Investment Taxation and Portfolio Performance[1]

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Abstract

We use the federal tax codes from 1926 through 2009 to construct the after-tax returns that individual investors, corporations, and broker-dealers would have generated on a set of benchmark portfolios. Portfolio strategies differ in the pace of capital gains realizations. This creates important heterogeneity in effective investment taxation beyond that implied by dividend yields. Tax burdens reduce the return premium that value portfolios earn over growth portfolios and the premium of small market capitalization portfolios over large market capitalization portfolios. Tax burdens exacerbate the equity premium puzzle, although they help explain mixed empirical results about the dividend preferences of high income and corporate investors.

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More than half of corporate equity in the United States is held in taxable accounts.[2] Taxes have a first-order effect on investors' after-tax wealth accumulation. Investors face two types of direct taxes: taxes on dividends and taxes on capital gains. Investors pay capital gains taxes when the gains are realized. Therefore, households enjoy flexibility in the timing of capital gains tax payments. This paper focuses on how portfolio construction impacts this flexibility. Because deferral reduces the economic burden of taxes, and because portfolio strategies differ in the extent to which they defer realizing capital gains, different strategies will impose different tax burdens on investors.

Capital gains taxes are paid based on the difference between the price at which a security has been sold and the price at which it was originally purchased. This original purchase price is often referred to as the "basis." An accumulated position in a security is often the result of multiple purchases at different prices on different dates. When part of a position is sold, the investor may choose to sell shares that were purchased on a specific date.[3] Our main calculations assume realistic "smart" tax-realization strategies, with the highest-basis shares of given companies sold before lower-basis shares. We show the impact of taxation using a broad set of equities (all listings on the NYSE) over a long sample (1927–2009). Instead of assuming static tax rates, our tax rates reflect the actual Federal and New York State tax codes. Unlike the previous literature, our paper is able to uncover tax effects that are caused by portfolio styles and by the rules that determine index inclusion.

We document after-tax portfolio performance for a range of equity strategies. These after-tax performance measures represent useful benchmarks for assessing the performance of investors who manage taxable portfolios. We find that the tax burden of a portfolio is related not only to the dividend yield, but also to portfolio style. By influencing the pattern of capital gains realization, portfolio style creates heterogeneity in investor tax burdens similar to the heterogeneity that stems from differences in dividend yield.

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[2] See Sialm (2009). This statistic underestimates the historical importance of equity taxation since personal tax-deferred accounts are a recent phenomenon.

[3] Investors may also elect to assume a 'weighted average' approach, where for tax purposes the basis is assumed to be the weighted average purchase price of the 'lots' of a particular shareholding in the portfolio.

Our findings have implications for the broad finance and economics literature. The finance literature (Fama and French, 1995) has shown that value stock portfolios have higher average returns than growth stock portfolios and small market capitalization stock portfolios have higher average returns than large market capitalization portfolio. We show that tax burdens reduce the premium of value over growth and small market capitalization over large market capitalization. Thus, the premiums are diminished for taxable investors. The finance literature has also developed theoretical motivation for tax-based clientel effects for dividend paying stocks, although empirical support for these theories is lacking. We find that capital gains realizations complicate the strict relation posited by the theoretical literature. Last, the economics literature shows the equity premium is higher than reasonable levels of risk aversion imply. We show that taxes exacerbate the puzzle.

We measure tax burden by computing an effective tax rate, which is the percent of pre-tax returns that are absorbed by capital gain and dividend taxes. A portfolio that delivers an after-tax return of 8.5 percent and a pre-tax return of 10 percent will have an effective tax rate of 15 percent. This effective tax rate will reflect the investor's statutory capital gains and dividend tax rates, as well as the pattern of portfolio holdings induced by a particular strategy. We find that an investor at the 95th percentile of Adjusted Gross Income (AGI), following the portfolio strategy of holding the value-weighted index of NYSE stocks in the CRSP dataset, would have had an effective tax rate of 12.55 percent over the period of 1927 to 2009.[4] An investor at the 99.5th percentile of income who was subject to both federal and New York state taxation would have had an effective tax rate of 21.85 percent. Even with the opportunity to defer the realization of capital gains, taxation has a first-order impact on wealth accumulation.

The impact of taxes can be compared to direct transactions costs, another drag on portfolio performance that has received considerable attention in the finance literature. A tax-exempt investor who holds the CRSP value-weighted NYSE index and faces a 2 percent round-trip transaction cost would

[4] The household's AGI percentile affects the statutory tax rates on capital gains and dividends.

suffer a loss equivalent to 10 basis points per year. Whereas an investor paying taxes at rates corresponding to the 95th percentile of income loses 110 basis points per year.

Although the tax disadvantages induced by high-dividend-yield stocks are well known (see, for example, Litzenberger and Ramaswamy (1979)), the tax disadvantages associated with capital gains realization have often been ignored. As a general rule, deferring realization of capital gains lowers effective tax burdens.[5] Portfolio styles vary in the extent to which they allow investors to postpone the realization of capital gains. Portfolio strategies that involve maintaining equal position weights, investing in small firms, and investing in value stocks tend to accelerate the realization of capital gains. For example, stocks that start out small will often leave a small-firm portfolio by becoming large. Because an investor maintaining a small-firm strategy will constantly sell firms that become large, this strategy induces the realization of capital gains. This creates a high capital gains tax burden for taxable investors who follow small-firm, value-stock, and equally-weighted portfolio strategies.

On the other hand, portfolios where holdings are value weighted, portfolios of large market capitalization stocks, and portfolios of growth stocks induce a lower capital gains tax burden. An investor paying the taxes prevalent at the 99.5th percentile of AGI would have experienced an effective tax rate of 20.10 percent on a growth stock portfolio and of 26.77 on a value portfolio. For size-based portfolios, the large capitalization firm portfolio has a 18.83 percent effective tax rate and the small market capitalization portfolio has a 26.06 percent effective tax rate. The high momentum portfolio forces high levels of short-term capital gains realization and has an effective tax rate of 32.28 percent.

In contrast to one-period tax models such as Brennan (1970), which imply that tax burdens are proportional to dividend yields, we find cases where portfolios with higher dividend yields have lower tax burdens. Dividend yields do not appear to be a sufficient statistic for tax burdens.

[5] Deferring capital gains allows an investor to earn the return on the unrealized capital gains. This, in general, will reduce tax burdens. An exception to this general rule can come in periods of rising statutory tax rates; with rising tax rates deferring capital gains will push those gains into periods with higher tax rates and can thus raise effective tax burdens.

Our results in this paper are all partial equilibrium results. We take portfolio strategies, pre-tax returns, and the structure of tax rates as given, and estimate the after-tax returns enjoyed by taxpaying investors. We do not argue that all investors pay taxes or directly present evidence on the equilibrium impact of taxes on pre-tax returns.[6] Our contribution is to consider portfolios that have been used countless times by practitioners and academics under the tacit assumption of no taxation, and to offer a precise estimate of these portfolios' after-tax returns.

Our results have practical implications for investors who have both taxable and tax-deferred accounts and thus need to decide what strategies to follow inside of each account.[7] With respect to tax-deferred retirement accounts, there is some evidence that portfolio managers consider the tax status of their investors in determining capital gains realization policies. Sialm and Starks (2009) find that portfolio managers with more defined contribution money appear to run their funds in a less tax-efficient manner. Our results add to the literature on tax-deferred retirement investing (see Shoven and Sialm, 2003) by suggesting that some investors should consider the tax burdens that different equity trading strategies induce in determining whether to hold particular assets inside of or outside of tax-deferred accounts.

Third, the trade-off theory of capital structure posits that optimal capital structure balances the costs of financial distress against the net tax benefits of debt finance (see Miller (1977) and Bradley et al (1984)). These net tax benefits reflect both the corporate-level deductibility of interest tax payments and household-level taxation of returns from equity and fixed-income investments. Our results suggest that the equity tax cost for the marginal investor will depend upon which portfolio strategy the investor follows. While the literature has focused in detail on the statutory tax rate of the marginal investor, our focus shows that effective tax rates depend both on the statutory tax rates as well as the pattern of capital gain realizations. If all investors hold the CRSP value-weighted index in the long-run, and are taxed at the

[6] Domar and Musgrave (1944) note that it is possible for investors to mitigate capital gains taxation by engaging in risk shifting. This result requires a full offset of capital losses as well as capital gains being assessed on returns above the risk free rate, both of which are at odds with actual tax treatment. Our estimation allows us to consider more realistic offset provisions as well as actual capital gains tax treatment.

[7] This decision about where to put particular assets (inside or outside of the tax-deferred accounts) is often referred to as the 'asset location' decision, versus the 'asset allocation' decision about the investor's overall portfolio mix.

99.5th percentile of AGI, then our results would imply that the effective tax rate on equity is 18.41 percent.

