Essays on the Financial Behavior of Corporations and Households

by

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ABSTRACT

This thesis consists of three essays. The first essay investigates what role employee stock options and CEO compensation have in explaining the surge in corporate share repurchases in the mid 1990s. Corporations may opt to fund options with repurchased shares to avoid the immediate dilution of earnings per share. Whether the top executives receive stock-based compensation may also influence distribution decisions. To test the importance of these two hypotheses, I collect data on stock option programs for over 800 U. S. corporations at the end of 1994. Estimates suggest that a firm with outstanding options representing 10% of shares outstanding will repurchase .9 percentage points more stock in 1995, as opposed to a firm with no option program. Once total outstanding options are controlled for, CEO options and option holdings of the top five executives are if anything negatively correlated with stock buybacks. Firms whose CEOs hold options are significantly more likely to retain earnings. The paper also considers what role the taxation of distributions has in explaining the growth of corporate share repurchases.

The second essay examines how participant choice in pension plans affects household portfolios. Some retirement plans allow the participant to choose how funds are invested. Being exposed to historical differences in asset returns may provide the participant with financial education which would otherwise not be received. This paper finds that households covered with pension plans in which the employee must decide upon investments are significantly more apt to hold stock outside of their retirement plan relative to households with plans offering no choice.

The third essay investigates the effect of specific features of the U.S. capital gains tax on turn-of-the-year stock returns. Both the fraction of long-term losses that are deductible from Adjusted Gross Income and the required holding period for long-term losses have changed over the past three decades. These changes alter the incentives for year-end capital loss realization for individual investors. This paper presents evidence that is consistent with the hypothesis that detailed provisions of the capital gains tax affect the link between past capital losses and turn-of-the-year stock returns.

This thesis is dedicated to Jim Weisbenner, whose hard work at "Backache Acres" instilled in me the work ethic and drive which ultimately carried me from the henhouse to MIT. Not bad for someone from Hurricane Corners, eh Jim?

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I would not have been able to reach this point without the support and guidance provided by many people. First and foremost, I thank my family. The more I age the more I grow to appreciate the hard work and personal sacrifices made by my parents, Jim and Sharon. I thank them for their support over the years. Kay provided much needed comic relief and kept me in the loop with stories from home. Obtaining the doctorate was all the more rewarding knowing that my grandmother, Ethel, would be able to share in the accomplishment in this her 100th year.

I have benefited enormously from my relationship with my advisor Jim Poterba. I am grateful for his guidance and patience during my four years at MIT. I can give no better compliment than to say that in my opinion he's the best in the business.

Many others have offered comments and suggestions on one or more of the essays in this thesis. I particularly want to thank the other members of the "PF group", namely Jeff Brown and Courtney Coile, who helped me all the way from studying for general exams to completing this thesis and whose friendship made graduate school more enjoyable. Barry Cheung's assistance with data collection during the hectic fall of '98 was invaluable.

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Contents

ESSAY ONE

Corporate Share Repurchases in the mid 1990s: What Role do Stock Options Play?

I am grateful to Fernando Aportela, Jennifer Babcock, Dan Bergstresser, Jeff Brown, Courtney Coile, Jon Gruber, Jerry Hausman, John Johnson, Mark Showalter, seminar participants at Columbia, Illinois, New York Federal Reserve Bank, and the Federal Reserve Board of Governors, and in particular Jim Poterba for helpful comments. I also thank Brian Hall, with assistance from Ali Ashan, for making available his data on CEO compensation. Barry Cheung's assistance in collecting data from proxy statements and annual reports was greatly appreciated. The National Science Foundation provided support for this research. This research was carried out using the NBER Asset-Pricing database.

Prior to the 1980s, distributions to shareholders were almost exclusively through dividends. The past two decades have seen a dramatic change in corporate payout policy, as firms are increasingly using share repurchases to distribute cash. For the S & P 500, share repurchases have grown from 10% to 75% of cash dividends on common stock from 1977-1996. The trend is likely to continue, as American companies announced intentions to buy back over $220 billion in shares from January 1997 through April 1998 (*The Economist*, April 25, 1998).

This begs the following questions: What has caused this change in corporate policy? Why are firms doing so much repurchasing of their stock in the 1990s? This has long been a puzzle in both public and corporate finance. Previous work has focussed on such motivations as takeover deterrence and signaling/market undervaluation in explaining the emergence of corporate share repurchases.[1] While surely relevant in some circumstances, they are unlikely to fully explain the doubling of stock buybacks from 1994-96.

Taxes have traditionally been advanced as a reason that firms would want to repurchase their own stock. Cash distributions made via share repurchases are tax advantaged relative to dividend payments for individual investors (Bagwell & Shoven (1989)). Perhaps the emergence and growth of stock buybacks is a result of firms learning how to minimize the tax burden of their shareholders. However, when the difference between the tax on dividends and capital gains was significantly reduced in the mid 1980s, share repurchases continued to grow. Further, the surge in stock buybacks in the mid 1990s occurred in a relatively stable tax environment. Thus, an alternative explanation for recent trends in corporate payout policy is needed.

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[1] Examples include Dann (1981), Vermaelen (1981), Asquith & Mullins (1986), and Comment & Jarrell (1991) on asymmetric information and signaling, and Denis (1990) and Bagwell (1991) on takeover threats. Ikenberry, Lakonishok, & Vermaelen (1995) and Stephens & Weisbach (1998) present evidence that recent price performance plays a role in the repurchase decision.

This paper investigates what role stock option programs and the form of CEO compensation have in explaining the recent surge in repurchases. The total number of outstanding options and shares available for future option grants has grown over 80% (when weighted by market value) from 1985-1996 for NYSE and S & P 500 corporations and over 50% since 1990 (Compustat). Hall & Liebman (1998) document the dramatic growth in CEO's stock-based compensation which has also occurred the last decade. CEOs of the largest corporations now receive stock option awards which are larger on average than annual cash compensation, whereas in 1980 the median stock option award was zero. Clearly, the growth in option programs could potentially be connected with the surge in share repurchases. The question is why?

In many circumstances, the corporation may have an incentive to repurchase stock to fund option programs. The firm has a choice as to how it will satisfy exercised options. It can simply issue new shares when options are exercised, thus diluting current shareholders' ownership of the firm. In order to avoid dilution, the firm can repurchase and then re-issue the stock necessary to satisfy the option program. However, that will lower cash available for other projects.

One would expect the decision of how to pay for options to be solely motivated by economic considerations. For example, ceteris paribus, firms with good investment opportunities opt to use cash flow for investment as opposed to repurchasing shares for option programs, and firms with poor marginal investment opportunities opt to use excess cash to repurchase stock and avoid share dilution.

However, accounting practices may provide an incentive for firms to use share buybacks.

Issuing new shares will immediately dilute such measures as earnings per share which are widely used to evaluate firm performance. In this case, the cost of the option program is apparent. Now suppose exercised options are fulfilled by repurchasing stock. Cash used for a repurchase to fund an option program is not subtracted out of income from operations, thus not affecting current earnings per share. Using cash flow to finance the purchase of stock, rather than for other purposes, will supposedly lower future earnings, but the effects are only felt down the road. The real costs firms are incurring from the past grants of options are not as directly apparent. As Gretchen Morgenstern concludes (*Forbes*, May 18, 1998), "Though the options don't count as cost, they are a mortgage on future earnings."[2] And share repurchases are referred to as "a pure earnings management scheme" by Charles Clough, chief investment strategist at Merrill Lynch (*The Wall Street Journal*, February 22, 1999).

Funding option programs through share repurchase as opposed to diluting the number of shares outstanding may, at least temporarily, obfuscate the real cost of option programs to the naïve investor. I'll refer to this motivation to avoid share dilution as the "funding hypothesis".

Two recent papers (Jolls (1998) and Fenn & Liang (1999)) have suggested an alternative explanation for the growth in share repurchases which focuses on the form of CEO compensation and agency problems (hereafter referred to as the "agency hypothesis"). The popular press also cites CEO compensation as a cause of the trend in corporate payout policy (*The Economist*, April 25, 1998 and *Business Week*, April 21,1997). A CEO with stock options has an incentive to purchase shares as opposed to paying dividends, even when that is not the preference of shareholders. A dividend payment will reduce the stock price and the value of outstanding

[2] A 1993 survey by the Hay Group, Inc. reports that 23% of surveyed corporations base annual bonuses at least in part on earnings per share. Thus, in some firms, CEOs may have a more personal incentive to manipulate earnings

options whereas a share repurchase will not, ceteris paribus.[3] Thus, distribution decisions of the firm will not solely reflect shareholder preference but will also depend on how the wealth of the person making those decisions is impacted. However, from the CEO's perspective, retention of earnings may be preferred to share buybacks, especially when the firm has good investment opportunities or the market may be driven by "irrational exuberance".

The "funding" hypothesis (avoid share dilution) and "agency" hypothesis (CEOs manipulate distributions to maximize value of own options) will give different predictions for a firm's payout policy based on the size of a firm's option program and the CEO's option holdings. It is important to note that there is variation across firms in the extent to which "optionization" extends below the CEO. At the end of 1994, such S & P 500 firms as Microsoft, Dell Computers, Shared Medical Systems, and Merck had large, broad-based option programs in which the CEO held less than .6% of options outstanding. At the other end of the spectrum, the CEOs of Reebok, Gateway, and Black & Decker held 35% or more of their company's outstanding options. Thus, it is possible to test if the link between option programs and share repurchases is driven by the tension between firm value maximization and CEO wealth maximization, or instead reflects a more widespread funding of option programs with repurchased shares.

To empirically test what is driving the relationship between share repurchases and options, I use a data set of over 800 firms. The data set was created by merging together data

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per share. Healey (1985) and Holthausen, Larker, and Sloan (1995) present evidence that executives manipulate reported earnings so as to maximize the value of bonus plan payments.

[3] Essentially no firms offer dividend-protected stock options. That means any dividends paid on a stock will not be paid out to those holding options on that stock. In a sample of 827 firms at the end of 1994, I find only two which mention in their proxy statement that they offer dividend-protected options. For these two corporations, dividend payments accrue in an optionee's account until the stock option is exercised.

from annual reports, 10-Ks, and proxy statements filed with the SEC at the end of fiscal year 1994 with the Compustat database. Unlike earlier work, I have accurate measures of firm financial behavior, the size of the option program, and the option holdings of the CEO. The sample represents nearly 2/3 of NYSE market value and 90% of share repurchases in 1995.

Two links between option programs and distribution policy emerge in the sample. Firms in general opt to fund option programs with repurchased shares to avoid dilution. However, after controlling for the effect of total options, the larger is the CEOs holding of outstanding options, the more apt the firm is to retain earnings and curtail cash distributions.

Estimates suggest that a 10% point increase in outstanding options (normalized by shares outstanding) is associated with roughly a .9% point increase in repurchases (normalized by assets) in 1995 and a 1.7% point increase in repurchases in 1995-96. (the average share repurchase payout rate for the whole sample is 1.6% in 1995 and 4.1% in 1995-96). CEO option holdings are if anything negatively correlated with the decision to buy back stock. *In other words, a desire to fund option programs with repurchased shares, as opposed to issuing new equity, appears to be a strong driving force behind the surge in share repurchases.*

Where the form of CEO compensation may matter is in the retention of earnings decision. An increase of a CEO's outstanding options by 1% point is associated with an estimated increase in the retention rate over the next two years of 3-4% points.[4] This result is consistent with the hypothesis that the distribution decision of a firm is impacted by CEO option holdings.

These results are of interest because they bear on such issues as the interplay between accounting practices and economic behavior, agency problems and the impact on firm

[4] The retention rate is defined as 1 - (dividends and repurchases in 1995 & 1996)/(income before extraordinary items in 1995 & 1996).

distribution decisions, and future trends in corporate distributions. Funding stock option programs through re-issuing repurchased shares as opposed to diluting existing shares may make it more difficult for analysts to observe the ultimate cost of stock-based compensation to the firm. The most important question raised by this paper is to what extent does the market capitalize the cost of stock-based compensation into share prices?

The paper will proceed as follows. Section 1 briefly reviews aggregate trends in corporate cash distributions and the emergence of share repurchases. It also discusses the tax motivation for share repurchases and documents the time series relationship between cash distributions and tax rates. The remainder of the paper focuses on the interplay between stock options, CEO compensation, and firm payout policy. Section 2 discusses the growth of employee stock option programs and the form of CEO compensation over the past decade. Previous work and hypotheses concerning the link between stock options and share repurchases are also discussed. Details on the data set constructed to test how and why option programs are funded is the subject of Section 3. Section 4 presents and analyzes empirical results and conducts robustness checks. Multiple estimation strategies are employed to test the consistency of the results. Section 4 also tests whether the tax motivation for share repurchases fairs any better in the cross-section than it does in the time series. Trends in stock option exercises for S & P 100 and Dow Jones firms are documented in Section 5. Section 6 concludes.

I. Trends in Firm Payout Policy and Tax Rates 1977-1996

Changes in corporate cash distributions over the past two decades has been well documented (sources include Bagwell & Shoven (1989), Dittmar (1997), and Jagannathan, et al.

(1998)). Therefore, after describing the data used, I will only briefly discuss the aggregate numbers. I also review how well trends in payouts match changes in tax rates on dividend and capital gain income faced by shareholders.

1.1 Data Description

The sample consists of all publicly traded industrial firms reported on the 1997 Compustat Industrial and Industrial Research file, which provide fiscal year accounting data over 1977-1996. I exclude companies for which Compustat does not report the purchase of stock (commercial banks, life insurance, and casualty and property companies).

Dividends are simply cash dividends declared on common stock (data item A21). Compustat reports dollars spent on repurchases of the firm's *own* securities (data item A115), which is obtained from the firm's Flow of Funds Statement. It does not include purchases of stock in other companies.[5]

Data item A108 reports the sale of common and preferred stock as recorded on the Flow of Funds Statement. Again, I net out any increases in preferred stock par value. The adjustment reduces aggregate sales by roughly 10-20%. This measure will understate the *true* dollar value of common stock issued by the firm because stock options are often exercised at a substantial discount from the market price.

[5] This measure overestimates the amount of repurchases of common stock because it aggregates all of the following: (1) conversion of Class A, Class B, special stock, etc., into common stock, (2) conversion of preferred stock into common stock, (3) purchase of treasury stock, (4) retirement or redemption of common/ordinary stock, (5) retirement or redemption of preferred stock, and (6) retirement or redemption or redeemable preferred stock. I subtract any decreases in the par value of preferred stock (data item A130) from this repurchase measure so it is more reflective of buyback of common stock. This adjustment reduces aggregate share repurchases by roughly 10%. Discussions with Doug Malcolm and Kelly Lampe at Compustat indicate the following adjustment should lead to an accurate measurement of the cost of acquiring common stock.

Finally, I also report net share repurchases (defined as dollars spent on repurchases less dollars received from the sale of stock) for those firms which repurchase shares. This will indicate to what extent share buybacks represent true equity shrink, or if the shares are instead re-issued at high frequency.

1.2 Firm Payout Policy

Table 1 reports the aggregate total of share repurchases, dividends, sale of stock, and *net* repurchases (defined as dollars spent on repurchases less dollars received form sale of stock for repurchasing firms and zero otherwise) for S & P 500 firms. A more detailed analysis of share buybacks for NYSE and S & P 500 firms is presented in Table 2.

A few themes emerge which will set the stage for the rest of the paper. While aggregate dividends normalized by market value have fallen by roughly 50% over the past two decades, share repurchase payout rates have more than quadrupled in aggregate (see Figure 1 at the end of the paper after the tables). If the trend continue, S & P 500 firms will consistently distribute more cash to shareholders via share buybacks as opposed to dividends. The proportion of firms buying back more than 1% of their equity has doubled over the past 15 years, with much of the change occurring in the mid 1980s.[6] Particularly striking is the surge in share buybacks in the

[6] A natural question to ask is why did corporations start to buyback shares in the early to mid 1980s? Prior to 1982, ambiguity existed in the law as to whether firms repurchasing shares on the open market would be charged with price manipulation. SEC Rule 10b-18, enacted in November 1982, provides cover for firms wishing to repurchase shares without being charged with price manipulation under provisions of the Securities and Exchange Act. The rule requires: (1) trades are made through one broker, (2) none of the trades are made as the opening transaction of the day or during the last half hour of the trading day, (3) none of the trades may be completed at a price exceeding the highest current independent bid price or the last independent sale price, whichever is higher, and (4) the total of such purchases in a day may not exceed 25% of the average daily trading volume for the preceding four weeks. The public announcement of a firm's intention to repurchase shares on the open market is another "safe harbor" provision. The rule clearly had an effect as evidenced in the time series as well as the number of open market repurchases. This discussion draws heavily from Ikenberry & Vermaelen (1996).

mid 1980s and the mid 1990s. Also, share repurchases are dominated by the mature, established firms.

