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Do after-tax returns affect mutual fund inflows?☆

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Abstract

This paper explores the relationship between the after-tax returns that taxable investors earn on equity mutual funds and the subsequent cash inflows to these funds. Previous studies have documented that funds with high pretax returns attract greater inflows. This paper presents evidence, based on a large sample of retail equity mutual funds over the period 1993–1999, that after-tax returns have more explanatory power than pretax returns in explaining inflows. In addition, funds with large overhangs of unrealized capital gains experience smaller inflows, all else equal, than funds without such unrealized gains. A large capital gain overhang discourages both gross fund inflows and gross outflows, but the inflow effect dominates the outflow effect. © 2002 Elsevier Science B.V. All rights reserved.

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The tax treatment of mutual fund investments has recently attracted substantial attention. Popular summaries of mutual fund performance, which focused exclusively on pretax returns as recently as the mid-1990s, now typically report some estimate of after-tax returns as well. The U.S. Securities and Exchange

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Commission (2001) has required mutual funds to report after-tax returns as well as pretax returns in communications to current and prospective shareholders. The tax issues surrounding mutual fund investment have become increasingly significant as mutual funds have become a more important channel for individual equity ownership. Data from the 1998 Survey of Consumer Finances reported in Kennickell, et al. (2000) show that 16.5% of households own mutual funds in taxable accounts, i.e., outside retirement accounts such as IRAs and 401(k)s. By comparison, 19.2% of households own corporate stock directly. The U.S. Congressional Budget Office (1999) estimates that in 1997, when mutual fund capital gain distributions exceeded $180 billion, they resulted in at least $15 billion of federal capital gains tax revenues.

Tax law requires mutual funds in the United States to "pass-through" dividends and capital gain realizations to their investors, and to allocate distributions equally across all fund shares, regardless of when the shares were purchased. The pass-through requirement restricts the fund investor's ability to exploit tax-timing strategies of the type discussed by Stiglitz (1983), Constantinides (1984) and Dammon and Spatt (1996). Moreover, some fund managers follow gain realization practices that diverge substantially from the tax-minimizing ones for taxable investors. Dickson and Shoven (1995), for example, report that fund managers sometimes sell their lowest-basis tax lot of a given stock. For taxable investors, however, selling the shares with the highest basis is the tax-minimizing approach.

The equal allocation rule for fund distributions implies that new fund investors receive the same per-share amount of capital gain realizations as old investors, even though their shares in the fund may have been created after the fund accrued the gains that are being realized. An investor who purchases shares in a fund that has unrealized capital gains on its current portfolio holdings may therefore be taxed on future capital gain distributions, even if the fund's underlying assets do not appreciate after the investor's purchase date. Accrued but unrealized gains are often called capital gains overhang. Barclay et al. (1998) show that funds with larger overhangs have lower net inflows than other funds. Warther (1997) tries to explain why funds might choose to build up unrealized gains.

The current study evaluates the impact of personal taxation on the returns earned by mutual fund investors. It focuses on taxable individual investors who hold mutual fund shares in conventional taxable accounts, not in tax-deferred retirement saving plans. The tax treatment of funds owned through tax-deferred accounts differs from that of funds held directly, since realized gains are not taxed until assets are withdrawn from the retirement plan, and all distributions, regardless of whether they reflect dividends or capital appreciation, are taxed as ordinary income. This study considers how the tax burden on different funds affects investor purchase and redemption decisions. There is a large previous literature on the relationship between fund performance, measured by pretax fund returns, and subsequent fund net inflows. This literature includes Ippolito (1992), Hendricks et al. (1994), Chevalier and Ellison (1997), Sirri and Tufano (1997) and Warther (1995). These studies find that net fund inflows are positively related to past performance. Because there is some persistence in fund performance, Gruber (1996) finds that the inflow-weighted

average of mutual fund returns is higher than the fund-weighted average. The precise explanation for persistence in fund returns, and the implications of such persistence for investor behavior, is an open issue. Carhart (1997) shows that persistence in fund expenses and in underlying asset returns, rather than persistence in stock-picking ability, explain most of the persistence in fund returns that previous studies have identified.

This study extends previous research on fund inflows and pretax returns in three ways. First, we consider the relationship between net inflows and both realized and potential individual income tax burdens. We find that funds that deliver returns that are more heavily taxed, i.e., include more dividends or realized capital gains, have lower subsequent inflows than funds that offer similar pretax returns and lower tax burdens. After-tax returns outperform pretax returns in explaining net inflows. We also confirm the Barclay et al. (1998) result that funds with larger stocks of unrealized capital gains have smaller net inflows, conditional on their past return performance.

Second, we explore the factors that explain the cross-sectional variation in the tax burdens that domestic equity mutual funds impose on their investors. We consider how fund turnover, the tenure of the management team, investment style, and other factors contribute to fund tax burdens. Turnover has a large effect on capital gain realizations, and new fund managers tend to impose large capital gains tax liabilities on investors by realizing accrued capital gains.

Finally, we move beyond the study of net fund inflows to explore the relationship between fund performance, gross fund inflows, and gross redemptions. Previous studies have focused on net fund flows because data on gross flows are not as readily available as data on net flows. We collect data on gross inflows and outflows from SEC filings, and use these data to evaluate how investors adjust their investment decisions to differences in after-tax returns and prospective capital gains tax liability.

The paper is divided into seven sections. The first describes the construction of tax-adjusted mutual fund returns. Because mutual fund investors are heterogeneous, we are forced to make some simplifying assumptions about the tax burdens on fund investors. Section 2 describes our sample of mutual fund returns, and reports summary statistics on the level and persistence of pretax and after-tax returns for a large sample of equity mutual funds in the 1990s.

Section 3 explores the determinants of the tax burdens on the returns to different equity mutual funds. We investigate how various fund characteristics are correlated with the tax burden that the fund imposes on its shareholders, and we find several aspects of fund behavior that have substantial predictive power in explaining investor tax burdens. The fourth section describes our data set on mutual fund inflows and presents summary information on net flows during our sample period.

Section 5 reports our basic findings on the relationship between fund returns, potential capital gains distributions, and fund net inflows. We compare the relative predictive power of pretax and after-tax returns in a range of regression models for fund inflows, controlling for a variety of other factors that may affect investor behavior. The results suggest that the tax burdens that funds impose on their investors affect fund inflows. The inclusion, or exclusion, of a substantial set of

control variables that capture other determinants of fund inflows does not affect this finding.

Section 6 examines how gross inflows and gross outflows vary with past performance. It summarizes our data on gross flows for a large sample of funds, and explores whether gross redemptions and gross inflows are affected differently by fund tax burdens and unrealized capital gains. We find that funds with a substantial capital gains tax overhang experience both lower inflows (tax-sensitive investors avoid such funds) and lower outflows (investors are reluctant to sell these funds and realize the associated capital gains). A brief conclusion suggests several directions for future work.

1. Measuring pretax and after-tax returns on mutual funds

Mutual funds typically generate three types of taxable income for investors who do not sell their fund shares. These are: (1) dividends, which are passed through to the investor and taxed as ordinary income, (2) short-term realized capital gains, which are also taxed as ordinary income, and (3) long-term realized capital gains, which are taxed at the prevailing long-term capital gains tax rate. In 1997 and 1998, some funds also generated intermediate-term capital gains that were taxed at a maximum tax rate between the ordinary income tax rate and the long-term capital gains tax rate. Even if an investor has not held shares in a mutual fund long enough to qualify for long-term capital gains treatment if the shares are sold, the fund's long-term capital gain distributions are still taxed as long-term gains.

In addition to these taxable returns, equity mutual funds may also generate untaxed capital gains and losses as a result of fluctuations in fund share prices. When a fund's assets rise in value, but the fund manager does not sell the appreciated assets, the net asset value of the fund rises. The tax burden on this component of returns is a function of both investor and manager behavior. Capital gains tax liability results when the manager sells the appreciated assets, or the investor sells the fund's shares.

Most discussions of mutual fund returns, and most academic studies of fund behavior and return performance, focus on pretax returns. Such returns are just the sum of the four return components described above. Recently, there has been increased attention to the after-tax returns on different mutual funds. In 1999, the Vanguard mutual fund family began to report returns to shareholders on both a pretax and after-tax basis. Morningstar, a leading mutual fund information service, now publishes after-tax return measures in its fund performance database. In the future, as a result of new SEC regulations, all mutual funds will be required to report after-tax returns in their communications with shareholders.

Despite the interest in after-tax returns, there is some disagreement on how to measure such returns. Investors differ in their tax rates, so it is not possible to create a "one size fits all" measure of after-tax fund performance. We follow Dickson and Shoven (1995) in constructing after-tax returns using the tax rates that apply to hypothetical upper-income taxable investors. We recognize the importance of tax

rate heterogeneity, but we suspect that it is limited by the fact that most mutual fund investors face marginal tax rates on dividends, interest, and short-term capital gains of between 28% and 39.6% and long-term capital gains tax rates of 20%.

We define a fund's total pretax return as

$$R_p = d + g_s + g_l + u, \tag{1}$$

where d denotes dividend payout as a fraction of the beginning-of-year net asset value, g_s denotes realized short-term capital gains, g_l denotes realized long-term gains, and u denotes unrealized capital gains or losses. Consider a taxable investor who faces a tax rate of τ_d on dividends and short-term realized gains and a rate of τ_{cg} on realized long-term capital gains. Assume that the effective accrual tax rate on unrealized capital gains, which Poterba (1999) defines as the present discounted value of the future taxes that will be due on these gains, is τ_{ucg}. We define the fund's one-year pre-liquidation after-tax return as

$$R_a = (1 - \tau_d) * (d + g_s) + (1 - \tau_{cg}) * g_l + (1 - \tau_{ucg}) * u. \tag{2}$$

We assume an effective tax rate of $\tau_{ucg} < \tau_{cg}$ on gains that are not distributed during the current calendar year. This effective tax rate could be zero if the mutual fund never realizes these gains, and if the investor holds his shares until death and benefits from basis step-up. The Securities and Exchange Commission has defined pre-liquidation returns by setting $\tau_{ucg} = 0$. In practice, it is likely both that the investor will sell mutual fund shares before death, and that the mutual fund manager will realize at least some gains in future years. The effective tax rate on undistributed accruing gains depends on the fund manager's realization strategy, the investor's investment horizon, and the rate of return at which the investor discounts future tax liabilities.

The problem of approximating future tax burdens would vanish if we assumed that the mutual fund investor sold his shares at the end of the calendar year. In this case, the after-tax return, which is sometimes defined as the post-liquidation return, would be $R'_a = (1 - \tau_d) * (d + g_s) + (1 - \tau_{cg}) * (g_l + u)$, and all unrealized gains or losses from the fund's investments would be taxable in the current year.

