TAX PLANNING BY MUTUAL FUNDS: EVIDENCE FROM CHANGES IN THE CAPITAL GAINS TAX RATE

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We investigate whether mutual funds engage in tax planning by testing how they respond to changes in the capital gains tax rates. While previous evidence suggests that individual investors time capital gains realizations, mutual fund managers may not tax plan like individuals because fund managers have incentives to consider the tax liability of both current and potential investors. Our analysis spans over 44 years and six major tax changes, allowing us to examine the effects of both tax rate increases and decreases. Overall, we find evidence consistent with tax planning by managers of both open-end and closed-end mutual funds.

Keywords: mutual funds, capital gains, tax planning, income shifting, tax overhang
JEL Codes: H20, G23

I. INTRODUCTION

We investigate whether mutual fund managers tax plan by testing whether they time securities sales in response to changes in the capital gains tax rate. Previous research suggests that individual investors react to the capital gains tax by timing asset sales (Auerbach, 1988). Over time individuals have increasingly chosen to invest their savings in mutual funds instead of individual stocks. Because U.S. mutual funds must pass through gains and losses for tax purposes, investing in mutual funds transfers part of the responsibility and opportunity for tax planning from individuals to mutual fund managers. From a tax perspective, investors who hold assets through a taxable mutual

1 For further evidence that individuals incorporate both changes in and the level of capital gains tax rates in determining when to buy and sell securities, see Feldstein and Yitzhaki (1978), Minarik (1981), Poterba (1987), Badrinath and Lewellen (1991), Burman, Clausing, and O’Hare (1994), Seyhun and Skinner (1994), and Seida and Wempe (2000).

2 According to Mahoney (2004), mutual fund investments as a percentage of household financial assets doubled over 10 years, from 8.3 percent in 1992 to 17.8 percent in 2002.

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Individually, individuals who invest a large proportion of their wealth in actively managed equity mutual funds can bear a substantial tax cost. Mutual fund investors in the aggregate appear to consider the tax responsiveness of funds in making their investing decisions, as Bergstresser and Poterba (2002) find that mutual fund inflows are positively related to after-tax returns and negatively related to expected future tax burdens. This raises a major question about taxation and mutual fund behavior: to what extent do mutual fund managers consider their investors’ tax status in managing assets?\footnote{When we talked to mutual fund managers about tax planning, the majority readily admit that they ignore tax effects in their trading decisions. Managers appear to focus primarily on pre-tax returns because pre-tax returns are reported in advertisements and used for comparisons to other funds, thus affecting fund flows. Also, some managers are partially compensated based on pre-tax returns.}

From a purely tax-planning perspective, the optimal policy for individual investors is to defer all capital gains realizations until death. However, the question of whether mutual funds tax plan is complicated by the possibility that mutual fund managers trade-off the preferences of current investors against potential investors. In the context of open-end funds, Barclay, Pearson and Weisbach (1998) — hereafter BPW — argue that while existing fund-holders prefer indefinite deferral of all capital gains, potential new investors would like a fund to recognize all its gains before making their own investment in order to minimize the tax to be paid on future capital gains realizations. In contrast to open-end funds, managers of closed-end funds should be less concerned about conflicting interests of current and potential fund-holders because closed-end funds do not continuously offer their shares for sale.

Several existing studies examine whether mutual fund managers engage in tax planning. Plancich (2003) examines the capital gains realizations surrounding one tax change, the Tax Reform Act of 1997, and finds that fund managers shifted the holding periods of securities from short-term to long-term in response to the reduction in the tax rate on long-term capital gains (the top tax rate was reduced from 28 percent to 20 percent). Similarly, Gibson, Safieddine and Titman (2000) find that after the 1986 Tax Reform Act (TRA) became effective, mutual funds systematically accelerated the sale of losers (asset with capital losses) prior to their new, synchronous tax year-end. Huddart and Narayanan (2002) find that capital gains taxes affect the propensity of fund managers to sell individual securities within their funds. Fund managers are more likely to sell losers than winners, even after controlling for past performance and other variables known to affect trading decisions. Eichner and Sinai (2000) provide some indirect evidence regarding the behavior of mutual fund managers in their study of capital gain realization behavior by households. They find that as the proportion of

\footnote{Investors can attempt to manage their other non-mutual fund assets to compensate for the expected distributions from their mutual fund holdings.}
household equity invested in mutual funds has increased over time, capital gains realizations have increased, suggesting that mutual funds realize more capital gains than individuals managing their own portfolios.

We add to this literature in several ways. First, because our data span six major tax changes we are able to test whether fund managers’ responses to tax increases differ from their responses to tax decreases. We predict that fund managers are less likely to alter their trading strategies in response to tax rate increases than to tax rate decreases because tax decreases give managers more time to plan around their other goals, which makes tax planning less costly.6 Previous research has focused on only a single tax change in one direction (e.g., Plancich, 2003).

Our second contribution is to utilize a sample of closed-end funds and examine whether closed-end fund managers tax plan in a similar manner to their open-end counterparts. Although closed-end funds are not open to new investors, closed-end fund managers have incentives to reduce unrealized capital gains overhang. The incentive exists because tax deferral will increase the future tax liability, and this future tax liability is expected to increase the size of the discount at which closed-end funds often trade relative to the fair market value of their underlying assets.

We find evidence that both open-end and closed-end funds adjust the amount of capital gains realized in response to increases or decreases in the federal tax rate on long-term capital gains. Within each mutual fund group, the effect is more pronounced for tax decreases than increases, consistent with it being less costly for managers to delay capital gains realizations. We further investigate the realization patterns of other groups of mutual funds that might differ in their propensity for tax planning, such as retirement-oriented funds, index funds, and tax-exempt bond funds.7 Specifically, we predict that the capital gains realizations of retirement-oriented funds and tax-exempt bond funds are less likely to be sensitive to changes in federal capital gains tax rates. Similarly, index funds are constrained because they are required to track a specific index, which might inhibit tax planning behavior. Consistent with our expectations, we fail to find significant shifting behavior for these three groups of funds, although we also cannot reject the null hypothesis that their behavior is the same as open-end stock funds. We also document that open-end and close-end stock fund managers adjust the capital gains overhang in response to tax changes.

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6 In facing a tax rate increase, fund managers must make changes to their portfolio (e.g., sell appreciated securities) between the time Congress enacts the tax change and the end of the year, which might be as short as 3–6 months. In contrast, when facing a tax rate decrease, fund managers have more flexibility because portfolio changes (e.g., a delay in selling appreciated securities) might be expected to occur after the tax rate has decreased. However, in the face of a tax rate decrease, funds would only have the same limited 3–6 month time frame to sell securities at a loss prior to the end of the year.

7 By “tax-exempt bonds funds” we refer to funds that focus on investing in tax-exempt bonds, such as municipal bonds. The funds themselves are not technically tax-exempt, and in practice will sometimes generate taxable gains or losses on sales of their investments.
In addition to the above short-term shifting behavior, we also find limited evidence that mutual funds adjust their capital gains realizations in the longer term in response to the level of capital gains tax rates. The evidence suggests that mutual funds generally realize higher amounts of gains in low tax rate years, and fewer gains in high tax rate years. However, we caution that unlike the studies of individual tax-payer realization behavior, such as Auerbach (1988), Gillingham and Greenlees (1992), and Eichner and Sinai (2000), we do not directly estimate long-run realizations elasticities, since it is not the focus of this study.

The magnitude of the tax savings to investors is significant. In our sample of 43,578 fund-years observations of open-end stock funds, an average fund had $389 million in assets at year-end. Surrounding tax rate changes, these funds shifted an average of $1.83 million in realized capital gains across years, representing approximately 0.5 percent of their total assets. This resulted in total potential tax savings of approximately $12.5 billion for investors during our sample years.8

One caveat is that the historical pattern of tax rates loosely lines up with the historical pattern of aggregate market returns. For example, during the high tax 1970s, market returns were poor at the same time that tax rates were high. So, tax rates were high during a period when fewer capital gains were available to be realized.9 This concern is partially mitigated by including an analysis of retirement-oriented funds and index funds in the study.

To further reduce the possibility that our results are due to the historical pattern of tax rates and returns, we supplement the above tests by examining trading behavior at the individual stock level for a sample of open-end mutual funds.10 By including trading behavior at the individual stock level, we are able to test whether funds respond to tax rate changes by buying or selling individual securities that either had built-in gains or losses. We find that fund managers are more (less) likely to sell stocks in the portfolio prior to an increase (decrease) in the capital gains tax rate. In addition, we find that the trading patterns reverse in the year following a tax change. These trading patterns are consistent with tax planning.

In sum, we provide systematic evidence that, on average, both open-end and closed-end mutual fund managers appear to engage in some tax planning in accordance with fund-holders’ tax preferences. Our findings are consistent with other evidence in the mutual fund literature which finds that the underlying clienteles of investors within the funds help shape fund managers’ trading behaviors (Jin and Kogan, 2007).

In the next section, we discuss how mutual funds are taxed and the relevant academic research. Section III describes our sample of open and closed-end funds. Section IV contains the results of our tests, and Section V concludes.

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8 Actual tax savings were likely lower, since some investors might have invested via tax-deferred or tax-exempt investment vehicles.

9 We thank an anonymous referee for highlighting this concern to us.

10 In this regard, our study complements Jin (2006), who examines general trading behavior of non-mutual fund institutional investors. It is also similar to Huddart and Narayanan (2002) who study individual security sales within mutual funds.
II. BACKGROUND: MUTUAL FUND TAXATION AND ACADEMIC RESEARCH

A. Taxation of Open-End and Closed-End Mutual Funds: Pass-Through Entities

For U.S. tax purposes, both open and closed-end funds pass through all capital gains to investors. As long as a fund distributes all of its income and realized capital gains to fund-holders, the fund completely escapes corporate taxation.\(^\text{11}\) Any distributions from a fund to its investors are taxed at the prevailing personal tax rates, and the distributions retain their tax character. Thus, capital gains that are passed along are taxed at personal capital gains tax rates, while dividend distributions are taxed at ordinary dividend income rates.\(^\text{12}\) Under the tax code, in order to avoid taxation at the fund level, a mutual fund must distribute at least 90 percent of its ordinary income and realized gains.\(^\text{13}\) Funds cannot pass through capital losses, but those losses can be carried forward (in the fund) for up to eight years and used to offset future gains. Starting in 2001, U.S. funds have been required to disclose after-tax returns for one, five and 10 year periods in addition to their previously mandated disclosures of pre-tax returns.\(^\text{14}\) However, these disclosures are only required in the prospectus offered by mutual funds, and are not required in advertisements or in other literature distributed by the funds.