Perhaps surprisingly, a number of firms are acting on both the share repurchase and issuance margin. The funding of option programs is undoubtedly one of the explanations for this puzzle. While corporations are buying back shares in record numbers, it is also worth noting that many of the shares are being re-issued. For example, when weighted by market value, 53% of NYSE and S & P 500 firms which repurchased more than 1% of their equity in 1996 also had stock sales in 1996 in excess of .05% of their market value. Given that the exercise price of stock sold to optionees is often significantly below the current market price the firm pays when repurchasing its stock, this suggests a substantial recycling of repurchased stock. Further, shares outstanding actually *increased* for about 1 in 4 of these repurchasers in 1996.

1.3 Payout Policy and Tax Rates

When a corporation distributes earnings via a dividend payment, the full amount of the dividend is taxed at the ordinary income tax rate for individual shareholders. If the corporation instead repurchases stock, non-tendering shareholders will receive capital gains which can be deferred (see Bagwell & Shoven (1989)). One might suspect this tax differential is driving trends in payout policy. Table 3, taken from Poterba (1998), reports weighted average marginal tax rates on dividend income and accruing capital gains in the U. S. over the past 20 years.[7] The average tax rate changes as the distribution of stock across different groups with different marginal tax rates changes.

[7] The accruing capital gains tax rate is calculated under the assumption that the top statutory tax rate on capital gains for individuals is reduced by half on account of capital gains deferral and half again because some gains escape taxation through basis-step up at death.

The fall in statutory dividend tax rates on households in the 1980s, coupled with the rise of equity ownership by pension plans, has substantially reduced the average tax rate on dividends. The difference between the tax rate on dividends and that on accruing capital gains has fallen from 23 percentage points in 1980 to 10-11 percentage points in the 1990s. It should rise slightly under the Taxpayer Relief Act of 1997.

As Figure 2 illustrates, the time series in not too supportive of a tax motivation. The tax advantage of capital gains over dividend income was large when share repurchases emerged in the early 80s. However, when the difference between the tax on dividends and capital gains was significantly reduced in the mid 1980s, share repurchases continued to grow. Further, the differential between the tax treatment of dividends and capital gains has been flat in the mid 1990s, when corporations started to buy back stock in record numbers.

Also, *direct* individual ownership of corporate equity was falling in the mid 1980s and mid 1990s at the same time share repurchases were increasing (see last column of Table 3). Individuals, as opposed to nonprofits or corporations, receive the biggest tax advantage from cash distributions made by share repurchases.[8]

Based on the time series alone, it is difficult to come away with any link between taxes and distributions.[9] If tax considerations don't appear to be driving the surge in stock buybacks, what is? The paper will now consider the emergence of employee stock option programs and the changing structure of CEO compensation.

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[8] Direct individual ownership excludes ownership through pension plans and mutual funds. See Dickson and Shoven (1995) for a discussion of to what extent mutual fund managers take into account the tax liability of their investors. Corporations currently pay tax on only 30% of dividends, but 100% of realized capital gains.

[9] While the difference between the taxation of dividends and accruing capital gains has diminished, it is still over 10 percentage points. Perhaps the emergence and growth of stock buybacks are a result of firms gradually learning

II. Payout Policy, Option Programs, and CEO Compensation

At the same time corporations are buying back shares with regularity after the recession of the early 1990s, corporations are issuing stock options to their employees in record numbers. The goal of the rest of this paper is to empirically disentangle what is really driving the connection between options and share repurchases in the mid 1990s and what the implications are for future policy.

I first document the growth of stock option programs over the past decade. I then discuss previous work in this area, with the key paper being Jolls (1998), and outline the "funding" hypothesis. The magnitude of the liability stock options represent is presented at the end of this section. I describe the data set collected on stock option programs and CEO compensation and conduct the empirical tests in Sections 3 and 4, respectively.

2.1 Stock Option Programs

Table 4 displays the growth over the past decade of option programs. Shares reserved for outstanding options and authorized for future grants has grown by 60% (unweighted sample) to 80% (weighted by market value) for NYSE and S & P 500 firms over 1985-96.[10] The ratio of reacquired shares stored in Treasury to shares reserved for options is zero for many firms. This

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how to minimize the tax burden of their shareholders. I later test for cross-sectional evidence of a correlation between firm distributions and direct individual ownership of the firm.

[10] This measure overstates outstanding options, which Compustat does not report, since it also includes the number of shares available for future grants under existing plans. The correlation of shares reserved for options with outstanding options was .88 and the median ratio of total outstanding options to total shares reserved for options was .7 in a sample of 827 firms at the end of 1994 I constructed.

suggests that if there is a reluctance on the part of firms to dilute outstanding shares, share buybacks should continue to trend upward in the foreseeable future.

For example, it is interesting that the aggregate doubling of share buybacks for the S & P 500 from 1994-1996 corresponded to a time when the number of shares held in Treasury relative to the number of outstanding options (let's refer to this as the funding ratio) had fallen dramatically for large corporations. The funding ratio (weighted by market value) was .21 at the beginning of 1993, but had fallen to .02 at the beginning of 1995 (perhaps due to the exercise of options). At the beginning of 1996, the number of shares held in Treasury represented about 1/8 of the number of outstanding options for large firms (1/8 is the median ratio weighted by market value). Given the growth in option programs, and the relatively small amount of re-acquired shares held in Treasury, firms will be faced with the dilemma of either buying back shares in large quantities or allowing share dilution.

2.2 Previous Work

Most research concerning stock options focuses on the correlation between CEO compensation and firm performance and/or the presence of agency problems (recent examples include Yermack (1995), Hall & Liebman (1998), and Hall (1998)). The accounting literature focuses on whether the standard accounting of employee stock options permits them to be used as an income management strategy (Matsunaga (1995)), or whether the difference between the corporate and top individual tax rate influences the type of option granted to employees (Balsam, et al. (1997)). Most in spirit with this paper, Jolls (1998) and Fenn & Liang (1999), investigate to what extent options influence the composition of cash distributions by the firm.

Jolls (1998) suggests that the incentives of the agents who run firms, determined by the CEO's compensation package, can explain repurchase behavior. This is the agency hypothesis.

While stock-based compensation for CEOs in the largest U.S. corporations was not widespread in the 1980s, the value of the average stock option grant now exceeds the average CEO cash salary (Hall & Liebman (1998)). Table 5 demonstrates that while annual cash based compensation for executives at large U. S. corporations has grown about 50% in real terms from 1985-94, the median value of option grants has almost doubled from just 1991-94.[11]

Jolls presents an optimal payout decision rule for CEOs, derived from a managerial objective function which places weight *both* on the value to shareholders and to the manger. Why should the CEO care about the composition of cash distributions of the firm? As was just mentioned, the portion of CEO compensation which is in the form of stock options has increased dramatically. An option gives the optionee the right to purchase stock at a set price over a certain period of time. However, firms very rarely offer dividend-protected stock options.[12] That means any dividends paid on a stock will not be paid out to those holding options on that stock. While conventional dividends will dilute the per-share value of stock, a share repurchase will not.

An example should clarify how the composition of distributions impacts the value of outstanding options. For example, let's assume a firm's market value is $1000 and there are 20 shareholders, thus the price per share is $50. If a firm pays a dividend of $5 per share, or $100 in aggregate, that will lower the price per share to $45 (ignoring any signaling effect of the distribution). Thus, the market value of stock underlying options has fallen 10%.

Now suppose the firm instead returns the $100 to shareholders by buying back stock. The $100 can by two shares. After the repurchase, the firm value is $900, there are now 18

[11] I thank Brian Hall, with assistance from Ali Ashan, for providing me with the data used to construct this table.

shares of stock outstanding and the price per share is still $50 (again ignoring signaling or other effects). The value of outstanding options is unaffected by the repurchase because share price is unaffected. Thus, ceteris paribus, CEOs will have an incentive to substitute share repurchases for dividend payments if they have outstanding stock options.

To test this hypothesis, Jolls collects a sample of firms *announcing* share repurchases or dividend increases in the *Wall Street Journal*, and compares them to a random sample of firms that did not announce a repurchase of dividend increase in 1993.[13] She concludes that firms which rely heavily on stock options to compensate their top executives are more apt to repurchase stock. This work has been influential because it links together two current topics in corporate finance, share repurchases and the "optionization" of CEO compensation. It also suggests that the form of CEO compensation can induce agency problems which ultimately impact the distribution decisions of firms. Further, the work has attracted the attention of the popular press (*The Economist*, April 25, 1998).

Fenn & Liang (1999) investigate motivations for corporate payout policy. They present evidence that management options is positively correlated with share repurchases and negatively correlated with dividend payments for a sample of 1100 nonfinancial firms over 1993 - 1997. They interpret this evidence as suggesting substitution of share repurchases for dividends, and

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[12] In a sample of 827 firms at the end of 1994, I find two which mention in their proxy statement that they offer dividend-protected options. Dividend payments accrue in an optionee's account until the stock option is exercised for these two firms.

[13] Using share repurchase *announcements* as opposed to *actual distributions* can lead to a misclassification of firms. Repurchase programs following an announcement are generally conducted over many years (Stephens & Weisbach (1998)), so many firms repurchasing stock in year t would not have made an announcement in year t. Usem, Schulman, & Brown (1995) and Stephens & Weisbach (1998) document that a nontrivial number of firms do not follow through on share repurchase announcements.

conclude, as Jolls does, that the repurchase decision is driven by the compensation of upper management.

2.3 Alternative Explanation for Link Between Share Repurchases and Stock Options

This paper argues that it is not the form of CEO compensation, but rather a desire to avoid dilution of shares outstanding and such accounting measures as earnings per share which is responsible for the surge in share repurchases in recent years (funding hypothesis). Charles Clough, chief investment strategist at Merrill Lynch, refers to stock buybacks as "a pure earnings management scheme" (*The Wall Street Journal*, February 22, 1999). A potentially serious drawback of previous work is its inability to empirically differentiate between the impact of total options and CEO options upon payout policy.[14] It is worth stating the obvious: CEO outstanding options is the product of total options outstanding and the percent of those options held by the CEO. It is important to establish which component is driving the link between stock options and payout policy.

From a fully informed shareholder's perspective, whether the firm issues new equity or repurchases and then re-issues shares when options are exercised should depend upon the marginal investment opportunities of the firm (proxied for by Tobin's q). Suppose there are two shares outstanding in a firm valued at $100, thus the price per share is $50. Suppose a worker is issued an option to purchase a share of stock at $20. If the firm issues new equity when the option is exercised, there will now be three shares outstanding, and cash on hand will increase by $20 (the exercise price paid by the optionee). Thus, the original shareholder's stake in the

[14] Jolls considers this alternative, but dismisses it. Jolls uses total grants of options during the year as a proxy for outstanding options, and finds it has little explanatory power. However, most options become exercisable or vest gradually over a three to five year period and do not expire for up to ten years. Thus, the correlation between repurchases and grants will be substantially lower than that for actual outstanding options if the firm is motivated to buy back stock to fund an option program.

corporation is diluted. Now, suppose that when the option is exercised, the firm decides to buy back one share to undo the dilution. If the firm repurchases one share for $40, there will now only be two shares outstanding after the option is exercised, but the firm's cash on hand will be reduced by $20 ($40 repurchase cost less $20 exercise price).

How should the firm fund the option program? If the firm's marginal q is one (the return to capital inside vs. outside the firm is the same), the shareholder shouldn't care. The firm value is either $120 with three outstanding shares, or $80 with two outstanding shares. Suppose a firm can earn a substantially higher return from additional investment relative to the return on capital outside the firm ($q > 1$). In this case, funding option programs through buybacks is particularly costly. The firm would be better off by allowing share dilution to occur when options are exercised and utilizing the cash that would have been used to repurchase stock to increase investment.

As mentioned in the introduction, firms may have an incentive to buy back stock to fund option programs, regardless of how the CEO is compensated. Issuing new shares will immediately dilute such accounting measures as earnings per share which is commonly used to evaluate firm performance. Funding exercised options with repurchased stock will not impact operating income or outstanding shares for the current period. Presumably, using cash to repurchase stock rather than for other uses will gradually lower future earnings, but the effects will be felt down the road. Matsunaga (1995) presents evidence that firm's that use income increasing measures such as how depreciation is expensed and how inventory is valued are also more apt to grant stock options. Further, work by Healy (1985) and Holthausen, Larker, and Sloan (1995) demonstrate how reported earnings are manipulated depending upon the incentives

of the firm and its executives. The key question is how well does the "market" sort through this accounting information.

A few years ago, the Financial Accounting Standards Board (FASB), attempted to come up with a standard that would require companies to make explicit future option costs, and realize the cost against current earnings.[15] Not surprisingly, the proposal met fierce opposition from corporate America and was killed at the end of 1994. As Dennis Beresford, chairman of the FASB from 1987-97 recalled, "The argument was: reduced earnings would translate to reduced stock prices. People said to me, 'If we have to record a reduction in income by 40%, our stock will go down by 40%, our options will be worthless we won't be able to keep employees. It would destroy all American business and Western civilization'" (*Forbes*, May 18, 1998).

As a compromise, FASB rule 123 requires firms (starting in 1996) to disclose in a footnote the impact upon earnings if the fair value of stock options were counted as an expense, with the cost divided equally across the vesting period of the option grants. However, the usefulness of this provision is suspect given investors have to search through footnotes at the end of annual reports to find the data, the data is not presented in the section where income and earnings per share are presented, and the way firms value options may differ across firms. Further, the pro forma effect on net income reported in the footnote the past few years is not representative of the pro forma effect on earnings in future years because the rule 123 method of accounting for compensation expense is not applied to options granted prior to 1995 which have yet to vest.

The clever analyst may be able to uncover the liability outstanding options represent. However, prior to 1996, many firms only reported options outstanding and the minimum and

[15] See Dechow, et al. (1996) and Revise, Collins, & Johnson (1999) for a discussion of the political economy surrounding the recommendation by FASB that options be recognized as an expense.

maximum exercise prices for those options in their annual report.[16] The typical shareholder or naïve analyst may not make appropriate corrections to earnings to account for stock-based compensation. Byron White, U. S. investment strategist at Morgan Stanley Dean Witter, concludes (*The Wall Street Journal*, May 13, 1998) "I think this whole area [stock options] is more serious than is being treated by analysts."

The debate surrounding the ultimate demise of recommendations that firms explicitly account for the cost of option programs in earnings, as they do cash based compensation, suggests that firms may feel the market has not fully capitalized the cost of option programs into share prices.[17] Recent studies by Bears & Stearns and Smithers & Co. suggests that explicitly accounting for the cost of options would substantially reduce measures of firm earnings, particularly in the technology sectors.[18] Smithers & Co. reported "It has proved far more difficult and time consuming then we had expected to obtain the data needed to make the calculations in the report. ... We set out to obtain information on all the 200 largest listed U. S. companies but the difficulties in obtaining the data led us to publish when we had 100 of them."

Perhaps no firm is more synonymous with the use of stock options than Microsoft. At the end of fiscal year 1994, Microsoft had outstanding options representing 20% of current shares outstanding. None of these were held by the CEO Bill Gates, and only a small fraction of these were held by the top five executive officers (.5%). Here is what Microsoft describes as the

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[16] Starting in 1996, corporations disclose the average exercise price for outstanding options in their 10-Ks.

[17] Another concern in the debate was how to fairly value the option grant.

[18] Bear Stearns found that deducting the value of current option grants would lower the 1997 reported earnings of the 30 stocks in the Dow Jones Industrial Average and 56 high-tech companies in the technology sector of the S & P 500 index on average by 10%. Smithers & Co., looking at 100 large U.S. companies in 1995 and 1996, concluded properly accounting for options would have reduced reported net income by 34%. The disparity arises because the Smithers & Co. report deducts the change in the value of *previously* granted options during the year from income, whereas Bear Stearns did not. The value of previously granted options rises as the stock price increases.

purpose of its share repurchase program, taken from its Quarterly Report to Shareholders (10-Q filing) on March 31, 1997:

> Management believes existing cash and short-term investments together with funds generated from operations will be sufficient to meet operating requirements for the next twelve months. Microsoft's cash and short-term investments are available for strategic investments, mergers and acquisitions, and to fund an increased stock buyback program over historical levels to reduce the dilutive impact of the Company's employee stock option and purchase programs.

Of course there is a cost to funding option programs by repurchasing shares as well (everyone owns the same fraction of a smaller pie), but the cost may not be as transparent to shareholders and the market.

Jolls' work makes the point that the distribution policy of firms may be influenced by the resulting impact on the wealth of the person making that decision. The argument above does not state that this is unreasonable. Indeed, the argument is very sensible. However, I would argue that if the "optionization" of CEO compensation impacts firm payout policy, it would likely be through *increasing retention of earnings*. Dividend payments reduce price per share and hence the value of options. Given that Tobin's q for most firms is very high, internal investment of funds may be the most profitable use of funds. A CEO acting solely to maximize the value of option holdings would likely prefer retentions to repurchasing stock at historically high prices or increasing dividends.