Popular discussions of mutual fund investments often warn investors against purchasing funds with large unrealized capital gains, arguing that when the fund realizes these gains, the investor will be taxed on gains he or she never earned. While gain realizations by fund managers can accelerate the payment of capital gains tax, they do not create nominal tax liabilities. When a mutual fund makes a capital gain distribution, the net asset value of the fund shares falls by the amount of the distribution. The decline in fund value creates a capital loss that is equal to the amount of the capital gain distribution, but investors do not realize this loss until they sell their shares in the fund. For an investor who purchases a fund just before a large gain is distributed, the option to sell mutual fund shares provides some protection against large capital gain tax liability. If the fund distributes gains that were accrued before the investor purchased the fund, the investor can sell the shares, realize a capital loss on the mutual fund shares, and use this loss to offset the fund's

capital gain distribution. This realization strategy is often ignored in discussions of the potential tax burdens associated with mutual funds with embedded capital gains.

If the investor chooses not to sell the shares in a fund that makes a large distribution, then the fund's capital gain distribution will accelerate tax payments. If the fund had not distributed gains, and the investor eventually sold the fund, then the full capital gains tax liability would be due when the fund shares were sold. When the fund has distributed some capital gains, the investor's capital gains tax liability when the fund shares are sold will be smaller than that in the absence of capital gain distributions. The total nominal tax burden will not be affected by the fund's distribution of gains, but the present value of taxes will be higher when the tax burden is accelerated as a result of gain distributions.

We use the difference between the pretax return in Eq. (1) and the after-tax return in Eq. (2) to measure the fund's tax burden. We could scale this by the fund's pretax return, thereby constructing an effective tax rate, but we do not because this approach runs into difficulty when a fund experiences negative returns. Our measure of the fund's tax burden is therefore

$$T = \tau_d * (d + g_s) + \tau_{cg} * g_l + \tau_{ucg} * u. \tag{3}$$

To construct this measure of a fund's tax burden, we need data on both long-term and short-term capital gain realizations. Morningstar has provided us with historical data on the disaggregated capital gain components for the funds that survived to January 1999. However, for mutual funds that were traded earlier in the 1990s, but disappeared due to merger or liquidation prior to January 1999, we have only obtained data on total capital gain distributions. We thus face a choice. We can study a sample of funds that is subject to survivorship bias, with accurate measures of tax burdens, or we can study a sample of funds without survivorship bias, but with inaccurate tax burden data. Elton et al. (1996) and Carpenter and Lynch (1999) suggest that funds with poor returns are most likely to be merged or liquidated. This may induce biases in studying the persistence of fund returns or inflows. Most of our analysis therefore uses data on all funds that were traded during our sample period, but does not distinguish between long-term and short-term capital gain realizations. This imparts some measurement error to our analysis of tax burdens.

When we do not know the disaggregate composition of realized gains, we assume that all gains are long-term. We therefore define after-tax returns as

$$R''_a = (1 - \tau_d) * d + (1 - \tau_{cg}) * (g_l + g_s) + (1 - \tau_{ucg}) * u \tag{4}$$

and we measure the tax burden as

$$T'' = \tau_d * d + \tau_{cg} * (g_l + g_s) + \tau_{ucg} * u. \tag{5}$$

To assess the magnitude and direction of any bias that results from aggregating short-term and long-term gain realizations, we obtain data on the composition of gain realizations for all of the funds that were in our sample at the end of 1999. We present results that explore the robustness of our findings to using these measures in Eqs. (4) and (5).

A critical question in defining the after-tax return concerns the choice of tax rates. It is difficult to measure the tax rates facing mutual fund investors. Information from tax returns, which can be used to compute weighted-average tax rates on interest or dividend income, does not identify the income from mutual funds separately from income from other investments. Other sources of information on asset ownership, such as the Survey of Consumer Finances (SCF) data used in Poterba and Samwick (2002), provide limited information on household attributes that may affect marginal tax rates. In particular, the SCF does not precisely identify the characteristics of the particular mutual funds that each household owns. If there are tax-based clienteles, with high tax rate households tending to invest in mutual funds that impose lower tax burdens than the funds held by lower tax rate households, calculations based only on mutual fund ownership may fail to describe actual tax burdens.

We assume that dividend income and short-term capital gain realizations are taxed at the marginal personal income tax rate of 31%. In 1998, this was the marginal income tax rate on married joint filers with taxable income of between $102,300 and $155,950, and for single persons with taxable income between $61,400 and $128,100. We further assume that all capital gains are long-term and that they are taxed at the prevailing maximum long-term capital gains tax rate. This rate was 28% from 1993 to 1997 and 20% in 1998 and 1999. We apply the same tax rates in computing the after-tax returns for all funds.

Table 1 presents summary information on the direct ownership of mutual funds from the 1998 Survey of Consumer Finances. Of the 16.2 million households that owned taxable mutual funds in 1998, roughly three-quarters had annual income of less than $100,000. These households owned 44% of all taxable mutual fund assets. While families with incomes of more than $250,000 represented only 5.4% of mutual fund investors, they held 31.3% of the assets in taxable mutual funds. Thus the median dollar of mutual fund investments by taxable households in 1998 was held by a household in the 31% marginal tax bracket, which supports our use of that tax rate in our calculations.

In most of our empirical work, we assume $\tau_{ucg} = 0.10$. This is half the statutory tax rate on realized long-term gains, and it is broadly consistent with effective tax rate calculations using a range of plausible values for realization rates and discount rates.

Table 1
Ownership of taxable mutual funds from the 1998 Survey of Consumer Finances. Entries in parentheses are percentages of column totals.

Household income	Millions of households owning taxable mutual funds	Holdings of taxable mutual funds (billion dollars)
<$50,000	5.94 (36.7%)	210 (14.3%)
$50–100,000	6.40 (39.5)	434 (29.6)
$100–150,000	1.79 (11.1)	158 (10.8)
$150–250,000	1.19 (7.3)	205 (14.0)
>$250,000	0.88 (5.4)	460 (31.3)
Total	16.20 (100.0)	1467 (100.0)

For example, Chay, et al. (2000) find that the relative value of realized and unrealized capital gains implicit in the pricing of closed-end mutual fund shares implies a value of τ_{ucg} very close to 0.10. Our empirical results are nevertheless quite robust to alternative assumptions about this tax parameter. In ongoing work, we are developing fund-specific estimates of the effective tax burdens on accruing gains.

2. Data on mutual fund returns

We restrict our analysis to U.S. domestic equity mutual funds, and we obtain data on fund returns from the seven January releases of the Morningstar mutual fund database published between 1994 and 2000. We merge data from each year's annual data release, rather than using the end-of-sample data release, to avoid survivorship biases that result from failure to include funds that disappear through merger or liquidation. This generates a universe of 42,806 fund-years of data. We treat separate share classes of a given fund as distinct funds.

Table 2 shows the number of funds in each year between 1993 and 1999. It tracks the rapid rise in the total number of funds, from 2,993 in 1993 to 9,363 in 1999. Merging data in this way also provides us with some historical data that are not available on the retrospective data file, such as load structure, manager tenure, and fund objective.

We exclude some mutual funds that were included in the merged Morningstar database in generating our sample of equity funds that were available to investors in each year between 1993 and 1999. First, we exclude any observations for which Morningstar does not report a ticker symbol, a net asset value, or a value for total fund assets at year-end. Second, we exclude funds that are identified as bond funds, hybrid funds, international funds, and specialty equity funds that hold shares in limited sectors of the market. Only 14,193 of the 42,806 fund-years of data in the

Table 2
Sample size and impact of sample restrictions, 1993–1999. Entries show the number of equity mutual funds in the Morningstar Principia database that satisfies various sample criteria. Entries in the last row indicate the number of funds for each year that are included in the sample used for estimation in later tables.

	1993	1994	1995	1996	1997	1998	1999	1993–1999
Total funds in sample	2,993	3,984	4,890	5,580	7,394	8,602	9,363	42,806
Total broad equity funds	889	1,132	1,531	1,847	2,441	2,985	3,368	14,193
Young funds	223	376	556	602	778	958	890	4,383
Missing data	228	381	589	594	765	956	892	4,405
Young or missing data	231	382	597	607	787	969	912	4,485
Institutional funds or funds Closed to new investors	116	190	295	352	511	626	725	2,815
Total excluded	300	488	760	848	1,111	1,378	1,462	6,347
Estimation sample	541	644	771	999	1,330	1,607	1,906	7,798

Morningstar sample correspond to broad-based equity funds of the type that we consider.

Third, we follow Chevalier and Ellison (1997) and focus on funds with at least three years of historical returns in our data file. This focuses our analysis on a sample of funds with an established return history, and it makes it possible for us to compute risk-adjusted measures of fund performance. It also, however, limits our sample in a way that could induce selection and survivorship biases. To address this issue, we report basic results for a sample of funds with at least three years of historical data and explore the sensitivity of our findings to relaxing this constraint. Our results are not very sensitive to including younger funds in the sample.

Fourth, we exclude a small set of fund-years in which measured net inflows exceed ten times beginning-of-period size, and fund-years for which Morningstar did not report ratings or information on the median market capitalization of the stocks in the fund's portfolio. Fifth, we exclude institutional equity funds. At the end of 1999, these funds held $236 billion in assets, compared with $2,407 billion for all equity funds. Finally, we exclude funds that are closed to new investors. Some high-profile funds, for example Fidelity Magellan, were closed to new investors at some points in our sample.

Table 2 shows the impact of our various sample restrictions on the total number of fund-years in our data sample. Of 14,193 possible equity fund-years for which we have data, we exclude 30.9% (4,383) because they lack information on three years of lagged returns. Many of these funds also have missing data, and the total number of fund-years excluded for either reason is 4,485. Taken together, these restrictions exclude a total of 6,347 fund-years from our sample, which leaves us with an estimation sample of 7,798 fund-years.

2.1. Summary statistics on pretax and after-tax returns

Table 3 presents summary statistics on mean and median returns, and the components of returns, for our data sample. It also presents summary information on the dispersion of fund returns and fund tax burdens. For the 1993–1999 period, the mean pretax return on equity mutual funds was 19.1% per year, while the mean after-tax return was 16.0%. Our sample period is characterized by very favorable returns on the U.S. equity market in general, so our average returns are likely to be significantly higher than those that would be observed over longer sample periods.