I. Why Does Capital Gains Deferral Matter?

This section describes how investors can reduce the burden of capital gains taxes by deferring the realization of gains. Deferring capital gains allows investors to earn the extra return on the assets they would otherwise have used to pay taxes. A simple example, which follows from Chay, Choi, and Pontiff (2006), illustrates the value of the option to defer capital gains taxes. Let r denote the return from an asset, and t be the tax rate on realized capital gains. Consider an investor with $1. If he realizes capital gains in every period, the investor's expected terminal wealth after n periods, W_{real}, will be

$$W_{real} = \left(1 + r(1-t)\right)^n .$$

This can be rewritten as

$$W_{real} = \sum_{i=0}^{n} \binom{n}{i} \left(r^i\right)(1-t)^i .$$

For an investor who defers realization, terminal wealth W_{def} of the $1 investment will be

$$W_{def} = (1+r)^n - t\left((1+r)^n - 1\right)$$

or

$$W_{def} = t + \sum_{i=0}^{n} \binom{n}{i} \left(r^i\right)(1-t).$$

The expected value of the difference between these two strategies is

$$W_{def} - W_{real} = t + \sum_{i=0}^{n} \binom{n}{i} \left(r^i\right)\left((1-t) - (1-t)^i\right).$$

For $n>1$ and $0<t<1$, this difference will be positive, and thus, deferring capital gains realization will produce higher levels of expected wealth.

The discount rate of this strategy corresponds to the after-tax return that is associated with realizing gains every period, $r(1-t)$. Figure 1 shows the impact of the holding period length on the

percentage change in wealth from capital gains deferral for a range of different values of the underlying nominal tax rate, and for an assumed pre-tax return of 9.25 percent (the arithmetic average return of our S & P index between 1926 and 2009). This value is calculated as $(W_{def} - W_{real})/W_{real}$. The impact of deferral on investment value is substantial. If the statutory capital gains tax rate is 25 percent, the decision to hold positions for ten years creates an additional 5.7 percent of investment value relative to realizing every period. This option to defer the realization of capital gains is at the heart of the analysis in the following sections.

(Insert Figure 1 here)

In many of our simulations, the bulk of rebalancing occurs annually, since most of our portfolios are based on characteristics determined once per year. Events such as delistings, IPOs, share issuance, share repurchases, and dividends will also cause some month-to-month rebalancing. To the extent that month-to-month rebalancing induces realization of short-term capital gains, our simulations use the appropriate short-term rate. Long-term and short-term capital gains tax rates have generally diverged during our sample period. In our simulations, the portfolio weights are determined by the particular strategy followed, for example value-weighted versus equal-weighted portfolios of NYSE stocks. We account correctly for the tax basis of individual lots of shares purchased, and apply the correct tax rate given the holding period observed for each lot of shares purchased and sold. Most of our analysis in this paper follows the common practice of preferentially selling the highest-basis positions, which in general defers capital gains realizations and reduces effective tax burdens. This practice does not create extra trading beyond the trading required to maintain the simple strategies under consideration. Constantinides (1983, 1984) also considers a tax timing strategy of selling short-term losers and holding long-term winners. Because this strategy generates trading and transactions costs, we do not use it for our main simulations. However in Section IV.D we consider the impact of using this strategy on investors' effective tax rates.

While we do not consider tax-timing strategies designed to take advantage of the differences in tax rates applied to long-term and short-term capital gains, our results do capture a different part of the value transferred to investors through tax deferral. The ability to defer the payment of taxes, and effectively earn a rate of return on unrealized capital gains taxes, turns out to be quite large.

II. Constructing Tax Rates, 1927–2009

Our simulation results use two separate approaches to assess the effect of investment taxation. One approach is to use the actual tax rates that investors were subject to between 1927 and 2009. Because we are interested in constructing portfolio returns enjoyed by investors at different points in the income distribution, we collect data on both the structure of taxes over the period, and the income distribution.

The second approach is to assume a static tax environment that is based on the 2011 tax code. When using this approach we investigate not only the effective tax rates for household investors but also effective tax rates for broker-dealers and corporations. During the year 2011, corporations were subject to a statutory tax rate of 35 percent on realized capital gains and interest. Corporations could exclude 70 percent of dividends from taxable income, creating an effective dividend tax rate of 10.5 percent. Broker-dealers were subject to a 35 percent nominal tax rate on capital gains, dividends, and interest received. Unlike individuals and corporations, capital gains taxes were levied on broker-dealers' realized and unrealized capital gains.

Because stock ownership is concentrated among high-income households, we focus on the top of the income distribution. In particular, we focus on households whose adjusted gross income placed them at the 95th percentile and 99.5th percentile of the distribution. In 2008 these points corresponded to AGI levels of $147,909 and $497,162, respectively.[8] Table I, based on data from the Surveys of Consumer Finances (SCF), demonstrates the concentration in the possession of stocks and dividends. Our measures

[8] In 2008 dollars. Our AGI percentiles are taken from Piketty and Saez (2003), which presented AGI percentiles through 1998. Piketty and Saez have continued to update the tables from their paper as new information has become available, and data through 2008 are now available at http://elsa.berkeley.edu/~saez/.

of equity holdings include only securities held outside of tax-deferred accounts; assets held within IRA and 401(k) retirement savings plans are excluded from these measures. We classify equities held through mutual funds as indirectly-held equities. Table I shows a sequence of AGI thresholds as well as the share of families who report AGI in excess of each threshold. The table also shows the share of directly-held equity and the share of total equity (held directly or indirectly) reported by households above each AGI threshold, as well as the share of dividends reported by households above each threshold. These results suggest that in 2000 (the reference year for the 2001 SCF), the median family reported an AGI between $25,000 and $50,000. In that same year, the median dollar of direct stockholdings was held by a household with an AGI between $275,000 and $300,000. This is close to the $288,350 breakpoint between the region where income was taxed at a 36 percent rate and the region where the marginal federal tax rate on income was 39.6 percent.

(Insert Table I here)

Including equities held indirectly through mutual funds creates a more egalitarian picture: the median dollar of direct and indirect equity is held by a household reporting an AGI of between $200,000 and $225,000. Dividends were more evenly distributed in 2001: the median dollar of dividends reported in the 2001 SCF was reported by a household with an AGI of between $150,000 and $175,000. However, dividends were still remarkably concentrated, however: the household receiving the median dollar of dividends still reported more income than 95 percent of households.

In an internet appendix we document the sources of tax rate data and some of the changes to relevant federal tax rates during our sample period. We calculate marginal tax rates separately for dividends and for capital gains. In addition, we separately measure capital gains tax rates by holding period, with each potentially being subject to a different rate. The holding periods considered are 1–5 months, 6–11 months, 12–17 months, 18–23 months, 2–5 years, 5–10 years, and more than 10 years. These distinctions are necessary because of the changing structure of tax rates observed over time. The last trading day of the month does not always correspond to the last calendar day of the month. Because

of this, if a transaction occurs in a month for which the marginal rate of the capital gains tax is influenced by the precise day of sale, we use the lower marginal rate.

For example, 1997 saw a special medium-term capital gains tax rate, distinct from the short-term and long-term capital gains tax rate, applied assets held for 12 to 18 months. The period between 1934 and 1937 also saw a variety of tax rates applied to capital gains with different rates for stocks held for less than one year, less than two years, less than five years, less than 10 years, and more than 10 years.

Some of our calculations consider New York state tax. New York has consistently been among the most populous states, and its residents have consistently been relatively wealthy.[9] Among the other very large states, California has higher marginal income tax rates, while Texas and Florida have no state income tax. Given the significance of New York in financial markets, using that state's tax rates to illustrate the impact of state-level taxation is appropriate. New York state taxes were particularly high during the 1960s and 1970s, with tax rates on dividends peaking at 15 percent from 1973 to 1978. Tax rates on capital gains during this period were lower, with rates on long-term gains peaking at 9 percent during the same period. For our assumed 99.5th percentile investor, tax rates have more recently fluctuated between 6.8 and 7.9 percent. Our simulations assume that New York state taxes are deductible from federal income taxes.

The tax code allows capital losses to be used to offset capital gains in the current year, and currently $3,000 worth of capital losses can be used to offset ordinary income. Our main calculations consider this provision by carrying forward losses until they can be used to offset gains in the portfolio.[10] This generates results that describe the after-tax investment performance of an investor who holds a portfolio in isolation. In this case, all realized losses are valuable only to the extent that they can be

[9] The 2000 US Census reported that per capita income in New York, at $23,389, was 8.35 percent above the national average of $21,587. See US 2000 Census Geographic Comparison Table (GCT) P14, 'Income and Poverty in 1999,' available at http://factfinder.census.gov/servlet/GCTSubjectShowTablesServlet?_lang=en&_ts=333968084029.

[10] Rather than assuming that $3,000 (or some other particular amount) of capital losses can be used to offset ordinary income, our simulations assume that all capital losses are carried forward until realized. Our reason for making this very slightly counterfactual assumption is that the fixed nominal level of the offset amount means that performance (on a percent basis) is not quite independent of portfolio size. We consider the pure carryforward assumption appropriate for an investor whose financial portfolio is of sufficient size that the $3,000 offset amount has a minimal impact on portfolio performance.

carried forward and used to offset future realized gains. Each month long- and short-term realized losses are used to offset long- and short-term realized gains. If losses are greater than gains, the net loss is carried over to the next month. Similar to the U.S. tax code (although on a monthly frequency), we preserve short-term and long-term losses separately, and use short-term losses to offset short-term gains; and long-term losses to offset long-term gains.

