23[a] | 6.24 | 6.49 | −0.25[a] |

Discount households are those with individual stock (or equity mutual fund) positions as of January 1994. Retail households are those with individual stock (or equity mutual fund) positions as of November 1998. Stock dividend yield is based on regular dividend payments made during the year (1994 or 1998). Monthly standard deviation of stock returns is based on two years of monthly returns (through 1994 or 1998). Equity fund dividend yield is based on ordinary income distributions made during the year; capital gain yield is based on capital gain distributions made during the year. All variables are calculated for each household, weighted by the size of positions, and then averaged across households.

[a] Significantly different from zero at the 1 percent significance level, two-tailed test.

economically small if the mutual fund location decision is primarily driven by a desire to shelter taxable income.

In summary, we find evidence that the distributions of funds and stocks held in taxable accounts differ from those held in TDAs. There is a preference for locating stocks with high dividend yields and funds with high capital gain yields in TDAs. However, the observed differences in yields are economically small.

## 7. Assessing the damage

The biggest mistake that we document is the excessive trading of equity in taxable accounts.[10] There are two reasons for this conclusion. First, trading incurs transaction costs and generally accelerates the recognition of capital gains. Second,

[10] It is also likely that many investors do not take full advantage of tax-deferred savings vehicles, though we are unable to document the extent of this mistake with incomplete portfolio holdings.

with high equity turnover in one's taxable account, the possible benefits of optimal location are relatively small.

Estimating the performance penalty paid for excessive trading and suboptimal location is complex and depends on many factors (e.g., utility functions, asset allocation, saving horizon, asset class returns, and tax rates). By making reasonable assumptions about these parameters, Shoven and Sialm (forthcoming, Table 3) provide useful ballpark estimates of the tax penalty that investors pay for excessive trading. In brief, they calculate certainty equivalents for simulated distributions of outcomes for investors with power utility who save over 30 years. Investors differ in their location decisions and the proportion of equity returns that are realized annually. In general, those who trade actively (either directly by trading individual stocks or indirectly by holding mutual funds with high turnover) will realize a greater proportion of their annual equity return.

Consider two investors from the Shoven and Sialm (forthcoming) simulations. The first investor trades actively and thus realizes 100 percent of his annual equity return, while the second trades less and thus realizes 25 percent of her return. Both investors naively locate an equal proportion of stocks and bonds in both their TDA and taxable accounts (i.e., suboptimal location). The certainty equivalent of the low-turnover investor is nine percent greater than that of the high-turnover investor. Furthermore, optimal location increases the certainty equivalent of the high-turnover investor by less than one percent. However, the low-turnover investor can increase her certainty equivalent by an additional nine percent by locating bonds first to her TDA and stocks to her taxable account. In the end, the investor who trades little and optimally locates her assets is 18 percent better off than the investor who trades frequently and naively locates his assets.

## 8. Conclusions

Investors can improve their after-tax returns by deferring the realization of capital gains on equity in taxable accounts. Investors who capitalize on the tax avoidance strategies that are available on equity can further enhance after-tax returns by strategically locating their investments in taxable or tax-deferred accounts (Huang, 2001; Shoven and Sialm, forthcoming; Dammon et al., 2002). Models of optimal asset location argue that investors should first locate assets with high payout ratios (e.g., taxable bonds) to their tax-deferred accounts. In this paper, we analyze the trading and location decisions of households with accounts at a discount broker and households with accounts at a retail broker.

To fully exploit the tax avoidance strategies available on equity, investors should trade little in their taxable accounts. Yet, we document that, on average, discount and retail households turnover more than 65 percent of their individual stocks annually—an average holding period of less than two years. The average holding period for equity mutual funds is longer, but still less than four years.

Furthermore, both discount and retail households have a strong preference for realizing gains, rather than losses, in their taxable accounts. Only in December, do we observe losses being realized at a greater rate than gains.

Our analyses of the asset location decisions of households yield good news and bad news. On one hand, the location decisions indicate that the average household is tax aware. For example, we document that the average household prefers to locate taxable bonds in retirement accounts, and mutual funds, rather than individual stocks, in retirement accounts. These are arguably sensible preferences, since bonds and, to a lesser extent, equity mutual funds, distribute a large fraction of their return as taxable income in a typical year.

On the other hand, our empirical results present several location puzzles. First, more than half of the households hold taxable bonds in their taxable accounts, despite having room to move at least a portion of this investment to their retirement account. Second, the preference for holding equity mutual funds in retirement accounts appears to be stronger than the preference for holding taxable bonds in retirement accounts. Third, the distributions of stocks (dividends) and funds (capital gains) held in retirement accounts are higher than those held in taxable accounts, but the differences are economically small. We conclude that either the existing models of optimal asset location are incomplete or a substantial fraction of investors are mislocating their assets. Though tax considerations leave clear footprints in the data we analyze, many households could improve their after-tax performance by fully exploiting the tax avoidance strategies available on equities.

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