B. Related Research

Although individual investors’ optimal policy may be to defer capital gains indefinitely, we observe both open and closed-end funds realizing capital gains each year.\(^\text{15}\) Prior literature offers several reasons why open-end fund managers realize capital gains. One reason is that open-end funds are forced to realize some capital gains whenever the outflows from the fund are larger than inflows (net redemptions) and the fund lacks cash to cover the shortfall. Because all fund-holders receive capital gains distributions, those who redeem their shares place a tax burden on the existing shareholders — a classic externality according to Dickson (1995).

\(^\text{11}\) For tax purposes, mutual funds are governed by the rules for regulated investment companies.

\(^\text{12}\) Capital gain distributions increase the tax basis of the fund shares held by investors. Starting in 2003, dividends that meet specific criteria have qualified to be taxed at the long-term capital gains tax rate — so called, “qualified dividends.”

\(^\text{13}\) Mutual funds meeting this requirement, but not distributing all income and capital gains, are taxed only on the undistributed income and capital gains. Additionally, under the Tax Reform Act of 1986, mutual funds that do not distribute at least 98 percent of their capital gains and ordinary income must pay an excise tax of 4 percent on the undistributed portion.

\(^\text{14}\) See Securities and Exchange Commission (2001a, 2001b). For these disclosures, the mutual fund is required to assume that the investors are taxed at the highest marginal tax rate.

\(^\text{15}\) Constantinides (1983) shows analytically that the optimal policy for individuals is to realize all losses immediately and defer all gains indefinitely. For this to hold, the $3,000 limitation for deducting capital losses against personal income must not be binding. In the case where capital losses are not immediately deductible and can only be carried forward (e.g., mutual funds), the optimal policy is to realize capital gains only to the extent of capital losses.
The second reason to realize capital gains is that open-end funds that attempt to minimize capital gains taxes may become unstable (Warther, 1998). As mutual funds mature, they accumulate large overhangs of unrealized capital gains, discouraging new inflows from investors. Since withdrawals by any fund-holder will increase the tax burden on all other fund investors, the remaining investors may withdraw money from the fund to pay this new tax liability. This cycle produces more taxes and additional withdrawals, which ultimately could cause the fund to collapse.

Finally, open-end funds may realize capital gains to help attract new investors who prefer a lower tax overhang (Barclay, Pearson and Weisbach, 1998; Bergstresser and Poterba, 2002). Potential new investors prefer a small overhang because investors pay tax on any gains that are distributed while they are invested in the fund, regardless of when the appreciation in value occurred.16 Consistent with the view that open-end fund managers have incentives to reduce the overhang in order to attract new investors, Barclay, Pearson and Weisbach (1998) find that open-end funds with large overhangs have smaller future inflows of new money.

The existing literature is, however, silent about the existence of tax-motivated trading for closed-end funds. Because closed-end funds do not have net redemptions, none of the three explanations developed above for open-end funds can explain why closed-end fund managers would choose to realize capital gains.17 It appears that from the tax perspective of its current fund-holders, a closed-end fund should not realize capital gains. However, from the perspective of prospective fund-holders, any unrealized capital gains could reduce the fund’s market value to below net realized value due to the potential tax liability (Malkiel, 1977; Morris and Scanlon, 1996). Empirically, it is well documented that closed-end funds, on average, trade at a discount to the net asset values of the underlying securities. Brickley, Manaster and Schallheim (1991) provide evidence that the discounts on closed-end funds are positively correlated with the amount of unrealized capital gains, and negatively correlated with unrealized capital losses.

III. DATA SOURCES, METHODOLOGY, AND DESCRIPTIVE STATISTICS

A. Databases of Open-End and Closed-End Funds

We obtain samples of both open-end and closed-end mutual funds to use for data in our tests. We compiled the sample of open-end mutual funds from the Center for Research

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16 If the fund has accumulated losses, then new investors can effectively get tax-free returns (see Business Week, December 13, 2004, “Their Losses, Your Gains”). By comparison, for funds that have accumulated gains, a financial advisor was quoted as saying: “If you invest right before a distribution, ‘you are getting the hangover... even though you didn’t go to the party’” (The Wall Street Journal, December 19, 1995, “Payouts Pose Tax Trap for New Fund Buyers”). Fund-holders who pay taxes on these capital gains do reduce the future taxes to be paid at the time they eventually sell shares in the fund. Assuming tax rates are constant over time, the overhang does not change the expected undiscounted tax liability for a new investor. However, the overhang does alter the expected timing of tax payments, thus increasing the net present value of the tax liability.

17 Both open and closed-end funds are forced to realize some capital gains when companies in their funds are acquired or when securities are converted by the issuers.
in Security Prices (CRSP) mutual funds database. The database contains information on the amount and type of distributions made by the fund, the net asset value of the fund, the fund objectives (i.e., stock vs. bond), and other data for all open-end mutual funds known to exist during 1961–2005. The portion of the database that we use has 28,428 fund entities and 132,536 fund-year observations, although our eventual sample is based primarily on a subset of 63,251 stock funds.

For purposes of comparison to the open-end funds, we also hand-collect data on closed-end funds from multiple sources. For each of the closed-end funds, we collect annual reports from 10K Wizard to obtain unrealized capital gain overhang, total net assets, and turnover information. Separately, we obtain the fund returns, market price of the fund, and shares outstanding at year end from the CRSP database. We are also able to separate the capital gains from dividend distributions using the coding information provided by CRSP. The final database of closed-end funds contains up to 35 years of data for 246 different funds over the years 1971–2005.

The minimum data that we require for an open-end fund to be included in our sample are: (1) number of shares at year-end, (2) classification of the fund as either stock or bond, (3) total net assets of $10 million (in constant dollars of 1990, and adjusted by inflation) at the beginning of the year, and (4) at least five consecutive years of data. Additionally, for all tests using the capital gains yields, we require the following: (5) capital gain distributions for the year, (6) income distributions for the year, and (7) return on the fund for the year (calculated by compounding the monthly returns).

B. Methodology

1. Estimation of Unrealized Capital Gain Overhang for Open-End Funds

Managers of open-end mutual funds have incentives to manage the unrealized capital gain overhang in the fund, in order to reduce the future tax liability for potential inves-

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18 This database was originally compiled by Carhart (1995) and later supplemented by CRSP. The following sources are used to compile the data: Investment Company Data, Inc. (IDCI), Weisbenberger Investment Companies annual volumes, Fundscope Monthly Investment Company Magazine, and the United & Babson Mutual Fund Selector.

19 To avoid partial years of data in our return and yield calculations, we exclude (1) the first fund-year observation for every fund, and (2) the last fund-year observation for any fund that disappeared during the sample period.

20 It is important for the funds to be classified correctly as either stock or bond funds; which we classify based on the fund objectives as provided by the CRSP mutual fund database. Whenever a fund objective was provided by more than one source, we chose the most frequent classification.

21 Our sample of closed-end funds is based partially on data collected by Hoskins (1994), and partially on the list provided by the Closed-End Fund Association (http://www.closed-endfunds.com). The closed-end funds are classified as either stock or bond based on the most prevalent security type (stock or bond) in the fund.

22 The data requirement in (3) reduces the sample size from 132,536 to 113,432. The requirement in (4) further reduces the sample to 82,512. In unreported sensitivity tests, we relaxed the two data requirements for open-end funds and obtained similar results.
tors. The unrealized capital gain overhang is an important feature in our analysis. Since actual overhang data are not available for the open-end funds during our sample period, we implement the following estimation procedure. When current year fund shares are greater than prior year fund shares, we follow Barclay, Pearson and Weisbach (1998) and estimate the unrealized capital gain overhang as the estimated overhang at the end of the prior year, plus the change in value of the shares outstanding in the fund at the beginning of the year, plus the change in the value of the new shares since their issuance, which is assumed to be distributed evenly throughout the year. When a net redemption occurs in any particular year, the unrealized capital gain overhang is calculated as the estimated overhang at the end of the prior year, plus the change in value of the shares outstanding in the fund at the end of the year. The estimation procedure is expressed as

\[
EstOver_t = \begin{cases} 
EstOver_{t-1} + (NAV_t - NAV_{t-1}) \times S_t + (S_t - S_{t-1}) \times (NAV_t - AP_t) & \text{if } S_t > S_{t-1} \\
EstOver_{t-1} + (NAV_t - NAV_{t-1}) \times S_t & \text{if } S_t \leq S_{t-1}
\end{cases}
\]

where:
- \( EstOver_t \) = total unrealized capital gain overhang in the fund at year-end \( t \),
- \( NAV_t \) = net asset value per share of the fund at year \( t \),
- \( S_t \) = number of shares in the fund at year \( t \),
- \( AP_t \) = average price paid during year \( t \) for new shares\(^{23}\) (estimated as the average price at the beginning and end of the year).

Since we do not know the tax basis for the open-end funds that started prior to the creation of our database, we only include those open-end funds that began after January 1, 1962 (the first full year of the open-end fund database). These funds begin with an overhang of zero.

For closed-end funds, instead of estimating the unrealized capital gain overhang we are able to calculate the actual amount of the overhang by subtracting the total cost basis of the securities from the fair market value of the assets. For closed-end funds this information is disclosed directly in their publicly-filed financial statements. The overhangs for both open and closed-end funds are winsorized at top and bottom 1 percent.\(^{24}\)

2. Do Mutual Fund Managers Shift Capital Gains in Response to Changes in Tax Rates?

Our initial tests examine the intertemporal variation of capital gains yield in response to changes in capital gains tax rates. Since capital gains yield and fund turnover are both affected by tax rate changes, we implement an instrumental variable method.\(^{25}\) We

\(^{23}\) For open-end funds, average price is net asset values per share.

\(^{24}\) We winsorize our estimated overhang for two reasons: (1) to reduce the scalar effect of total net assets, which would have existed even if we used the actual overhang data, and (2) to mitigate measurement errors. When using the data without winsorization, our results remain significant at the 10 percent level or better.