Carrying forward losses generally increases tax burden, relative to using the losses immediately. Carrying forward losses is particularly disadvantageous for portfolios that create short-term capital gains realization. The result is an increase in the chance that a short-term loss is used to offset a long-term gain, which is less valuable than offsetting a short-term gain.

In order to assess the sensitivity of our results, in Section IV. D. we calculate portfolio returns under the assumption that investors immediately and fully receive a benefit to realized loses.

III. Return Data

Our data on stock prices, splits, distributions, mergers, and delistings come from the database available through the Center for Research in Security Prices (CRSP). Our use of CRSP data on stock prices and events follows standard practice among both finance academics and investment practitioners. For distributions and for cash flows resulting from stock delistings, we use the appropriate tax rates for our hypothetical investor to calculate after-tax performance.

A. Constructing Portfolios

Portfolios are constructed on the basis of market equity, book-to-market ratio, momentum, and firms' dividend policies. Our construction of these portfolios follows investment management industry practice, which often involves constructing and marketing portfolios that focus on particular categories of

stocks, for example small-cap stocks or value stocks.[11] Book equity data for the period since 1962 comes from Compustat, and measures of book equity are constructed according to the procedures detailed in Davis, Fama, and French (2000). For the period before Compustat coverage, book equity data come from the U.S. Historical Book Equity data that is available on Ken French's website.[12]

For portfolios based on firm size, book-to-market, and momentum, decile cutoffs are also taken from Ken French's data library. The portfolios are constructed based on the sample of firms listed on the New York Stock Exchange. We focus on the value-weighted portfolios of firms in the top and bottom quintiles. Firms are sorted into size quintiles based on their market equity capitalization at the end of the most recent June. For the months of July through December, firms are sorted into book-to-market quintiles based on their ratio of book equity to market equity as of the end of the previous year. For the months of January through June, firms are sorted into BE/ME breakpoints based on their level as of the next-to-last December. Firms are placed in momentum quintiles based on stock performance between 12 months and two months earlier. For the market capitalization, book-to-market, and momentum extreme quintile portfolios, each stock is weighted by its market capitalization; thus, some rebalancing is needed each month to reflect events such as distributions, share issuance, share repurchases, and delistings. For the market capitalization and book-to-value portfolios, heavy trading from the change in cut-off values is induced in the month of July. For the momentum portfolios trading is more evenly dispersed across the calendar year.

Dividend-based portfolios are constructed based on firms' dividend policies in the most recently completed year. Firms are allocated first to portfolios of dividend payers versus non-dividend payers.

[11] Of the 19,220 individual fund share classes in the December 2010 CRSP Mutual Fund database that are identified as 'Equity' mutual funds, 1256 have a name that includes 'small-cap'; 1048 have a name that includes 'mid-cap'; and 994 have a name that includes 'large-cap.' 2469 have a name that includes 'value', and 3457 have a name that includes 'growth.' 285 have a name that includes the word 'dividend.' Thirty-eight percent of funds have one or more of these terms in their name. SEC rule 35d-1 addresses the link between mutual funds' names and their actual portfolios. While the rule does not specifically codify positions with respect to "small capitalization", "value", "growth", or "large capitalization" strategies, the SEC scrutinizes investment company names in order to determine whether those names are misleading to investors with respect to the underlying assets in the portfolio. See http://www.sec.gov/rules/final/ic-24828.htm.

[12] http://mba.tuck.dartmouth.edu/pages/faculty/ken.french/data_library.html

Dividend paying firms are further divided into a top half and bottom half based on the dividend payment divided by lagged share price. The policy makes these portfolios somewhat more trading-intensive than they would be if we constructed portfolios based on longer patterns of dividend events. Again, a firm's weight in each dividend portfolio is proportional to its market capitalization.

Additional simulations are based on constructing a value-weighted portfolio of the NYSE stocks (VWRET), and an equally-weighted portfolio of NYSE stocks. The VWRET portfolio requires limited trading and the average turnover for that portfolio is below 4 percent per year. The EWRET portfolio requires much more trading, with monthly rebalancing to maintain equal weights on the portfolio's stocks as their market prices fluctuates. Finally, we run simulations with the stocks included in the S & P index. Because the S & P 500 was created in 1957, for the period before 1957 we use the S & P 90, the benchmark that was superseded by the larger index. We refer to the entire series as the "S & P."

B. Constructing Portfolio Returns

All portfolios include only stocks listed on the NYSE. This restriction eliminates drastic portfolio changes when NASDAQ data enter the CRSP dataset. The analysis starts in June of 1927, with a $100 portfolio. The $100 is allocated across the stocks, depending on the strategy chosen. For instance, if the strategy chosen is a value-weighted portfolio of the smallest half of the companies in the market, then the portfolio weights are set accordingly. All portfolios are totally self-financing; tax distributions and capital gains are reinvested in the portfolio.

The portfolio values in July 1927 depend on the pattern of distributions, delistings, and changes in price over the preceding month. The program that calculates the portfolio return first accounts for all of these distributions and delistings, paying the appropriate taxes and recording the amount of cash on hand after these distributions are made. Then, the appropriate portfolio weights for the next month are chosen. These portfolio weights may be different from the preceding month if stocks have moved in to or out of the portfolio under consideration. For instance, if we are analyzing the return to the small-firm strategy, a

firm that moves beyond the relevant market equity size breakpoint, will have a weight of zero starting in the month that it moves out of the relevant group.

The portfolio is reallocated according to the new desired portfolio weights. Reallocation involves the realization of some capital gains or losses, since some stocks are purchased and some are sold. The realization of capital gains, for a taxable investor, means that the reallocation to the new desired portfolio weights imposes a new round of taxes in the simulation. This round of taxes is in addition to the taxes that were involuntary, based on the distribution of dividends and on capital gains realized through the removal of companies from the portfolio. In our simulation, the taxes paid on these gains change the size of the portfolio in that month, leading to a new round of capital gains realizations. These capital gains realizations, in turn, create a new set of taxes. Our approach is to iterate three times down this path. Three iterations bring us very close to the fixed point where the capital gains taxes that must be paid are precisely payable given the cash taken from the portfolio from the net sale of stock.

The simulation routine keeps track of the basis of each of the shares in the portfolio, adjusting the per-share basis as necessary for distributions and for corporate events such as stock splits. To calculate portfolio returns, the simulation routine preferentially liquidates the high-basis shares, in order to defer the realization of capital gains. Section IV.D considers the robustness of our findings to this assumption.

C. Portfolio Values, Liquidation Values, and Continuation Values

Calculating an after-tax return to a portfolio strategy requires an assumption about the after-tax value of the capital gains that remain unrealized in the portfolio. Two polar approaches are available. One approach is to construct a return based on the nominal value of the stocks held in the portfolio. This approach assumes a zero rate of taxation on undistributed capital gains in the portfolio. This assumption would be appropriate for an investor who planned to pass the assets to heirs through an estate and thereby enjoy the step-up in basis that occurs upon death. An opposite approach would be in each month to calculate the value of the cash that the investor would have after liquidating the portfolio and paying the

appropriate capital gains taxes on the unrealized capital gains. This assumption is appropriate for an investor with a very short horizon.

We calculate returns based on the nominal value of the portfolio. We have checked the robustness of our results to this assumption and have found relatively minor differences.[13] We calculate continuously compounded returns over a very long time period, and continuous compounding is unaffected by prices over the intermediate periods.[14] Thus, the return is affected by the initial price, the final price, and the stream of dividends. The impact of the final price is small relative to the high present value associated with an 80-year stream of dividends.

In addition to calculating measures of portfolio value and measures of returns, we also calculate a measure of the "capital gains overhang" for each portfolio. This overhang is the normalized difference between the nominal value and the liquidation value:

$$\text{Overhang} = (\text{Nominal value} - \text{Liquidation value})/\text{Nominal value} \qquad (1)$$

Overhang will increase as the share of unrealized capital gains in the portfolio rises, and as the statutory capital gains tax rates rise. Over time, a strategy that successfully defers realizing capital gains (thereby decreasing the present value of the tax burden) will create a portfolio with a substantial overhang of unrealized capital gains. This formulation departs from the definition of overhang used by some authors, but it has the advantage of communicating the potential cost of unrealized gains.

Since we use continuously compounded (natural log) returns, a comparison of returns for various strategies reveals the actual performance difference between the strategies. Along these lines, for each tax level associated with each strategy, we compute an effective tax rate, an effective capital gains tax rate,

[13] Previous versions of the paper used a price level that was 42.7% lower than the nominal value. This parameter was based on Chay, Choi, and Pontiff (2006) finding that one dollar of realized capital gains equates to 93¢ of unrealized gains and a nominal capital gains tax rate of 15%. These estimation differences produce almost no differences in our results.

[14] If P_t denotes the price of non-dividend-paying stock in period t, then the log return over n periods is $ln(P_{t+n}/P_t)$, regardless of the value of prices between t and $t+n$.

and an effective dividend tax rate. All three of the effective rates that we develop are used by Israel and Moskowitz (2011) in their study of the tax consequences of practitioner portfolios.