Finally, Bagwell (1992) and Shleifer (1986) provide another rationale for managers to avoid share dilution. Classical theory suggests that the firm has a fundamental value which shouldn't be a function of the number of shares in the firm or who holds those shares. However,

Bagwell (1992) and Shleifer (1986) provide evidence of a non-flat supply curve by studying price responses to Dutch auction share repurchases and the inclusion of firms into the S & P 500, respectively. This suggests firm value may be affected by the supply of shares and/or who owns the shares. Perhaps repurchasing of shares on the open market from outsiders and transferring of them to insiders (employees) may also have the effect of replacing shareholders with the lowest valuation of the firm with new shareholders with a higher valuation of the firm, thus potentially increasing share price.

2.4 Magnitude of Liability Stock Options Represent

To put in perspective the magnitude of the liability stock-based compensation represents, data was collected for all the non-bank and utility members of the S & P 100 and Dow Jones Industrial and the members of the S & P 500 Technology Sector at the end of 1997. Nearly all the firms provided the average exercise price for *exercisable* outstanding options and the average remaining life on outstanding options along with the expected dividend payment and price volatility of the stock (131 of 142 firms). Using this information, I calculate both the "in-the-money" value of the exercisable options (market price less average exercise price) and also use the average remaining life for all outstanding options, the stock volatility, and the dividend payout rate to calculate a value of the options based on the Black-Scholes formula.[19] For this group of 131 firms, exercisable options had an in-the-money value of $66.5 billion (44% of 1997 earnings) and a value of $158 billion (105% of 1997 earnings) using the Black-Scholes formula. Thus, stock based compensation represents a non-trivial liability for firms.

[19] My measure understates the true in-the-money value of exercisable options because options with an exercise price above the current market price are included in the average exercise price. Also, my Black-Scholes calculation assigns the average remaining life and average exercise price to all outstanding options, and assumes a risk-free rate of 5.18% (the six-month Treasury bill rate).

Table 6 presents stock option exercises, dilution, and share repurchases for the nine members of the S & P 100 and Dow Jones Industrial which had stock option exercises form 1993-97 in excess of 10% of shares outstanding. While firms such as Cisco Systems and Computer Sciences Corporation allow dilution to occur when stock options are exercised, other firms, such as Monsanto and the Aluminum Company of America, fully fund their option program with repurchased shares. However, avoiding share dilution comes at a substantial cost. Cash spent on share repurchases 1993-97, is over 50% of earnings for the Aluminum Company of America and over 40% of earnings for Monsanto.

Table 7 presents more specific detail for Microsoft. Microsoft has adopted a strategy to at least partially avoid share dilution, as 55% of options exercised between 1993-97 were funded by share repurchases. Without the repurchases, share dilution over the period would have been 21.4% as opposed to the actual 10.7%. Cash spent on share repurchases, *less* cash received from optionees when options are exercised, was over 40% of earnings from 1993-97, and was 70% of earnings in 1997!

Perhaps the future cost of option grants made in the late 1980s and early 1990s was capitalized into the stock price at that time, and the market is already expecting these cash flows to occur. However, the dollars spent on repurchases will only start to impact earnings down the road, by absorbing cash flow that could be used for other projects which yield future payoffs. This is of particular concern in the years to come as the increased granting of options today will lead to an increased exercise of options tomorrow.

Section 3 will describe the data set I have constructed to determine what is driving the link between repurchases and options. Unlike earlier work in this area, I have collected data on *both* total options outstanding and CEO option holdings. I also have data on actual dollars spent

buying back stock as opposed to share repurchase announcements. I will test for both evidence of the agency hypothesis developed by Jolls and the funding hypothesis just described in Section 4.

III. Data on CEO Compensation and Option Programs

Prior to 1992, this analysis would not be possible. In 1992 the SEC expanded disclosure requirements regarding option programs. Since then, proxy statements list outstanding options of the most highly paid executive officers. The annual report to shareholders (ARS) and 10-K filings provide information on the balance of option programs, including grants during the year, outstanding options at the end of the year, and shares available for future grants under existing stock compensation plans. Relevant data was collected for firms at the end of fiscal year 1994 from the Laser D SEC database which contains proxy statements, annual reports, and 10-Ks filed by U. S. corporations. The 1997 Compustat database details financial activities of corporations.

The sample consists of all publicly traded companies which were a member of the S & P 500 or the MidCap 400 at the end of 1994, or are included in one of the May 1995 *Forbes 500* lists (sales, profits, assets, and/or market value), with the following exceptions. Corporations in highly regulated industries, such as banks (SIC two-digit industry 60) and utilities (SIC two-digit industry 49) are excluded. Firms which do not have data in Compustat in 1995 or undergo a significant merger are dropped, as are firms for which data on CEO options and/or total outstanding options is not available either through the annual report or the proxy statement. Finally, I also require that institutional ownership of the corporation at the end of 1994 is

available. The remaining sample consists of 827 firms, which in aggregate represent nearly 2/3 of the capitalization of the NYSE and 90% of repurchases of NYSE firms.

Tables 8 summarizes the option programs and CEO compensation, direct individual ownership, and distribution policy of the 827 firms. Other characteristics of the sample, such as market value, investment, cash flow, stock performance, etc., are reported in the Appendix. There I also report correlations between variables and break the sample down by industry groups. The firm variables constructed from Compustat should be self-explanatory, and are explained in detail in the notes in the Appendix.

Total options outstanding represent on average 5.7% of shares outstanding of the firm at the end of 1994, and the average ratio of CEO options to total outstanding options is about 1/8.[20] Of course if every company granted options to the chief executive officer in the same proportion, there would be no hope of identification. The correlation between CEO options and total options is .55. I rank CEO options and total options across firms, and then test whether the median of the differences in rank between the two is zero. The test-statistic, under the hypothesis of equal ranking of CEO and total options, has a p-value of .0043.

Figures 3 and 4 are histograms displaying the variation in the size of option programs and the fraction of outstanding options held by the CEO, respectively. Forty-five percent of firms in the sample have outstanding stock options representing over 5% of outstanding shares at the end

[20] CEO options is the sum of incentive stock options and non-qualified options. In the sample, each type of option has the same typical terms: exercise price is fair market price at the date of grant, expiration date is five to ten years from the date of grant, and options become exercisable gradually over a period of years (e. g., 20% over five years). The main difference between the two options is the tax treatment upon exercise. The optionee pays no tax on an incentive stock option (ISO) until the stock is sold, and then the gains over the exercise price are taxed at the capital gains rate, provided the option plan meets certain conditions set by the IRS (section 422). When a non-qualified option is realized, the optionee pays tax on the gain over the exercise price, and the corporation receives a deduction from taxable income for the same amount.

of 1994, and 14% have outstanding options representing over 10% of shares outstanding.[21] CEOs held over one quarter of a firm's stock options in 11% of the sample.[22] Forty-six firms had stock option programs in which the CEO had no holdings. Thirty-two firms have no outstanding options, including Berkshire Hathaway. Its CEO, Warren Buffett, is one of the lone voices in corporate American sounding alarms about option-based compensation.

The proxy statements also report compensation and stock option holdings for executives other than the CEO. The number of executive officers serving at the end of fiscal 1994 and covered by the proxy statement reporting requirements is typically five. In the few cases when more or less than five are reported, total option holdings for the group are scaled to reflect five officers. Figure 5 displays the histogram of the fraction of a corporation's outstanding options held by the top five executives. The median ratio of the top 5 officers' holdings to total options is .278, with substantial variation across firms. Specifications throughout the paper will focus on the option holdings of the CEO, as some of the reported executives may have more limited ties to the actual operations of the firm.[23]

Figure 6 displays the distribution of direct individual ownership across the 827 corporations in the sample. Standard and Poor's *Security Owner's Stock Guides* provide institutional ownership data which covers investment companies (mutual funds), banks,

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[21] Borland International (software), Information Resources (data base products), Octel Communications (voice processing systems), Cadence Design Systems (software), and Structural Dynamics Resources (computer engineering) all have options outstanding exceeding 25% of shares currently outstanding. The ratio of outstanding options to shares currently outstanding is .074 for Disney, .041 for GE, .139 for General Mills, .034 for General Motors, .115 for Heinz, .058 for IBM, .156 for Merrill Lynch, , and .196 for Microsoft.

[22] The CEOs of Gateway 2000 (computers), NACCO Industries (fork lifts / coal mining), McDonnell Douglas (aircraft), Mercury Finance (consumer finance), Diagnostic Products (medical products), and Western National (life insurance) hold over 60% of their corporation's outstanding options.

[23] The qualitative results obtained throughout also hold when the CEO options are replaced by those held by the top 5 executives.

insurance companies, college endowments, and "13F" money managers. Thus, direct individual ownership excludes household holdings of corporate equity though mutual funds or pension plans. Direct individual ownership is a proxy for the tax status of a corporation's shareholders. As mentioned earlier, the tax differential between dividends and capital gains is largest for the individual investor. Therefore, my measure of individual ownership should be highly correlated with the fraction of shareholders of a firm which are most concerned about the tax consequences of distributions, reap the biggest tax advantage from capital gains as opposed to dividends, and have direct control over their shares.

There is variation in the fraction of shares held directly by individuals, as direct individual ownership is less than 20% of the firm for one sixth of the sample and there is direct individual ownership of at least 60% of shares in one eighth of the sample. The above reasoning suggests that one would expect a correlation between payout policy and the individual ownership share if taxes were driving trends in corporate distributions.

Most of the firms make distributions of some sort, as three quarters pay dividends and half repurchased stock in 1995 (31% repurchase more than 1% of market value). There is substantial variation in firms across market value and industrial classification. Half the sample was a member of the S & P 500 and 37% was a member of the MidCap 400 at the end of 1994. The rest were listed in *Forbes* but in neither of the Standard and Poor's indices.

IV. Empirical Results

I now employ a variety of estimation techniques to disentangle the link between option programs, the form of CEO compensation, and firm payout policy. Tables 9-13 present "reduced form" regressions of a firm's cash distributions and retention of earnings of the form:

$$(\textit{Payout Policy}) = \beta_0 + \beta_1 * \textit{TOTAL OPTIONS} + \beta_2 * \textit{CEO OPTIONS} + \beta_3 * \textit{INDIV. OWNERSHIP} + \beta_4 * \textit{FINANCIAL CHARACTERISTICS} + \varepsilon$$

Payout Policy may be defined as the level of stock buybacks, the propensity to repurchase stock, earnings retention, and/or the probability of falling into one of four payout policies.

For this study, the primary focus will be on the magnitude and importance of β_1 and β_2, the coefficients on the option variables. Clearly, the decision to repurchase is also impacted by the composition of shareholders and the financial situation and investment opportunities of the firm. For example, one might expect that a correlation between option programs and share repurchases reflects an omitted underlying shareholder preference for share repurchases, perhaps motivated by taxes. From a tax perspective, individuals should have the biggest preference for share buybacks. If firms were learning how to minimize the tax burden of their shareholders, one would expect a positive correlation in the cross-section between share repurchases and direct individual ownership of the corporation. Thus, the proportion of direct individual ownership in the corporation is also included in specifications.

Clearly, the ability of a firm to finance share buybacks should be influenced by the firm's cash flow. The "traditional" view of dividend taxation (Poterba & Summers (1985)) suggests equity buybacks/issues are the marginal source of investment funds. Thus, share repurchases may be adjusted to accommodate past investment needs of the firm. The decision to repurchase shares should also depend on the marginal investment opportunities of the firm (proxied for by Tobin's q). Ceteris paribus, firms with good investment opportunities may opt to use cash to

finance investment as opposed to distributing it to shareholders through share buybacks (Jensen (1986)). On the other hand, a standard signaling model may predict a positive relationship between distributions and q, as payouts signal firm quality. Previous work suggests such factors as cash on hand (repurchase is then easier to conduct, or firm is more attractive takeover target), the leverage of the firm (repurchase can redo capital structure of firm by adjusting debt-equity ratio, or using cash for repurchase is more risky more highly leveraged firm is), and firm size (a proxy for financing costs, asymmetric information, etc.) may also impact the decision to buy back stock. Finally, specifications are reported both with and without industry controls.[24]

4.1 Basic Results

Table 9 presents estimates from a Tobit model for the level of share repurchases in 1995. Total outstanding options are significantly and substantively related to share buybacks. Once the size of the option program is included in the specification, CEO option holdings are if anything negatively correlated with share repurchases (although insignificantly so when other firm characteristics are included in the specification).[25] Lagged investment and cash flow have the expected sign and are strongly correlated with stock buybacks. Consistent with earlier work, such as Bagwell and Shoven (1988), highly leveraged firms are less likely to repurchase stock (this could reflect financial distress or adjustment of debt-equity ratio through repurchase). Both direct individual ownership and Tobin's q have no predictive power for the magnitude of stock buybacks. Given the tax preference for individual shareholders for distributions made via stock buybacks, it is surprising that there is no cross-sectional correlation between them.

[24] I will assign corporations to industry groups as follows. Firms are first grouped to SIC one digit categories. Then, any 2-digit SIC group with more than five firms is controlled for separately.

[25] When one does not control for outstanding options to all employees, there is a positive but insignificant correlation between CEO option holdings and stock buybacks. A similar pattern emerges when one focuses on the option holdings of the top 5 executives.

The marginal effect of stock options evaluated at the sample average indicates that a 10% point increase in outstanding options normalized by shares outstanding is associated with roughly a .9% point increase in the repurchases normalized by assets that year (the average payout rate for the whole sample is 1.6%). This estimated increase in repurchase activity (.09 marginal effect) matches fairly well the average level of outstanding options which are exercised during the year which is .08 in the sample.[26]

Table 10 presents estimates for regressions of the stock buyback decision in 1995, share repurchases in 1995-96, and share dilution in 1995. Specifications (1) – (2) present the marginal effect of options upon the decision to repurchase at least one percent of market value in 1995 using a Probit model evaluated at the "average characteristics of the sample." The same pattern in coefficients observed in the levels specification is generally observed in the binary choice model. Total outstanding options is positively correlated with the decision to repurchase shares. A firm with options representing 10% of shares outstanding is 10 percentage points more likely to buy back more than 1% of its stock than a firm with no option program (average for all firms is .31). This relationship is not driven by the option holdings of the CEO or executive officers.

While price appreciation over the previous year and Tobin's q do not have much of an impact on the *level* of stock buybacks, they do seem to impact the decision of whether to repurchase shares. Firms with higher investment opportunities, as proxied for by q, are significantly less likely to decide to repurchase stock. This is consistent with Jensen's (1986) free cash flow theory, but inconsistent with most signaling models in which distributions are

[26] This ratio is obtained by multiplying the fraction of outstanding options at the end of 1994 which are exercisable by the fraction of exercisable options which are exercised in 1994. As option programs age, and previous grants vest, the fraction of outstanding options exercised each year should rise.

increasing with q. Nohel and Tarhan (1998) also find that positive investor reaction to share buybacks is best explained by the free cash flow hypothesis as opposed to signaling.

Specifications (3) – (4) represent the decision to repurchase stock in both 1995 and 1996. The marginal effect of outstanding options upon share repurchases over 1995-96 is .17, or twice the impact estimated in Table 9 for stock buybacks in one year. This is plausible, as option exercises in 1995-96 would likely be double that observed in 1995 alone.

Specifications (5) – (6) examine dilution of shares outstanding over 1995 by estimating median regressions. The results imply that the median dilution of shares outstanding over 1995 is about 1.3% for a firm with outstanding options representing 10% of outstanding shares (one cannot reject that the median dilution equals the average fraction of outstanding options which are exercised in a given year). One also cannot reject a zero correlation between the change in shares outstanding and the size of the option program at the 25^{th} percentile. This implies a sizeable number of firms partially fund the option program with repurchased shares. The main conclusion to draw, counter to previous work, is that once one controls for total options, the "optionization" of CEO compensation has no explanatory power for repurchases.

So far the evidence has been supportive of the "funding hypothesis". However, I would not say that it refutes the basic reasoning that the form of CEO compensation can alter distribution policy.

It is important to remember the extraordinary growth in firm value since the early 1980s, and in particular 1995 and 1996 when the payout decisions of the firms in my sample were observed. The average two year return over 1995-96 for firms in my sample is 50%. Also, many firms likely had good internal investment opportunities. Thus, a CEO concerned about the value of his outstanding options would likely rather retain earnings as opposed to buying back

company stock which is selling at historic multiples or increasing dividends. Under this line of reasoning, one would expect retentions to be increasing with CEO options.