\(^{25}\) We thank an anonymous referee for suggesting this econometric method.
select the lagged value of turnover (\( \text{Turnover}_{it-1} \)) as the instrument for fund turnover (\( \text{Turnover}_{it} \)). This instrument is expected to affect capital gains yield only through the variable \( \text{Turnover}_{it} \), but is not correlated with the error term in the regression. To check for a possible weak instrument, we conduct a partial F-test from the first stage. The partial F-statistic for our instrument, \( \text{Turnover}_{it-1} \), is 11.26 (\( p \)-value < 0.001), indicating that our instrument is not a weak instrument for \( \text{Turnover}_{it} \). Thus, our test regresses the realized capital gains yield on the lagged value of turnover (the instrument) and other factors known to affect capital gains yield, including prior-period capital gains overhang, fund returns at \( t - 1 \) and \( t - 2 \), and fund growth dummy. These factors are taken from Barclay, Pearson and Weisbach (1998) and are defined following (2) below.

To capture whether the mutual funds respond to different levels of capital gains tax rates, we add two tax variables to BPW’s tests. The first variable (\( \text{CurrentCGTax}_t \)) is the actual tax rate on long-term capital gains for year \( t \), which provides a test of whether the capital gains yield depends on the prevailing tax rate. We use the statutory tax rate on long-term capital gains on the highest income tax bracket, and assume that capital gains tax rates for other filers were likely to have changed along with changes in this tax rate.\(^{26}\) If mutual funds realize more (less) capital gains after tax rates decrease (increase), then \( \text{CurrentCGTax}_t \) will have a negative coefficient. The other shifting variable (\( \text{ExpectedCGTax}_t \)) is the capital gains tax rate for year \( t + 1 \). If mutual funds realize more (less) capital gains before tax rate increases (decreases), then \( \text{ExpectedCGTax}_t \) will have a positive coefficient. Our regression is estimated separately for open-end stock funds and closed-end funds:

\[
CGYield_{it} = \beta_0 + \beta_1 \text{Overhang}_{it-1} + \beta_2 \text{ExpectedCGTax}_t + \beta_3 \text{CurrentCGTax}_t \\
+ \beta_4 \text{Ret}_t + \beta_5 \text{Ret}_{t-2} + \beta_6 \text{Turnover}_t + \beta_7 \text{GrowthDummy}_t + \epsilon_{it}
\]

where:

\( CGYield_{it} \) = capital gains realized in a given year \( t \) divided by the net asset value of the fund (or the market value of the closed-end fund) at the beginning of the year, for fund \( i \).

\( \text{Overhang}_{it-1} \) = the unrealized capital gains in the fund at the beginning of year \( t \) divided by the total net assets of the fund at the beginning of year \( t \), for fund \( i \).

\( \text{ExpectedCGTax}_t \) = the actual long-term capital gains tax rate for year \( t + 1 \),

\(^{26}\) We assume that the highest income tax filer is no longer subject to deduction and exemption phase-outs, and we also exclude the impact of alternative minimum taxes. These tax rates are taken from Eichner and Sinai (2000), Table A1 (appendix), and are supplemented with maximum statutory tax rates on long-term capital gains for 1998 through 2005. Mid-year tax changes occurred in 1978 (effective October 31, 1978) and in 1981 (effective June 10, 1981), so Eichner and Sinai (2000) averaged the tax rate changes across the years of the tax changes. The year 1997 was also a mid-year tax change, but it occurred earlier in the year (effectively as of May 7, 1997), however in this case Eichner and Sinai (2000) assume that most of the realizations in 1997 were likely deferred to the second half of the year, and realized at the lower tax rate. We made a similar assumption for 2003, since the effective date of the tax change was May 5, 2003. Results are qualitatively similar if average tax rates are used for 1997 and 2003.
\[ \text{CurrentCGTax}_t = \text{the actual long-term capital gains tax rate for year } t, \]
\[ R_{it} = \text{the compounded monthly return of fund } i \text{ during year } t, \]
\[ \text{Turnover}_{it} = \text{the minimum of the market value of total security sales or total security purchases during year } t \text{ divided by the average total net assets, for fund } i \text{ (we use } \text{Turnover}_{it-1} \text{ as the instrument)}, \]
\[ \text{GrowthDummy}_{it} = \text{dummy variable which equals one when the number of shares outstanding in year } t \text{ is greater than the number of shares in year } t-1, \text{ for fund } i. \]

Our predictions for the control variables are as follows. The coefficient on Overhang is expected to be positive because a larger prior period overhang implies a larger potential capital gain that can be realized. The return to the fund (\( R \)), in both the current or recent prior years, is expected to have a positive relation to the realized gains because higher returns suggest higher potential realizations. Higher Turnover in the fund is expected to lead to higher realizations. GrowthDummy is a dummy variable that equals one when the number of shares outstanding in year \( t \) is greater than the number of shares in year \( t-1 \). The GrowthDummy is included because as a fund grows it is able to use new cash inflows to cover any net redemptions, thereby reducing realizations that would otherwise be required to fund withdrawals.

Although the above tests control for confounding effects, they might not be able to capture whether the realizations for any specific fund increased or decreased because all funds are included in the analysis whether or not they exist in consecutive years. Therefore, we also look at changes in realized capital gain yields, which allow each mutual fund to be used as its own control across time, more directly testing for changes in realizations. However, as this requires that the fund is in our sample for both years surrounding a tax change, we lose 3,295 open-end mutual funds and 378 closed-end mutual fund observations. We again implement the instrumental variable method, where the regression is specified as

\[
\Delta \text{CGYield}_{it} = \beta_0 + \beta_1 \Delta \text{Overhang}_{it-1} + \beta_2 \Delta \text{ExpectedCGTax}_t + \beta_3 \Delta \text{CurrentCGTax}_t + \beta_4 (R_{it-1} - R_{it-2}) + \beta_5 \Delta \text{Turnover}_{it} + \beta_6 \Delta \text{GrowthDummy}_{it} + \epsilon_{it}
\]

As in our estimates of (2), we use \( \Delta \text{Turnover}_{it-1} \) as the instrument for \( \Delta \text{Turnover}_{it} \). We use two variables of tax rate changes in (3). The variable \( \Delta \text{ExpectedCGTax}_t \) is defined as the actual capital gains tax rate for year \( t + 1 \) less the capital gains tax rate for year \( t \), while \( \Delta \text{CurrentCGTax}_t \) is the actual capital gains tax rate for year \( t \) less the capital gains tax rate for year \( t - 1 \). If mutual funds realize more (less) capital gains before tax rate increases (decreases), then \( \Delta \text{ExpectedCGTax}_t \) will have a positive coefficient. Similarly, if mutual funds realize more (less) capital gains after tax rates decrease (increase), then \( \Delta \text{CurrentCGTax}_t \) will have a negative coefficient.

3. Differential Response to Tax Increases and Decreases

To the best of our knowledge, the prior literature has not explicitly tested whether mutual fund managers will respond symmetrically to tax rate increases and decreases.
The longer time horizon of our sample, which spans both tax rate increases and tax rate decreases, allows us to assess whether fund managers respond differently to tax increases than tax decreases. One reason that responses might be expected to differ is if the trading costs associated with responding to capital gains tax increases are higher than the costs associated with responding to capital gains tax decreases. For example, managers can adjust to tax decreases by merely delaying security sales, which may be less costly from a portfolio strategy perspective than hastening security sales. Responses will also differ if the perceived benefits to maximizing after-tax returns differ for capital gains increases versus decreases. For example, it is possible that investors are more sensitive to taxes when tax rates increase. Regardless of the reason, it is an open question as to whether mutual fund managers respond differently to tax rate increases versus tax rate decreases.

To test whether mutual fund managers respond differently to tax rate increases and decreases, we add four variables to (3): $\Delta \text{ExpectedCGTax}_t^+$, $\Delta \text{ExpectedCGTax}_t^-$, $\Delta \text{CurrentCGTax}_t^+$ and $\Delta \text{CurrentCGTax}_t^-$. The modified regression is specified as

\[
\Delta \text{CGYield}_t = \beta_0 + \beta_1 \Delta \text{Overhang}_{t-1} + \beta_2 \Delta \text{ExpectedCGTax}_t^+ + \beta_3 \Delta \text{ExpectedCGTax}_t^- \\
+ \beta_4 \Delta \text{CurrentCGTax}_t^+ + \beta_5 \Delta \text{CurrentCGTax}_t^- + \beta_6 (R_{t-1} - R_{t-2}) \\
+ \beta_7 \Delta \text{Turnover}_t + \beta_8 \Delta \text{GrowthDummy}_t + \epsilon_t
\]

4. Do Changes in Tax Rates Affect the Capital Gains Overhang?

An untested implication of the BPW model is that the optimal overhang decreases as the capital gains tax rate increases. Therefore we expect that, in order to decrease the size of the overhang, open-end funds would realize larger capital gains in the years leading up to (and after) a tax rate increase. We also expect closed-end funds to manipulate the capital gains overhang, but to a lesser extent than open-end funds.

To examine the effect of changes in tax rates on the capital gains overhang, we estimate an ordinary least squares (OLS) regression of the capital gains overhang on the capital gains tax rate and various characteristics of open and closed-end mutual funds. These regressions are the same as in Barclay, Pearson and Weisbach (1998) except that we add next year’s capital gains tax rate (a proxy for the expected rate). In addition, we control for past returns since the tax overhang sensitivity is higher in absolute value.

27 Alternatively, deferring a sale requires the fund manager to retain the risk of a security that the manager would otherwise sell.

28 Barclay, Pearson and Weisbach (1998) did not report this result in their paper. We thank them for running a separate simulation required to obtain it.

29 Barclay, Pearson and Weisbach (1998) also include estimated growth volatility and estimated return volatility variables in a two-stage regression. In our tests for open-end stock funds, we add the growth volatility variable (proxied by the standard deviation of growth rates in fund assets over the prior three years divided by the average growth rate of the prior three years) and the return volatility variable (proxied by the actual monthly return volatility for the fund) in our regression. Our results for open-end stock funds do not change.
for funds with larger prior returns (Huddart and Narayanan, 2002). The regressions are specified as

\[ Overhang_{it} = \beta_0 + \beta_1 ExpectedCGTax_i + \beta_2 Age_{i-1} + \beta_3 R_{it-1} + \beta_4 R_{it-2} + \beta_5 GrowthDummy_i + \beta_6 IncomeYield_{i-1} + \epsilon_{it} \]

C. Descriptive Statistics

1. Yearly Returns, Income Yields, and Capital Gains Yields of Mutual Funds

In Table 1 we present descriptive statistics on the components that make up open- and closed-end fund returns. These components will be used in subsequent tests. The yearly returns are composed of the following three elements: the income yield, the realized capital gain yield, and the unrealized capital gain yield. The income yield measures the cash inflows from dividends or interest on securities held by the fund. It is defined as the dividends declared during the year divided by the net asset value of the fund at the beginning of the year. The realized capital gain yield, which is used as the dependent variable in many of our tests, is the capital gains declared during the year divided by the net asset value of the fund at the beginning of the year. To calculate the unrealized capital gain yield, we first calculate the total return of the fund for the year by compounding the monthly returns, and then subtract both the income yield and capital gains yield.