The effective tax rate is computed by taking the difference between the log return of a tax-exempt investor and the log return of a taxed investor, and then dividing that difference by the log return of the tax-exempt investor. Thus, the effective tax rate measures the proportion of the tax exempt investor's performance that would have been consumed by taxes. The effective capital gains tax rate and the effective dividend tax rate are calculated in a similar manner. For the effective capital gains (dividend) tax rate, we calculate the log return of a taxable investor, under the assumption that the investor is rebated all dividend (capital gains) taxes each period. We calculate the difference between this return measure and the tax-exempt return, and divide by the tax-exempt return. Since the performance differences between the tax-exempt and taxable investor are caused entirely by either dividend or capital gains taxes, this measure calculates the actual impact of these taxes on performance. In addition, since we measure the percentage difference of log returns, the effective capital gains tax rate and the effective dividend tax rate do not add up to the total relative tax cost. The small discrepancy is caused by a Fisher effect.

The interpretation of the effective capital gains and dividend tax rates is different from the interpretation of the nominal capital gains and dividend tax rates. For example, the nominal dividend tax rate tells us the incremental cost of receiving an extra dollar in dividend income, whereas the effective dividend tax rate describes how dividend taxes diminish after-tax returns. If a portfolio never pays a dividend, the effective dividend tax rate would be zero, despite the fact that the nominal dividend tax rate is positive.

IV. Results

The next subsections (subsections IV.A–IV.D) describe the impact of taxation on the returns to different benchmark portfolios. The tables in these subsections report two types of results. One set of results reports the actual after-tax returns an investor would have received under the assumption that the

investor paid taxes according to the tax code that prevailed each period. These results provide a historical record of the actual after-tax performance for each investment strategy. These measures of effective tax rates can be influenced by changes in the tax code over time. For example, a strategy that pushes capital gains realizations towards periods where tax rates are particularly low will be associated with a low historical effective tax rate because of both the value of deferral and the fact that deferral has pushed gains realizations to periods where rates are low. If capital gains realizations are deferred in a period of rising statutory tax rates, then the measured historical effective tax rate will reflect two offsetting effects: the value of deferral and the deferral of gains into periods where rates are high. In a second set of results we examine the after-tax returns that investors would have earned under the counterfactual assumption that tax rates were fixed throughout the period at the rates prevailing in 2011. These results estimate the value of capital gains deferral, cleansed of the influence of the historical path of statutory rates.

Figure 2 provides an overview of our results. It compares pre-tax and after-tax returns for an investor at the 99.5^{th} percentile of income who was subject to both federal and New York State taxation. The tax rates used in the simulations are the rates that prevailed historically. The figure also compares returns for a hypothetical corporate investor who paid tax based on the tax rates that prevailed in 2011. The (negative) slope of the line connecting the pre- and after-tax returns for each strategy is proportional to the size of the wedge between pre-tax and after-tax returns. For the pairings with more negative slopes, the size of this tax wedge has been greater. The figure illustrates how different the effective tax burdens have been for different portfolios, even for the same investor. There are even cases where a ranking of portfolios based on average pre-tax returns does not map to the ranking based on after-tax returns. For example, an individual investor experiences a pre-tax return on the high dividend portfolio that is higher than that of EWRET, while the after-tax return is lower. For the corporate investor, although the pre-tax return to the momentum portfolio is higher than the pre-tax return of the value portfolio, on an after-tax basis the momentum portfolio has a slightly lower return.

(Insert Figure 2 here)

A. Fundamental Long Strategies

Table II reports the after-tax returns to broad market portfolios and to portfolios constructed based on stocks' dividend yields. The table also shows the after-tax returns to a strategy of holding three-month treasury bills, our reference "risk-free" asset.[15] Because dividend yields and turnover influence the strategies' estimated tax burdens, we report the annual dividend yield and annual turnover associated with the strategy portfolio.[16] For each portfolio, Table II presents five different results. The first row of results shows the average of the natural log of after-tax returns.[17] The second row shows the average tax overhang as a share of portfolio value, using the measure of overhang described earlier in the text. The third and fourth rows show the percent decrease in the strategies' returns that can be attributed to capital gains and dividends, respectively. The fifth row shows the total effective tax rate.

(Insert Table II here)

The portfolios described in Table II span a range of dividend yields and turnover. The no-dividend portfolio has a dividend yield of 0.55 percent on an annualized basis. This positive dividend yield reflects the initiation or resumption of dividends among companies that paid no dividends during the previous year. Not surprisingly, the portfolio constructed from stocks with high (previous) dividend yields has the highest dividend yield among the strategies in the table, with an annualized yield of 5.46 percent. The CRSP value-weighted portfolio has the lowest turnover, with an annualized turnover of 4.09 percent. The CRSP equal-weighted portfolio has the highest turnover, with an annualized turnover of 45.32 percent.

[15] We assume that Treasury bill interest is taxed at the relevant rates for interest income.
[16] The reported dividend yield and annual turnover are calculated based on the untaxed portfolio for each strategy. Incorporating taxes makes can make some very slight differences in measured dividend yields and turnover.
[17] Using the average of the natural log of returns reflects our concern with the impact of taxes on actual wealth accumulation over time. To see the distinction between arithmetic returns and log returns, consider the two-period arithmetic return sequence {-50%,+50%}. The arithmetic average of the raw returns is 0%, but starting with $100, an investor who experienced these returns would end up with $75 (from $100 to $150 to $75.) The use of log returns (in this case {-0.69, 0.405}) rather than arithmetic returns delivers results that correspond to actual wealth accumulation in a multi-period setting. In this case, -0.693 + 0.405 = -0.288, and exp(-0.288) = 0.75.

Table II shows that, for both individual investors and corporations, the Treasury bill is most tax disadvantaged, while for securities dealers the Treasury bill is the most tax advantaged. For dealers, the effective tax rate on Treasuries is slightly lower than the nominal rate (34.94 percent versus 35 percent), reflecting the fact that our effective tax rate is defined as the percentage decrease in log returns rather than arithmetic returns. For stock portfolios, compounded returns cause the effective tax rates for dealers to be higher than the nominal rate.

For individual investors the high-dividend-yield portfolio is the most tax-disadvantaged of the equity portfolios, followed by the equal-weighted portfolio. For corporations the no dividend portfolio has the highest effective tax rate among the equity portfolios; it is followed by the high dividend portfolio. For both individual investors and corporations the equal-weighted portfolios have higher effective tax rates than the value-weighted and the S & P 500 portfolios, despite the fact the equal-weighted strategy has the lowest dividend yield among the three strategies. A similar (although less pronounced) result comes when we compare the low-dividend portfolio against the S & P 500 portfolio. Although the low-dividend strategy has a slightly higher dividend yield than the S & P 500 portfolio strategy, it enjoys a lower effective tax rate for both corporate and individual investors. These findings contradict the common practice (see for example Brennan (1970), Litzenberger and Ramaswamy (1979), and others) of assuming that the dividend yield is a proxy for a strategy's tax burden.

With the exception of the no-dividend portfolio, and in one case the equally-weighted portfolio, dividend taxation is more costly for individuals than capital gains taxation. However, the impact of capital gains taxation varies widely across the portfolio strategies. In the case of the equally-weighted portfolio, the impact of capital gains taxes is almost as large as the impact of dividend taxes.

The three dividend portfolios demonstrate the complicated interaction between capital gains and dividend tax burdens. As noted above, it has been common practice for researchers to use dividend yield as a proxy for the tax cost of a portfolio. The no-dividend portfolio typically has the lowest effective tax rate, followed by the low-dividend and then the high-dividend portfolios, although tax burdens are not

proportional to dividend yields. For the case of a New York investor paying the rates that prevailed in 2011 at the 99.5th income percentile, the effective tax rate of the low dividend portfolio is lower than that of the no dividend portfolio. The pattern of trading associated with maintaining the no-dividend portfolio appears to accelerate the capital gains realizations, offsetting the lower dividend taxes on the no-dividend portfolio.

As noted above, this divergence between dividend yields and effective tax rates is a consequence of the turnover patterns induced by the different portfolio strategies. The low-dividend portfolio has an annual turnover of 6.89 percent, while the other dividend-level portfolios have turnover levels of over 30 percent. The low-dividend portfolio has a much lower effective capital gains tax rate than either the no-dividend and high-dividend portfolios. It is well-documented that dividend initiations tend to follow stock price increases (see for example Aharony and Swary (1980), and Asquith and Mullins (1983)), thus the turnover associated with the dividend initiations tend to force the liquidation of positions with capital appreciation. In sum, although dividend-sorted portfolios may group stocks based on *dividend* tax burdens, trading patterns for particular strategies will affect their effective capital gains and total tax rates.

Although total effective tax rates increase with income for both the S & P 500 and the value-weighted index, the highest income levels sometimes exhibit a decrease in the portion of the tax rate that is attributable to capital gains taxes. This result is observed across a variety of strategies, and is a consequence of the structure of tax rates that has generally prevailed. During our sample period, capital gains tax rates have generally reached their maximum levels at thresholds lower than those at which nominal dividend tax rates achieve their maxima. Investors at the very highest income levels thus re-invested lower proportions of their portfolios' dividends than did the investors who face tax rates applicable to somewhat lower incomes. In our simulations, reinvesting a lower share of the paid-out dividends decreases the total value of future capital gains, relative to the tax-exempt portfolio. This creates a crowding-out effect that reduces the measured effective capital gains tax rate.