To investigate this hypothesis I estimate regressions of the rate of retention of earnings over 1995-96. Retentions are earnings less cash used to finance common dividends and share repurchases, and the median retention rate for the sample is .54. Firms in which CEO's have large holdings of stock options retain significantly and substantially more of their earnings over 1995-96. I estimate both robust and median regressions because cash distributions greatly exceed earnings for some corporations over this period. The estimates, presented in Table 11, suggest a firm whose CEO holds options representing 1% of outstanding shares will retain 3-4 percentage points more of earnings, and the results are generally significant at the .10 level across specifications and estimators. This finding is consistent with the agency hypothesis.

One could argue that the firms issuing options to workers and CEOs are not a random subsample of firms. For example, firms with strong growth opportunities will be more apt to retain earnings. They may also be more apt to offer stock-based compensation (both to free up current cash flow and because investment opportunities may lead to high stock returns). Thus, the positive correlation between CEO option holdings and earnings retention may reflect strong investment opportunities rather than the CEO adjusting distribution policy to maximize the value of his/her stock options. However, while price appreciation and Tobin's q are associated with a greater rate of retention of earnings, their inclusion in the specification does not eliminate the impact of CEO option holdings.

4.2 Multinomial Logit Model of Payout/Retention Decisions

To further shed light on the payout and retention decisions of firms, I estimate a multinomial logit model. I classify firms into one of four categories based on whether the firm

repurchased more than 1% of its market value in 1995 and/or increased the dividend payout rate in 1995 over the average payout rate from 1992-94. Just under half of the firms neither repurchased shares or increased dividends, 22% increased dividends and didn't repurchase stock (meaning didn't repurchase at least 1% of market value), 18% repurchased over 1% of market value and did not increase dividends, and the remaining 13% both repurchased shares and increased dividends.

The results of the estimation of the propensity of falling into the four payout regimes is presented for a parsimonious specification in Table 12. Besides total and CEO options, lagged investment, lagged cash flow, and Tobin's q are included in the specification. Since the coefficients are difficult to interpret, the partial derivatives of the probability of choosing a particular payout are evaluated at the sample means and reported in Table 12 as well.

The results are broadly consistent with those obtained earlier. The marginal effects imply that a firm with a stock option program representing 10% of outstanding shares is about 18 percentage points more likely to repurchase stock and not increase dividends and 20 percentage points more likely to neither repurchase shares or raise dividends relative to a firm with no stock option program. Retained earnings can perhaps be used to repurchase stock at a later date, whereas dividend increases lower the cash available for other activities such as stock buybacks. It comes as no shock that the firm with outstanding options is estimated to be 26% less likely to not buyback stock and increase dividends.[27]

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[27] If a dividend increase is instead defined as a increase in dividends per share (as opposed to dividends normalized by market value) the estimated marginal probabilities and associated standard errors are as follows for the total outstanding options variable:

RP = 1 & DIV ↑ = 0: 1.362 (.368), RP = 1 & DIV ↑ = 1: -.324 (.576), RP = 0 & DIV ↑ = 1: -3.695 (.709), RP = 0 & DIV ↑ = 0: 2.658 (.657)

The effect of CEO options on corporate policy is less pronounced given the imprecise estimates. A one percentage point increase in CEO options, holding total options constant, is associated with a 3.1% point fall in the probability the firm repurchases shares and does not increase dividends (t-statistic = 1.88), with most of the probability shifting to the retention of earnings regime.

The marginal effects of investment and q are also worthy of attention. Consistent with earlier results, lagged investment is negatively correlated with subsequent decisions to repurchase stock. This raises the possibility that share repurchases may at least partially be a marginal source of investments. Given the favorable tax treatment of repurchases over dividends for individual investors, the more share repurchases are adjusted in response to investment needs, the higher is the after-tax return investors will receive in lieu of further investment in the firm, and thus the higher is the firm's user cost of capital. Further work is needed to better determine the relationship between investment needs and movement by the firm along the equity issuance/repurchase margin. At a minimum, the growth in share repurchases and the evident link between share buybacks and lagged investment justifies a re-examination of "trapped equity" models of investment.

Tobin's q lowers the probability of a share repurchase and no dividend increase, and increases the probability a firm does not repurchase more than 1% of market value but does increase dividends. This is consistent with the free cash flow model applying to share repurchases and signaling models applying to dividend increases (Bernheim (1991) and others discuss how dividends are an effective signal of firm quality because of the high tax cost associated with their use).

An underlying assumption of the multinomial logit model is that the choice between alternative A and B is independent of the availability of alternative C, after controlling for the explanatory variables. Hausman & McFadden (1984) suggest a specification test which is conducted by dropping one or more choices from the model and testing for a change in the coefficients for the remaining alternative(s). I conduct the test by dropping the firms that repurchased shares and increased dividends and dropping the firms that only increased dividends. One cannot reject the null hypothesis of correct specification. Further, no coefficient estimate changes in value by more than its standard error when the two alternatives are deleted, and the options variables in particular are unchanged.

4.3 Other Robustness Checks

I find that while total options are strongly correlated with share repurchases, options held by the CEO if anything decreases buyback propensity. Previous work concluded that CEO option holdings were driving share repurchases. It is natural to wonder what is driving the discrepancy in results.

First, it is worth pointing out that my sample is considerably larger and more recent, and my data is of better quality. I focus on actual rather than announced share repurchases. I am also able to distinguish between whether the relationship between stock options and share repurchases is driven by CEOs maximizing the value of their own stock-based compensation, or instead reflects a more prevalent desire to fund option programs with repurchased shares regardless of the composition of the CEO's compensation. For example, a weak positive relationship between share repurchases and the option holdings of the CEO or top 5 executives of the firm evaporates when outstanding options for all employees are included in the regressions.

Table 13 provides some robustness tests by adding alternative covariates to the basic Tobit specification of Table 9. For example, the general relationship between option programs and stock buybacks is unaffected by the ratio of CEO options to total options or the option holdings of the top 5 executives.

As an alternative measure of how "important" option-based compensation is to the CEO, I divide the market value of the stock underlying the CEO's options by the CEO's annual cash salary and bonus. CEOs for whom this ratio is large may be more concerned with the value of their options, and hence how payout policy impacts their value, relative to firms for whom this is small. The median value of this ratio in the sample is 7.5 and the mean is 11.8. A ratio of eight would indicate that a dividend payout of 5% would reduce the value of the stock underlying his/her options by 40% of annual salary. This ratio is negatively correlated with stock buybacks (t - statistic = 1.37) and its inclusion does not alter the impact of total outstanding options.

Finally, one could argue that agency problems and decisions about the composition of distributions extend below the CEO. Perhaps total outstanding options is a better proxy for "decision makers" option holdings than those of the CEO or top 5 executives. Or perhaps those with influence over the distribution decision take into account how payout policy will impact the value of their employees' options in general, regardless of whether they personally have any wealth in options. An indirect method of testing this is to include the ratio of exercisable options to options outstanding in the regression. The "funding hypothesis" suggests that firms whose options may be exercised now will be more likely to buy back stock than firms whose options are not yet exercisable.[28] The "agency hypothesis" does not predict any relationship between the

[28] One would expect a positive, but weak relationship given that many options become exercisable within a couple years from the date of grant, but need not be exercised for up to ten years. Also, unexercisable options at the beginning of the year may become exercisable by year-end.

fraction of options which are exercisable and share repurchases, as payout policy impacts the value of exercisable and unexercisable options in the same manner. The last column of Table 13 reveals that the amount of exercisable options is a positive and significant predictor of share buybacks.

4.4 Interpretation of Causality

First, a cross-sectional analysis cannot rule out that some firm-specific effect is driving the correlation between options and payout policy. One possibility, raised by Jolls and others, is that a correlation between share repurchases and option programs could reflect an underlying shareholder preference for share repurchases. Under this scenario, the option program is thus approved by shareholders to provide top executives with the incentive to carry out share buybacks as opposed to dividend increases, and thus the causality underlying the correlation is reversed.

Such reasoning also implies that firms whose shareholders prefer dividends to share repurchases should set up compensation to induce those distributions. For example, dividend-protected options, dividends declared on stock while the option is outstanding accrue in an account, should be granted to CEOs of firms whose shareholders prefer dividends. In my sample of 827 firms, only two firms mention in proxies that their options are dividend-protected, Lyondell Petrochemical and Atlantic Richfield. Given that some firm's shareholders may prefer dividends, but only two of 827 firms have dividend-protected options, the reverse causality argument that variation in shareholder preferences across firms is driving the correlation between repurchases and options results is somewhat weakened.

A shareholder preference for share repurchases would likely arise because of its tax treatment relative to dividend income for individual investors. However, there is essentially no

cross-sectional correlation between the proportion of direct individual ownership in corporations and the propensity of that firm to buy back stock. Further, the estimated link between option programs and share repurchases is generally unaffected when firm covariates are added.[29] This suggests that if there is some omitted factor like management skill or corporate governance driving the relationship, it must be uncorrelated with all the observable firm characteristics included in the specifications.

If the compensation board wants to distribute a certain amount of wealth to its employees via stock options, it may adjust option grants to reflect the past distribution policy of the firm. Thus, the interpretation of the options coefficient could be clouded by reverse causality. However, I would argue if present at all, this endogeneity would bias downward the options coefficient in a share repurchase reduced form. For example, suppose there are two firms which are identical, except one pays dividends and the other repurchases shares. If each firm wants to distribute the same amount of wealth to employees via stock options, the dividend-paying firm will have to grant *more* options to compensate for the reduction in the option value when a dividend is paid.

A second issue is the interpretation of the relationship between firm payouts and the other financial variables such as investment and cash flow, which clearly belong in regressions of distributions. Obviously, firms make decisions over many financial variables simultaneously. Assuming firms have access to external financing, and since most models focus on investment opportunities and decisions as the primary determinant of firm value, it is natural to think of distributions responding on the margin to investment needs rather than the reverse. Given

[29] When only total outstanding options and CEO options are included in the Tobit specification of share repurchases, the coefficient on total options / shares outstanding is .214 (.064). When firm financial characteristics and industry controls are included the coefficient is .195 (.068).

perfect measurement of investment opportunities (Tobin's q), the coefficient on lagged cash flow can also be given a causal interpretation. However, since the form of distributions can potentially impact future investment through changing the user cost of capital, feedback effects are possible. Further, mismeasurement of q could potentially cloud interpretation of the coefficient on cash flow.

My response to this is two-fold. First, this paper analyzes the link between option programs, CEO compensation, and payout policy of firms in the mid 1990s. While the impact of other variables upon distributions is also of interest, that is not the focus of this paper. Establishing that the estimated impact of options upon payouts is not too sensitive to the inclusion of other relevant firm-specific variables, which may be partly endogenous, is confirming evidence for the options effect. Second, it is nearly impossible to find truly exogenous shocks to investment, which wouldn't also be correlated with shocks in cash distributions.[30] This does not mean we should give up, but it does mean we should be explicit about what we are estimating and how we interpret the estimates.

V. Stock Option Exercises

So far I have focussed attention on the impact of option programs upon future distribution decisions. Tables 14 and 15 instead present evidence on the dilution stock option exercises create during the year of exercise and document how well trends in stock option exercises match trends in stock buybacks over the past five years.

[30] If the data set was firms in 1987 rather than 1995, one could use variation across firms in the composition of capital as an instrument for investment. Elimination of the equipment tax credit raises the cost of capital disproportionately for equipment-intensive firms.

Table 14 presents estimates of the dilution of shares outstanding in 1994 upon option exercises in 1994 both with and without other firm covariates. The coefficient of one from the median regression suggests up to half of the firms at least partially fund option exercises by repurchasing shares during the year of exercise.

I also obtain data from 1993-97 for all the non-bank and utility firms who are currently a member of the S & P 100 and/or the Dow Jones Industrial Index. I also exclude CBS and Columbia/HCA Healthcare who do not have option data over the five year period from the sample. This leaves a panel of 98 firms. Table 15 demonstrates both the yearly dilution resulting from option exercises and the growth of stock option exercises in the mid 1990s. Except for 1993, the median dilution resulting from stock option exercises is around .35-.5 and significantly less than one. Perhaps most striking is how the growth in stock option exercises matches fairly closely the growth in share repurchases in the mid 1990s. For example, at the same time the share repurchase payout rate increased from .009 to .025 from 1993-97, the market value of the stock options exercised (normalized by firm value) increased from .007 to .015 for these 98 firms. Given the growth of stock-based compensation since the early 1990s, one would expect option exercises to increase in the future. If the past five years is any indication, this should have ramifications for future corporate distributions.

VI. Conclusion

There are many possible motivations for firms to use cash to repurchase their own stock. This paper has focused on the role of stock option programs in explaining the surge in corporate buybacks in the mid 1990s. Determining what is underlying this change in corporate payout

policy is essential if one is to assess whether the trend will continue, to what extent the form of CEO compensation impacts firm payout policy, and ultimately what the repercussions are for firm value.

Previous work has focused on incentives provided by CEO compensation to avoid dividend payments, which reduce the value of outstanding options. Substituting share repurchases for dividends will indeed increase the value of outstanding options, but so will an increased retention of earnings. Firms may also have an incentive to fund option plans with repurchased equity as opposed to issuing new shares, so as to not immediately dilute such measures as earnings per share.

Collecting CEO compensation and option program data at the end of fiscal year 1994 for a sample of over 800 corporations enables me to identify what is driving the link between stock options and share buybacks. I find that total options outstanding is a strong predictor of share buybacks, regardless of the composition of CEO compensation. CEO option holdings is a strong predictor of the earnings retention of firms over 1995-96. There is no cross-sectional relationship between share repurchases and the level of direct individual ownership in the firm, as tax motivations would suggest.

The immediate dilution of outstanding shares, which would occur if new shares were issued to finance option programs, would makes the cost of stock options apparent. An option program accompanied by share repurchases, on the other hand, lowers cash reserves of the firm, but won't impact current earnings from operations or dilute shareholder's ownership share of the firm. A clever analyst can likely ascertain the liability outstanding stock options represent. Nonetheless an option program combined with a repurchase program makes it more difficult to observe this liability, and some naïve investors may not appropriately account for it.

Given the growth in stock-based compensation in corporate America, one is left to ponder: To what extent has the market already capitalized into share value the ultimate cost that options exercised in the next ten years will represent? If the market hasn't yet, will it in the future? One of the golden rules of economics is that there is no free lunch, although Warren Buffet, CEO of Berkshire Hathaway, seems to believe many of his colleagues have found one in the form of option-based compensation.

> [Some contend] that options should not be viewed as a cost because they "aren't dollars out of a company's coffers." I see this line of reasoning as offering exciting possibilities to American corporations for instantly improving their reported profits. For example, they could eliminate the cost of insurance by paying for it with options. So if you're a CEO and subscribe to this "no cash-no cost" theory of accounting, I'll make you an offer you can't refuse: Give us a call at Berkshire Hathaway and we will be happy to sell you insurance in exchange for a bundle of long-term options of your company's stock. (Warren Buffett, Letter to Shareholders, Berkshire Hathaway, Inc., 1992 Annual Report, taken from Revsine, Collins, & Johnson (1999).)

It should come as no surprise that Berkshire Hathaway has a policy of converting all option programs of companies it acquires to cash based compensation. "The acquiree's true cost is thereby bought out of the closet and charged, as it should be, against earnings (Warren Buffett, *Forbes*, May 18, 1998)."

What does this suggest for future trends in corporate policy? Clearly there is a reluctance for corporations, especially large firms, to increase outstanding shares in response to option programs. Given the increase in the "optionization" of compensation, and the absence of a substantial pre-funding of options (there is a small number of repurchased shares held in Treasury among those firms with option programs), I would expect share repurchases to continue to grow. The difference between the top individual tax rate on labor income and the long-term capital gains rate was increased by the Tax Payer Relief Act of 1997, further suggesting

corporations will have an incentive to substitute capital gains income for labor income to reduce their employees' tax liability.

This paper suggests four avenues for further research. First, to what extent is stock-based compensation capitalized into share prices? While the cost of cash-based compensation is incurred by the firm immediately, the ultimate cost of stock-based compensation is uncertain when granted and is realized in the future. Feldstein & Seligman (1981) and Bulow, et al. (1987) find that a corporation's unfunded pension liability is capitalized into share prices. Other examples of research in this vein include studies of whether property taxes are capitalized into housing values and whether municipal bond prices reflect budgetary institutions. While collecting the data on the distribution of exercise prices for outstanding options for a large cross-section of firms may be daunting, future research into whether option programs are accounted for in stock prices would be fruitful.

Second, how should the market view repurchase announcements by firms with large numbers of outstanding options? The positive excess return surrounding announcements has been well documented, but given that the repurchased shares will likely be shortly re-issued, there is little permanent purging of free cash flow from the firm. On the other hand, the option programs funded with repurchased shares transfer stock from outsiders (tendering shareholders) to insiders (employees). This increased insider ownership may reduce agency problems by aligning the incentives of employees and shareholders and thus increase firm value.