Table 1 shows that, on average, both open-end and closed-end funds realize capital gains, so they are not following a policy of zero realizations. For this table we include only stock funds (both aggressive and balanced funds) as opposed to bond funds, since stock funds are more likely to have marginal investors who are taxable, providing more of an incentive for fund managers to be responsive to tax changes. The mean (median) realized capital gains for open-end funds is 4.46 percent (2.64), while the mean (median) for the closed-end funds is 4.88 percent (3.97). The returns to our open-end stock funds appear smaller, on average, than those reported by BPW (11.20 percent versus 15.19). Compared to alternative measures of returns over the same periods, this difference probably exists because our study covers a different sample period than BPW. In addition, they include only funds that are still active in 1992, a fund selection procedure that introduces survivorship bias. Our sample mitigates this bias by also including funds that either merged or perished.

Finally, since capital gains realizations are limited by the unrealized capital gains in the funds, we report an additional measure: the amount of capital gains realized as a percentage of what was potentially realizable. This variable is calculated as the

30 Since capital gains distributions made from mutual funds typically occur near year-end, we assume they are not reinvested in the fund. Also, since we are interested only in the capital gains passed along to investors, our calculation of the capital gain yield does not take into account loss carry-forwards.
### Table 1
Descriptive Statistics
(Sample of Open-End Stock Funds (1962–2005) and Closed-End Stock Funds (1971–2005))

#### Panel A: Components of Mutual Fund Returns

<table>
<thead>
<tr>
<th>Variables</th>
<th>Open-End Stock Funds</th>
<th>Closed-End Stock Funds</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>N</td>
<td>Mean (%)</td>
</tr>
<tr>
<td>Income Yield</td>
<td>63,251</td>
<td>3.17</td>
</tr>
<tr>
<td>Realized CG Yield</td>
<td>63,251</td>
<td>4.46</td>
</tr>
<tr>
<td>Unrealized CG Yield</td>
<td>63,251</td>
<td>3.57</td>
</tr>
<tr>
<td>Total Return</td>
<td>63,251</td>
<td>11.20</td>
</tr>
<tr>
<td>Realized CG as a Percent of Realizable</td>
<td>63,251</td>
<td>24.10</td>
</tr>
<tr>
<td>Unrealized CG Overhang</td>
<td>63,251</td>
<td>3.18</td>
</tr>
</tbody>
</table>

#### Panel B: Mean Capital Gains Yield and Overhang for Three Ranges of Tax Rates

<table>
<thead>
<tr>
<th>Variables</th>
<th>Open-End Stock Funds</th>
<th>Closed-End Stock Funds</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Realized CG Yield (%)</td>
<td>Realized CG as a Percent of Realizable</td>
</tr>
<tr>
<td>CG Tax Rate &lt; 24%</td>
<td>6.83</td>
<td>24.37</td>
</tr>
<tr>
<td>24% ≤ CG Tax Rate ≤ 28%</td>
<td>2.91</td>
<td>24.19</td>
</tr>
<tr>
<td>CG Tax Rate &gt; 28%</td>
<td>1.40</td>
<td>22.57</td>
</tr>
</tbody>
</table>

Notes: Variables are defined as follows. When we refer to capital gains as being “realized,” we imply that the gains are both “realized” and “recognized.” Income yield is the dividends declared during the year divided by the net asset value of the fund (or the market value of the closed-end fund) at the beginning of the year. We assume all dividends declared by the fund are reinvested in the fund until the end of the year. Realized CG yield is the capital gains declared during the year divided by the net asset value of the fund (or the market value of the closed-end fund) at the beginning of the year. Unrealized CG yield is the total return of the fund during the year less the sum of the income yield and the realized capital gain yield. Total return is yearly return for the fund including all distributions. Realized CG gain as a percent of realizable is realized capital gain during the year divided by the realizable capital gain, where the realizable gain is the sum of the total unrealized capital gain overhang at the beginning of the year, the capital gain realized during the year, and the capital gain not realized during the year. Unrealized CG overhang is the total unrealized capital gain in the fund at year-end divided by the total net assets of the fund at year-end. All values are winsorized at top and bottom 1 percent. The capital gains tax rate (CG Tax Rate) is defined in the text.
realized capital gain during the year divided by the potentially realizable capital gain. The potentially realizable capital gain (the denominator) is approximated as the sum of: (1) the total unrealized capital gain overhang in the fund at the beginning of the year, (2) the capital gain realized during the year, and (3) the capital gains not realized during the year. For the open-end funds, the mean (median) realized capital gain as a percent of realizable, is 24.10 percent (22.30), and for the closed-end funds it is 29.52 percent (20.05).

Panel B of Table 1 also reports the average capital gains yield and capital gains realized as a percent of realizable gains over three ranges of tax rates. These comparisons show that mutual funds in our sample realize larger (smaller) levels of capital gains in lower (higher) tax rate years, although this should be viewed as only descriptive information because these are univariate comparisons. For our sample, the open-end (closed-end) stock funds realize an average capital gains yield of 6.83 (5.37) percent when the tax rate is less than 24 percent, but they realize only 1.40 (4.98) percent when tax rates are above 28 percent.

2. Descriptive Evidence by Year

Table 2 provides some descriptive evidence regarding open-end funds realization behavior over time. We report the average realized capital gains yield and average unrealized capital gains overhang for the open and closed-end stock funds by year. Table 2 also lists the highest marginal capital gains tax rate for each year from 1962–2005. To emphasize the years surrounding significant changes in tax rates, we shade those years in which the capital gains tax rate either increased or decreased significantly, usually by 4 percentage points or more. There are two exceptions. One exception is between 1967 and 1972 when the capital gains tax increased from 25 percent to 35 percent over the six years. To avoid clustering, we choose 1969–1970 as the representative tax change among the consecutive tax rate increases. The other exception is for the period 1980–1982 when the capital gains tax decreased from 28 percent to 20 percent. We choose 1981–1982 as the representative tax change years since the tax change took place in the middle of 1981.

If the funds are shifting as predicted, we expect decreased realizations in the year before the tax rate decreases and increased realizations in the following year. Similarly, we expect increased realizations in the year before the tax rate increases and decreased realizations in the following year. Since Table 2 reports the raw capital gains yield and

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31 Whenever the realizable capital gain is estimated to be less than zero (978 out of 63,251 observations), we redefine it by excluding from the calculation the unrealized capital gain overhang in the fund at the beginning of the year. All values were winsorized at top and bottom 1 percent.

32 In this study, we focus on the long-term capital gains tax rate as a proxy for all relevant tax rates (e.g., shorter-term capital gains tax rates). Evidence in Blouin, Raedy and Shackelford (2003) suggests that this proxy may not fully capture the effects of other tax rates.

33 Consistent with the notion that mutual fund managers defer realizing capital gains in the face of tax-rate increases, the mean realized capital gains yield generally decreased over the period of 1967–1972.
Table 2