These results indicate that the effective tax rate on capital gains depends on the investment strategy of the portfolio, even when the portfolio is being managed in a tax-efficient way. Strategies such as the value-weighted strategy offer more ability to defer capital gains, leading to a lower effective tax rate on capital gains. Contrary to our result, previous empirical work has often assumed an effective tax rate on capital gains that is fixed and does not vary across strategies. For example, a study by Bergstresser and Poterba (2002), which calculates the after-tax performance of different mutual funds, applies an effective tax rate of 10 percent to unrealized capital gains across all of the funds in the sample.[18]

Individual dividend preference. Miller and Modigliani (1961) argue that investors in higher tax brackets will hold equity portfolios with lower dividend yields. Their reasoning follows from the fact that dividends have historically been taxed at the same rate as ordinary income, while capital gains taxes are often capped at a lower rate. Empirical evidence on tax-induced dividend clienteles has been mixed. For example Lewellen et al. (1978), using brokerage firm data from 1964-1970, find no evidence of dividend clienteles. Some studies do find evidence of a relationship between investors' tax rates and the concentration of dividends in their portfolios, but the finding is often sensitive to empirical methodology or is of secondary importance as a driver of dividend investment behavior when compared with other observable investor characteristics. Scholz (1992), for example, uses the 1983 Survey of Consumer Finances and reports regression-based evidence consistent with dividend clienteles. In particular, he constructs a household-specific measure of the difference in tax rates between capital gains and dividends and finds that in a multivariate setting this measure has explanatory power for portfolio dividend yields. But it is also true that the top wealth groups in his sample hold stock portfolios with higher dividend yields than the overall market, and that in 4 of the top 5 wealth categories observed portfolio dividend

[18] Researchers have followed a variety of approaches for dealing with the fact that the effective tax rate on unrealized capital gains represents a dynamic problem. Dickson and Shoven (1995) focus on the 30-year period between 1963 and 1992, and assume portfolio liquidation at the end of 1992. This approach captures the dynamic nature of the problem within the period, and with a 30-year period the loss of information that follows from their assumption of 100 percent liquidation at sample end of the sample is likely minimal. A consequence of their approach is the limitation to funds with long histories and the counterfactual across-the-board assumption of 100 percent liquidation at the end of the period. Peterson, Pietranico, Riepe, and Xu (2002) accommodate the dynamic nature of the problem by measuring returns over 3-year periods. Their approach implicitly assumes that capital gains deferred to the end of a 3-year period are not taxed.

yields are higher than the market average.[19] Graham and Kumar (2006) also provide evidence suggesting tax induced dividend clienteles, but they also find that individual characteristics other than income, such as age and portfolio size, appear to have explanatory power than far exceeds tax-based characteristics. Graham and Kumar find strong evidence that high income investors are less likely than low income investors to buy high dividend stocks before ex-dividend dates and more likely to buy high-dividend stocks after ex-dividend dates. This result, although consistent with dividend taxation affecting trading, does not speak to our calibrations of the long-run tax burdens of dividend yield portfolios.

Consistent with the somewhat mixed empirical findings, our results suggest only a slight tax benefit for investors with higher incomes to reduce exposure to high-dividend portfolios and increase exposure to non-dividend portfolios. For an investor in the 90th percentile of AGI (which corresponds to annual income of $107,540), the ratio of the effective tax rate on the high-dividend portfolio to the effective tax rate on the no dividend portfolio is 1.51.[20] For an investor at the 95th percentile this ratio increases to 1.54.[21] For an investor in the 99.5th percentile of AGI, the ratio increases to 1.56. Overall, these ratios do not seem to vary enough to warrant big differences in portfolio composition. Although this analysis focuses on the upper part of the income distribution, this upper part of the income distribution holds the bulk of equity. The flatness of effective tax burdens on dividend portfolios across AGI levels is not being driven by flatness in relative tax rates. Over our sample time period the average ratio of the statutory marginal tax rate on dividends to rate applied to realized long-term capital gains is 1.69 for investors in the 90th percentile of AGI, 1.72 for investors in the 95th percentile of AGI, and 1.85 for investors in the 99.5 percentile of AGI.

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[19] Scholz (1992) in his Table 2, breaks his sample into groups based on household wealth, which he demonstrates is correlated with the marginal tax rate on dividends. The top five groups are the 70th-80th percentile; the 80th-90th; the 90th-98th, the 98th-99th, and the 99th-100th. Across the entire sample of households, the average portfolio dividend yield is 4.53 percent. Among the top group, the average dividend yield is 5.43 percent. In the next groups (from the top), the dividend yields are 5.29 percent, 4.39 percent, and 4.73 percent. Among these deciles, where the bulk of equities are held, there appears to be an upward slope to the relationship between dividends and tax rates, which is not consistent with tax-based dividend clienteles. But in a multivariate setting, with a set of controls for household characteristics, the dividend tax differential does have the expected relationship with portfolio dividend yields.

[20] We have calculated results for the 90th percentile of AGI, but these results are no included in this version of the paper.

[21] From Table 2; 1.54 = 18.21/11.81.

Corporate dividend preference. A large theoretical literature notes that corporations have an comparative advantage in holding dividend paying stocks following from their ability to exclude 70% of dividends from their taxable income.[22] This literature implicitly assumes that effective capital gains tax rates do not vary between high-dividend portfolios and other portfolios. Using corporate blockholder data, Barclay, Holderness, and Sheehan (2009) find no evidence that dividend yields are associated with having large corporate blockholders. Our findings shed some light on this puzzle. A comparison of the effective tax rates reported in Table II for high income individuals in NY and for corporations shows that both of these groups have similar effective tax rates on the equal weighted portfolio and on the high dividend portfolio. Individuals have a relative advantage in holding the no dividend portfolio, while corporations have a relative advantage in holding the low dividend portfolio, as well as in holding the S & P 500 portfolio and the value-weighted market index portfolio. Our results show that the pattern of capital gains realizations obscures what is otherwise an obvious tax advantage for corporations with respect to dividends. Corporations have relative advantage holding low dividend paying stocks, but a disadvantage holding non-dividend paying stocks and high dividend paying stocks. Although corporations might prefer to initially hold a portfolio of high dividend paying stock, maintaining that portfolio requires selling shares of stocks whose dividends yields fall. Because dividend yields often fall as stock prices increase, this accelerates the realization of capital gains and increases effective tax rates.[23]

Equity premium puzzle. Our results calibrate the premium of after-tax equity returns to after-tax interest rates. This evidence relates to the literature on the "Equity Premium Puzzle," which focuses on the extent to which equity returns have been high relative to their systematic risk and relative to observed risk-free interest rates.[24] Table II shows that the effective tax rate on the risk-free return is substantially higher than the effective tax rate on the market portfolio, a finding that exacerbates the equity premium puzzle. For all investors except dealers, the measured equity premium either falls minimally or actually

[22] See, for example Shleifer and Vishny (1986) and Allen and Michaely (2003).
[23] Barclay et al. also find that corporations are no more likely to buy stock in a dividend payer or non-dividend payer. Our results offer no explanation to this finding, thus non-tax issues may be influencing the decision.
[24] See, for example, Mehra and Prescott (1985).

rises when we moved from untaxed specifications to specifications that incorporate taxes.[25] Because capital gain taxation lowers investment volatility (Domar and Musgrave, 1944), this pattern of results makes the apparent equity premium puzzle even more pronounced on an after-tax basis.

B. Style Portfolios

Table III reports the after-tax return to value-weighted portfolios that are constructed following six different investment styles. These six portfolios are based on firms' market capitalization, their book-to-market value ratios, and their stock return momentum. Based on the historical tax rates presented in Panel A, the style portfolios are roughly sorted from the lowest to the highest effective tax rates. The various portfolios show substantial differences in their effective tax rates. For many levels of AGI, the highest-tax portfolio (low momentum) has an effective tax rate that is four times that of the lowest-tax portfolio (large market capitalization). The fact that winner stocks tend to get sold out of both the value and small firm portfolios means that the effective tax rates on these portfolios are higher than for the large-firm and growth-firm portfolios. This effect is large in economic magnitude: the effective tax rates on the value and small-firm portfolios are between four and nine percentage points higher than for the large-firm and for the growth portfolios. Value portfolios are particularly tax disadvantaged because they both accelerate the realization of capital gains and tend to have high dividend yields.

(Insert Table III here)

These market capitalization and book-to-market results have implications for the asset pricing literature. The existing literature has focused on the extent to which observed return differences between large and small capitalization stocks and between value and growth stocks represent compensation for risk exposure (Fama and French, 1995) and the extent to which these differences reflect investor

[25] The equity premium for the untaxed investor is 5.36 percent (=8.99 percent – 3.63 percent). For the investment portfolios using historical rates, the equity premium at the 95th percentile of federal income tax was 5.42 percent; at the 99.5th percentile of federal income tax the premium was 5.32 percent; at the 99.5th percentile including NY taxes the premium was 5.25 percent. Using the 2011 tax code, the equity premium at the 99.5th percentile (including NY taxes) was 5.78 percent; for a corporation it was 5.92 percent; for a dealer the equity premium was 3.11 percent.

irrationality (Lakonishok, Shleifer, and Vishny, 1994). This debate implicitly assumes that investors are tax-exempt and has not considered the extent to which these observed differences reflect compensation for investment taxation. Table III shows that accounting for taxes does not change the rank ordering of the after-tax performance of the size and value-based portfolios. Even after accounting for the taxes induced by patterns of capital gains realization, the portfolio of small firms has a return higher than the portfolio of large firms, and the portfolio of value stocks has a return higher than the portfolio of growth stocks. Taxes thus do not appear to "explain" the entire value and size effects. It is true, however, that the effective tax rates on the value and small market capitalization portfolios are substantially higher than the effective tax rates on their counterparts. By that standard, consideration of taxation reduces the magnitude of these effects. For a tax-exempt investor the return premium of value over growth is 3.52 percent (11.76 percent minus 8.24 percent), while the premium is 1.80 percent (8.08 percent minus 6.28 percent) for a high income resident of New York state. A tax-exempt investor faces a size premium amounting to 2.22 percent, while for a high income resident of New York that premium is 0.78 percent.