Table 3 provides some insight on the reason for the difference between the pretax and after-tax return. Undistributed capital gains average 9.8% per year. Heavily taxed dividends average 0.9%, and capital gain distributions account for an average pretax return of 8.4%. Given our assumptions about the marginal tax rates of the representative mutual fund investor, these pretax returns generate a tax burden of 3.2% per year. If we set the tax rate on undistributed capital gains to zero, the tax burden would average 2.2% per year. We confirm Dickson and Shoven's (1995) finding of significant heterogeneity in the tax liabilities associated with different mutual fund investments. The difference between the tax burdens on funds in the

Table 3
Summary statistics on mutual fund returns, 1993–1999. Statistics are based on the estimation sample of 7,798 fund-years described in Table 2. Each fund-year is weighted equally in computing summary statistics. All entries are measured in percentage points, and returns are measured net of expenses.

Return component	Mean	Standard Deviation	Median	Interquartile range
Pretax return	19.1%	18.7%	18.4%	19.6%
Dividend yield	0.9	1.3	0.4	1.4
Capital gain distributions	8.4	7.3	7.2	9.3
Undistributed capital gain	9.8	18.2	8.2	19.5
Tax burden	3.2	2.2	3.1	2.5
After-tax return	16.0	16.7	15.2	17.4
Taxes/pretax return, conditional on pretax return >0	18.0	10.5	15.4	7.8
Net inflow	18.9	74.2	1.5	39.5

Table 4
Mean pretax and after-tax fund returns. Calculations are based on the estimation sample of fund-years described in Table 2. Tax burden calculations assume a marginal tax rate of 31% on dividends, the statutory maximum long-term capital gains tax rate (28% prior to 1997, 20% thereafter) on capital gains distributions, and an effective tax rate of 10% on undistributed capital gains.

Year	Sample size	Fund-weighted		Asset-weighted	
		Pretax return	Tax burden	Pretax return	Tax burden
1993	541	13.2%	2.8%	15.1%	3.0%
1994	644	−1.8	0.9	−0.7	1.1
1995	771	30.5	4.7	32.6	4.9
1996	999	18.1	3.7	18.1	3.5
1997	1,330	23.4	3.7	25.7	3.8
1998	1,607	13.9	2.2	21.0	3.0
1999	1,906	25.1	3.5	26.5	3.7
All years	7,798	19.1	3.2	22.3	3.5

75th and 25th percentiles is 2.5 percentage points. A difference of this magnitude looms large relative to potential differences in expected returns across funds.

Table 4 presents summary statistics on fund pretax and after-tax returns for each of the years in our sample period. We show means that weight each mutual fund equally, as well as means that weight funds by their total assets under management. Asset-weighted summary statistics describe the return on the average dollar invested in equity mutual funds better than fund-weighted summary statistics. The first column of Table 4 shows the number of mutual funds in our sample for each year. The next two columns show year-by-year equal-weighted average pretax returns, and average tax burdens. The last two columns show analogous asset-weighted returns. The results show that returns on large funds have exceeded those on small funds. The asset-weighted mean pretax return is 22.3% per year, compared with a mean return

of 19.1% when all funds are weighted equally. The average tax burden is 3.5% on an asset-weighted basis, compared to 3.2% on an equal-weighted basis. The statistics on interquartile ranges in Table 3 suggest significant variation in both returns and tax burdens across funds.

Table 5 illustrates this heterogeneity by reporting the pretax return, tax burden, after-tax return, and unrealized capital gains as a share of assets for the twenty largest funds in our sample for calendar year 1999. The data show a wide range of tax burdens for different funds; this is due both to differences in investment objectives and to tax management. For example, an investor facing the tax rates that we assume, and holding the Fundamental Investors Fund in 1999, faced a tax burden of 3.6 percentage points. The same investor holding the Fidelity Blue-Chip Growth fund faced a tax burden of 2.8% on a very similar pretax return. Holding the Vanguard Total Stock Market Index Fund would have resulted in a tax burden of 2.7 percentage points, also with a similar pretax return. These estimated tax burdens impute a 10% tax burden on unrealized gains. If we set the tax rate on such gains to zero, the tax burdens on the three funds are 2.4, 0.9, and 0.6 percentage points, respectively. The difference between these sets of tax burdens highlights the inter-fund differences in the fraction of capital gains realized and distributed, and emphasizes the role of this fraction for determining the fund's tax burden. The after-tax returns in the penultimate column of Table 5 impute a 10% tax rate on unrealized capital gains.

The last column in Table 5 reports the stock of unrealized gains held by each fund, as a percentage of its total asset value at year-end. This is the ratio of two stocks, and it is distinct from the flow of undistributed gains within the year, which is reported in column four. The table shows very substantial variation across funds in the importance of unrealized capital gains relative to fund value. At some funds, unrealized gains account for more than half of assets, while at others, the corresponding fraction is less than one quarter. The differences across funds are due to differences in past return experience, differences in the past pattern of fund inflows, and differences in manager behavior with respect to gain realization.

2.2. Adjusting returns for risk

Part of the disparity in returns and in tax burdens across equity mutual funds is due to differences in the risks associated with the assets that the funds invest in. To study how past returns affect inflows to funds, we need to control for differences in fund returns that are due to market-wide returns and the differential riskiness of different investment strategies. Previous researchers have related fund inflows to three adjusted measures of fund returns. The first is the fund return relative to a market index, $A_{it}^{m} = R_{it} - R_t^{\mathrm{m}}$, where R_{it} is the individual fund return and R_t^{m} is a measure of the market return. The second, which corrects for risk differences more explicitly, is the 'alpha' from a one-factor risk-adjustment model. This can be calculated as

$$A_{it}^{1} = R_{it} - r_t - \beta_{it}^{\mathrm{m}} * (R_t^{\mathrm{m}} - r_t) \tag{6}$$

Table 5
Pretax returns, after-tax returns, and embedded capital gains for the 20 largest equity mutual funds that were open to new investors on December 31, 1999. Tax burden calculations assume a marginal tax rate of 31% on dividends, the statutory maximum long-term capital gains tax rate on capital gains distributions, and an effective tax rate of either zero or 10% on undistributed capital gains. Data for the calculations are drawn from the Morningstar Principia database.

Fund name	Assets ($billion)	Pretax return	Undistributed gains	Dividends	Realized capital gains	Tax burden on undistributed gains = 0.1	Tax burden on undistributed gains = 0	After-tax return	Unrealized capital gains/asset value
Vanguard Index 500	104.7	20.9%	18.8%	1.2%	0.9%	2.4%	0.6%	18.4%	43%
Fidelity Magellan	99.2	23.1	13.1	0.6	9.4	3.4	2.1	19.7	45
Washington Mutual Investors	55.1	1.0	−10.2	1.8	9.5	1.4	2.4	−0.4	35
Investment Company of America	53.7	15.9	4.5	1.6	9.8	2.9	2.5	13.0	52
Janus	37.9	47.4	30.9	1.0	15.5	6.5	3.4	40.9	51
American Century/ 20th Century Ultra	37.6	41.2	37.0	0.0	4.1	4.5	0.8	36.6	47
Vanguard Windsor II	26.9	−5.7	−16.3	2.3	8.4	0.7	2.4	−6.4	23
Fidelity Blue-Chip Growth	25.9	23.7	19.3	0.3	4.1	2.8	0.9	20.8	38
Fidelity Advisors Growth Opportunity	24.2	3.7	−7.1	0.7	10.1	1.5	2.2	2.1	39
Growth Fund of America	23.8	44.6	30.1	0.2	14.3	5.9	2.9	38.7	54
Fidelity Equity-Income	23.1	7.0	−3.7	1.5	9.2	1.9	2.3	5.1	39
Income Fund of America	21.4	0.5	−9.2	5.0	4.7	1.6	2.5	−1.1	10
Putnam Growth and Income A	21.1	1.5	−8.5	2.0	8.0	1.4	2.2	0.1	19
Putnam Voyager A	20.4	54.8	41.2	0.0	13.6	6.8	2.7	48.0	52
Fidelity Growth Company	19.2	77.6	65.2	0.0	12.3	9.0	2.5	68.6	56
Vanguard US Growth	19.1	22.1	16.1	0.6	5.4	2.9	1.3	19.2	45
Fidelity Equity-Income II	18.2	4.1	−8.8	1.2	11.7	1.8	2.7	2.2	37
MSDW Dividend Growth Securities B	17.1	−1.0	−5.9	1.1	3.8	0.5	1.1	−1.5	50
Vanguard Windsor	16.7	11.4	−2.6	1.7	12.2	2.7	3.0	8.6	23
Vanguard Total Stock Market Index	16.3	23.5	21.2	1.2	1.2	2.7	0.6	20.8	33
Fundamental Investors	15.6	23.7	12.7	1.4	9.6	3.6	2.4	20.1	31

where r_t denotes the risk-free short-term interest rate and R_t^m again denotes a measure of the market return. We estimate β_{it}^m using monthly data on fund returns and market returns from the 36 months prior to the start of the calendar year for which we compute the risk-adjusted return.

Finally, a third approach to adjusting returns for market-wide performance and risk involves computing the alpha from a multifactor asset pricing model. The approach is similar to that in Eq. (6), except that several factors are used in place of the single market factor. Our implementation of this approach employs three factors – the market factor, a "small stock vs. large stock" factor, and a "value vs. growth" factor – that are analyzed in Fama and French (1996). Previous studies have used all of these risk-adjustment strategies to study inflows. Chevalier and Ellison (1997) focus on relative returns, while Gruber (1996) and Carhart (1997) use variants of the third measure, with different sets of factors. The two risk-adjustment strategies have only a limited impact on the ranking of the returns on different funds. Most funds in the top quartile of the distribution of funds when ranked simply by pretax return are also in the top quartile of the risk-adjusted return distribution.

The taxes that investors pay on fund returns are also risky, so we also adjust tax payments for risk. When we risk-adjust pretax returns by subtracting the average fund return from each fund's return, we correspondingly subtract the average fund tax burden from each fund's tax burden. We implement this return-adjustment procedure by including a set of indicator variables for each year in our sample in our regression models. This approach, introducing time effects, is a broader adjustment than subtracting the market return for the year from each fund-year return observation. With individual year dummy variables in the regression, only differences in returns across funds, not differences from year-to-year average fund returns, affect inflows. This procedure controls for changes in a fund's tax burden that are related to fluctuations in overall market returns. When we use the one-factor and three-factor risk adjustment procedures, we incorporate additional information on the historical covariation between a fund's return and the market return. We assume that returns on the market portfolio are taxed at a constant rate of 10%, which would be exactly correct (given our other assumptions) if all returns took the form of unrealized capital gains. We then define the risk-adjusted tax burden as:

$$\mathrm{AT}_{it} = T_{it} - \beta_{it}^m * (0.10 * R_t^m). \tag{7}$$

The values of AT_{it} are different in the one-factor and the three-factor risk-adjustment cases, since the coefficient estimates of β_{it}^m which are estimated using univariate regression in the one-factor risk-adjustment setting are not the same as those that are estimated using multivariate regression in the three-factor risk-adjustment setting.