Third, more work needs to be done investigating the link between investment needs and distributions. Share repurchases have grown dramatically in the mid 1990s and their inherit flexibility allows then to serve multiple purposes (Jagannathan, et al. (1998) discuss the flexibility of share repurchases). Relative to dividends, they may be a more suitable marginal

source of investment funds. To the extent that investment needs are being financed at least partially by movements along the equity repurchase/issuance margin, that should cause us to rethink the correct view of the cost of capital and the benefits of corporate and personal tax integration.

Finally, this paper set out to explore recent trends in corporate cash distributions. In doing so, it also revealed the growth of stock-based compensation. A survey by Share Data indicates 45% of companies with option plans and 5000 or more employees now grant options to all of their workers. Three years ago only one in ten firms did. Further, 74% of companies with option plans and less than $50 million in sales offered stock option plans to all of their workers. Stock-based compensation is no longer for top executives only. This raises questions as to how general workers value stock option grants as opposed to cash compensation, especially risk-averse individuals. The analysis in Huddart and Lang (1996) and Heath, Huddart, & Lang (1998) suggests employees may be sacrificing substantial value by exercising options substantially before the expiration date. Also, not accounting for growing stock-based compensation in standard measures of labor income likely leads to an understatement of real wage growth in the U. S. the past few years.

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Table 1: Aggregate Payout Policy for S & P 500 Firms 1977-1996 (in billions of 1996 $)

	$ Share Repurchase	$ Share Repurchases less $ Sale of Stock for Repurchasing Firms	$ Sale of Stock	$ Dividend	Share Repurchase Payout Rate	Dividend Payout Rate
1977	6.6	2.8	19.3	74.5	.004	.044
1978	6.5	1.3	16.6	76.8	.005	.054
1979	7.0	-.6	20.2	78.3	.005	.058
1980	8.3	.1	26.0	77.9	.006	.058
1981	7.4	1.0	35.9	78.7	.005	.049
1982	12.5	3.5	32.2	78.0	.009	.056
1983	10.4	-.6	39.6	80.5	.007	.052
1984	38.0	28.5	23.6	81.3	.021	.042
1985	53.0	37.7	32.8	81.2	.031	.047
1986	47.4	27.6	37.5	88.6	.023	.043
1987	57.5	39.8	29.3	90.5	.025	.039
1988	58.8	47.9	17.3	106.2	.026	.046
1989	51.5	28.0	29.4	93.5	.022	.041
1990	44.3	34.2	18.2	92.7	.016	.034
1991	22.7	9.3	33.4	90.4	.009	.036
1992	28.6	17.7	35.7	91.6	.009	.030
1993	34.9	18.4	37.0	92.2	.011	.030
1994	40.0	26.6	26.7	92.2	.012	.028
1995	63.3	48.8	22.3	104.7	.019	.032
1996	75.4	51.4	36.4	98.9	.018	.023

Source: Compustat files.
Share repurchases, sale of stock, and dividends are totals for common stock. The denominator for the payout rate is the aggregate market value at the end of the previous year. The CPI-U index taken from the *1998 Economic Report of the President* is used to convert all dollar totals into 1996 dollars.

Table 2: Prevalence and Magnitude of Share Repurchases for NYSE and S & P 500 Firms
(equally weighted and weighted by market capitalization)

	% of firms								Repurchase Payout			
	Does firm repurchase any stock?		Does firm repurchase more than 1% of market value (RP > .01)?		RP > .01 in 1 of Last 3 years?		Given RP > .01, does firm sell shares in same year?		Median of distribution (given repurchase)		95th% of distribution (given repurchase)	
	Equally weighted	Weighted by value	Equally weighted	Weighted by value	Equally weighted	Weighted by value	Equally weighted	Weighted by value	Equally weighted	Weighted by value	Equally weighted	Weighted by value
1980	.25	.30	.13	.17	.27	.28	.49	.64	.010	.013	.172	.057
1984	.34	.40	.19	.28	.33	.37	.37	.37	.015	.024	.175	.146
1988	.43	.55	.25	.36	.47	.57	.33	.38	.015	.018	.130	.130
1992	.32	.49	.16	.27	.39	.47	.48	.38	.009	.013	.087	.050
1996	.37	.54	.24	.36	.40	.51	.44	.53	.018	.019	.112	.079

Notes: "RP > .01" means share repurchases exceeded 1% of firm's market value at beginning of year. A firm is defined as selling shares if sales from stock exceeded .05% of firm's market value at the beginning of the year. "Weighted by value" means statistics are weighted by a firm's market capitalization at the beginning of the year. "Repurchase payout" is share repurchases normalized by the market value at the beginning of year.

Table 3: Weighted Average Marginal Tax Rates & Individual Ownership of Corporate Equity in U. S. 1977-1996				
	Average Marginal Tax Rate on:			
	Dividends	Accruing Capital Gains	Difference between Div. and Accruing Capital Gains	Direct Individual Ownership of Corporate Equity
1977	.259	.057	.202	.545
1978	.250	.055	.195	.525
1979	.262	.042	.220	.542
1980	.269	.042	.227	.562
1981	.266	.042	.224	.545
1982	.208	.035	.173	.518
1983	.202	.034	.168	.494
1984	.183	.032	.151	.474
1985	.177	.032	.145	.473
1986	.181	.032	.149	.467
1987	.170	.045	.125	.460
1988	.147	.046	.101	.452
1989	.149	.047	.102	.439
1990	.143	.046	.097	.441
1991	.149	.046	.103	.470
1992	.152	.047	.105	.479
1993	.162	.047	.115	.464
1994	.159	.047	.112	.439
1995	.160	.048	.112	.449
1996	.159	.048	.111	.422

Source: Poterba (1998) for weighted tax rates and Poterba & Samwick (1995) and *Flow of Funds* for ownership. "Direct" individual ownership of corporate equity is direct household ownership as reported in the Federal Reserve's *Flow of Funds*, adjusted to subtract out holdings of nonprofit institutions. It does not included tax-deferred holdings through annuities or pension plans and does not include mutual fund holdings.

Table 4: Optionization and its "Funding" for NYSE and S & P 500 Firms 1985-1996						
	Options / Shares Outstanding				Shares held in Treasury / Options	
	Unweighted		Weighted by market value		Unweighted	Weighted
	Median	90th%	Median	90th%	Median	Median
1985	**.0451**	**.1149**	**.0303**	**.0812**	**.0273**	**.1045**
1986	.0467	.1203	.0302	.0866	.0184	.1216
1987	.0459	.1221	.0377	.0892	.0077	.1166
1988	.0479	.1310	.0360	.0845	.0614	.1848
1989	.0506	.1430	.0353	.0852	.0486	.2235
1990	**.0538**	**.1479**	**.0346**	**.0941**	**.0470**	**.3236**
1991	.0575	.1624	.0370	.0885	.0315	.3368
1992	.0575	.1639	.0406	.1015	.0160	.2392
1993	.0562	.1602	.0422	.1034	.0046	.2148
1994	.0597	.1551	.0449	.1179	0	.0507
1995	.0650	.1639	.0469	.1154	0	.0170
1996	**.0720**	**.1608**	**.0535**	**.1239**	**.0022**	**.1223**

"Options" refers to shares reserved for options (annual data item 215 in Compustat) at the beginning of the year. This measures options currently outstanding and those available for future grants. "Shares held in Treasury" refers to shares of common stock held in the firm's Treasury (annual data item 87) normalized by shares outstanding. Shares held in Treasury are not counted as outstanding and reflect repurchased shares that have not been re-issued as of yet. Weighted statistics are weighted by firm market capitalization.

"Shares reserved for options" overstates outstanding options, which Compustat does not report, since it also includes the number of shares available for future grants under existing plans. The correlation of shares reserved for options with outstanding options was .88 and the median ratio of total outstanding options to total shares reserved for options was .7 in a sample of 827 firms at the end of 1994 I constructed.

Table 5: Compensation of CEOs of Large Firms 1985-1994								
	Annual Salary + Bonus (in thousands 1994 $)			Value of Options granted Using Black-Scholes (in thousands 1994 $)			Options granted normalized by shares outstanding	
	Mean	Median	90th%	Mean	Median	90th%	Median	90th%
1985	826	702	1421	412	0	840	.0000	.0223
1986	932	795	1497	395	59	935	.0002	.0240
1987	966	847	1622	511	84	1249	.0004	.0333
1988	1050	936	1754	530	59	1175	.0003	.0323
1989	1050	945	1753	654	50	1362	.0003	.0372
1990	1017	871	1781	764	62	1390	.0006	.0546
1991	995	857	1741	845	153	1986	.0011	.0604
1992	1061	852	1901	1144	227	2130	.0031	.0556
1993	1187	946	2051	887	240	1979	.0032	.0675
1994	1284	1036	2205	1271	307	2950	.0052	.0933

Brian Hall provided this data on CEO compensation. The data essentially covers the largest publicly traded companies in the U. S. To be included in the sample a firm must have been included in one of the *Forbes* 500 lists (sales, profits, assets, and/or market value) at least four times between 1984-94. I drop firms that do not have data on salary, option grants to CEO, and the estimated value of the grant. Coverage ranges from a maximum of 397 companies in 1987 to a minimum of 342 in 1994. See Hall and Liebman (1998) for further description of the data.

Table 6: Option Exercises, Share Repurchases, & Dilution fiscal years 1993-97 (S & P 100 and Dow Jones firms with option exercises over 93-97 exceeding 10% of shares outstanding)				
	(Option Exercises 1993-97) / (Shares Outstanding at end of 1992)	% Δ Shares Outstanding 1993-97	Share Repurchases 1993-97 (million $)	Repurchases 93-97 / Net Income 93-97
Aluminum Co. of America	.15	-.02	1396	.55
Cisco Systems	.15	.39	508	.18
Computer Sciences Corp.	.11	.57	0	0
Merrill Lynch	.10	-.19	3788	.55
Microsoft	.20	.11	5609	.61
Monsanto	.11	-.01	1111	.44
National Semiconductor	.15	.49	123	.20
Tektronix	.13	.10	76	.17
Travelers	.25	.72	3311	.37

Source: Annual Reports to Shareholders 1993-1997.
All numbers adjusted for stock splits.

Table 7: Share Repurchases, Option Exercises, and Earnings for Microsoft (fiscal years 1993 – 1997)						
	Share Repurchases		Exercised Options		Net Income	Shares Outstanding at end of year
	Million $	# of shares (millions)	Million $	# of shares (millions)	Million $	# of shares (millions)
FY 1993	250	12	208	52	953	1128
FY 1994	348	18	239	42	1146	1162
FY 1995	649	24	278	35	1453	1176
FY 1996	1261	26	421	40	2195	1194
FY 1997	3101	37	597	45	3439	1204
Total	5609	117	1743	214	9186	-

Source: Microsoft Annual Reports to Shareholders 1993-1997.
All share numbers adjusted for stock splits.
Number of shares outstanding at the end of fiscal year 1992 was 1088 million.

Table 8: Summary Statistics for Option Programs, CEO Compensation, & Distributions for 827 Firms drawn from *Forbes*, S & P 500, and MidCap 400 at end of 1994			
	Mean & std. deviation	Median	$10^{th} - 90^{th}$%
Total Options Outstanding normalized by shares outstanding at end of 1994	.057 (.047)	.046	.013 - .115
CEO Options Outstanding normalized by shares outstanding at end of 1994	.007 (.011)	.004	.000 - .016
CEO Options / Total Options	.124 (.116)	.090	.018 - .256
Exercisable Options / Total Options	.520 (.219)	.506	.239 - .811
CEO Salary + Bonus in thousands of $	1209 (1342)	956	445 – 1999
Direct Individual Ownership end of 94	.38 (.19)	.36	.16 - .64
Prob(Repurchase > 0)	.49 (.50)		
Prob(Repurchase > .01*Market Value)	.31 (.46)		
REPURCHASES in 1995 / ASSETS end of 1994	.016 (.041)	0	0 - .052
REPUCHASES in 1995 & 1996 / ASSETS end of 1994	.041 (.086)	.006	0 - .115
Prob(DIVIDEND > 0)	.75 (.43)		
DIVIDENDS in 95 / ASSETS end of 1994	.018 (.024)	.012	0 - .043
REPURCHASES / (Total Cash Payouts) in 1995	.31 (.35)	.15	0 - .90

See Appendix for other characteristics of sample and distribution across industries.

Table 9: Regressions of Share Repurchases in 1995

Dep. Variable = REPURCHASES in 95 / ASSETS at end of 1994

Coefficients from Tobit specification are reported

Total Outstanding Options / Shares Outstanding	**.177 (.055)**		**.224 (.065)**	**.195 (.068)**
CEO Outstanding Options / Shares Outstanding		**.118 (.251)**	**-.404 (.295)**	**-.168 (.306)**
Individual Ownership of Firm	.004 (.014)	-.003 (.014)	.003 (.014)	.000 (.015)
Lagged Investment	-.299 (.051)	-.284 (.050)	-.303 (.051)	-.224 (.058)
Lagged Cash Flow	.297 (.052)	.286 (.052)	.297 (.052)	.261 (.054)
Tobin's q	-.001 (.004)	.000 (.004)	-.001 (.004)	-.003 (.004)
Cash on hand at end of 94	-.024 (.023)	-.006 (.023)	-.028 (.024)	-.008 (.024)
Long-term Debt at end of 94	-.057 (.017)	-.056 (.017)	-.056 (.017)	-.059 (.020)
Price Appreciation in 1994	-.010 (.010)	-.008 (.010)	-.010 (.009)	-.008 (.010)
Log(Value in millions of $)	.007 (.002)	.006 (.002)	.006 (.002)	.006 (.002)
Constant	-.072 (.018)	-.057 (.019)	-.066 (.019)	-
Industry Controls	No	No	No	Yes
Log Likelihood	320.4	315.5	321.3	356.8
Sample Size	781	781	781	781
Scaling Factor for Marginal Effect	.649	.568	.415	

See text and Appendix for variable descriptions.
Investment, cash flow, cash on hand, and debt are normalized by total assets at end of previous year.
Scale factor for computing marginal effects is calculated at the means of the covariates.
Forty-six of the 827 observations are lost with the inclusion of the non-option covariates.

Table 10: Regressions of Share Repurchases and Share Dilution

Marginal Effects reported from Probit in columns (1) – (2)
Coefficients from Tobit specification in columns (3) – (4)
Coefficients from Quartile Regressions reported in columns (5) – (6)

	(1)	(2)	(3)	(4)	(5)	(6)
	Dep. Variable = Probability (RP > .01 in 1995)		*Dep. Variable: (Repurchases in 95 & 96) / ASSETS*		Dep. Variable: *% Δ in Shares Outstanding 1995*	
					Median	25th percentile
Total Outstanding Options / Shares Outstanding	**1.065 (.434)**	**.922 (.484)**	**.346 (.112)**	**.294 (.115)**	**.126 (.022)**	**.051 (.045)**
CEO Outstanding Options / Shares Outstanding	**-2.563 (1.987)**	**-1.172 (2.125)**	**-.228 (.480)**	**-.147 (.483)**	**-.110 (.089)**	**.053 (.195)**
Individual Ownership Of Firm	-.138 (.094)	-.159 (.105)	.026 (.023)	.026 (.024)	-.006 (.003)	-.003 (.005)
Lagged Investment	-1.594 (.354)	-1.077 (.426)	-.428 (.078)	-.304 (.087)	.032 (.011)	.050 (.018)
Lagged Cash Flow	1.577 (.361)	1.285 (.393)	.397 (.084)	.273 (.083)	-.028 (.016)	-.039 (.021)
Tobin's q	-.113 (.030)	-.123 (.033)	.004 (.007)	.001 (.007)	.000 (.001)	.001 (.002)
Cash on hand at end of 94	.042 (.163)	.133 (.176)	-.064 (.041)	-.040 (.042)	.014 (.007)	.014 (.013)
Long-term Debt at end of 94	-.291 (.118)	-.387 (.145)	-.072 (.028)	-.080 (.031)	.004 (.004)	.009 (.006)
Price Appreciation in 1994	-.122 (.066)	-.137 (.073)	.066 (.015)	.079 (.015)	.011 (.003)	.003 (.006)
Log(Value in millions of $)	.062 (.015)	.070 (.017)	.008 (.004)	.008 (.004)	.000 (.001)	-.001 (.001)
Constant	-	-	-.080 (.031)	-	.002 (.004)	-.001 (.009)
Industry Controls	No	Yes	No	Yes	No	No
Log Likelihood	-446.0	-404.3	209.6	246.1	-	-
Sample Size	781	781	770	770	781	781

See notes below Table 9. "RP > .01" means share repurchases during the year exceeded 1% of the value of the firm at the beginning of the year.
Factor to convert Tobit coefficients into marginal effects evaluated at the sample mean is .478.
Standard errors for quartile regressions are estimated by bootstrap resampling (500 iterations).