Similar to the findings in Table II, dividend yields are an imperfect proxy for effective tax rates. The small-firm portfolio has the lowest dividend yield, in spite of the fact that its effective tax rate is higher than the effective tax rates on the portfolios of growth stocks and large-firm stocks.

The high and low momentum portfolios have the highest effective tax rates. This may be attributable to the fact that they involve high turnover and that their positions are often sold with short-term capital gains, which carry a higher nominal rate than long-term gains.[26] Exposure to short-term nominal tax rates is likely to be more pronounced for the low momentum portfolio. A stock that was low momentum, but then performs well will, in general, cease to be a low momentum stock, and consequently will be sold out of the low-momentum portfolio, inducing the realization of capital gains. A high momentum stock, on the other hand, will need to perform well in order to remain in the high-momentum

[26] As described earlier, our construction of the portfolios follows standard practice in recalculating inclusion in size-based and value-based portfolios at an annual frequency, and calculating inclusion in momentum-based portfolios at a monthly frequency.

portfolio. Our empirical results suggest that the effective tax rate on the low momentum portfolio is over double the effective tax rate for the other portfolios. Some caution should be taken in interpreting the effective tax rate on the low momentum portfolio, since the base non-taxable return of this portfolio, at 2.47 percent low (Jegadeesh and Titman, 1993). Thus a small change in the incurred tax burden (in terms of return percentage points) may have a large impact on effective tax rate, which is based on a ratio of after-tax to pre-tax returns.

C. Broad Considerations

Heterogeneity. With the exception of the risk free portfolio and the low momentum portfolio, investments with higher average returns also have higher effective tax rates. These effective tax rates have the effect of decreasing the after-tax heterogeneity across portfolios: the differences across portfolios in after-tax returns tend to be less extreme than differences across portfolios in pre-tax returns. Thus, studies that find cross-sectional return predictability, may overstate the true cross-sectional return differences that taxable investors would actually experience.

Besides lowering return differences, in some cases consideration of taxation induces reversals in between the rankings of the pre-tax and after-tax performance of portfolio strategies. For example, the highest-performing portfolio for the tax-exempt investor has been the momentum portfolio, but this portfolio would rank second (behind the value-firm portfolio) for a New York investor at the 99.5^{th} percentile of AGI, paying the tax rates prevailing at 2011. Although the tax exempt investor enjoys higher returns on the value-firm portfolio than on the equally-weighted market portfolio, a corporation (taxed at 2011 rates) and all household investors (taxed at historical rates) enjoyed higher average returns on the equal-weight portfolio. All of the hypothetical taxable investors we considered enjoy higher returns with the equal-weighted portfolios than with the high dividend portfolio, but the hypothetical tax-exempt investor experienced higher returns on the high dividend portfolio. The tax-exempt returns on the small firm portfolio are higher than on the value-weighted market portfolio and on the low dividend portfolio,

although corporations (assuming the 2011 statutory tax rates), have higher after tax returns on the value-weighted market portfolio and on the low dividend portfolio.

Historical Context. Table II can be used to compare the effective tax rates on historical returns, assuming the tax rates that prevailed historically, against the effective tax rates based on this historical stock market performance and the counterfactual assumption of the 2011 tax code between current and historical tax rates for an investor domiciled in New York with an AGI in the 99.5th percentile. This exercise allows us to place the estimated tax rates given the current pattern of taxes into historical perspective. For all portfolios, the 2011 tax code shows lower effective tax rates across the board. The risk-free bill and no-dividend portfolios have the smallest decrease in effective tax rates--about 20 percent. The largest decreases-almost 45 percent-occur for the S&P 500, value-weighted, and low-dividend portfolio strategies.

D. The Impact of Loss Treatment

The current U.S. tax code allows investors to deduct up to $3,000 per year in net realized losses from their ordinary income. Any net loss in excess of $3,000 is carried forward to the next year, where it may then be used to offset realized capital gains. Net losses may be carried forward indefinitely, until the death of the investor, at which point they expire.[27] Our previous results assumed that realized losses are carried forward each month until they can be used to offset gains in the portfolio.

In this section we consider a second approach for the use of losses. The simulation results in this section are based on the assumption that losses are used immediately, for example against a different portfolio on which our hypothetical investors have some gains. We model this as a tax-induced inflow of resources into the particular portfolio. Using losses immediately (rather than postponing their use) thus decreases our measured effective investment tax rates

[27] The tax code grants investors, when they die, a 'basis step-up' to the value of the asset at the time of death. This extinguishes any overhang of capital gain tax liability.

Table IV compares the historic effective investment tax rates for individuals domiciled in NY at the 99.5th percentile of AGI as well as the effective tax rates for these individuals and corporations, assuming that the 2011 tax code was in effect throughout our sample. For brevity, we focus on these three tax rate assumptions. The pattern of results, in terms of the comparison of carrying forward losses versus using them immediately, is similar for other tax rate assumptions we considered.

(Insert Table IV here)

In each case, carrying losses forward produces higher effective tax rates than using losses immediately. Focusing on the results based on the actual historical tax rates, the portfolios on which the carry-forward assumption has the lightest impact (and it amounts to only a 49 basis point increase in effective tax rates) is lowest-turnover portfolio—the S & P 500 portfolio strategy. The impact of the carryforward assumption is more meaningful on the higher-turnover portfolios. For the small-firm and no-dividend portfolios carryforward assumption affects effective tax rates by more than three percentage points.

Using the 2011 tax code, portfolios with higher turnover have larger effective tax rates, and the increase in tax rates is even larger than it is for the historic results. For our hypothetical household investors the measured effective tax rates roughly double. These findings are consistent with the theoretical work of Ehling, Gallmeyer, Srivastava, and Tompaidis (2009), who show in a two-asset setting that investor welfare is reduced when losses must be carried forward rather than being immediately realized.

V. Conclusion

Taxes have a profound impact on portfolio performance. Dividend taxes are affected by the dividend yields of individual stocks, while capital gains taxes are affected by portfolio construction and portfolio style. We find that portfolio-induced capital gains realization creates important heterogeneity in effective investment taxation--equal-weighted portfolios, small-firm portfolios, and value portfolios tend

to have higher exposure to capital gains taxation, whereas value-weighted portfolios, large-stock portfolios, and growth portfolios tend to have lower exposure to capital gains taxation. Although the investment taxation literature tends to focus on dividend taxes, the heterogeneity induced by capital gains realization is an equally important consideration. For the first time, our paper calculates precise tax costs of benchmark portfolios. Besides documenting the relative costs of dividend and capital gains taxation, this exercise provides new insights into several literatures.

The finance literature has studied return premiums of value stocks over growth stocks and small market capitalization stocks over large market capitalization stocks. These premiums are often attributable to compensation for risk or to market inefficiency. We show these premiums remain after taxes are considered, yet they are greatly reduced. Thus, some portion of these premiums might reflect compensation for taxes.

A literature has studied whether or not taxes induce dividend clienteles. Clienteles are argued to arise since relative dividend taxation is more onerous for some investors, such as wealthy individuals, and less onerous for other investors such as corporation shareholders. We show that once the capital gains cost of maintaining of high or low dividend portfolio is considered, many of the postulated tax advantages of the clientele are dissipated. This provides insight into the mixed evidence that this empirical literature has produced.

The economics literature has difficulty reconciling plausible levels of risk aversion with the premium of market returns over interest rates. This analysis usually assumes no investment taxation. Our estimates of the tax burden of a broad market portfolio and Treasury bills, shows that tax considerations make this puzzle even more puzzling.

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Figure 2. The solid lines map before- and after-Federal and New York State tax returns that correspond to the appropriate tax rate for an investor with AGI at the 99.5 percentile. The dotted lines map before- and after-federal tax returns for a corporation that is taxed in accordance with the 2011 tax code. The slopes of the lines are proportional to the effective tax burden.