2.3. Return persistence

Rational investors will adjust their mutual fund investments in response to historical differences in returns only if past returns must help predict future performance. To evaluate the predictive power of past returns, we estimate first-

order autoregressions of the form

$$R_{it} = \zeta_t + \rho * R_{it-1} + \upsilon_{it}, \tag{8}$$

where R_{it} denotes the return on fund i in year t, and ζ_t is a year-specific intercept term. We also estimate similar models for risk-adjusted returns, for after-tax returns, and for the tax burden on different funds.

Table 6 reports the results. We find positive persistence across years for each of the measures of fund performance. For relative returns, the autocorrelation coefficient for pretax returns is 0.518. The autocorrelation of the relative after-tax return is somewhat higher: 0.532. Perhaps more importantly for our analysis, there is substantial persistence in the estimated tax burden; the autocorrelation of T_{it} is 0.397. This suggests that an investor who was concerned about minimizing the tax burden associated with a mutual fund investment could use past evidence on a fund's tax burden to predict the future burden of the fund.

The remaining panels of Table 6 show the autocorrelation of one- and three-factor risk-adjusted return measures and the associated tax burden measures. Our results support Carhart's (1997) finding that controlling for risk factors reduces the persistence of fund returns. With one-factor risk-adjusted returns, we find autocorrelations of pretax and after-tax returns of 0.362 and 0.367, respectively. The autocorrelation of the tax burden is 0.361.

Another way to view the persistence of returns and tax burdens is to ask what fraction of the variation in returns in a given year can be explained by the prior year's return. The traditional R^2 statistics for the autocorrelation models in Table 6 are misleading, because the autoregressive models include time effects as well as lagged returns. We therefore report the incremental R^2 associated with adding lagged returns, or lagged taxes, to regression models that already include time effects. The incremental R^2 values for pretax returns range from 0.083 for returns relative to the market, to 0.057 with a one-factor risk adjustment, to 0.024 for three-factor risk-adjusted returns.

Several previous studies of persistence in mutual fund returns, such as Carhart (1997) and Gruber (1996), report average returns on portfolios of mutual funds that have been sorted by lagged returns. This is an alternative to our use of autocorrelation coefficients and incremental R^2 values. When we compute statistics that are comparable to those in the earlier studies, we find a similar degree of return persistence. If we sort funds into deciles based on actual lagged returns, then compute decile averages of the one-factor risk-adjusted returns, the Spearman rank correlation coefficient between the decile's lagged actual return and the current risk-adjusted return is 0.976. Note that this calculation does not weight funds by their asset values. Gruber (1996) reports a rank correlation of 0.891 using four-factor risk-adjusted returns. When we compute a similar rank correlation coefficient using data on one-factor risk-adjusted returns in Carhart (1997), the estimated correlation coefficient is very similar to that in our sample. Ippolito (1992), who reports autocorrelations like those in Table 6, finds slightly less persistence than we do. It is possible that the sequence of positive market return years during our sample limits the applicability of our persistence findings to other time periods.

Table 6
Persistence of pretax and post-tax mutual fund returns, and of mutual fund tax burdens. Estimates for relative returns are based on the estimation sample of 7,798 fund-year observations, described in Table 2. Estimates for risk-adjusted returns use a sample of 5,208 fund-year observations for which lagged return information, needed to compute risk adjustments, is available. All regressions include year dummies. Standard errors, shown in parentheses, are corrected for clustering using a nonparametric version of the technique suggested by Moulton (1987). The estimating equation in each case is $R_{it} = \zeta_t + \rho * R_{it-1} + \upsilon_{it}$ where R_{it} denotes the return on fund i in year t, or in some cases the tax burden, and ζ_t is a year-specific intercept term. Asterisks denote coefficients that are statistically significantly different from zero at the 95 percent confidence level.

	Relative return measures			One-factor risk-adjusted return measures			Three-factor risk-adjusted return measures		
	Pretax	After-tax	Tax burden	Pretax	After-tax	Tax burden	Pretax	After-tax	Tax burden
Lagged return	0.518*	0.532*	0.397*	0.362*	0.367*	0.361*	0.224*	0.194*	0.409*
	(0.018)	(0.018)	(0.016)	(0.020)	(0.020)	(0.019)	(0.019)	(0.019)	(0.019)
R^2	0.185	0.217	0.281	0.085	0.088	0.127	0.070	0.066	0.132
Increment to R^2	0.083	0.086	0.057	0.057	0.059	0.063	0.024	0.019	0.073

*

3. The determinants of mutual fund tax burdens

The dispersion of tax burdens across mutual funds is of potential interest to taxable investors, regardless of its capacity to predict fund inflows. In this section, we explore the characteristics of mutual funds that are associated with high tax burdens. We relate tax burdens to a set of variables, some of which, like the turnover rate, are under the control of the fund manager. We explain tax burdens as a function of both lagged and contemporaneous information, and also as a function only of lagged information. We do not attempt to model the manager behavior that leads to the patterns we observe.

We estimate partial correlation coefficients by fitting regression models of the form

$$T_{it} = \alpha + X_{it} * \beta + v_t + \zeta_{it}, \tag{9}$$

where T_{it} dsenotes our estimate of the tax burden on fund i in year t and X_{it} is a set of fund characteristics. The set of explanatory regressors, X_{it}, includes: the turnover of stocks in the fund; an indicator variable for whether or not the fund is an index fund, which would indicate a reduced need for trading; an indicator for whether or not the fund is a tax-managed fund; and an indicator variable for new management taking charge of the fund in recent years, which may indicate a shift in portfolio strategy. We include several years of lagged fund inflows as a share of fund assets, since a fund experiencing inflows does not need to sell shares to raise cash, and consequently has a greater opportunity to pursue a low realizations strategy. We also include the fund's current pretax returns, the fund's lagged tax burden, and a set of indicator variables for fund styles (large-cap growth, small-cap value, etc.), since realization differences across investment styles may influence investor tax burdens.

In addition to regression models that explain a fund's current tax burden, we also estimate prediction equations for tax burdens, which take the form

$$T_{it} = \varphi + Z_{it-1} * \theta + v_t + \varpi_{it}. \tag{10}$$

In this equation, all of the variables in Z_{it-1} are observable at the beginning of an investment period. Potential investors could use an equation like Eq. (10) to forecast future tax burdens on various funds.

Table 7 reports three regression models, which suggest several broad conclusions.[1] First, a fund's current return is strongly positively correlated with its tax burden. A 100 basis point increase in a fund's return leads, on average, to roughly a ten basis point increase in the fund's tax burden. Second, both current and lagged turnover are important correlates of a fund's tax burden. While current turnover is associated with a higher tax burden, higher past turnover has a negative effect on the current tax burden. This is conditional on current turnover. Assets that have been recently purchased are likely to have smaller embedded capital gains than assets purchased in the more distant past. A twenty percentage point increase in annual turnover, from

[1] The correlation over time in the dependent and independent variables for each fund necessitates an adjustment to the standard errors reported by least squares estimation. We correct for this "clustering bias" using the nonparametric version of Moulton's (1987) procedure that is programmed in STATA.

Table 7
Determinants of mutual fund tax burdens, 1994–1999. The dependent variable is the fund tax burden in year t, which has a mean of 3.2% and a standard deviation of 2.2%. All equations include indicator variables for each year. Standard errors, shown in parentheses, are corrected for clustering using a nonparametric version of the technique suggested by Moulton (1987). Estimates correspond to the equation $T_{it} = \alpha + X_{it} * \beta + v_t + \zeta_{it}$, where T_{it} denotes our estimate of the tax burden on fund i in year t and X_{it} is a set of fund characteristics. Asterisks denote coefficients that are statistically significantly different from zero at the 95 percent confidence level.

Variable	Mean	Model 1	Model 2	Model 3
Constant		1.436*	1.501*	1.571*
		(0.174)	(0.130)	(0.140)
Tax burden ($t-1$)	3.224	0.240*	0.211*	0.181*
		(0.038)	(0.031)	(0.033)
Tax burden ($t-2$)	2.908	0.124*	0.062	0.087*
		(0.038)	(0.034)	(0.033)
Turnover (t)	0.790	0.601*	0.656*	0.649*
		(0.098)	(0.096)	(0.099)
Turnover ($t-1$)	0.801	−0.478*	−0.456*	−0.441*
		(0.084)	(0.080)	(0.085)
Return (t)	18.079	0.101*	0.105*	0.104*
		(0.002)	(0.002)	(0.002)
Return ($t-1$)	16.818	−0.020*	−0.019*	−0.017*
		(0.005)	(0.005)	(0.005)
Return ($t-2$)	14.715	−0.027*	−0.013*	−0.024*
		(0.006)	(0.004)	(0.005)
New manager (t)	0.060	0.494*	0.473*	0.485*
		(0.171)	(0.169)	(0.161)
New manager ($t-1$)	0.096	0.049	0.094	0.088
		(0.074)	(0.068)	(0.071)
Expense ratio	1.272	−0.043	−0.091*	−0.099*
		(0.062)	(0.043)	(0.044)
$8 \leqslant$ Fund age < 16	0.354	−0.089	−0.116*	−0.122*
		(0.047)	(0.044)	(0.047)
$16 \leqslant$ Fund age	0.313	0.020	0.006	−0.014
		(0.051)	(0.045)	(0.049)
Index fund indicator	0.032		−0.393*	−0.372*
			(0.098)	(0.097)
Tax-managed?	0.001		−0.282*	−0.322*
			(0.075)	(0.077)
Inflow ($t-1$) ($\times 10^{-2}$)	18.769	−0.238*	−0.254*	−0.213*
		(0.048)	(0.039)	(0.042)
Inflows ($t-2$) ($\times 10^{-2}$)	27.635	0.009	−0.059	−0.009
		(0.038)	(0.034)	(0.034)
Inflows ($t-3$) ($\times 10^{-2}$)	48.634	−0.025	−0.024	−0.030*
		(0.015)	(0.014)	(0.014)
Unrealized gains ($t-1$)	20.710	0.002		0.005*
		(0.002)		(0.002)
Fund style indicators?		No	Yes	Yes
R^2		0.902	0.900	0.908
N		3701	4340	3701

*

the mean of 79–99%, is associated with a 13 basis point increase in the fund's tax burden in the current year, and a nine basis point decrease in the burden next year. Third, a fund's current tax burden is positively related to the share of a fund's value at the previous year-end that is comprised of unrealized appreciation on fund assets. A ten percentage point increase in unrealized gains as a share of fund assets raises the current tax burden by five basis points.