Mean Realized Capital Gain Yield and Unrealized Capital Gain Overhang by Year

<table>
<thead>
<tr>
<th>Year</th>
<th>Tax Rate</th>
<th>Maximum Long-term Capital Gains</th>
<th>Open-End Stock Funds</th>
<th>Closed-End Stock Funds</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Realized CG Yield (%)</td>
<td>Unrealized CG Overhang (%)</td>
<td>N</td>
</tr>
<tr>
<td>1962</td>
<td>0.25</td>
<td>2.40</td>
<td>-42.93</td>
<td>139</td>
</tr>
<tr>
<td>1963</td>
<td>0.25</td>
<td>1.67</td>
<td>-39.81</td>
<td>149</td>
</tr>
<tr>
<td>1964</td>
<td>0.25</td>
<td>2.21</td>
<td>-35.46</td>
<td>157</td>
</tr>
<tr>
<td>1965</td>
<td>0.25</td>
<td>2.54</td>
<td>-29.80</td>
<td>169</td>
</tr>
<tr>
<td>1966</td>
<td>0.25</td>
<td>3.77</td>
<td>-30.37</td>
<td>173</td>
</tr>
<tr>
<td>1967</td>
<td>0.25</td>
<td>3.42</td>
<td>-25.89</td>
<td>196</td>
</tr>
<tr>
<td>1968</td>
<td>0.27</td>
<td>6.60</td>
<td>8.20</td>
<td>221</td>
</tr>
<tr>
<td>1969</td>
<td>0.28</td>
<td>5.98</td>
<td>-13.02</td>
<td>264</td>
</tr>
<tr>
<td>1970</td>
<td>0.30</td>
<td>1.64</td>
<td>-23.14</td>
<td>286</td>
</tr>
<tr>
<td>1971</td>
<td>0.33</td>
<td>1.21</td>
<td>-9.89</td>
<td>316</td>
</tr>
<tr>
<td>1972</td>
<td>0.35</td>
<td>2.25</td>
<td>-6.11</td>
<td>342</td>
</tr>
<tr>
<td>1973</td>
<td>0.35</td>
<td>2.60</td>
<td>-33.28</td>
<td>328</td>
</tr>
<tr>
<td>1974</td>
<td>0.35</td>
<td>0.89</td>
<td>-44.59</td>
<td>311</td>
</tr>
<tr>
<td>1975</td>
<td>0.35</td>
<td>0.31</td>
<td>-39.47</td>
<td>344</td>
</tr>
<tr>
<td>1976</td>
<td>0.35</td>
<td>0.68</td>
<td>-25.30</td>
<td>359</td>
</tr>
<tr>
<td>1977</td>
<td>0.35</td>
<td>1.04</td>
<td>-27.86</td>
<td>384</td>
</tr>
<tr>
<td>1978</td>
<td>0.34</td>
<td>1.35</td>
<td>-26.68</td>
<td>415</td>
</tr>
<tr>
<td>1979</td>
<td>0.28</td>
<td>2.95</td>
<td>-20.76</td>
<td>447</td>
</tr>
<tr>
<td>1980</td>
<td>0.28</td>
<td>2.58</td>
<td>-12.83</td>
<td>488</td>
</tr>
<tr>
<td>1981</td>
<td>0.24</td>
<td>5.52</td>
<td>-24.11</td>
<td>531</td>
</tr>
<tr>
<td>1982</td>
<td>0.20</td>
<td>2.34</td>
<td>-10.1</td>
<td>615</td>
</tr>
<tr>
<td>1983</td>
<td>0.20</td>
<td>3.42</td>
<td>-7.15</td>
<td>730</td>
</tr>
<tr>
<td>1984</td>
<td>0.20</td>
<td>3.72</td>
<td>-12.34</td>
<td>858</td>
</tr>
<tr>
<td>1985</td>
<td>0.20</td>
<td>1.69</td>
<td>-1.90</td>
<td>1,067</td>
</tr>
<tr>
<td>1986</td>
<td>0.20</td>
<td>6.24</td>
<td>-2.27</td>
<td>1,320</td>
</tr>
<tr>
<td>1987</td>
<td>0.28</td>
<td>6.29</td>
<td>-10.31</td>
<td>1,605</td>
</tr>
<tr>
<td>1988</td>
<td>0.28</td>
<td>1.07</td>
<td>-6.21</td>
<td>1,876</td>
</tr>
<tr>
<td>1989</td>
<td>0.28</td>
<td>2.18</td>
<td>-1.71</td>
<td>2,145</td>
</tr>
<tr>
<td>1990</td>
<td>0.28</td>
<td>1.24</td>
<td>-8.35</td>
<td>2,335</td>
</tr>
<tr>
<td>1991</td>
<td>0.28</td>
<td>1.35</td>
<td>-1.36</td>
<td>2,656</td>
</tr>
<tr>
<td>1992</td>
<td>0.28</td>
<td>2.11</td>
<td>-1.32</td>
<td>2,871</td>
</tr>
<tr>
<td>1993</td>
<td>0.28</td>
<td>2.86</td>
<td>-3.55</td>
<td>2,855</td>
</tr>
<tr>
<td>1994</td>
<td>0.28</td>
<td>2.56</td>
<td>-2.54</td>
<td>2,850</td>
</tr>
<tr>
<td>1995</td>
<td>0.28</td>
<td>3.19</td>
<td>-5.94</td>
<td>3,246</td>
</tr>
<tr>
<td>1996</td>
<td>0.28</td>
<td>4.90</td>
<td>-7.81</td>
<td>3,562</td>
</tr>
<tr>
<td>1997</td>
<td>0.28</td>
<td>6.92</td>
<td>-9.28</td>
<td>4,033</td>
</tr>
<tr>
<td>1998</td>
<td>0.20</td>
<td>5.81</td>
<td>10.91</td>
<td>3,490</td>
</tr>
<tr>
<td>1999</td>
<td>0.20</td>
<td>7.22</td>
<td>17.27</td>
<td>4,062</td>
</tr>
<tr>
<td>2000</td>
<td>0.20</td>
<td>12.89</td>
<td>1.29</td>
<td>4,133</td>
</tr>
<tr>
<td>2001</td>
<td>0.20</td>
<td>3.26</td>
<td>-3.58</td>
<td>2,217</td>
</tr>
<tr>
<td>2002</td>
<td>0.20</td>
<td>2.23</td>
<td>3.64</td>
<td>1,120</td>
</tr>
<tr>
<td>2003</td>
<td>0.15</td>
<td>4.98</td>
<td>10.92</td>
<td>1,737</td>
</tr>
<tr>
<td>2004</td>
<td>0.15</td>
<td>3.66</td>
<td>12.85</td>
<td>3,498</td>
</tr>
<tr>
<td>2005</td>
<td>0.15</td>
<td>6.30</td>
<td>11.83</td>
<td>4,149</td>
</tr>
<tr>
<td>Mean</td>
<td>4.46</td>
<td>3.57</td>
<td>63,251</td>
<td>4.88</td>
</tr>
</tbody>
</table>

Notes: Realized capital gain yield and unrealized capital gain overhang are both defined in the footnote to Table 1. Table reports the mean. Years surrounding significant changes in the capital gains tax rates are shaded for emphasis.
does not control for any factors known to be correlated with the yield, this evidence
should be viewed solely as descriptive.34

During the four capital gains tax changes other than the change in the 1980s (the
the realization patterns of capital gains for open-end mutual funds appear consistent with
tax planning. Specifically, the funds realize greater capital gains after the 1978–1979,
1996–1997 and 2002–2003 rate decreases (for example, from 1.35 percent up to 2.95
percent during 1978–1979, from 4.90 percent up to 6.92 percent during 1996–1997,
and from 2.23 percent up to 4.98 percent during 2002–2003), and realize fewer capital
gains after the 1969–1970 rate increase (from 5.98 percent down to 1.64 percent).
Closed-end funds exhibit similar realization patterns. However, open-end mutual funds
seem to unexpectedly realize fewer capital gains (5.52 percent down to 2.34 percent)
after the tax rate decreases from 1981 to 1982 and realizations were largely unchanged
following the tax rate increase in 1986–1987 (6.24 percent to 6.29 percent). Finally, we
see that during both periods of capital gains tax increases (1969–1970 and 1986–1987),
the average overhang decreases, and during four periods of tax decreases, the overhang
increases. This is consistent with our expectation that the average unrealized capital
gain overhang moves in the opposite direction as the tax rates change, but again these
results should only be viewed as descriptive comparisons.

IV. EMPIRICAL RESULTS

A. Do Mutual Funds Shift Capital Gains Realizations in Response to Tax Rate
   Changes?

We examine intertemporal variations of capital gains yield in response to changes in
capital gains tax rates. Our first test is a two-stage least squares regression with the first
stage producing the predicted value of fund turnover. In the second stage, we regress
the realized capital gains yield on predicted fund turnover and other factors known to
affect capital gains yield (see Section III.B.2 for a full description).

Panel A of Table 3 reports the results of the regressions using the instrumental variable
method. We conduct our statistical tests using Rogers (1993) standard errors (standard
errors clustered by year). For open-end funds, all of the control variables except the
growth dummy are significant in the predicted directions, and consistent with the results
in Barclay, Pearson and Weisbach (1998). For example, the coefficient on Overhang_{it-1}
is significantly positive for open-end funds, suggesting that the larger the overhang at
the beginning of the year in the portfolio, the higher the realized capital gains yield.
While we expect a positive coefficient on Overhang_{it-1} for open-end funds, we make no
prediction for closed-end funds as it is unclear whether closed-end fund managers have
incentives to reduce capital gain overhang. For the analysis of closed-end funds, the
coefficient on Overhang_{it-1} is not statistically significant. Finally, the two tax variables
are both significant in the predicted direction. The coefficient on ExpectedCGTax, is

34 Also, since Table 2 reports data for the complete sample, some funds may not be in existence for consecu-
tive years.
Table 3  
Regressions of Realized Capital Gains Yields on Tax and Control Variables 
(Open-End and Closed-End Stock Funds) 

Panel A: Instrumental Variable Regression\(^1\)

\[ \begin{align*} 
\text{CGYield}_{it} &= \beta_0 + \beta_1 \text{Overhang}_{it-1} + \beta_2 \text{ExpectedCGTax}_{it} + \beta_3 \text{CurrentCGTax}_{it} \ 
+ \beta_4 \text{R}_{it-1} + \beta_5 \text{R}_{it-2} + \beta_6 \text{Turnover}_{it} + \beta_7 \text{GrowthDummy}_{it} + \epsilon_{it} 
\end{align*} \]

<table>
<thead>
<tr>
<th>Variables</th>
<th>Predicted Effect</th>
<th>Open-End Stock Funds (N=46,873)</th>
<th>Closed-End Stock Funds (N=2,420)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intercept</td>
<td>?</td>
<td>Coefficient Estimate 0.036</td>
<td>p-value 0.007</td>
</tr>
<tr>
<td>Overhang(_{it-1})</td>
<td>+/−</td>
<td>Coefficient Estimate 0.016</td>
<td>p-value 0.045</td>
</tr>
<tr>
<td>ExpectedCGTax(_{it})</td>
<td>+</td>
<td>Coefficient Estimate 0.145</td>
<td>p-value 0.005</td>
</tr>
<tr>
<td>CurrentCGTax(_{it})</td>
<td>−</td>
<td>Coefficient Estimate −0.174</td>
<td>p-value 0.010</td>
</tr>
<tr>
<td>(\text{R}_{it-1})</td>
<td>+</td>
<td>Coefficient Estimate 0.153</td>
<td>p-value 0.029</td>
</tr>
<tr>
<td>(\text{R}_{it-2})</td>
<td>+</td>
<td>Coefficient Estimate 0.069</td>
<td>p-value 0.007</td>
</tr>
<tr>
<td>Turnover(_{it})</td>
<td>+</td>
<td>Coefficient Estimate 0.005</td>
<td>p-value 0.000</td>
</tr>
<tr>
<td>GrowthDummy(_{it})</td>
<td>+</td>
<td>Coefficient Estimate 0.007</td>
<td>p-value 0.040</td>
</tr>
<tr>
<td>Adjusted R(^2)</td>
<td>0.087</td>
<td></td>
<td>0.112</td>
</tr>
</tbody>
</table>

Panel B: Change Specification

\[ \begin{align*} 
\Delta \text{CGYield}_{it} &= \beta_0 + \beta_1 \Delta \text{Overhang}_{it-1} + \beta_2 \Delta \text{ExpectedCGTax}_{it} + \beta_3 \Delta \text{CurrentCGTax}_{it} \ 
+ \beta_4 (\text{R}_{it-1} - \text{R}_{it-2}) + \beta_5 \Delta \text{Turnover}_{it} + \beta_6 \Delta \text{GrowthDummy}_{it} + \epsilon_{it} 
\end{align*} \]