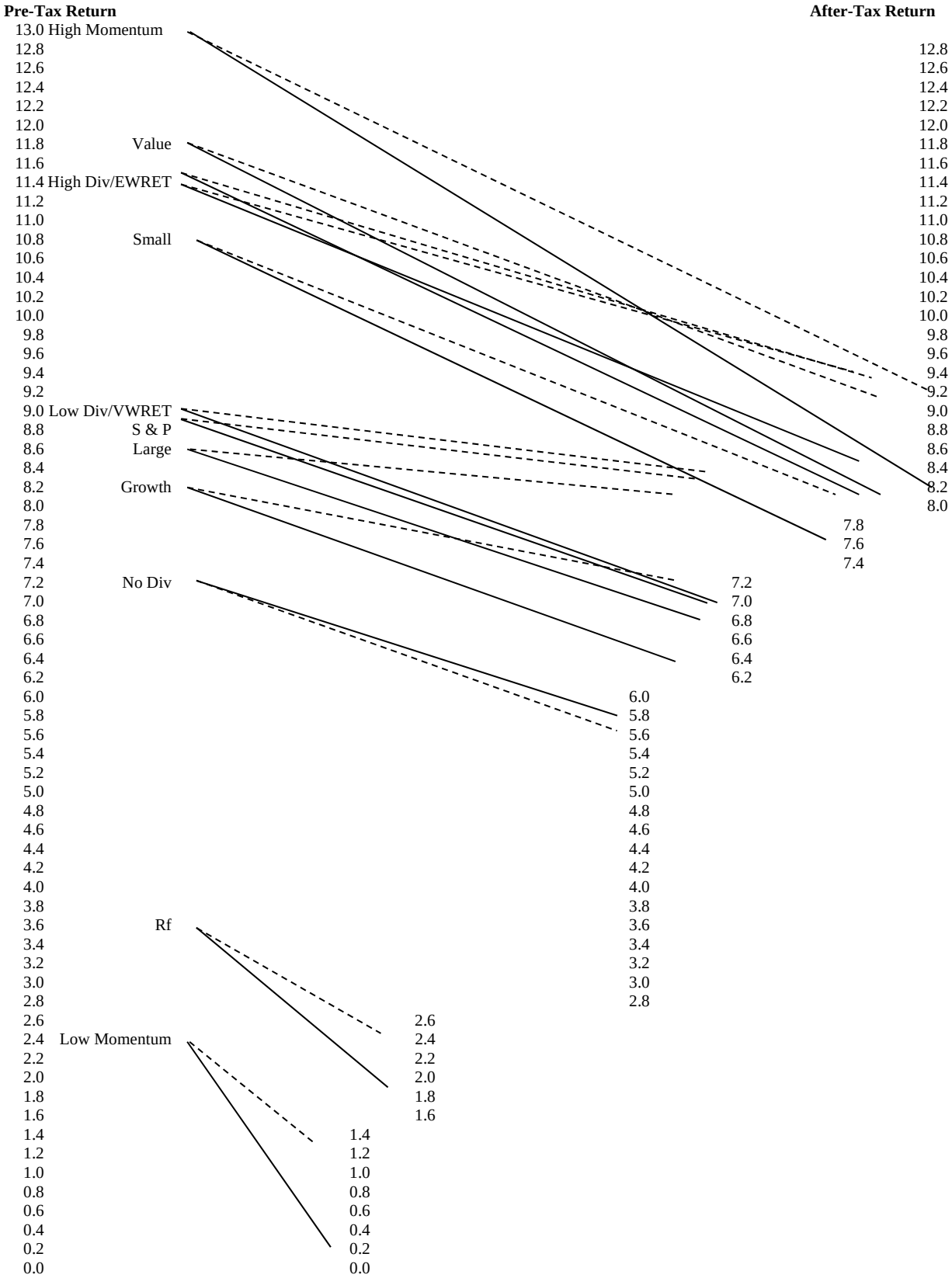

Table I. Direct and Indirect Taxable Ownership of Equity by Family AGI, 2001 Survey of Consumer Finances

Level of family AGI (current dollars)	Share of families above threshold	Share of direct taxable equity above threshold	Share of direct + indirect taxable equity above threshold	Share of dividends above threshold
0	**88.1%**	**99.9%**	**99.6%**	**98.6%**
25,000	59.7	97.3	96.3	93.3
50,000	31.9	90.3	87.4	82.4
75,000	17.3	80.9	77.4	70.5
100,000	**9.7**	**74.5**	**69.8**	**61.8**
125,000	6.7	69.5	63.9	55.9
150,000	4.9	65.8	59.1	51.6
175,000	3.7	62.6	55.3	45.6
200,000	**3.0**	**60.0**	**52.5**	**42.2**
225,000	2.6	55.7	48.8	38.1
250,000	2.2	52.7	45.6	36.6
275,000	2.0	51.4	44.5	35.8
300,000	**1.7**	**44.6**	**38.8**	**34.9**
325,000	1.6	42.6	36.8	33.7
350,000	1.4	40.4	35.0	32.8
375,000	1.3	40.0	34.5	31.6
400,000	**1.1**	**38.2**	**33.0**	**30.6**

Table II, Tax Impact of Long Strategies

Sample period is 6/1927–6/2009. Assumes investors have immediate use of net realized losses. Dividend yield and turnover correspond to the dividend yield and turnover of the portfolio of a tax-exempt investor. Return is the average annualized log return, which is computed by multiplying 12 times the log of the nominal portfolio value divided by last month's nominal portfolio value. Overhang is the amount of nominal value that the portfolio would lose upon liquidation. CG Effective Tax Rate is the percentage difference between the after-tax return and the return of a taxed portfolio that reinvests dividend taxes that would have otherwise been paid. Div Tax Cost is the percentage difference between the after-tax return and the return of a taxed portfolio that reinvests capital gains taxes that would have otherwise been paid. Effective Tax Rate is the percentage loss of taxable return relative to the tax-exempt return

	Rate based on actual tax code				**Rate based on 2011 code**		
Strategy (dividend yield, turnover)	**Tax Exempt**	**95**	**99.5**	**99.5 +NY**	**99.5 +NY**	**Corp.**	**Dealer**
S & P (3.87, 4.21)							
After-tax Return	8.85	7.74	7.19	6.92	7.79	8.11	5.38
Avg Overhang		7.49	9.74	12.05	7.64	12.12	
CG Effective Tax Rate		1.79	2.05	2.61	2.32	3.61	24.72
Div Effective Tax Rate		10.47	16.19	18.35	9.51	4.60	15.34
Tot. Effect. Tax Rate		12.55	18.80	21.85	12.04	8.37	39.22
VWRET (3.87, 4.09)							
After-tax Return	8.99	7.89	7.34	7.07	7.95	8.28	5.47
Avg Overhang		7.80	10.30	12.73	8.46	13.39	
CG Effective Tax Rate		1.71	1.91	2.44	1.98	3.22	24.87
Div Effective Tax Rate		10.29	15.93	18.05	9.36	4.52	15.09
Tot. Effect. Tax Rate		12.29	18.41	21.41	11.54	7.90	39.13
EWRET (3.55, 45.32)							
After-tax Return	11.39	9.68	8.84	8.43	9.43	9.46	7.10
Avg Overhang		5.28	7.52	9.23	7.21	11.66	
CG Effective Tax Rate		7.01	9.84	11.70	10.12	13.44	27.23
Div Effective Tax Rate		7.68	11.93	13.46	6.78	3.28	10.94
Tot. Effect. Tax Rate		14.97	22.36	26.00	17.14	16.93	37.64
No Div (0.55, 31.39)							
After-tax Return	7.24	6.39	6.02	5.76	6.10	5.51	4.50
Avg Overhang		3.49	4.45	5.40	3.80	6.26	
CG Effective Tax Rate		10.36	14.33	17.45	14.14	23.05	35.54
Div Effective Tax Rate		1.43	2.57	2.91	1.66	0.80	2.67
Tot. Effect. Tax Rate		11.81	16.92	20.38	15.80	23.86	37.85
Low Div (3.95, 6.89)							
After-tax Return	8.98	7.87	7.31	7.04	7.93	8.28	5.46
Avg Overhang		8.08	10.86	13.42	9.52	15.02	
CG Effective Tax Rate		1.64	1.85	2.35	1.94	3.09	24.62
Div Effective Tax Rate		10.44	16.13	18.30	9.57	4.63	15.43
Tot. Effect. Tax Rate		12.38	18.60	21.64	11.71	7.87	39.24
High Div (5.46, 31.06)							
After-tax Return	11.46	9.37	8.44	7.91	9.26	9.29	7.01
Avg Overhang		2.84	4.03	4.94	3.53	5.66	
CG Effective Tax Rate		6.70	8.88	10.92	8.70	13.75	22.90
Div Effective Tax Rate		11.31	17.10	19.44	10.37	5.01	16.72
Tot. Effect. Tax Rate		18.21	26.37	30.93	19.21	18.90	38.83
Risk-Free Bill							
After-tax Return	3.63	2.47	2.02	1.82	2.17	2.36	2.36
Tot. Effect. Tax Rate		32.04	44.21	49.79	40.08	34.94	34.94

Table III, Tax Impact of Style Strategies

Sample period is 6/1927–6/2009. Assumes investors have immediate use of net realized losses. Dividend yield and turnover correspond to the dividend yield and turnover of the portfolio of a tax exempt investor. Return is the average annualized log return, which is computed by multiplying 12 times the log of the nominal portfolio value divided by last month's nominal portfolio value. Overhang is the amount of nominal value that the portfolio would lose upon liquidation. CG Effective Tax Rate is the percentage difference between the after-tax return and the return of a taxed portfolio that reinvests dividend taxes that otherwise would have been paid. Div Tax Cost is the percentage difference between the after-tax return and the return of a taxed portfolio that reinvests capital gains taxes that otherwise would have been paid. Effective Tax Rate is the percentage loss of taxable return relative to the tax exempt return.