Table 11: Regression of Retention Rate of Earnings over 1995-96

Dep. Variable = 1 – (Dividends & RP in 1995-96) / (Earnings in 1995-96)

	Robust Regression	Robust Regression	Median Regression	Median Regression
Total Outstanding Options / Shares Outstanding	**-.591** **(.446)**	**-.456** **(.454)**	**-.752** **(.908)**	**-1.229** **(.839)**
CEO Outstanding Options / Shares Outstanding	**3.594** **(1.688)**	**3.326** **(1.722)**	**3.024** **(2.487)**	**4.218** **(2.295)**
Individual Ownership of Firm	-.074 (.081)	-.038 (.084)	-.050 (.125)	-.075 (.133)
Tobin's q	.031 (.188)	.077 (.020)	.020 (.042)	.094 (.031)
Cash on hand at end of 94	.176 (.144)	.036 (.149)	.286 (.316)	.119 (.289)
Long-term Debt at end of 94	.254 (.100)	.316 (.112)	.319 (.165)	.409 (.143)
Price Appreciation in 1994	.142 (.054)	.166 (.055)	.156 (.113)	.143 (.096)
Log(Value in millions of $)	-.068 (.013)	-.056 (.013)	-.062 (.017)	-.047 (.019)
Constant	.969 (.110)	-	.921 (.168)	-
Industry Controls	No	Yes	No	Yes
Sample Size	680	680	680	680

Standard errors for median are calculated based on bootstrapped distribution (500 iterations).
Earnings is income before extraordinary items (annual data item 20 in Compustat). Firms with negative earnings over period are excluded.
See text and Appendix for variable descriptions.
Cash and Debt are normalized by total assets at end of 1994.

Table 12: Multinomial Logit Analysis of Payout Decisions

4 Regimes:
RP = 1 & DIV ↑ = 0
RP = 1 & DIV ↑ = 1
RP = 0 & DIV ↑ = 1
RP = 0 & DIV ↑ = 0

(RP = 1 if repurchase/market value > .01 in 1995
DIV ↑ = 1 if dividend payout in 1995 exceeds the average over 1992-94 where dividend payout rate = dividend / market value)

Coefficients from Multinomial Logit Model

	RP = 1 & DIV ↑ = 0	*RP = 1 & DIV ↑ = 1*	*RP = 0 & DIV ↑ = 1*	*RP = 0 & DIV ↑ = 0*
Total Outstanding Options / Shares Outstanding	**7.893 (2.426)**	**-14.278 (4.197)**	**-16.045 (3.539)**	Base case
CEO Outstanding Options / Shares Outstanding	**-24.731 (12.433)**	**-7.501 (19.280)**	**.779 (14.855)**	Base case
Lagged Investment	-9.265 (2.440)	-9.911 (2.612)	-3.321 (1.581)	Base case
Lagged Cash Flow	10.005 (2.532)	15.613 (2.763)	10.5311 (2.245)	Base case
Tobin's q	-1.083 (.267)	.114 (.199)	.298 (.168)	Base case
Constant	-.002 (.346)	-1.955 (.315)	-1.493 (.261)	Base case

Estimated Marginal Effect Upon Probability of Payout Regime

	RP = 1 & DIV ↑ = 0	*RP = 1 & DIV ↑ = 1*	*RP = 0 & DIV ↑ = 1*	*RP = 0 & DIV ↑ = 0*
Total Outstanding Options / Shares Outstanding	**1.805 (.355)**	**-1.166 (.496)**	**-2.590 (.606)**	**1.950 (.634)**
CEO Outstanding Options / Shares Outstanding	**-3.143 (1.676)**	**-.330 (1.867)**	**1.111 (2.386)**	**2.363 (2.573)**
Lagged Investment	-.938 (.388)	-.738 (.350)	-.019 (.288)	1.694 (.392)
Lagged Cash Flow	.709 (.471)	1.123 (.467)	1.022 (.425)	-2.854 (.527)
Tobin's q	-.154 (.037)	.023 (.019)	.082 (.026)	.049 (.039)
Constant	.082 (.046)	-.157 (.048)	-.202 (.049)	.278 (.062)

Model Performance and a Specification Test follow on next page

Table 12 (continued)

Model Performance

Log Likelihood = -858.3

Actual and Predicted Outcomes of Payout Regimes

Actual	Predicted *RP = 1 & DIV ↑ = 0*	*RP = 1 & DIV ↑ = 1*	*RP = 0 & DIV ↑ = 1*	*RP = 0 & DIV ↑ = 0*	Total
RP = 1 & DIV ↑ = 0	8	3	1	124	136
RP = 1 & DIV ↑ = 1	0	4	34	62	100
RP = 0 & DIV ↑ = 1	1	4	55	109	169
RP = 0 & DIV ↑ = 0	14	3	28	320	365
Total	23	14	118	615	770

Specification Test by dropping "*RP = 1 & DIV ↑ = 1*" and "*RP = 0 & DIV ↑ = 1*" regimes

H_0 = Decision between "RP = 1 & DIV ↑ = 0" and "RP = 0 & DIV ↑ = 0" independent of alternatives
H_A = Decision between "RP = 1 & DIV ↑ = 0" and "RP = 0 & DIV ↑ = 0" is not independent of alternatives

Test-statistic: χ^2 (6) = 1.69, p-value = .95

Coefficients for "RP = 1 & DIV ↑ = 0", where "RP = 0 & DIV ↑ = 0" is base case
Log Likelihood = -273.9

Total Options	CEO Options	Investment	Cash Flow	Tobin's q	Constant
7.782	-24.929	-8.910	9.328	-.842	-.314
(2.403)	(12.644)	(2.399)	(2.440)	(.223)	(.279)

See text and Appendix for variable descriptions.
Investment and cash flow are normalized by total assets at end of previous year.
Total and CEO outstanding options are normalized by total shares outstanding.

Table 13: Robustness Checks of Link Between Option Programs, CEO Compensation and Share Repurchases

Dep. Variable = REPURCHASES in 95 / ASSETS at end of 1994

Coefficients from Tobit specification are reported

Total Outstanding Options / Shares Outstanding	.243 (.073)	.209 (.060)	.210 (.058)	.224 (.059)
Ratio of CEO Options to Total Options	-.021 (.025)			
Market Value of Stock Underlying CEO Options / Annual Salary		-.00021 (.00015)		
Top 5 Officer Outstanding Options / Shares Outstanding			-.278 (.204)	
Ratio of Exercisable Options to Total Outstanding Options				.026 (.012)
Scaling Factor for Marginal Effect	.405	.413	.410	.533

Individual ownership, investment, cash flow, Tobin's q, cash on hand, debt, price appreciation, and firm market value are also included in the specifications, but the coefficients are not reported.

Scale factor for computing marginal effects is calculated at the means of the covariates.

Table 14: Stock Option Exercises during 1994

Coefficient from Quartile Regression of % Δ in Shares Outstanding during 1994 upon (Option Exercises / Shares Outstanding)

	Median		25th percentile	
Option Exercises / Shares Outstanding	1.019 (.064)	1.154 (.140)	.116 (.487)	.599 (.275)
Other Controls	No	Yes	No	Yes
Sample Size	816	744	816	744

Investment, cash flow, Tobin's q, cash on hand, debt, price appreciation, industry effects, and firm market value during 1994 are the other controls. Data on stock option exercises was not provided for 11 of the 827 firms.
Standard errors for quartile regressions are estimated by bootstrap resampling (500 iterations).

Table 15: Option Exercises for S & P 100 & Dow Jones Firms 1993-1997

	(Option Exercises * closing price) / Market Value beginning of year	$ Share Repurchases during year / Market Value beginning of year	Coefficient from Median Regression of % Δ in Shares Outstanding upon Option Exercises / Shares Outstanding
1993	.007	.009	.993 (.069)
1994	.005	.012	.385 (.119)
1995	.011	.027	.333 (.137)
1996	.012	.019	.509 (.187)
1997	.015	.025	.442 (.256)

Sample includes 98 of the 108 firms currently listed in the S & P 100 and/or the Dow Jones Industrial indices. Eight banks and utilities are excluded, as are CBS and Columbia/HCA Healthcare (do not have data on option exercises over the past five years).

Appendix

Other Characteristics of 827 Firms Drawn from *Forbes*, S & P 500, and MidCap 400 at end of 1994			
	Mean & std. deviation	Median	$10^{th} - 90^{th}$%
Member of S & P 500 at end of 94	.49 (.50)		
Member of MidCap 400 at end of 94	.37 (.48)		
Market Capitalization at end of 1994 in $M	4046 (8146)	1548	413 – 8567
Lagged Investment / Assets(t-1)	.077 (.067)	.062	.011 - .147
Lagged Cash Flow / Assets(t-1)	.118 (.086)	.114	.029 - .251
Tobin's q	1.77 (.93)	1.49	1.05 – 2.76
Cash Balance(t-1) / Assets(t-1)	.091 (.124)	.044	.006 - .245
Long-term Debt(t-1) / Assets(t-1)	.194 (.173)	.168	.006 - .403
Price Appreciation Over 1994	.000 (.296)	-.022	-.306 - .294
Return in 1995 (including dividend)	.260 (.427)	.229	-.161 - .653
Return in 1995-96 (including dividend)	.509 (.744)	.404	-.186 – 1.189

Correlations Between Variables										
	Total Option	CEO Option	Indiv. Own	Invest-ment	Cash Flow	q	Cash	Debt	Δ Price	Log (size)
Total Options / Shares Outstand.	1.00									
CEO Options / Shares Outstand.	.54	1.00								
Individual Ownership	-.16	-.10	1.00							
Lag Investment / Assets	.04	-.02	-.06	1.00						
Lag Cash Flow / Assets	-.01	-.08	-.11	.41	1.00					
Tobin's q	.09	-.03	-.04	.22	.66	1.00				
Cash on Hand / Assets	.28	.06	-.03	-.04	.16	.38	1.00			
Long-term Debt / Assets	-.03	.05	.04	.05	-.25	-.22	-.32	1.00		
Price Appreciation	.07	.00	-.13	.05	.33	.34	.21	-.09	1.00	
Log(VALUE in millions of $)	-.18	-.26	.00	.03	.22	.22	-.06	-.03	.15	1.00

Sample by Industry Group			
Broad Industry Group	2-digit SIC	# of firms	% of sample
Mining/Construction	10 – 19	46	5.6
Manufacturing	20 – 39	443	53.6
Transportation/Public Service	40 – 49	61	7.4
Wholesale/Retail Trade	50 – 59	123	14.9
Finance/Insurance	60 – 69	87	10.5
Nonfinancial Services	70-79	67	8.1
2-digit SIC groups with more than 25 firms in sample			
28 (Chemicals & Allied Products) 74 firms, 35 (Industrial, Commercial Machinery, & Computer Equipment) 64 firms, 63 (Insurance Carriers) 58 firms, 36 (Electrical Equipment) 43 firms, 73 (Business Services) 34 firms, 20 (Food and Kindred Products) 32 firms, 38 (Measurement Instruments, Photo. Goods, Watches) 31 firms, 48 (Communications) 30 firms, 27 (Printing, Publishing, & Allied Products), 33 (Primary Metal Industries), and 37 (Transportation Equipment) 28 firms			

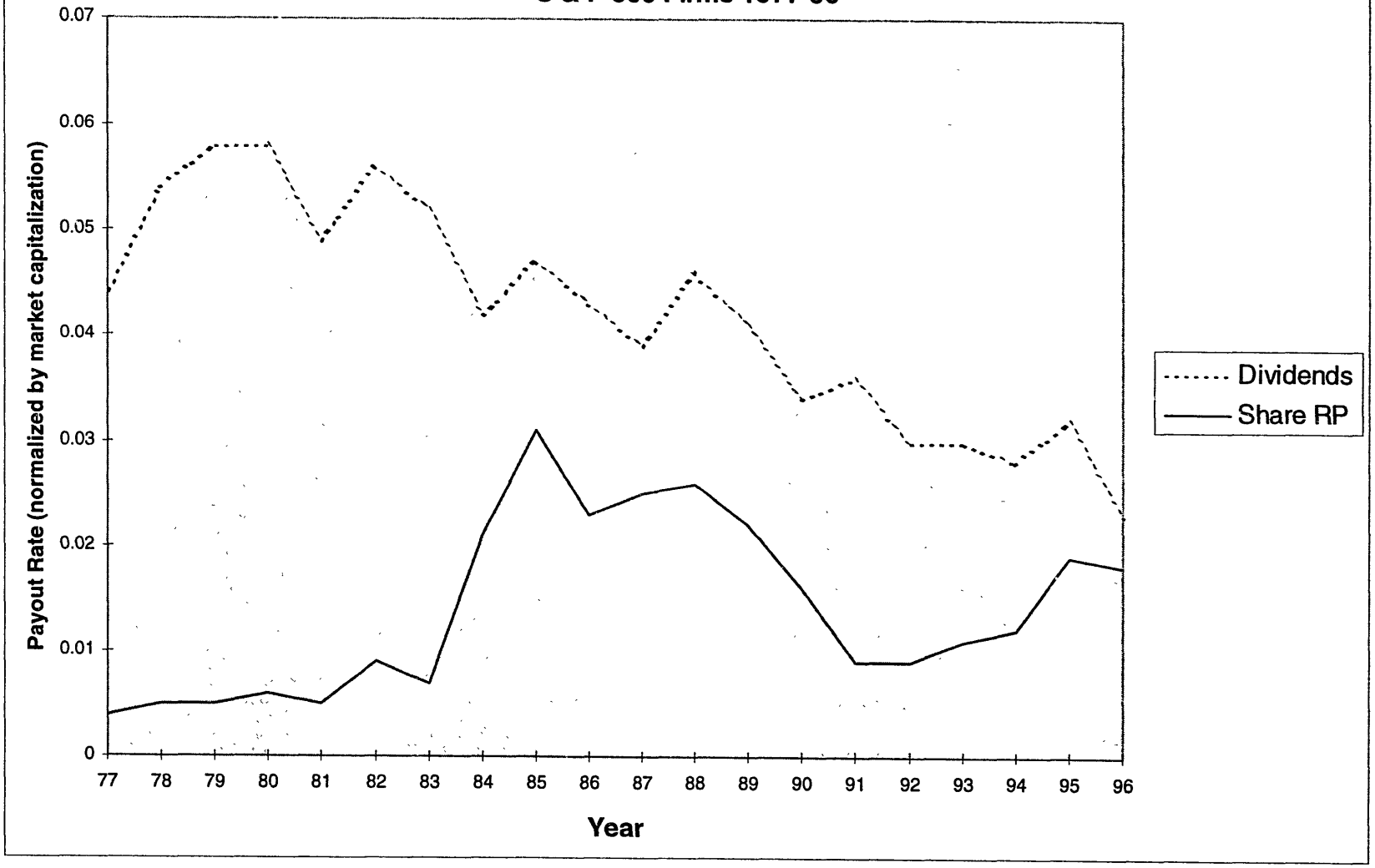
Notes: The sample consists of all publicly traded companies which were a member of the S & P 500 or the MidCap 400 at the end of 1994, or were included in one of the May 1995 *Forbes 500* lists (sales, profits, assets, and/or market value). Corporations in highly regulated industries, such as banks and utilities are excluded. Firms which do not have data in Compustat in 1995 or for whom CEO options and/or total outstanding options are unavailable are dropped. Firms must also have institutional ownership data available at the end of 1994.

Total options outstanding and transactions during the year are obtained from annual reports to shareholders or 10-Ks at the end of fiscal year 1994. CEO options outstanding and salary data are obtained from proxy statements or 10-Ks filed at the end of fiscal year 1994.

Standard & Poor's *Security Owner's Stock Guides* provide institutional ownership data. The S & P data cover investment companies, banks, insurance companies, college endowments, and "13F" money managers. Thus, direct individual ownership excludes household holdings of corporate equity through mutual funds or pension plans.

Investment is capital expenditures for property, plant, and equipment (Compustat annual data item 30). Cash flow is income before extraordinary items (Compustat annual data item 20) plus depreciation (Compustat annual data item 14). Cash on hand is defined as cash and short-term investments (Compustat annual data item 1). Long-term debt is Compustat annual data item 9. Tobin's q is the market value of common and preferred stock plus total liabilities divided by total assets, all measures at the end of 1994. Total liabilities and total assets reflect book values.