<table>
<thead>
<tr>
<th>Variables</th>
<th>Predicted Effect</th>
<th>Open-End Stock Funds (N=43,578)</th>
<th>Closed-End Stock Funds (N=2,042)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intercept</td>
<td>?</td>
<td>Coefficient Estimate −0.021</td>
<td>p-value 0.084</td>
</tr>
<tr>
<td>(\Delta \text{Overhang}_{it-1})</td>
<td>+/−</td>
<td>Coefficient Estimate 0.163</td>
<td>p-value 0.052</td>
</tr>
<tr>
<td>(\Delta \text{ExpectedCGTax}_{it})</td>
<td>+</td>
<td>Coefficient Estimate 0.237</td>
<td>p-value 0.048</td>
</tr>
<tr>
<td>(\Delta \text{CurrentCGTax}_{it})</td>
<td>−</td>
<td>Coefficient Estimate −0.136</td>
<td>p-value 0.008</td>
</tr>
<tr>
<td>(\text{R}<em>{it-1} - \text{R}</em>{it-2})</td>
<td>+</td>
<td>Coefficient Estimate 0.123</td>
<td>p-value 0.030</td>
</tr>
<tr>
<td>(\Delta \text{Turnover}_{it})</td>
<td>+</td>
<td>Coefficient Estimate 0.008</td>
<td>p-value 0.007</td>
</tr>
<tr>
<td>(\Delta \text{GrowthDummy}_{it})</td>
<td>+</td>
<td>Coefficient Estimate −0.025</td>
<td>p-value 0.094</td>
</tr>
<tr>
<td>Adjusted R(^2)</td>
<td>0.061</td>
<td></td>
<td>0.067</td>
</tr>
</tbody>
</table>

Notes: In Panel A, both open-end stock funds (from 1962–2005) and closed-end stock funds (from 1971–2005) are separately pooled over time, and equations are estimated using instrumental variable regressions. The regression regresses \(\text{CGYield}_{it}\) on predicted values of fund turnover and the tax variable. Other variables are defined in the text. We use \(\text{Turnover}_{it-1}\) as the instrument for \(\text{Turnover}_{it}\). Standard errors of coefficient estimates are clustered by year. In Panel B, equations are estimated using instrumental variable regressions. The regression regresses \(\Delta \text{CGYield}_{it}\) on predicted values of fund turnover changes and tax variables. We use \(\Delta \text{Turnover}_{it-1}\) as the instrument for \(\Delta \text{Turnover}_{it}\). Standard errors of coefficient estimates are clustered by year. Variables are defined as follows. \(\Delta \text{CGYield}_{it}\) is the change in realized capital gains yield. \(\Delta \text{Overhang}_{it-1}\) is the change in unrealized capital gains overhang. \(\text{R}_{it-1} - \text{R}_{it-2}\) is the prior-year change of yearly return for the fund including all distributions. \(\Delta \text{Turnover}_{it}\) is the change in fund’s turnover. \(\Delta \text{GrowthDummy}_{it}\) is a dummy variable which is equal to one if the average fund growth rate of total net assets for the current year is larger than the average fund growth rate in the prior year. Other variables are defined in the text. 

(1) The superscripts in this column provide measures of the statistical significance of the difference between the tax shifting variables for the open-end and closed-end funds. The superscript "\(x\)" indicates the difference is significant at the 1 percent level; the superscript "\(y\)" indicates the difference is significant at the 5 percent level; the superscript "\(z\)" indicates the difference is significant at the 10 percent level; and the superscript "\(t\)" indicates a statistically insignificant difference.
0.145 and significant for open-end funds and 0.227 for closed-end funds. This suggests that when the expected capital gains tax rate is legislated to increase, funds realize more capital gains on average, consistent with tax planning.

The coefficients from these regressions can be used to estimate the magnitude of the change in capital gains realizations in response to a change in the tax rate. For open-end funds, a 1 percentage point increase in the expected capital gains tax rate will increase the current-period capital gains yield by 0.00145 (0.145 × 0.01). Since the mean capital gains yield is 4.46 percent, this implies that a 1 percentage point increase in the expected capital gains tax rate (e.g., an increase from 19 percent to 20 percent) will translate into an increase of 0.25 percent (0.00145/0.0446) of capital gains realized in the current period. In dollar amounts, since our sample average of open-end fund size is $389 million, a 1 percentage point increase in the expected capital gains tax rate will increase current-period capital gains realizations by $0.56 million. Similarly, for closed-end funds, a 1 percentage point increase in the expected capital gains tax rate appears to induce fund managers to increase their capital gains realizations by 4.65 percent in the current period.

The coefficient on CurrentCGTax, is negative and significant for open-end funds at –0.174, and negative and marginally significant for closed-end funds at –0.413. In sum, the tax variables are significant in the predicted directions, suggesting that fund managers shift capital gains realizations in response to the level of tax rates. Furthermore, we conduct a regression test to compare the tax sensitivities between open-end and closed-end funds, and we only find a marginal significance for the difference in the coefficient on the expected capital gains tax rate between open-end and closed-end funds.

Although the above tests control for confounding effects, they might not capture whether the realizations for any specific fund increased or decreased because all funds are included in the analysis whether or not they are in existence in consecutive years. Therefore, we also look at changes in realized capital gain yields, which allow each mutual fund to be used as its own control across time, more directly testing for changes in realizations.

The results of these tests with the changes specification, in Panel B of Table 3, are generally consistent with the levels results above. In particular, the coefficient on ΔExpectedCGTax for open-end funds (0.237) implies that, when the expected capital gains tax rate is legislated to increase, funds realize more capital gains on average, consistent with tax planning. For open-end stock funds, an expected increase of 1 percent of capital gains tax rate in the coming year (e.g., an increase in the tax rate from 19 percent to 20 percent) will explain 22.79 percent of the increase of capital gains yield in the current period. In dollar amounts, given an average open-end fund size of $389 million, a 1 percentage point increase in the expected capital gains tax rate will increase capital gains realizations by $0.92 million. However, the coefficient on ΔExpectedCGTax, for the closed-end funds is not statistically significant.

35 The coefficient on the change of expected capital gains tax rates is 0.237. This indicates that a 1 percentage point increase in the expected capital gains tax rate will increase the change in the current-period capital gains yield by 0.00237 (0.237 × 0.01). To understand its relative magnitude, the sample average change of capital gains yield is 1.04 percent (untabulated). Thus, a one percentage point increase in the expected capital gains tax rate will explain 22.79 percent (0.00237/0.0104) of the increase in capital gains yield in the current period. The dollar impact is calculated as the average fund size ($389 million for open-end funds) multiplied by the average change in the capital gains yield (0.237 × 0.01 for a one percentage point change).
In addition to estimating how open-end and closed-end fund managers respond to anticipated changes in tax rates, we also estimate $\Delta CurrentCGTax_t$ to measure the extent to which funds alter their capital gains realizations after a tax rate change. For open-end stock funds the coefficient on $\Delta CurrentCGTax_t$ is negative at −0.136 and significant at the 1 percent level. Similarly, for closed-end funds the coefficient on $\Delta CurrentCGTax_t$ is negative at −0.166 and significant at the 10 percent level. These results support the hypothesis that mutual fund managers shift capital gains realizations in the short-term in response to changes in capital gains tax rates.\(^3\) In particular, in the year in which tax rates increase, both open-end and closed-end fund managers realize relatively fewer capital gains compared to years where the tax rate remains unchanged.\(^4\)

While the above results are significant, it is possible that they are biased due to unobserved or omitted fund characteristics. To further control for fund-specific heterogeneity, we follow Himmelberg, Hubbard and Palia (1999), and adopt a fund-specific, fixed-effects model. Accordingly, we require that funds exist for at least five years and span at least one change in the capital gains tax. Note that this screening eliminates some “transient” funds which usually disappear after several years of poor performance. Because the funds in this sample tend to be more successful, we would expect them to have larger unrealized capital gains overhangs, on average, and therefore have even larger incentives to reduce unrealized gains overhang. To cater to existing shareholders, we also expect greater tax sensitivity surrounding major capital gains. In untabulated fixed-effects analyses of open-end stock funds, we find that the coefficient on $\Delta ExpectedCGTax_t$ is positive and significant, and that the coefficient on $\Delta CurrentCGTax_t$ is negative and significant.\(^5\) Thus, the fixed-effects model confirms our prediction that open-end stock fund managers shift capital gains realizations in a manner consistent with tax planning.

In summary, we provide evidence that both open-end and closed-end stock funds respond to changes in tax rates by realizing gains in patterns consistent with shifting. Our conclusions are supported by three separate tests and are robust to different specifications and different time periods, although some of the results for closed-end funds are only marginally significant or insignificant. In the next section, we investigate whether our results hold for other groups of funds that are expected to differ in their propensity to tax plan.

### B. Capital Gain Realization Behavior of Funds with Different Tax Sensitivities

While actively managed stock mutual funds exhibit the above realization patterns of capital gains, there are certain funds that might not be sensitive to changes in tax rates,\(^6\)
namely index funds, retirement-oriented funds, and taxable and tax-exempt bond funds. Index funds are managed to track a specific index, and therefore might be constrained in attempting to tax plan in response to tax rate changes.\(^{39}\) We manually search fund names using the keyword “index” in the CRSP mutual fund database. Retirement-oriented funds are also expected to be insensitive to changes in tax rates, since the funds are likely to be held through tax-deferred (e.g., 401(k) plans) or tax-exempt vehicles (e.g., Roth IRAs after 1997). We identify retirement-oriented funds using a keyword search for “retire” in the CRSP mutual fund database.

Compared to open-end stock funds, bonds funds are less likely to be sensitive to changes in capital gains tax rates, because a larger fraction of fund returns are in the form of income yield. When bond funds are held in taxable accounts, capital gains realized by those funds are taxable. We further distinguish between bond funds that typically hold taxable securities, taxable bond funds, and bond funds that hold municipal bonds (i.e., tax-exempt bond funds). Taxable bond funds are more likely to be held by low marginal tax rate investors or to be held via tax-deferred (or tax-exempt) vehicles, while tax-exempt bond funds are typically held by investors with high marginal tax rates. Overall it is an empirical question whether these funds are sensitive to changes in tax rates. We rely on Lipper asset codes provided by the CRSP mutual fund database to classify taxable and nontaxable bond funds.