Our finding that current turnover is an important predictor of a fund's tax burden stands in contrast to some recent industry analyses, such as Belden (1997). This may be because we focus on the marginal impact of turnover in explaining tax burdens, rather than the total explanatory power of turnover in accounting for tax burden differences. In principle, turnover need not lead to higher tax burdens. A fund manager who realizes losses and holds gains may have a higher turnover rate than one who does not harvest losses, but the resulting tax burden on such a fund may be lower than that on a comparable, but lower-turnover, fund. Our empirical findings suggest that turnover is not typically directed at tax-minimization.

The results in Table 7 suggest substantial positive serial correlation in mutual fund tax burdens. A ten basis point increase in the tax burden on a fund in the current year predicts nearly a two basis point increase in the tax burden next year. This finding is largely a result of our combination of cross-sectional and time-series data on the tax burdens of individual funds. If we include fixed effects (by fund) in equations like those in Table 7, thereby allowing each fund to have a separate intercept in the tax burden equation, the results change. With fund fixed effects, the coefficients on the lagged tax burden become negative. This presumably reflects the fact that a firm that distributes a substantial capital gain in one year, and thereby incurs a large tax burden, is less likely to distribute a large capital gain in the next year.

A number of other findings in Table 7 warrant comment. Index funds have substantially lower tax burdens than other funds. The estimates in the last column suggest that the average differential between the tax burden on index funds and other funds is roughly 37 basis points. Tax-managed funds have tax burdens about 32 basis points below other funds. Managerial changes and past inflows are also correlated with current tax burdens. Funds with new managers have tax burdens about 49 basis points higher than other funds. Funds with higher inflows in previous years display lower tax burdens than funds with lower past inflows. Inflows are persistent, so funds with higher past inflows may face lower levels of redemptions in the current year.

Table 8 presents equations similar to those in Table 7 but restricts the set of explanatory variables to include only lagged information. The predictive effect of lagged tax burdens on current burdens is attenuated when we exclude several current variables from the regression specification. In most specifications, however, the combined effect of the tax burden in the previous two years on the current tax burden is positive. Lagged turnover of fund assets is a statistically significant predictor of the current tax burden. Other lagged covariates also have statistically significant effects. Younger funds display higher tax burdens, and tax-managed

Table 8
Prediction of mutual fund tax burdens using lagged information. All equations include indicator variables for each year, as well as indicator variables for fund styles. Standard errors, shown in parentheses, are corrected for clustering using a nonparametric version of the algorithm in Moulton (1987). The estimation period is 1994–1999. Estimates correspond to the equation $T_{it} = \varphi + Z_{it-1} * \theta + v_t + \varpi_{it}$ where T_{it} denotes the tax burden on fund i in year t, and Z_{it-1} denotes a vector of lagged explanatory variables. Asterisks denote coefficients that are statistically significantly different from zero at the 95 percent confidence level.

Variable	Mean	Model 1	Model 2	Model 3
Constant	1.000	1.395*	4.137*	1.576*
		(0.248)	(0.357)	(0.216)
Tax burden ($t-1$)	3.224	−0.167*	0.012	−0.054
		(0.062)	(0.059)	(0.067)
Tax burden ($t-2$)	2.908	0.145	0.148*	0.193*
		(0.074)	(0.064)	(0.071)
Turnover ($t-1$)	0.801	0.500*	0.273*	0.219*
		(0.064)	(0.055)	(0.059)
Return ($t-1$)	16.818	0.078*	0.052*	0.061*
		(0.010)	(0.010)	(0.010)
Return ($t-2$)	14.715	−0.107*	−0.068*	−0.096*
		(0.014)	(0.011)	(0.013)
New manager ($t-1$)	0.096	0.019	−0.053	−0.047
		(0.142)	(0.133)	(0.134)
Expense ratio ($t-1$)	1.272	−0.105	−0.171	−0.200*
		(0.087)	(0.125)	(0.099)
$8 \leqslant$ Fund age < 16	0.354	−0.366*	−0.401*	−0.390*
		(0.115)	(0.104)	(0.108)
$16 \leqslant$ Fund age	0.313	−0.139	−0.220*	−0.211
		(0.128)	(0.105)	(0.109)
Index fund	0.032		−0.171	−0.159
			(0.125)	(0.126)
Tax-managed indicator	0.001		−0.245*	−0.261*
			(0.110)	(0.100)
Inflows at $t-1$ ($\times 10^{-2}$)	18.769	−0.206*	−0.297*	−0.213*
		(0.096)	(0.091)	(0.092)
Inflows ($t-2$) ($\times 10^{-2}$)	27.635	−0.031	−0.056	−0.046
		(0.076)	(0.071)	(0.076)
Inflows ($t-3$) ($\times 10^{-2}$)	48.634	−0.109*	−0.098*	−0.102*
		(0.040)	(0.042)	(0.041)
Unrealized gains ($t-1$)	20.710	0.010		0.001
		(0.006)		(0.006)
Fund style indicators?		No	Yes	Yes
R^2		0.436	0.474	0.492
N		4860	5553	4860

*

funds display lower tax burdens than other funds. Past inflows have a statistically significant and negative effect on current tax burdens.

Many of the factors that we have used to "explain" fund tax burdens can be affected by fund managers. Chevalier and Ellison (1997) note that fund managers' compensation is highly dependent upon their assets under management. In this

setting, the impact of tax burdens on a fund's asset base, which will be mediated through their effect on net inflows, becomes a central issue. This is the empirical question to which we now turn.

4. Measuring mutual fund inflows

To measure the net inflows to equity mutual funds, we rely primarily on data reported by Morningstar. We compute net inflows from annual data on fund assets. Morningstar reports total assets, as well as the net asset value (NAV) for each fund share, at the end of each calendar year. We estimate annual net inflows as a fraction of assets at the end of the previous year, I_t^u, as follows:

$$I_t^u = \text{Assets}_t/\text{Assets}_{t-1} - (\text{NAV}_t + \text{DIV}_t + \text{GAINS}_t)/\text{NAV}_{t-1}. \quad (11)$$

This measure subtracts the growth in fund size attributable to returns on assets in the fund at the end of the previous year from the total growth in fund assets. It is the most commonly used measure of inflows in the empirical literature. We adjust this measure, following Ippolito (1992), to account for the fact that new shares are purchased throughout the year. We therefore compute a modified inflow measure (I_t) as:

$$\text{I}_t = I_t^u/(1 + R_t/2), \quad (12)$$

where R_t denotes the fund's return over the calendar year. In Eq. (11), DIV_t and GAINS_t correspond to dividend and capital gain distributions, respectively.

We distinguish inflows that result from reinvestment of dividends and realized capital gains from net new-money inflows.[2] (Net inflows including such reinvestments could be estimated as $I_t' = \text{Assets}_t/\text{Assets}_{t-1} - \text{NAV}_t/\text{NAV}_{t-1}$.) We focus on net new-money inflows to allow for the possibility that such inflows are more sensitive to relative performance than reinvested dividends and capital gains. Since roughly 90% of dividends and realized gains are reinvested at equity mutual funds, this seems like a plausible assumption. To explore the sensitivity of our findings to our assumption that new-money inflows are critical, we have estimated our basic regression equations using both I_t' and I_t^u, rather than I_t, the dependent variable. The results using I_t' are similar to the findings that we report using I_t.[3]

[2] In some cases, unsuccessful funds are merged into more successful funds within the same fund family. Such mergers could result in spurious variation in our measure of fund inflows. We are not aware of any way to correct for this, but we suspect that it has at best a small impact on our results, especially when we weight funds by assets, since most funds that are merged into other funds are small.

[3] When funds have large positive or negative returns, the annual difference in assets under management may diverge from the sum of daily or monthly inflows. We evaluated the importance of this bias by obtaining monthly Financial Research Corporation data on fund net inflows for a small sample of equity mutual funds in the last few years of our sample period. We found that our estimate of the fund net inflow based on annual data diverged relatively little, for most funds, from the actual sum of the monthly fund net inflows

The average fund in our sample experienced net inflows of 18.9% of beginning-of-year assets; weighting funds by initial assets, the inflow rate is 15.7%. On average, larger funds experience smaller inflows, relative to assets, than smaller funds. Median net inflows (4.2%, weighting funds by assets) are also smaller than mean net inflows. The difference between the mean and the median is indicative of substantial skewness in net inflow rates across funds. This is supported by other statistics: 48% of all funds years, accounting for 37% of all fund assets, showed net outflows rather than net inflows. The wide differences in the inflow experience of different funds are the result of many factors. We now investigate whether differences in the tax burdens that funds place on their taxable investors are one of them.

5. The determinants of mutual fund net inflows

We model mutual fund inflows as a function of past returns and other fund characteristics:

$$I_{i,t} = R_{i,t-1} * \theta + X_{i,t} * \phi + v_t + \upsilon_{i,t}. \tag{13}$$

$I_{i,t}$ is the fund's inflow, $R_{i,t-1}$ denotes a fund's past returns, possibly risk-adjusted, and the $X_{i,t}$ vector includes other factors that may explain fund inflows. We estimate models in which the lagged return variable measures lagged pretax returns, as well as models in which it measures lagged after-tax returns, so that we can evaluate the relative predictive power of the two sets of return measures. The variables included in $X_{i,t}$ are control variables that may influence inflows for reasons unrelated to returns. These include fund age, the initial size of the fund, fund turnover, the fund's stock of unrealized capital gains, and the fund's objective. To allow for changing investor tastes for funds with different investment styles, in many of our estimating equations we include a set of year-specific indicator variables for each of nine different fund investment styles. Since our data span the 1993–1999 period, this amounts to adding 63 dummy variables to the regression models. Allowing for this rich set of style-control variables should reduce the impact of spurious factors on our regression results.

Past research explores the functional form linking historical returns to current fund inflows. Sirri and Tufano (1998) and Chevalier and Ellison (1997) find substantial nonlinearities in this relationship. Funds in the highest-return strata experience large inflows relative to those with slightly lower returns. While we currently focus our analysis on ordinary least-squares results from Eq. (13), an earlier version of this paper also presented results from a specification that allowed for differences in the marginal effect of higher returns at different quantiles of the return distribution. Our findings about the relative predictive power of pretax and after-tax returns in nonlinear models were similar to those in the linear models we now emphasize.