	Rate based on actual tax code				**Rate based on 2011 code**		
Strategy (dividend yield, turnover)	**Tax Exempt**	**95**	**99.5**	**99.5 +NY**	**99.5 +NY**	**Corp.**	**Dealer**
Large (3.89, 5.70)							
After-tax Return	8.61	7.53	6.99	6.73	7.62	7.98	5.21
Avg Overhang		8.16	10.84	13.37	9.40	14.82	
CG Effective Tax Rate		1.35	1.47	1.86	1.51	2.43	24.59
Div Effective Tax Rate		10.82	16.71	18.94	9.82	4.75	15.84
Tot. Effect. Tax Rate		12.51	18.83	21.85	11.56	7.35	39.55
Growth (3.19, 18.68)							
After-tax Return	8.24	7.09	6.58	6.28	7.07	7.13	5.02
Avg Overhang		6.65	9.20	11.27	8.70	13.86	
CG Effective Tax Rate		4.96	5.83	7.31	5.50	9.12	26.33
Div Effective Tax Rate		8.54	13.55	15.40	8.43	4.08	13.60
Tot. Effect. Tax Rate		13.89	20.10	23.77	14.22	13.45	39.03
Small (2.85, 40.39)							
After-tax Return	10.83	8.90	8.01	7.51	8.53	7.95	6.67
Avg Overhang		-0.07	0.01	-0.08	-1.60	-2.26	
CG Effective Tax Rate		10.68	15.17	18.42	15.45	23.77	29.67
Div Effective Tax Rate		7.10	10.85	12.16	5.73	2.77	9.24
Tot. Effect. Tax Rate		17.76	26.06	30.65	21.18	26.57	38.36
Value (3.98, 43.65)							
After-tax Return	11.76	9.55	8.61	8.08	9.45	9.06	7.38
Avg Overhang		1.79	2.48	2.93	1.56	2.55	
CG Effective Tax Rate		9.14	12.22	14.92	12.21	19.27	25.79
Div Effective Tax Rate		9.48	14.27	16.01	7.37	3.56	11.88
Tot. Effect. Tax Rate		18.77	26.77	31.33	19.68	22.94	37.21
High Momentum (3.28, 364.30)							
After-tax Return	13.01	10.18	8.81	8.25	9.35	9.24	8.09
Avg Overhang		1.63	2.28	2.61	2.59	2.70	
CG Effective Tax Rate		16.13	23.48	26.65	22.86	26.40	29.55
Div Effective Tax Rate		5.70	8.99	10.19	5.48	2.65	8.83
Tot. Effect. Tax Rate		21.80	32.28	36.63	28.16	28.98	37.83
Low Momentum (3.61, 426.91)							
After-tax Return	2.47	0.93	0.35	0.11	0.67	1.17	0.73
Avg Overhang		-0.83	-1.18	-1.36	-1.72	-1.56	
CG Effective Tax Rate		28.93	37.96	42.38	44.55	38.83	24.51
Div Effective Tax Rate		36.52	56.51	63.82	31.87	15.41	51.38
Tot. Effect. Tax Rate		62.45	85.93	95.57	72.68	52.72	70.23

Table IV. Importance of Loss Realization Rules

Sample period is 6/1927–6/2007. Comparison of effective tax rates of portfolios depending on whether investors immediately use realized losses or whether losses are carried forward to future periods. Effective Tax Rate is the annualized percentage loss of taxable return relative to the tax-exempt return.

Strategy (dividend yield, turnover)	**Effective Tax Rate, Carry Forward Losses (Effective Tax Rate, Use Losses Immediately) [Difference]**		
	Percentile Individual 99.5th +NY		**Corporate**
	Actual Code	**2011 Code**	**2011 Code**
S & P (3.87, 4.21)	21.85	12.04	8.37
	21.36	11.13	7.05
	0.49	0.91	1.32
No Div (0.55, 31.39)	20.38	15.80	23.86
	16.07	7.14	13.06
	4.31	8.66	10.80
Low Div (3.95, 6.89)	21.64	11.71	7.87
	20.75	9.64	4.76
	0.89	2.07	3.11
High Div (5.46, 31.06)	30.93	19.21	18.90
	28.99	15.51	14.03
	1.94	3.70	4.87
Large (3.89, 5.70)	21.85	11.56	7.35
	20.68	9.34	4.00
	1.17	2.22	3.35
Growth (3.19, 18.68)	23.77	14.22	13.45
	21.80	10.28	7.69
	1.97	3.94	5.76
Small (2.85, 40.39)	30.65	21.18	26.57
	27.32	15.26	18.94
	3.33	5.92	7.63
Value (3.98, 43.65)	31.33	19.68	22.94
	29.43	14.99	16.76
	1.90	4.69	6.18

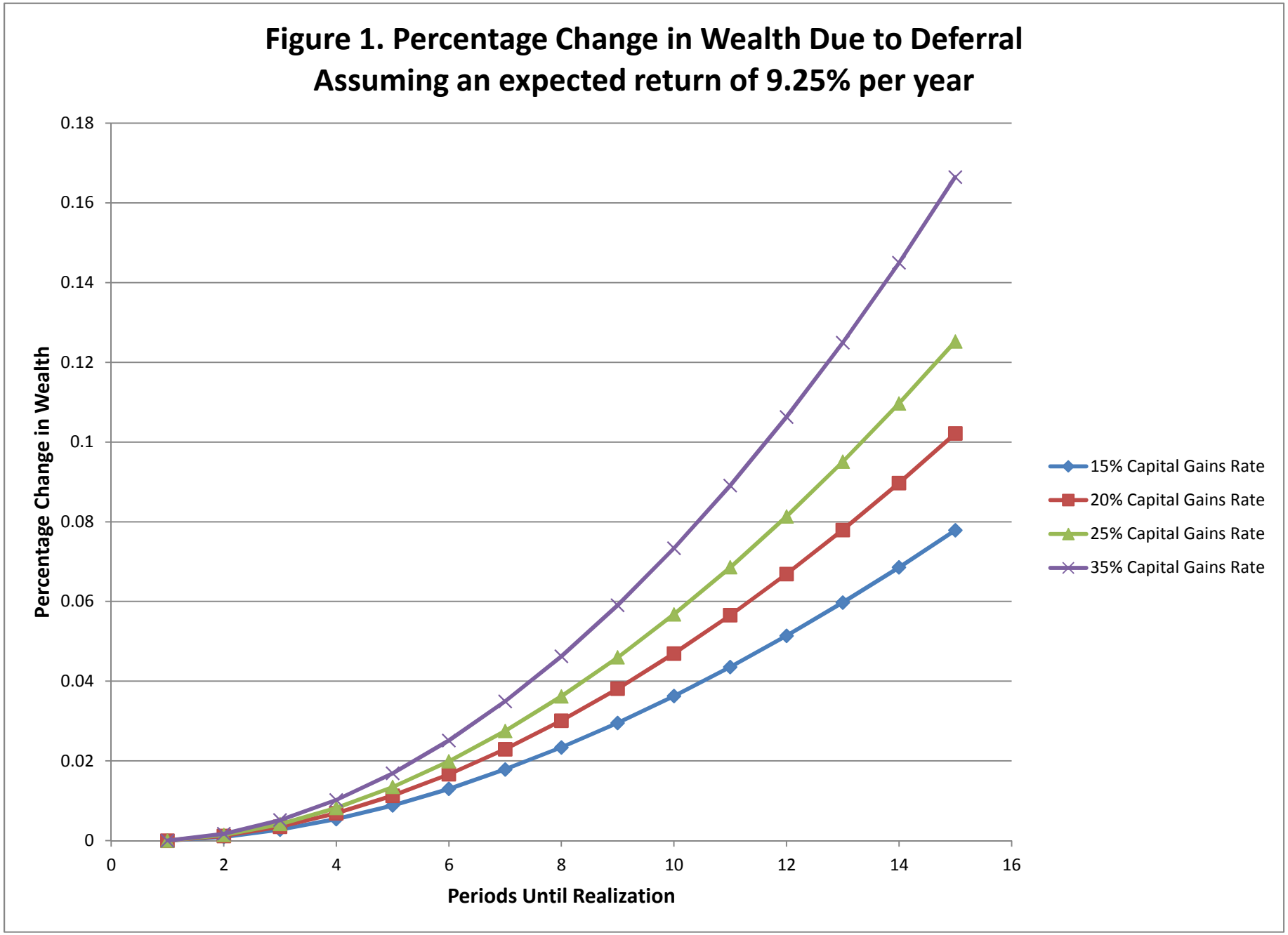
Figure 1. Percentage Change in Wealth Due to Deferral
Assuming an expected return of 9.25% per year
Percentage Change in Wealth
0.18
0.16
0.14
0.12
0.1
0.08
0.06
0.04
0.02
0
0
2
4
6
8
10
12
14
16
Periods Until Realization
15% Capital Gains Rate
20% Capital Gains Rate
25% Capital Gains Rate
35% Capital Gains Rate