Table 4 provides the results of the instrumental variable regressions for index funds, retirement-oriented funds, and taxable and tax-exempt bond funds. As with the actively managed funds in Table 3, we focus on the coefficients of the two tax variables. For index funds, the coefficients on \(\Delta \text{ExpectedCGTax}_t\) and \(\Delta \text{CurrentCGTax}_t\) are negative but insignificant. Similarly, for our sample of retirement-oriented funds, we are unable to reject the null hypothesis of no tax planning. The signs of the coefficients on both tax variables, \(\Delta \text{ExpectedCGTax}_t\) and \(\Delta \text{CurrentCGTax}_t\), are the opposite of what would be predicted for tax planning (–0.247 and 0.276, respectively) and neither is significant. Furthermore, in our regressions using the sample of tax-exempt bond funds, neither tax variable is statistically significant. In contrast, our taxable bond funds do exhibit evidence of tax planning. The coefficients on the two tax variables are both of the sign predicted for tax planning (0.153 and –0.225, respectively), and are statistically significant at the 1 percent level.

We also compare the coefficients for these four groups of funds (index, retirement, taxable and tax-exempt) directly to the coefficients on the sample of open-end stock funds from Panel B of Table 3. For the samples of index, retirement, and tax-exempt funds, we are unable to reject the null hypothesis that there is no statistical difference

\(^{39}\) While index funds are generally managed to passively track a specific index, it is possible that these funds are quite active in regards to tax management, since they often only invest in a subset of the stocks in any specific index. For example, an index fund that tracks the S&P500 might only invest in 40–50 stocks, and could sell out of holdings of certain securities that have decreased in value (e.g., IBM), and instead purchase stock in another company in the same sector (e.g., HP). We thank one of the anonymous reviewers for pointing this out.
Table 4: Instrumental Variable Regressions of Realized Capital Gains Yields on Tax and Control Variables for Different Groups of Open-End Funds

\[
\Delta CGYield_{it} = \beta_0 + \beta_1 \Delta Overhang_{it-1} + \beta_2 \Delta ExpectedCGTax_{it} + \beta_3 \Delta CurrentCGTax_{it} + \beta_4 (R_{it-1} - R_{it-2}) + \beta_5 \Delta Turnover_{it} + \beta_6 \Delta GrowthDummy_{it} + \epsilon_{it}
\]

<table>
<thead>
<tr>
<th>Variables Predicted Effect</th>
<th>Index Funds (N=1,258)</th>
<th>Retirement-Oriented Funds (N=764)</th>
<th>Taxable Bond Funds (N=35,936)</th>
<th>Tax-Exempt Bond Funds (N=7,262)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intercept</td>
<td>?</td>
<td>0.012 0.863</td>
<td>-0.017 0.042</td>
<td>-0.038 0.876</td>
</tr>
<tr>
<td>(\Delta Overhang_{it-1})</td>
<td>?</td>
<td>0.400 0.001</td>
<td>0.152 0.000</td>
<td>-0.053 0.901</td>
</tr>
<tr>
<td>(\Delta ExpectedCGTax_{it})</td>
<td>0/+</td>
<td>-0.247 0.432</td>
<td>0.153 0.013</td>
<td>-0.249 0.879</td>
</tr>
<tr>
<td>(\Delta CurrentCGTax_{it})</td>
<td>0/-</td>
<td>0.276 0.357</td>
<td>-0.225 0.006</td>
<td>-0.022 0.870</td>
</tr>
<tr>
<td>((R_{it-1} - R_{it-2}))</td>
<td>+</td>
<td>-0.005 0.993</td>
<td>0.108 0.006</td>
<td>0.202 0.878</td>
</tr>
<tr>
<td>(\Delta Turnover_{it})</td>
<td>+</td>
<td>-0.002 0.889</td>
<td>-0.029 0.000</td>
<td>-0.025 0.889</td>
</tr>
<tr>
<td>(\Delta GrowthDummy_{it})</td>
<td>+</td>
<td>0.034 0.824</td>
<td>0.006 0.001</td>
<td>0.004 0.878</td>
</tr>
</tbody>
</table>

Adjusted R²: 0.071 0.377 0.101 0.061

Notes: This table presents the regression results for four groups of mutual funds. Each group of funds is pooled over time, and equations are estimated using instrumental variable regressions. The regression regresses \(\Delta CGYield_{it}\) on predicted values of fund turnover changes and tax variables. We use \(\Delta Turnover_{it-1}\) as the instrument for \(\Delta Turnover_{it}\). Standard errors of coefficient estimates are clustered by year. Variables are defined in the footnotes to Table 3. The superscript “y” (“z”) indicates that the coefficient is statistically different at the 5 percent (10 percent) level from the same coefficients for the regression of open-end stock funds (in Panel B, Table 3). Coefficients for Index funds, Retirement-oriented funds, and Tax-Exempt Bond funds are not significant.
between the relevant tax coefficients for these samples and our sample of open-end stock funds. For our much larger sample of taxable bond funds, we do find that the coefficient on $\Delta ExpectedCGTax_t (0.153)$ is significantly smaller than the same coefficient for our stock funds (0.237), at the 10 percent level, although the absolute value of the coefficient on $\Delta CurrentCGTax_t (−0.225)$ is larger than the coefficient for the stock funds (−0.136).

Overall, these results provide us with a small degree of additional comfort. As expected, we are not able to find evidence that retirement-oriented funds are sensitive to changes in capital gains rates, which is not surprising since these funds cater to tax-exempt or tax-deferred investment vehicles. Similar results hold for tax-exempt bond funds, which are more likely to cater to investors with high marginal tax rates. These results should be interpreted with caution, however, because in our direct comparisons to open-end stock funds, we are unable to reject the null hypothesis that there is no statistical difference.

C. Differential Response to Capital Gain Tax Increases and Decreases

In Table 5 we assess whether fund managers respond differently to tax increases than tax decreases. We differentiate between capital gains tax rate increases and tax rate decreases by including four variables: $\Delta ExpectedCGTax_t^+$, $\Delta ExpectedCGTax_t^-$, $\Delta CurrentCGTax_t^+$ and $\Delta CurrentCGTax_t^-$, respectively. The results for open-end funds and closed-end funds are similar, so we focus our discussion on open-end funds. As shown in Table 5, the negative coefficient on $\Delta ExpectedCGTax_t^-$ suggests that fund managers refrain from realizing capital gains in the current year in anticipation of future capital gains rate decreases. Conversely, the positive and statistically significant coefficient for $\Delta CurrentCGTax_t^+$ suggests that, in the year following a decrease in the capital gains tax rate, fund managers respond by realizing additional capital gains. In addition, we find a negative yet insignificant coefficient on $\Delta CurrentCGTax_t^-$. For open-end funds, the coefficients on expected tax rate increases and expected tax rate decreases are significantly different, with the coefficient on $\Delta ExpectedCGTax_t^-$ significantly larger in absolute value than the coefficient on $\Delta ExpectedCGTax_t^+$. However, the coefficients on current tax rate increases and current tax rate decreases are not statistically different.

We obtain similar results in the group of closed-end funds, with the exception that the coefficient on $\Delta ExpectedCGTax_t^+$ is positive yet insignificant. Thus, within each mutual fund group, the shifting pattern is more pronounced for tax decreases than increases, consistent with it being less costly for managers to delay capital gains realizations.

D. Is the Shifting Behavior Consistent with Managers’ Concerns about Potential Investors?

Recall that the univariate test results from Panel B of Table 1 show that the overhang is higher (lower) when expected tax rates are lower (higher). Table 6 reports the results of OLS regressions of the capital gains overhang on capital gains tax rates and the various characteristics of mutual funds. For the open-end stock funds, the coefficient on
the expected tax rate variable is negative (–0.634) and significant. This result suggests that open-end fund managers adjust their overhang in response to changes in capital gains tax rates. After controlling for confounding effects, mutual funds exhibit lower (higher) levels of overhang when future tax rates are higher (lower). In comparison, the expected tax rate variable for the closed-end funds is not statistically significant. While open-end fund managers face some incentives to reduce unrealized overhang,
our result on closed-end funds is consistent with the conjecture by Barclay, Pearson and Weisbach (1998, p. 32) that closed-end funds potentially have “… limited incentives to manage the overhang of unrealized gains, because they rarely issue additional shares after the initial public offering.” However, due to the small size of our sample of closed-end funds, we fail to find a statistical significant difference between the tax variables of the two groups.

E. Stock-Holding Analysis of Tax-Motivated Trading Behaviors

Our previous analysis has focused on tax planning by mutual fund managers at the overall fund level. If taxes are the correct explanation for the above results, we would also expect to detect tax planning in the trading behavior of individual stocks within the mutual fund. Following Huddart and Narayanan (2002), we estimate the tax basis of each security held in each fund, and then use this information to capture the idiosyncratic tax effect of net trading in each security held by the mutual fund. We use the CDA/Spectrum mutual funds holding database, which contains stock holding information

<table>
<thead>
<tr>
<th>Variables</th>
<th>Prediction</th>
<th>Open-End Stock Funds (N=46,873)</th>
<th>Closed-End Stock Funds (N=2,239)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intercept</td>
<td>?</td>
<td>0.088</td>
<td>–0.427</td>
</tr>
<tr>
<td>ExpectedCGTax</td>
<td>–</td>
<td>–0.634</td>
<td>0.986</td>
</tr>
<tr>
<td>Age</td>
<td>?</td>
<td>–0.035</td>
<td>0.002</td>
</tr>
<tr>
<td>R_{t-1}</td>
<td>+</td>
<td>0.538</td>
<td>0.095</td>
</tr>
<tr>
<td>R_{t-2}</td>
<td>+</td>
<td>0.353</td>
<td>0.615</td>
</tr>
<tr>
<td>GrowthDummy</td>
<td>–</td>
<td>0.039</td>
<td>0.333</td>
</tr>
<tr>
<td>IncomeYield</td>
<td>–</td>
<td>–1.741</td>
<td>0.241</td>
</tr>
</tbody>
</table>

Adjusted R² 0.321 0.217

Notes: Both open-end stock funds (from 1962–2005) and closed-end stock funds (from 1971–2005) are pooled over time, and equations are estimated using OLS regressions. Variables are defined as follows. Overhangit is the unrealized capital gains in the fund at the end of the year divided by the total net assets of the fund at the beginning of the year. Ageit is the age of the fund from the starting year to the current year. IncomeYieldit is the dividends declared during year t divided by the net asset value of the fund at the beginning of the year. Other variables are defined in the footnotes to Table 3.