Figure 1: Dividend & Share Repurchase Payout Rates for S & P 500 Firms 1977-96



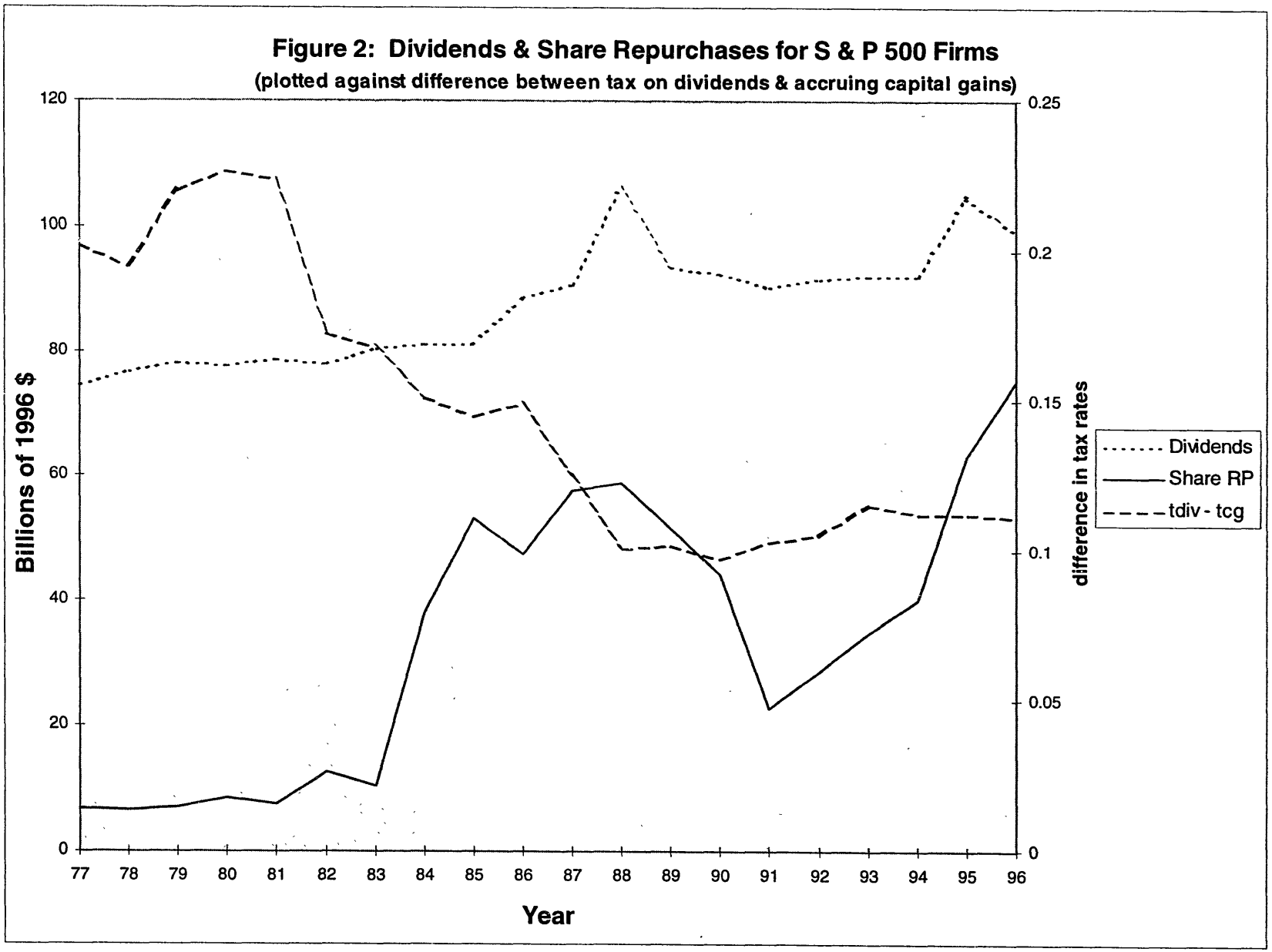


Figure 2: Dividends & Share Repurchases for S & P 500 Firms
(plotted against difference between tax on dividends & accruing capital gains)
Billions of 1996 $
difference in tax rates
Year
Dividends
Share RP
tdiv - tcg
120
100
80
60
40
20
0
0.25
0.2
0.15
0.1
0.05
0
77
78
79
80
81
82
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94
95
96

Figure 3: Ratio of Options Outstanding to Shares Outstanding

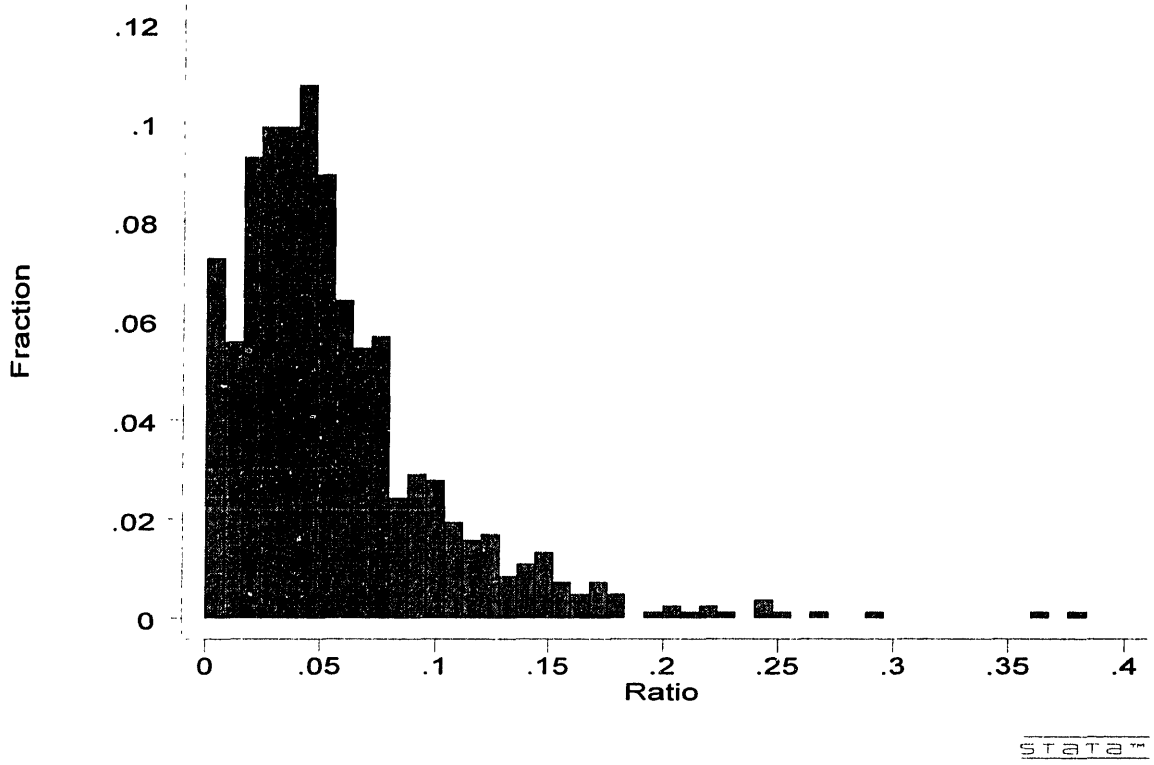


Figure 4: Ratio of CEO Option Holdings to Total Options Outstanding

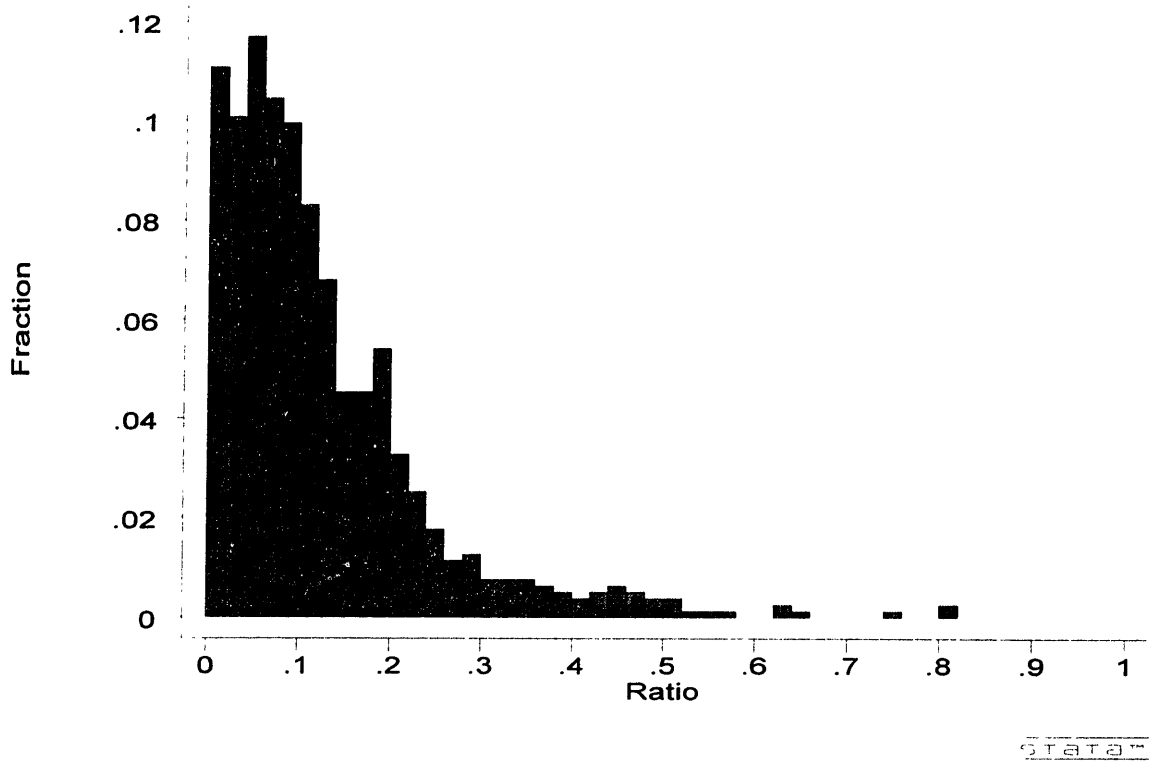


Figure 5: Ratio of Top 5 Officer Options to Total Options

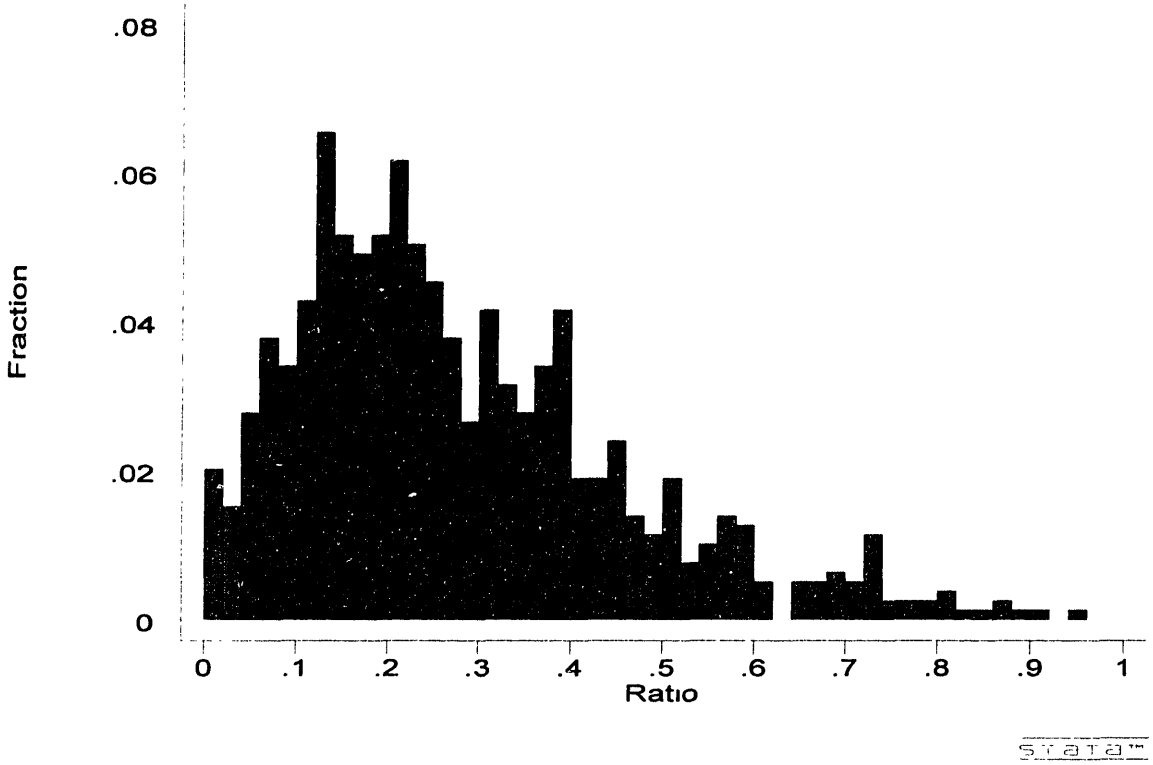
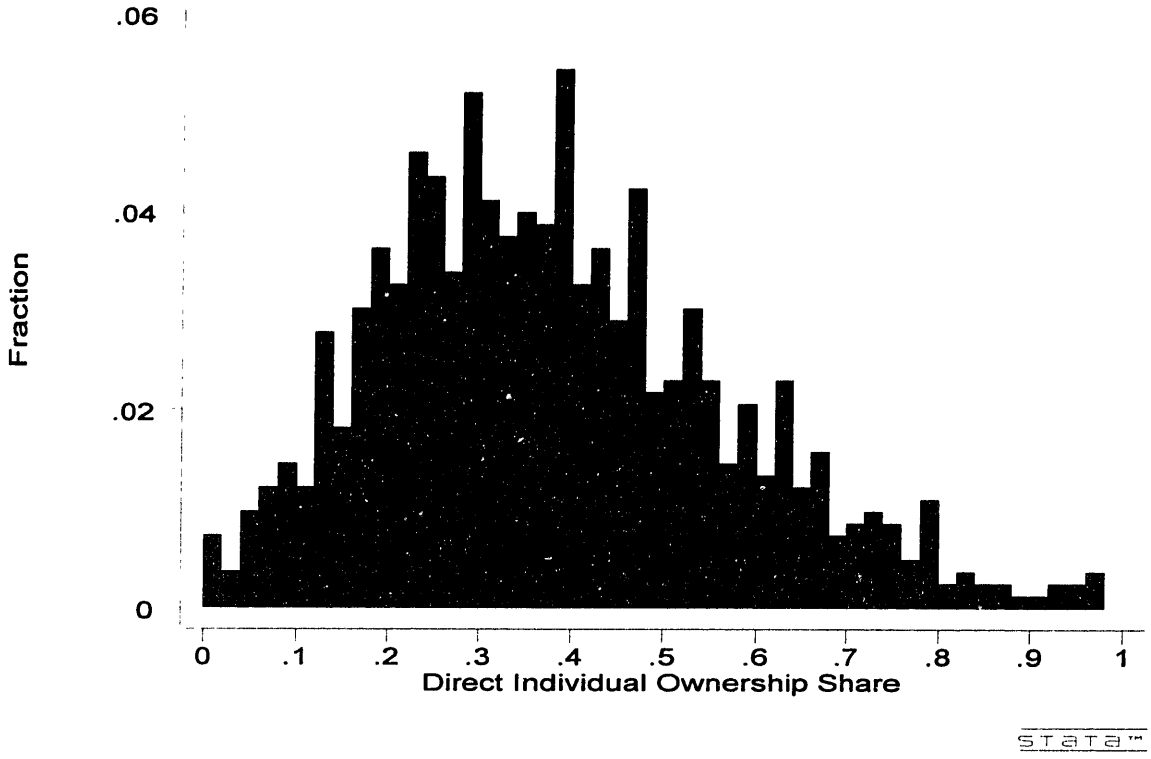


Figure 6: Distribution of Direct Individual Ownership of Firms



ESSAY TWO

Do Pension Plans with Participant Investment Choice Teach Households to Equitize?

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The past two decades has seen a dramatic shift in private pension plans. In 1975, 39% of the workforce was covered by a defined benefit pension plan and only 14% was covered by a defined contribution plan (U. S. Department of Labor (1997)). Eighteen years later, defined contribution plan coverage is nearly 37% while about one in four workers have a defined benefit plan. Workers now play a more active role in providing for their retirement through work. Many defined contribution plans, most notably 401(k) s, allow participants to control the level of contributions and in some cases direct how assets are invested. While much attention has been given to how such retirement plans affect the *level* of saving (Poterba, Venti, & Wise (1996), Engen, Gale, & Scholz (1996)), little research has addressed how they affect a household's *composition* of saving or portfolio decisions. Given the substantial equity premium observed in the United States this century, the question of *how* people save is as relevant as the *amount* they save.

My hypothesis is that, ceteris paribus, retirement plans in which workers are given a choice as to how assets are invested provide financial education to workers they may not otherwise receive. Having to decide between investing in a stock or bond fund, seeing first hand the current and historical return performance of equities versus fixed income securities, and realizing the relative ease with which investments in stocks can be made today (mutual funds, e-trade, etc.) may cause workers to hold equity outside of their retirement plan. Defined contribution plans where the employer makes investment decisions, or formula plans which depend on years of service, wage, age, etc. don't offer this education component.