5.1. Fund inflows and returns: results without other covariates

Table 9 presents the estimates from linear regressions that relate inflows to lagged returns, tax burdens, and lagged inflows.[4] In Table 9 and all subsequent tables, we weight the observations for each fund by the fund's net assets under management.[5] The first panel of Table 9 presents results in which the fund return is measured relative to the average year-specific return on all funds. We implement this by including a set of indicator variables for each year in the regression specification. Including such time effects ensures that the coefficient estimates are not affected by any time-varying factors that do not vary across funds, such as the year's market return. The table shows results using fund returns that have been risk-adjusted using our one-factor and the three-factor risk-adjustment procedures. Each panel of the table reports two regression models with year-specific style-indicator variables and four without.

The first regression equation in each panel relates fund inflows to lagged pretax returns, while the second relates inflows to both lagged pretax returns and the lagged tax burden. The third is a similar to the second, but it includes year-specific style indicators. These three equations provide a direct test of whether the tax burden has any explanatory power for fund inflows. The fourth specification includes the lagged inflow to the fund, and the fifth includes both the lagged inflow and the capital gains overhang, defined as unrealized capital gains as a share of net asset value at the end of the previous year. The sixth includes these variables as well as the year-specific style indicators. In nearly all cases the results are quite robust with respect to inclusion of the broad set of style indicators.

The results in Table 9 demonstrate the substantial explanatory power of lagged pretax returns in describing net mutual fund inflows. While the coefficients vary across different risk-adjustment methods, and the explanatory power of the relative return variable is somewhat greater than that of the risk-adjusted return measures, the broad pattern of results is similar in the different specifications. A one hundred basis point increase in a fund's return predicts between a 1.2 and a 2.6 percentage point increase in the fund's inflows in the following year.

The findings are consistent with the view that some mutual fund investors are attuned to the tax burdens that funds impose. When the regression equations include the tax burden, in most cases we clearly reject the null hypothesis of a zero coefficient on the tax burden. Including year-specific style indicators tends to increase the absolute value of the tax burden coefficient.

The estimates in Table 9, Panel B suggest that a one hundred basis point increase in the tax burden on a fund is associated with a substantial decrease in subsequent

[4] We also estimate equations that allow the effect of past returns to depend on fund characteristics, such as fund turnover. Since turnover affects capital gain realizations, funds with higher past returns and high turnover might attract different inflows than funds with high past returns and low turnover. When we added turnover*return interactions to equations like those in Tables 9 and 10, the coefficients on the interaction variable were negative and marginally statistically significant. The coefficient value was −1.32 (0.62). The other regression coefficients changed very little when this variable was added.

[5] An earlier draft of the paper showed that weighting all funds equally yields very similar results.

Table 9
Linear regression models for fund inflows. All regression models include year dummies. Standard errors, which are shown in parentheses, are corrected for clustering using a nonparametric version of the technique described in Mouton (1987). Estimates correspond to equation $I_{i,t} = R_{i,t-1} * \theta + X_{i,t} * \phi + v_t + \upsilon_{i,t}$ where $I_{i,t}$ is the fund's inflow, $R_{i,t-1}$ denotes a fund's past returns, possibly risk-adjusted, and $X_{i,t}$ is a vector of other explanatory variables. The mean of the dependent variable is 15.7, the standard deviation is 50.2, and the interquartile range is 25.2. Asterisks denote coefficients that are statistically significantly different from zero at the 95 percent confidence level.

Independent variable	Sample mean	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
Panel A: Returns relative to average returns							
Pretax	20.45	1.527*	2.302*	2.642*	1.662*	1.864*	2.108*
Return ($t-1$)		(0.095)	(0.145)	(0.136)	(0.147)	(0.175)	(0.171)
Tax	3.30		−7.716*	−8.462*	−3.715*	−4.476*	−5.145*
Burden ($t-1$)			(0.800)	(0.759)	(0.829)	(0.877)	(0.807)
Inflow ($t-1$)	20.56				0.182*	0.166*	0.161*
					(0.026)	(0.029)	(0.029)
Unrealized gains	26.06					−0.244*	−0.267
($t-1$)/NAV($t-1$)						(0.070)	(0.077)
R^2 (N)		0.196	0.223	0.268	0.319	0.333	0.369
		(7,798)	(7,798)	(7,798)	(7,696)	(6,634)	(6,634)
Style * year?		No	No	Yes	No	No	Yes
Panel B: One-factor risk-adjusted returns							
Pretax	−2.85	1.220*	1.753*	2.140*	1.235*	1.267*	1.609*
return ($t-1$)		(0.087)	(0.147)	(0.145)	(0.155)	(0.160)	(0.174)
Tax	0.96		−5.510*	−6.723*	−1.892	−2.662*	−3.814*
burden ($t-1$)			(0.972)	(0.900)	(1.018)	(0.168)	(1.004)
Inflow ($t-1$)	19.78				0.223*	0.216*	0.201*
					(0.042)	(0.044)	(0.045)
Unrealized gains	26.65					0.039	−0.054
($t-1$)/NAV($t-1$)						(0.064)	(0.070)
R^2 (N)		0.187	0.205	0.269	0.328	0.327	0.380
		(5,208)	(5,208)	(5,208)	(5,180)	(4,536)	(4,536)
Style * year?		No	No	Yes	No	No	Yes
Panel C: Three-factor risk-adjusted returns							
Pretax	−2.23	1.654*	1.687*	1.968*	1.235*	1.367*	1.596*
return ($t-1$)		(0.129)	(0.150)	(0.147)	(0.140)	(0.148)	(0.159)
Tax	0.98		−0.340	−3.001*	1.636*	0.501	−1.550*
burden ($t-1$)			(0.623)	(0.745)	(0.576)	(0.654)	(0.739)
Inflow ($t-1$)	27.34				0.234*	0.227*	0.213*
					(0.042)	(0.044)	(0.045)
Unrealized gains	26.65					0.052	−0.036
($t-1$)/NAV($t-1$)						(0.072)	(0.072)
R^2		0.182	0.182	0.244	0.322	0.327	0.375
Sample size		5,208	5,208	5,208	5,180	4,536	4,536
Style * year?		No	No	Yes	No	No	Yes

*

inflows to a fund. The precise estimates vary across specifications, suggesting that such an increase in tax burden would lead to between a 1.8% and a 6.7% decline in inflows. A fund that reduced its tax burden from the 25th percentile to the 75th percentile, i.e., by 2.5 percentage points, would be predicted to experience a substantial increase in inflows.

The "relative to market" and one-factor risk-adjusted results in Table 9 are very similar. The tax burden in both cases has a negative and statistically significant effect on inflows. When we introduce the three-factor risk adjustment, however, the estimated coefficient on the tax burden becomes positive when the specification does not include year-specific fund style effects. With year-specific style effects, the coefficient on the tax burden remains negative, and it is statistically significantly different from zero. We interpret this pattern of results as suggesting that changing tastes for different types of funds, which are captured by the year-specific style effects but not by our other specifications, can have an important effect on mutual fund inflows.

Our findings are consistent with the view that tax-aware investors consider the tax burdens on funds when they allocate their investments, but there are also other potential explanations. One is that index funds, which have relatively low tax burdens in comparison to other equity funds, have grown rapidly during our sample period for reasons unrelated to their tax properties. To test this hypothesis, we excluded all index funds from our regression sample. Our resulting coefficient estimates were smaller than those in Table 9, but still statistically significant. For example, in Panel A in Table 9, the tax burden coefficient in Model 5 is -4.476. When we exclude all index funds from the sample, the resulting coefficient estimate is -2.405.

The results in Table 9 are based on data for the entire 1993–1999 sample period. There have been important changes during our sample period in the extent to which the tax consequences of mutual fund investing are discussed in the investment press. When Jeffrey and Arnott (1993) published their paper on investment returns for taxable clients, tax issues received much less attention than they do today. Taxable investors may have become more sensitive to after-tax returns over time, although at the same time assets in tax-deferred accounts have become an increasingly important fraction of mutual fund assets. These two factors could have opposite effects on the sensitivity of mutual fund inflows to after-tax returns. To test for changes over time in the net impact of tax burdens on fund inflows, we estimated regression models like those in Table 9 with separate coefficients on the tax burden variable for each year. The negative effect of the tax burden on returns was greater in the later years in the sample than in the early ones, although the year with the single largest effect of the tax burden is 1995.

5.2. *Fund characteristics, returns, and inflows*

The foregoing regression models compare the predictive power of pretax and after-tax returns in forecasting mutual fund inflows, but they do not include control variables for other mutual fund attributes that might affect inflows. The effect of

some of these variables, such as a fund's capital gains overhang, on mutual fund inflows are of independent interest.

We expand our regression specification to include: two indicator variables for fund age, one for funds that are between three and eight years old and another for funds that are older; fund size, which is measured as the logarithm of fund net assets; the fund's expense ratio in the previous year; and an indicator variable for load funds. We also include the median market capitalization and average price/book ratio of the stocks in each fund's portfolio as additional measures of the fund's investment strategy, as well as the Morningstar rating assigned to a fund. As in Table 9, we continue to include a set of year-specific fund style variables in some of our specifications. When we do not include this full set of year*style interactions, we include year effects as well as time-invariant style effects. We focus on the "relative to market" risk adjustment.

Table 10 reports the central findings from our expanded specification. Some of the new covariates have substantial effects on fund inflows, and adding the controls improves the explanatory power of the regression model, but the results continue to suggest that funds with higher tax burdens experience lower inflows than similar funds with lower tax burdens. The findings suggest that inflows are greater at younger funds and the proportional inflow of assets is smaller at large funds. The coefficients on the investment objective variables indicate that, controlling for fund performance, inflows to small company funds have been greater than inflows to other types of domestic equity funds. The coefficients on the expense ratio variable are negative and statistically significant. A fund's Morningstar rating, which is measured on a five-point scale, also has a substantial predictive effect on inflows. Increasing the rating by one point raises inflows as a share of fund assets by about six percentage points in the regression models that weight funds by their asset values.

If taxable investors are concerned about purchasing shares in a fund that might realize gains and thereby burden them with higher taxes, a larger capital gain overhang could be associated with smaller fund inflows. The findings in Barclay et al. (1998) support this view. The equations in the last two columns of Table 10 include the capital gains overhang variable. It is a statistically significant and negative determinant of fund inflows. The weighted results imply that a 10% increase in the share of unrealized capital gains relative to fund assets is associated with a reduction of between 1.7 and 2.3 percentage points in fund inflows.