(1) The superscripts are defined in the notes to Table 3.
for open-end funds. We investigate the net sells of individual stocks by mutual funds in the two quarters preceding and in the two quarters following a tax change. Due to data limitations, we examine only three tax changes: the 1986–1987 tax rate increase, the 1996–1997 tax rate decrease and the 2002–2003 tax rate decrease. In each quarter, we estimate the gain or loss that would be realized on the sale of a given stock by a given mutual fund (Gain), and assess the importance of this variable in explaining stock sale decisions.

In the quarters prior to (following) a tax rate increase, we expect fund managers to be more likely to sell securities that have built-in gains (losses) in order to shift the gains realizations to the earlier, lower tax rate years. By comparison, in the quarters prior to a tax rate decrease, we expect fund managers to delay sales of securities that have larger built-in gains in order to shift capital gains to the subsequent lower tax rate year.

Since the effective date for the 1986 tax change was January 1, 1987, we define the first and the second quarters of 1986 as the two quarters before the capital gains tax change, and the first and the second quarters of 1987 as the two quarters after the tax change. Similarly, the 1997 tax change was May 7, 1997, so we define the fourth quarter of 1996 and the first quarter of 1997 as the two quarters before the capital gains tax change, and the fourth quarter of 1997 and the first quarter of 1998 as the two quarters after the capital gains tax change. Note that instead of using the two exact quarters prior to and after the tax change, we use the same two quarters as in the previous years. This is to reduce the possibility that our findings are due to seasonal fluctuations that are typical in institutional trading, and also as an attempt to alleviate the concern that our results are simply driven by institutional window dressing surrounding the end of the year. The quarters around the 2002–2003 tax change are defined similarly.

Following Huddart and Narayanan (2002), we include both excess returns and unexpected earnings, and their lagged values, to capture momentum trading and information-based trading. As in Gompers and Metrick (2001), we control for firm size, the market-to-book ratio, and fund turnover. The logistic regression is estimated as follows.

\[
\Pr(NetSale_{ist} = 0) = \logit(\beta_0 + \beta_1 Gain_{BEFORE} + \beta_2 Gain_{AFTER} + \beta_3 Turnover_{ist} + \beta_4 \ln(MB)_{ist} + \beta_5 \ln(MV)_{ist} + \beta_6 AR_{ist} + \beta_7 AR_{ist-1} + \beta_8 UE_{ist} + \beta_9 UE_{ist-1} + \epsilon_{ist})
\]

where:

- \( NetSale_{ist} = 1 \) if the stock position is sold by institution \( i \) in the quarter \( t \), then \( NetSale = 1 \), otherwise = 0,
- \( Gain_{BEFORE} = \) the capital gains before the tax change that would be realized if the entire position were sold, expressed as a fraction of portfolio value,
- \( Gain_{AFTER} = \) the capital gains after the tax change that would be realized if the entire position were sold, expressed as a fraction of portfolio value,

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40 The capital gains tax rate increase of 1986, signed into law by President Ronald Reagan, was first unveiled by the U.S. Department of the Treasury in a plan to simplify the tax system in November 1984. In contrast, the capital gain tax cut of 1997 was signed into law on August 6, 1997, but was applied retroactively to all transactions on or after May 7, 1997.
Table 7

(6) \( \Pr(\text{NetSale}_{ist}) = \logit(\beta_0 + \beta_1 \text{Gain}_{\text{BEFORE}} + \beta_2 \text{Gain}_{\text{AFTER}} + \beta_3 \text{Turnover}_{ist} + \beta_4 \ln(\text{MB})_{ist} + \beta_5 \ln(\text{MV})_{ist} + \beta_6 \text{AR}_{ist} + \beta_7 \text{AR}_{ist-1} + \beta_8 \text{UE}_{ist} + \beta_9 \text{UE}_{ist-1} + \epsilon_{ist}) \)

<table>
<thead>
<tr>
<th>Variables</th>
<th>Predicted Effect</th>
<th>CG Tax Rate Decrease in 2003 (N=182,365)</th>
<th>CG Tax Rate Decrease in 1997 (N=144,363)</th>
<th>CG Tax Rate Increase in 1986 (N=24,775)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Coef. Est.</td>
<td>p-value</td>
<td>Coef. Est.</td>
</tr>
<tr>
<td>Intercept</td>
<td>?</td>
<td>-2.224</td>
<td>0.000</td>
<td>-2.571</td>
</tr>
<tr>
<td>( \text{Gain}_{\text{BEFORE}} )</td>
<td>for tax decrease, + for tax increase</td>
<td>-1.232</td>
<td>0.017</td>
<td>-0.105</td>
</tr>
<tr>
<td>( \text{Gain}_{\text{AFTER}} )</td>
<td>for tax decrease, + for tax increase</td>
<td>0.577</td>
<td>0.012</td>
<td>0.211</td>
</tr>
<tr>
<td>( \text{Turnover}_{ist} )</td>
<td>+</td>
<td>9.577</td>
<td>0.000</td>
<td>10.121</td>
</tr>
<tr>
<td>( \ln(\text{MB})_{ist} )</td>
<td>+</td>
<td>0.058</td>
<td>0.014</td>
<td>0.167</td>
</tr>
<tr>
<td>( \ln(\text{MV})_{ist} )</td>
<td>+</td>
<td>0.052</td>
<td>0.000</td>
<td>0.050</td>
</tr>
<tr>
<td>( \text{AR}_{ist} )</td>
<td>-</td>
<td>-0.119</td>
<td>0.058</td>
<td>-0.026</td>
</tr>
<tr>
<td>( \text{AR}_{ist-1} )</td>
<td>-</td>
<td>0.057</td>
<td>0.197</td>
<td>0.043</td>
</tr>
<tr>
<td>( \text{UE}_{ist} )</td>
<td>+</td>
<td>0.034</td>
<td>0.071</td>
<td>0.102</td>
</tr>
<tr>
<td>( \text{UE}_{ist-1} )</td>
<td>+</td>
<td>-0.002</td>
<td>0.732</td>
<td>-0.001</td>
</tr>
<tr>
<td>Chi-square statistic</td>
<td></td>
<td>4.237</td>
<td>0.000</td>
<td>5.328</td>
</tr>
<tr>
<td>Pseudo R²</td>
<td></td>
<td>0.172</td>
<td>0.143</td>
<td>0.136</td>
</tr>
</tbody>
</table>

Notes: This table presents the results of a logit regression of net security sales on estimated built-in gains and control variables for domestic growth funds around three periods of capital gains tax changes. The stock holding data is extracted from the CDA/Spectrum database, and the styles of mutual funds are based on the Investment Objective Codes of CDA/Spectrum. Variables are defined in the text.
Turnover\textsubscript{ist} = the minimum of the market value of either total security sales or total
security purchases, divided by average total net assets,

\[ \ln(MB)\textsubscript{ist} = \text{the log of the market-to-book ratio for stock } s \text{ held by the institution } i \text{ in quarter } t, \]

\[ \ln(MV)\textsubscript{ist} = \text{the log of the market capitalization of stock } s \text{ held by the institution } i \text{ in quarter } t, \]

\[ AR\textsubscript{ist} = \text{the abnormal return of stock } s \text{ (i.e., the stock return over the quarter less the return implied by the CAPM) held by institution } i \text{ in quarter } t, \]

\[ UE\textsubscript{ist} = \text{the unexpected earning (i.e., the difference between earnings per share before extraordinary items in the current year and in the prior year) of stock } s \text{ held by the institution } i \text{ in quarter } t. \]

In our analysis the key variables of interest are Gain\textsubscript{BEFORE} and Gain\textsubscript{AFTER}. If mutual
fund managers are tax planning, then prior to (following) tax rate increases we would
expect the coefficient on Gain\textsubscript{BEFORE} (Gain\textsubscript{AFTER}) to be positive (negative). Conversely,
prior to (following) tax rate decreases, we would expect the coefficient on Gain\textsubscript{BEFORE}
(Gain\textsubscript{AFTER}) to be negative (positive).

The results of this analysis, reported in Table 7, are generally consistent with mutual
fund managers engaging in some tax planning. Surrounding the tax rate decrease in
2003, the coefficient on Gain\textsubscript{BEFORE} is \(-1.232\) and the corresponding marginal effect is
0.131 (untabulated), indicating that a one unit increase in Gain\textsubscript{BEFORE} will reduce the
probability of net stock sales by 13.1 percent. The coefficient on Gain\textsubscript{AFTER} Surrounding
the tax rate decrease in 2003 is 0.577 and the corresponding marginal effect is 0.053
(untabulated), indicating that a one unit increase in Gain\textsubscript{AFTER} will increase the probability
of net stock sales by 5.3 percent. Both coefficient estimates are in the predicted direction.
The coefficients for the 1997 tax rate decrease have the same signs and are significant.
This suggests that, prior to the tax rate decrease, fund managers were less likely to sell
appreciated securities, whereas following the tax rate decrease they were more likely to
sell appreciated securities. By comparison, surrounding the tax rate decrease of 1986,
the mutual fund managers appeared more likely to sell securities prior to the increase,
as indicated by the positive coefficient on Gain\textsubscript{BEFORE} of 3.552. While we expected
a negative and significant coefficient on Gain\textsubscript{AFTER}, the coefficient is not statistically
significant. Overall, our stock-holding level analysis provides additional evidence of
tax planning, and suggests an asymmetric response to tax increases and tax decreases.

V. CONCLUSIONS

This paper investigates whether managers of mutual funds respond to shareholder-
level taxes on capital gains by timing the realization of capital gains. To answer this
question we examine the capital gains realizations of both open-end and closed-end
mutual funds surrounding six major tax changes. We find evidence that both open-end
and closed-end stock funds realize higher levels of capital gains in the year before tax rate increases, and realize less in the year before rate decreases, consistent with managers shifting realizations to reduce taxes. These results hold both in our fund-level analysis in which our key variable is the overall capital gains realizations in a fund, and also in our stock-holding level analysis in which we examine the trading behavior of individual securities within the mutual funds. In contrast, we do not find similar realization patterns for three groups of funds that might differ in their propensity to tax plan, namely retirement-oriented funds, index funds, and tax-exempt funds.

While these results provide evidence that mutual fund managers might partially tax plan on the behalf of their investors, we caution that it does not suggest investors can ignore the tax ramifications of their fund investments. These results merely provide evidence of some degree of tax planning by mutual funds. The majority of the funds in our sample are realizing a non-trivial amount of capital gains, suggesting that individual investors could still improve their after-tax returns by maintaining a stock portfolio separate from their mutual fund holdings, and selling assets with capital losses to offset the capital gains realized by their funds.

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