The regressions in Tables 9 and 10 include lagged tax burdens, which may not provide the best forward-looking prediction of a fund's future tax burdens. The appeal of these variables is that they naturally extend past work on how lagged pretax returns affect inflows. The disadvantage is that they may involve inefficient predictors. To explore this issue, we also estimate models based on those in Table 10, but replace the lagged tax burden with the current tax burden. Since the current tax burden is not known when investors are allocating their funds, and it depends on the current return, we estimate these models by instrumental variables, using lagged values of the fund's tax burden as instruments. The results suggest a substantial negative effect of the current tax burden on inflows, with coefficients in some cases twice as large in absolute value as those in Table 10. The standard errors were also

Table 10
Determinants of mutual fund inflows allowing for multiple control variables. All linear regression models include year dummies. Standard errors, which are shown in parentheses, are corrected for clustering using a nonparametric version of the technique described in Mouton (1987). Estimates correspond to equation $I_{i,t} = R_{i,t-1} * \theta + X_{i,t} * \phi + v_t + v_{i,t}$, where $I_{i,t}$ is the fund's inflow, $R_{i,t-1}$ denotes a fund's past returns, and $X_{i,t}$ is a vector of other explanatory variables. The sample size for all equations is 6,240 observations. Asterisks denote coefficients that are statistically significantly different from zero at the 95 percent confidence level.

Variable	Mean	Model 1	Model 2	Model 3	Model 4
Pretax return ($t-1$)	20.45	1.967*	2.093*	1.511*	1.677*
		(0.190)	(0.176)	(0.194)	(0.183)
Tax burden ($t-1$)	17.15	−6.723*	−7.112*	−3.424*	−3.916*
		(1.052)	(0.950)	(1.003)	(0.915)
Unrealized capital gain($t-1$)/ asset value ($t-1$)	26.06			−0.174*	−0.228*
				(0.073)	(0.079)
Inflow ($t-1$)	21.69			0.159*	0.148
				(0.030)	(0.031)
8 < age ⩽ 16	0.293	−12.897*	−12.799*	−7.208*	−7.451*
		(2.061)	(1.972)	(1.884)	(1.792)
16 < age	0.534	−15.244*	−14.322*	−8.177*	−7.629*
		(2.278)	(2.184)	(2.071)	(1.954)
Large blend	0.303	−3.054		−2.708	
		(1.794)		(1.601)	
Large growth	0.137	0.271		0.534	
		(2.585)		(2.486)	
Mid-cap value	0.048	−0.183		−1.545	
		(2.873)		(2.381)	
Mid-cap blend	0.061	0.305		−0.501	
		(2.557)		(2.382)	
Mid-cap growth	0.075	7.703		5.952*	
		(4.647)		(2.955)	
Small value	0.021	0.000		0.356	
		(2.735)		(2.880)	
Small blend	0.014	7.209		3.361	
		(4.647)		(4.064)	
Small growth	0.018	4.075		3.031	
		(3.320)		(2.949)	
Log fund size ($t-1$)	8.156	−2.747*	−3.289*	−2.336*	−2.766*
		(0.622)	(0.570)	(0.530)	(0.494)
Expense ratio ($t-1$)	0.961	−6.091*	−5.772*	−6.611*	−6.329*
		(2.077)	(2.021)	(1.780)	(1.701)
Turnover ($t-1$)	0.690	−0.007	−0.196	−2.050	−2.534
		(1.562)	(1.501)	(1.537)	(1.514)
Load dummy	0.572	1.997	2.216	1.986	1.999
		(1.449)	(1.426)	(1.178)	(1.144)
Median market cap	17.29	0.061	0.004)	0.039	−0.013
		(0.050)	(0.049)	(0.046)	(0.043)
Price/book ratio	5.178	−1.423*	−0.602	−0.663	0.128
		(0.648)	(0.615)	(0.636)	(0.595)
Morningstar rating	3.738	6.740*	8.138*	5.294*	6.141*
		(0.984)	(0.957)	(0.933)	(0.944)
Style * year?		No	Yes	No	Yes
R^2		0.321	0.363	0.388	0.422

*

much larger than in Table 10, however, and in most cases one could not reject the null hypothesis that the estimates in Table 10 are within the 95% confidence interval for the instrumental variable results. The results suggest a need to develop better instruments for predicting the current tax burden.

5.3. Alternative approaches to capital gains

All of our results so far are based on a measure of tax burden that aggregates long-term and short-term capital gains, and that assumes that any short-term gains are taxed at the long-term capital gains tax rate. While we cannot disaggregate the components of capital gain realizations for funds that have disappeared, we can use the sample of funds in the January 1999 Morningstar data release to assess possible biases from aggregating capital gains.

We choose the results in the third column of Table 10, in which the estimated tax burden exhibits a coefficient of −3.424 (1.003) on fund inflows, as our benchmark case. When we re-estimate this specification on the subsample of firms in the Morningstar database for which we have more detailed capital gains distribution data, we obtain similar results. The coefficient estimate is −2.716 (1.180). The standard error rises as a result of the smaller sample size in this case. When we disaggregate capital gain realizations into short-term and long-term components, which we can do for the restricted sample, and we apply the higher income tax rate to the short-term component, the coefficient estimate on the tax burden variable declines to −1.976 (1.018). These findings suggest that our basic results using an aggregated measure of capital gain realizations are robust to using disaggregate data.

A separate measurement issue that warrants some investigation is our treatment of the accrual-equivalent tax rate on accruing but unrealized capital gains. For most of the funds in our sample, undistributed capital gains account for at least half of the pretax return. Our analysis assumes that the accrual equivalent tax burden on these gains is 10%, half the statutory long-term capital gains tax rate in 1999. To explore the sensitivity of our findings to our assumption about the tax burden on unrealized gains, we redefine the tax burden variable by assuming that unrealized capital gains are untaxed. The estimate of the coefficient on the tax burden variable is −1.973 (0.589) in this case. Once again, this provides some confirmation for the robustness of our findings.[6]

[6] We have experimented with including dividends, realized capital gains, and unrealized capital gains separately in our inflow equation. All three return components have positive effects on inflows, and the coefficient on unrealized capital gains is typically larger than that on the other two components of returns. We tried to estimate effective tax burdens from the relative values of the coefficients on the different return components, but in many cases, the resulting estimates exceeded the top statutory income tax rate. These "implicit effective tax burdens", however, are the ratio of regression coefficients, and they are not estimated very precisely.

5.4. The effect of tax burdens on inflows to institutional funds

Our empirical findings in Tables 9 and 10 are based on a large sample of retail funds. They are consistent with the hypothesis that at least some taxable investors are allocating their money across funds in response to differences in the fund's after-tax returns. It is nevertheless possible that these results are not driven by the behavior of tax-conscious individual investors seeking to avoid tax liabilities, but by other factors. The tax burden on funds that generate returns in the form of capital gains, particularly unrealized capital gains, is lower than the tax burden on funds that generate more of their income from dividends. If investors move money to funds that accrue capital gains, then inflows could exhibit the pattern that we find even if investors are not concerned about the after-tax performance of their funds. More generally, given the limited attention that the tax status of various funds received until the middle of our sample period, there is some question of whether tax-aware mutual fund investing is the best explanation for our findings.

One way to evaluate this question is to study the relationship between lagged returns, lagged tax burdens, and fund inflows for funds that are not held by taxable investors. We do this by studying inflows to funds that Morningstar identifies as institutional funds. Most institutional investors, such as pension funds and endowments, are not taxable, so they should be concerned with pretax rather than after-tax returns. There is substantial heterogeneity within the set of institutional funds. Many have large minimum balance requirements, while others restrict the set of potential investors. Industry experts suggest that tax-exempt investors may hold more than 90% of the shares of institutional funds.

We identify a sample of 1126 fund-years corresponding to institutional funds over the 1993 to 1999 period, and we estimate our basic regression models with these data. Table 11 presents our findings, which provide only mixed support for our "taxable investor" interpretation. For the set of institutional funds, there is a strong positive effect of pretax returns on net inflows, and a negative effect of the fund's tax burden. The coefficient on the pretax return in the specification in column four of the table is 2.55 (0.35), compared with 1.68 (0.18) in our sample of retail funds (Table 10, Model 4). The coefficient on the tax burden for the institutional funds is −7.83 (1.75), compared with −3.92 (0.92) for the noninstitutional funds. This negative coefficient on the tax burden variable, for a set of funds that is unlikely to be held by taxable investors, is a substantial challenge to the "tax aware" interpretation of the earlier results. We do not have a convincing explanation for this finding.

One finding in Table 11 that does support the taxable investor interpretation of our earlier results concerns the stock of unrealized capital gains in different funds. For the institutional fund sample, the capital gains overhang variable has a small and statistically insignificant effect on inflows. The coefficient on the capital gains overhang is three times larger, and statistically significantly different from zero, for retail funds. This finding is consistent with the view that the institutional investors who hold these funds are not concerned with capital gains taxes in the way that taxable individual investors are.

Table 11
Determinants of net inflows to institutional equity funds in the Morningstar Principia database. All regressions include year dummies. Standard errors, shown in parentheses, are corrected for clustering using a nonparametric version of the technique described in Moulton (1987). Estimates correspond to equation $I_{i,t} = R_{i,t-1} * \theta + X_{i,t} * \phi + v_t + \upsilon_{i,t}$, where $I_{i,t}$ is the fund's net inflow, $R_{i,t-1}$ denotes a fund's past returns, and $X_{i,t}$ is a vector of other explanatory variables. The sample size is 1,126 observations. Asterisks denote coefficients that are statistically significantly different from zero at the 95 percent confidence level.

Variable	Mean	Model 1	Model 2	Model 3	Model 4
Pretax return ($t-1$)	22.01	2.219*	2.672*	2.120*	2.548*
		(0.293)	(0.340)	(0.299)	(0.348)
Tax burden ($t-1$)	3.38	−8.152*	−8.673*	−7.043*	−7.830*
		(1.595)	(1.714)	(1.621)	(1.747)
Unrealized capital gain ($t-1$)/ asset value ($t-1$)	27.52			−0.077	−0.073
				(0.107)	(0.124)
Inflow ($t-1$)	25.705			0.033	0.029
				(0.018)	(0.020)
$8 < \text{age} \leqslant 16$	0.305	−0.646	−0.273	0.001	0.141
		(3.193)	(3.358)	(3.123)	(3.363)
$16 < \text{age}$	0.046	−4.239	−3.735	−2.368	−2.798
		(4.352)	(5.154)	(4.203)	(4.945)
Large blend	0.466	4.564		4.686	
		(4.029)		(4.017)	
Large growth	0.069	20.369*		20.652*	
		(6.800)		(6.747)	
Mid-cap value	0.077	−4.340		−4.443	
		(6.786)		(6.825)	
Mid-cap blend	0.029	15.380*		15.869*	
		(5.934)		(5.695)	
Mid-cap growth	0.043	13.312		13.992*	
		(7.130)		(6.948)	
Small value	0.065	8.558		8.745	
		(5.159)		(5.148)	
Small blend	0.031	9.431		9.437	
		(5.389)		(5.392)	
Small growth	0.030	26.288*		26.981*	
		(8.105)		(7.896)	
Log fund size ($t-1$)	6.855	−3.343*	−3.237*	−3.280*	−3.201*
		(0.956)	(0.941)	(0.952)	(0.937)
Expense ratio ($t-1$)	0.650	−5.032	−0.263	−5.752	−1.262
		(5.065)	(5.114)	(4.887)	(5.037)
Turnover ($t-1$)	0.505	3.034	0.866	−0.86	0.415
		(2.195)	(2.485)	(2.351)	(2.639)
Load dummy	0.000	−24.330*	−22.029*	−24.662*	−21.200*
		(6.548)	(6.758)	(6.987)	(7.217)
Median market cap	22.131	0.158	0.190	0.152	0.185
		(0.092)	(0.102)	(0.090)	(0.101)
Price/book ratio	5.348	−5.724*	−5.625*	−5.445*	−5.514*
		(1.573)	(1.735)	(1.569)	(1.725)
Morningstar rating	3.742	4.877*	5.923*	4.749*	5.882
		(2.088)	(1.971)	(2.127)	(1.991)
Style * year?		No	Yes	No	Yes
R^2		0.212	0.254	0.217	0.257

*

6. Gross inflows and gross outflows

The data from Morningstar and most other sources make it possible to construct net inflows, but not gross purchases and gross sales, at individual mutual funds. With the exception of Chordia (1996), most previous research has analyzed the determinants of net fund inflows. The Investment Company Institute (1999) presents aggregate evidence showing that net inflows are the result of large, and in part offsetting, gross inflows and gross redemptions. In recent years gross redemptions for equity, bond, and hybrid funds have been just under 20% of total assets.

There can be important differences in the way an individual fund's return history and other characteristics affect gross inflows and gross redemptions. To explore these issues, we collect gross inflow and gross outflow data for a small subset of funds. We identify the 200 largest mutual funds in our sample in each of the past five years, and search the SEC's Edgar archive (at www.sec.gov), the private Edgar-online page (www.edgar-online.com), and fund web-pages themselves for reports detailing these funds' share purchases and redemptions. The resulting dataset contains 686 fund-years of data over the period 1994–1998. Limiting our sample in this way avoids explicit conditioning on mutual funds' subsequent growth, except to the extent that this growth affects our ability to gather fund data. For this sample of funds, the gross inflow, weighted by fund assets, averages 36.1% of beginning-of-year assets, while the average gross outflow amounts to 26.5% of assets. These data suggest that the net inflows that we analyze above mask much larger gross inflows and gross outflows. Outflows are not due to investors "cashing out" dividends and distributed capital gains: the average reinvestment rate for funds in our sample was over 93%.

If taxable investors observe persistence in tax-management skills and allocate new investment according to after-tax performance, then we should find a strong effect of lagged returns on gross inflows. Alternatively, if investors are reluctant to sell shares of funds that have accrued substantial undistributed capital gains, typically tax efficient funds, then we might find a positive relationship between measured tax burdens and subsequent gross outflows. Both explanations could yield a negative link between net inflows and tax burdens, but they cannot be distinguished without data on gross flows.

Table 12 reports regression results in which the dependent variables are the net inflow, the gross inflow, and the gross outflow for each fund in our restricted sample. The equations in columns one, three and five do not include the capital gains overhang variable, while the other equations do. Given the small sample size, we do not include the rich set of other covariates that we analyzed in earlier models. The independent variables in all equations are the lagged relative return, the lagged relative tax burden, and a full set of year-dummies. The estimates show that the effect of pretax returns and tax burdens is similar in this restricted sample and in the much larger Morningstar sample that we use above. The pretax return has a positive effect on net inflows, and the tax burden has a negative effect.

The estimates in the last four columns disaggregate these effects. Most of the effect of pretax returns on net inflows is due to a strong effect of pretax returns on gross

Table 12
After-tax returns and gross inflows and outflows for the 200 largest equity mutual funds at the end of the previous year, 1994–1998. After excluding funds for which detailed disaggregated data were not available, the sample includes 686 fund-years of data. Returns are measured relative to average returns on all funds in the sample. Standard errors, shown in parentheses, are corrected for clustering using a nonparametric version of the technique suggested by Moulton (1987). Estimates correspond to equation $I_{i,t} = R_{i,t-1} * \theta + X_{i,t} * \phi + v_t + \upsilon_{i,t}$, where $I_{i,t}$ is the fund's gross inflow, gross outflow, or net inflow, $R_{i,t-1}$ denotes a fund's past return, and $X_{i,t}$ is the fund's unrealized gains as a share of asset value. Asterisks denote coefficients that are statistically significantly different from zero at the 95 percent confidence level.

Explanatory variable	Net inflow		Gross inflow		Gross outflow	
Constant	9.766*	15.522*	32.613*	45.208*	22.847*	29.686*
	(1.772)	(2.389)	(2.916)	(3.435)	(2.039)	(2.477)
Pretax return ($t-1$)	2.142*	2.232*	1.958*	2.156*	−0.183	−0.076
	(0.260)	(0.258)	(0.275)	(0.270)	(0.181)	(0.183)
Tax burden ($t-1$)	−5.816*	−5.362*	−7.565*	−6.571*	−1.749	−1.209
	(1.578)	(1.509)	(2.311)	(2.239)	(1.622)	(1.651)
Unrealized gains as a share of fund value		−0.361*		−0.791*		−0.429*
		(0.097)		(0.167)		(0.111)
Adjusted R^2	0.242	0.267	0.123	0.197	0.028	0.085

*

inflows. The effect of pretax returns on gross outflows is minimal. High tax burdens are associated with lower gross inflows, as we would expect if taxable investors were allocating their new money to mutual funds in part based on past after-tax returns. The tax burden has no statistically significant effects on outflows.

The results in Table 12, with respect to the interaction between gross flows and the undistributed capital gains overhang, confirm our earlier results using the Morningstar sample. A high capital gains overhang significantly reduces net inflows to a fund. This is the result of a large negative effect on gross inflows, and an offsetting (but weaker) negative effect on gross outflows. The gross inflow effect is consistent with taxable investors trying to avoid funds that will accelerate the distribution of capital gains. It provides additional support for Khorana and Servaes' (1999) finding that new funds are more likely to be created in parts of the mutual fund marketplace that are occupied by established funds with substantial capital gains overhangs. The gross outflow effect is consistent with taxable investors being reluctant to sell shares in, and realize gains in, funds that have large embedded capital gains. These results are generally supportive of the view that fund flows respond to factors that taxable investors would consider in determining their fund allocations. The value of the gross flows data is clearly illustrated by the interesting findings with respect to gross redemptions, which could not be detected using only information on net fund flows.

7. Conclusion

This paper suggests that the individual income tax burden that fund investors face when they hold a fund is negatively correlated with fund inflows. This is consistent

with the view that taxable investors consider the impact of income taxation on asset returns when they decide which mutual fund shares to purchase or redeem. Mutual funds that offer higher after-tax rates of return attract greater inflows than those with lower after-tax returns, even after we control for a fund's pretax return. We also find that a fund's unrealized capital gain overhang negatively affects net fund inflows, even though it also reduces the likelihood of redemptions. This result is consistent with the Barclay et al. (1998) findings for an earlier data sample. The inflow effects associated with changes in income tax burdens or capital gains overhang are comparable in magnitude to the effects of fund expense ratios on inflows.

Our findings suggest that taxation can play a role in the way investors choose their mutual funds. Yet there are at least two reasons for caution in interpreting the results. One is that for part of our sample period, particularly the early years, investors would have to work hard to obtain information on the after-tax returns of a broad sample of funds. For funds that they already own, of course, investors should have adequate information on after-tax returns; they could use this information when considering additional investments. The barriers to information acquisition have fallen in recent years, and the apparent impact of tax burden on fund inflows has increased. The concern that investors might not be aware of the tax performance of different funds also applies to our findings with respect to the impact of unrealized gains on fund inflows than to those with respect to after-tax returns.

A second concern is that a very substantial fraction of the assets at mutual funds is held in tax-deferred retirement accounts. Investors holding funds in these accounts should not be sensitive to the tax burden measures that we study. Ideally, we would like to measure the fund inflows that are attributable to taxable individual investors and to study how those flows respond to various factors. We are not aware of any data source that provides the requisite information on fund flows, however. The simple existence of a substantial body of nontaxable money in equity mutual funds is not inconsistent with our findings, which suggests that some investors are sensitive to tax considerations.

Our findings are one strand of evidence on whether taxes feature prominently in the decisions made by mutual fund managers and fund investors, and they should be evaluated in a broad context. Several mutual fund complexes have recently introduced tax efficient mutual funds, which try to avoid realizing capital gains and avoid holding high-dividend stocks. While these funds have grown more rapidly than other mutual funds since they were introduced, they represented only 0.9% of equity fund assets at the end of 1999. Index funds, which are relatively tax-efficient and account for roughly 10% of equity fund assets, have also grown faster than other mutual funds during the last decade.

There is some evidence that taxes affect the behavior of mutual fund managers even at funds that are not explicitly tax-managed. Bhabra et al. (1999) and Gibson, et al. (2000) find evidence of tax-motivated trading in late October, which is the end of the tax year for mutual funds. On the other hand, Barber et al. (2000) present evidence suggesting that many taxable investors who hold equity mutual funds

through a large brokerage firm do not pursue trading strategies that are consistent with after-tax return maximization. This evidence does not rule out the possibility that many taxable individual investors are concerned with after-tax returns.

Finally, the growth of mutual funds as vehicles for taxable investors to hold common stocks raises basic questions, discussed in Poterba (2002), about the degree to which taxes affect investor behavior. Because mutual funds cede decisions about realizing gains and losses from individual investors to fund managers, they reduce the individual's control over portfolio decisions with substantial tax consequences. Mutual fund investing may offer other advantages that offset the potential increase in investor tax burdens, such as the opportunity to diversify portfolio holdings. Studying the determinants of investor choices between direct ownership of common stocks, perhaps through managed accounts at financial institutions, and ownership of mutual funds, is a natural issue for further investigation.

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