Bernheim (1993) concludes that the baby boom generation is saving only about one third the amount necessary to maintain their consumption level in retirement. If one is concerned about the amount of wealth that will be available for retirement, one must be concerned not only

about the level of saving, but also to the extent to which financial assets are held in equities. Any program, such as retirement plans with participant choice of investments, which alters perceptions of the "riskiness" or difficulty of investing in stocks could have important consequences for household consumption during retirement.

Understanding the spillover effects of participant choice is also motivated by the debate concerning Social Security reform. Many Social Security privatization plans (e.g., Gramlich, Scheiber, Forbes) call for universal saving accounts to either replace or complement the existing program, with individuals having a choice between equity and bond funds similar to the Federal Employees' Thrift Plan.

To better understand the effect of participant choice plans upon own-account portfolios, it is useful to first examine how the finances of households with various types of pension coverage differ. Working households can be covered by various retirement plans. Some are formula based (defined benefit or DB), while others are account based (defined contribution or DC). Within the universe of DC plans, some allow workers discretion as to how contributions are invested while others do not. Some households may be covered by multiple plans of various types.

Of particular interest is how own-account asset levels and composition vary across households with different retirement plan coverage. I will then exploit variation in the extent to which workers have a choice as to how assets in a retirement plan are invested to test whether an "education effect" is present. Ceteris paribus, do the portfolios and equity holdings of households who must decide how to invest their pension assets differ from those who do not? If so, are the differences attributable to the education received by being "forced", perhaps for the

first time, to make investment decisions (How do I allocate contributions among stock and bond funds?)?

The answer to the first question is affirmative, as households in DC plans with participant choice as to how funds are invested hold more of their own-account assets in stock than do households in DC plans without choice. The answer to the second question is more difficult. One has to be concerned that differences in own-account portfolios simply reflect financially savvy and risk-taking individuals selecting into jobs with DC plans where workers have a choice as to how assets are invested or financially savvy workers requesting that employers provide participant-directed pension plans. Of course participation in pension plans is not a natural experiment, and rather reflects a conscious decision. By focusing on a segment of the population I classify as "financially unsavvy", I argue that the results obtained can be identified as an education effect. This suggests, at least for this segment of the population, that pension plans with choice provide education which impacts household portfolio decisions, leading to a higher probability of owning stock outside of the DC plan. While it is difficult to quantitatively extrapolate the magnitude of this "education effect" to the population at large, such a change in asset composition could have significant impacts on future wealth, given the equity premium observed historically in the United States.

The paper will proceed as follows. Basic details of pension plans are provided in Section 1. Section 2 reviews the relevant literature on retirement plans and saving, education and saving, and behavioral economics. There I also motivate why we should care not only about *if* people save but *how* they save by briefly discussing the equity premium observed in the United States. Section 3 describes the Survey of Consumer Finances, the primary data set used for this study, and provides demographic and financial attributes of households with different retirement plan

coverage. The estimation strategy for determining if plans with participant choice in investment provide an education component which causes households to change the composition of their non-retirement account financial assets will be presented in Section 4. That section also presents results. Robustness checks such as focussing attention on 401 (k) plans, testing for substitution between retirement account and own-account stock holdings, and seeking corroboration from an additional data source follow in Section 5. Section 6 offers conclusions.

I. Basics of Pension Plans

Before proceeding further, it is necessary to first give a brief review of the characteristics of different retirement plans offered by employers. This section draws heavily from the Bassett, Fleming, & Rodrigues (1998) survey based on the 1993 Current Population Survey, the EBRI's *Fundamentals of Employee Benefit Programs*, and *The 401(k) Plan Handbook.*

Employer sponsored retirement plans can generally be categorized as formula based (defined benefit or DB) or account based (defined contribution or DC). Defined benefit or formula plans have declined in importance in recent years, however, a sizeable fraction of the workforce, roughly 25%, is still covered by a DB plan. The typical DB plan provides a lifetime nominal annuity at retirement, with the benefit being a function of years of service, highest salary earned, etc.. The Pension Benefit Guarantee Corporation (PBGC) provides insurance to pension plans which satisfy ERISA requirements. The employer faces minimum funding requirements based on actuarial liabilities which accrue to the pension plan and is responsible for any gain/loss which occurs to the retirement funds.

Defined contribution plans have steadily grown in importance as a retirement saving vehicle. Examples of DC plans are money purchase plans, profit sharing plans, ESOPs, thrift or savings plans, TIAA-CREF, and 401 (k)s. Employers make contributions to an individual account based on employee salary, employee contributions, employer match, and/or employer profits. The worker is responsible for gains and losses which accrue in the account. There is no guarantee of account performance and PBGC does not provide insurance. Account balances are generally portable if you leave your job. There are a number of margins upon which DC plans can vary. Some plans allow the employee to borrow against the account, or withdraw funds in case of emergency. The extent to which workers have any discretion over the amount contributed to the DC plan or how the money is invested also varies. This paper will exploit variation in the degree to which investments are participant-directed.

The most common DC arrangement, 401 (k) plans, accounted for over 2/3 of total DC contributions in 1993. Aggregate 401 (k) contributions alone exceed annual contributions to DB plans. A 401 (k) is a salary reduction plan (an agreed upon reduction in employee's salary is used to finance the retirement account). It effectively started in 1982 after IRS clarification of its tax treatment. Unlike most other DC plans, contribution decisions are usually at the employee's discretion. The GAO (1997) reports that 1993 Form 5500 filings indicate that 65% (73% when weighted by assets and 73% when weighted by participants) of 401 (k) plans with 100 or more participants were participant-directed. The employer will typically match employee contributions by making further contributions on the employee's behalf. The typical match is 50%, ending when employee benefits reach 6% of salary (Buck Consultants (1994)). Employee contributions are capped at $10,000 and total contributions are limited to the minimum of

$30,000 or 25% of salary starting in 1998. Non-discrimination rules insure that DC benefits are distributed relatively evenly across income levels of the firm's workers.

Hybrid plans, the most popular of which is the cash balance plan, combine characteristics of both DC and DB plans. However, the U. S. Department of Labor (1994) reports only 3% of full-time defined benefit plan participants in medium and large private establishments were cash balance plans.

This paper will compare the own-account asset holdings of households covered by a DC plan in which they decide how the assets are invested to the own-account portfolios of households covered by a DC plan without choice. It should be noted that roughly half of the workforce does not participate in a retirement plan (Bassett, Fleming, & Rodrigues (1998)). Thus caution must be exerted when trying to extrapolate any results obtained from the workforce covered by a retirement plan to the population as a whole.

II. Literature Review and Equity Premium

2.1 Literature Review

This study draws from the literatures on retirement plans and saving, education and saving, and behavioral economics. This work is unique in the respect that it focuses upon the *composition* of saving rather than upon the *level* of saving. The historical returns available to investors presented below indicate that the composition question is just as important as the level question.

Research into pension plans and saving dates back at least to the work of Katona (1965) and Cagan (1965) who observed that those with pension plans save more directly than those

without. This relationship runs counter to the predictions of a simple life-cycle model in which pension wealth should offset private wealth dollar for dollar. They attribute this finding to "education" or "recognition" effects, thus positing that saving preferences are endogenous. Of course, this interpretation is easily discounted because of saving heterogeneity across the population.

Since then, many researchers have further analyzed the relationship between pension and non-pension wealth. Gale (1995, p. 6) provides a review of this work and concludes that, "taken at face value, the literature shows little offset between pensions and other wealth; most of the studies suggest offsets of 20 percent or less, and almost half suggest either no offset at all or a positive effect of pensions on other wealth." However, Gale argues such results are plagued by multiple biases and after correcting for many of these finds relatively high levels of offset. Gustman & Steinmeier (1998) address many of the concerns raised by Gale and find that pensions cause little, if any, displacement of other forms of wealth for the cohort of 51 to 61 year olds from the HRS. The one conclusion that can be drawn from this literature is that no strong consensus has emerged regarding the spillover effects of pensions upon non-retirement account finances.

A voluminous literature has studied what effect 401 (k) plans in particular have had on household asset accumulation (see Engen, Gale, & Scholz (1996) and Poterba, Venti, & Wise (1996)). This literature has not focused attention, however, on how 401 (k) plans may have affected the composition of household wealth. Particularly relevant for my paper, this debate has brought out the concern that employers offer 401 (k) plans to satisfy a workforce of innate savers, or that employees who are pre-disposed to save seek out firms with pension plans matching their preferences.

Bayer, Bernheim, & Scholz (1996) (hereafter BBS), Bernheim & Garrett (1996) (hereafter BG), and Bernheim, Garrett, & Maki (1997) (hereafter BGM) all study the impact of *direct* financial education upon the level of saving. BBS & BG focus on investment education in the workplace using surveys of firms and households, respectively. BBS find retirement seminars increase contributions to savings plans. BG also find positive effects of financial education upon both saving in general and saving for retirement in particular. They also find evidence of spillover effects across spouses.

An inherent problem in interpreting their results is that the prevalence of a saving program could be systematically tied to worker preferences. The direction of the bias is not clear, though. Firms may provide investment education to satisfy the demands of a workforce predisposed to save or firms with a segment of the workforce which is not predisposed to save may be more apt to offer seminars in order to relax nondiscrimination rules. BBS and BG present evidence that education is remedial, suggesting their results are biased downward.

BGM study the impact of education on saving decisions by exploiting cross-sectional and time series variation in high school requirements for financial planning courses. They also conclude direct education can influence financial decision-making.

The work of Bernheim and others suggest that *direct* education (e.g., seminars and classes) may have important effects on saving behavior. None of the studies address how the *composition* of assets is affected by investment education. This paper is also different from previous work in that it studies whether the less direct "education" acquired simply through having to allocate assets in an employer sponsored retirement plan impacts portfolio decisions. This raises the key question: In actuality do workers who participate in a DC plan in which they

choose how the funds are invested receive any basic information about the options from the employer, and do they have many investment options from which to choose?

Section 404 (c) of ERISA specifies when an employer is not liable for investment results when he provides participant choice. The 404 (c) regulations require that the plan offer a broad range of investment choices (at least three core options must present materially different risk/return characteristics), allow participants to give investment instructions concerning the three core options at least quarterly, and provide sufficient information for informed investment choices. The Employee Benefit Research Institute (1994 & 1995) reports 73% of 401 (k) participants are provided some educational material. Further, 92% of 401 (k) participants read materials given by employers and 44% say doing so causes them to invest differently. Typical investment options are corporate equity (sometimes a firm's own stock), guaranteed investment contracts, U. S. government securities, corporate bonds, and balanced funds. The mean number of investment options provided by employees is 5.4 (Buck Consultants (1994)), so there is some choice to be made.

Benartzi & Thaler (1998) present evidence which casts some doubt on the financial education 401 (k) participation provides. Looking at a database of retirement plans, the authors find that the proportion of assets invested in stocks depends strongly on the proportion of stock funds in the plan. At least in the sample of retirement plan participants they examine, there appears to be a framing effect as assets chosen appear to depend on the make-up of the funds offered in the plan. This suggests we might expect any spillovers to own-account investing to be minimal. If participants continue to invest equally across all investment options provided, regardless of characteristics, it is doubtful they have acquired any financial education that they can apply to their non-retirement account finances. However, education need not occur only at

the time of the first allocation decision. Participants may split funds among alternatives initially, and then adjust as they observe the pattern of returns across plan alternatives.

Similar in spirit to my paper, Papke (1998) also investigates the economic impact of participant-directed retirement plans. However, her question of interest is distinct from mine. She examines how asset allocation, participant contributions, and account balances *within* the retirement plan differ across account based plans with and without employee investment choice. Her preferred estimates indicate that participants with choice invest 15 percentage points more in stocks and contribute almost 5 percentage points more in salary. She does not consider spillover effects upon *own-account* assets. She also utilizes a different data source than this paper. Her sample is drawn from the 1992 National Longitudinal Survey of Mature Women, which is a sample of women aged 55-69 and their husbands.

At this point it is natural to ask, why should participation in a retirement plan with participant choice alter worker's perceptions of risk and provide any financial education the worker couldn't or shouldn't receive on his/her own? To answer this requires leaving the rational agent paradigm and entering behavioral economics (see Thaler (1994) for a discussion of psychology and saving behavior). Undoubtedly inertia, procrastination, or psychic costs provide what are perceived by some households to be real impediments to investing more heavily or at all in stocks.

Benartzi & Thaler (1995) propose a model in which investors gain utility not from wealth levels but from returns, and households are loss averse. A household's attitude towards risk then depends crucially upon the time horizon over which returns are calculated. For example, the daily barrage of stock performance data and the much greater variability in stock returns over

shorter horizons could make stocks look unattractive. The "psychic" damage they inflict upon the investor, who is evaluating performance on a daily basis, could outweigh the return premium.

In a behavioral economics context, participation in a retirement plan with participant choice could have important repercussions. The plan may provide the household with asset return performance data to utilize when deciding how to allocate contributions across fund options it would or could not obtain otherwise. The employee will likely be presented with historical performance of fund options over time periods from one to five years, and will be provided with account balances on a quarterly basis. Lengthening the time frame over which households evaluate performance, even slightly, will increase their willingness to equitize more of their financial assets.

2.2 Equity Premium

At this point, I would be remiss if I didn't at least touch upon the equity premium, the superior performance of stocks relative to bonds, since it helps motivate this research. To demonstrate the equity premium available to investors, I look at historical returns 1871-1996. Data from 1926-1996 is from Ibbotson (1996) and data from 1871-1925 is from Shiller (1989). Stock returns are measured by the Standard and Poor's Index. This index was comprised largely of railroad stock in the early part of the sample. High-grade corporate bond and Treasury bill returns are available from 1926. To get a longer time series, I augment the Treasury bill series with commercial paper returns which are available over the period 1871-1925.

I consider buy-and-hold strategies with a $1 initial investment. I assume all taxes on returns are deferred, as is the case with pension plans. Table 1 compares investing in the S & P index of stocks versus short-term Treasury bills/commercial paper (1871-1996) and investing in stocks versus high-grade corporate bonds (1926-1996). Both the fraction of time stocks

outperform fixed-income securities and the median difference in terminal values of the portfolios normalized by the median value of the fixed-income portfolio are reported.

The equity premium appears huge (around 6% per annum)! Over a 20 year investing horizon, stocks have nearly always outperformed interest bearing securities and by a wide margin. While the exact magnitude of the return premium of equities may depend on where one starts the time series, the importance and existence of the equity premium cannot be disputed.

Of course, investors do not care only about mean returns, but the covariance of those returns with their other assets and own consumption. Even in an expected utility framework, researchers still observe a large equity premium puzzle. The reader should see Campbell, et al (1997) and Siegel & Thaler (1997) for a review of this literature and other possible explanations for the puzzle. This paper will not attempt to deal with the general equilibrium consequences of increased investor rationality upon future equity returns.

While the extent to which equities will outperform bonds in the future, after adjusting for risk, is an open question, it is clear that they have done so in the past by a wide margin. If the pattern of return performance documented in Table 1 persists, it is clear that studying portfolio composition decisions by households is important.

III. Data and Attributes of Households across Pension Plan Coverage

I use the 1995 Survey of Consumer Finances (SCF). It is a cross-sectional survey taken every three years by the Federal Reserve. The SCF oversamples the rich because asset ownership is skewed, so weights are needed to convert sample averages to population aggregates. The 1995 sample consists of 4,299 households. The SCF has detailed data on asset

ownership. It also asks questions concerning pension plan coverage and attributes and financial preferences. The 1995 survey has new questions regarding whether the DC plan participant has "any choices about how the money is invested" and whether those covered by a DB plan were eligible but chose not to participate in a supplemental DC plan. The main disadvantage of the SCF is that it is a cross-sectional data set and not a panel. Such commonly used data sets as the Current Population Survey (CPS), Panel Survey of Income Dynamics (PSID), Health & Retirement Study (HRS), and Survey of Income & Program Participation (SIPP) either lack specific financial data, lack specific pension plan characteristics, and/or cover an age group that excludes many working households.

My unit of observation is the household because the SCF provides asset data on a household basis and Bernheim & Garrett (1996) show strong spousal spillover effects. The SCF reports data for up to three pensions per person from his/her current job. I restrict my sample to households where at least one spouse works for pay for an employer and where neither spouse is 65 or older. If the self-employed spouse of a worker sets up a retirement plan for the household, that household is also dropped from the sample. The remaining sample reflects 54% of original sample, 62% weighted.

Households now fall into one of five categories based on employer-provided retirement plan coverage.

(1) household participates in a DC plan with investment choice, referred to as CHOICE
(34% of remaining sample, 32% weighted)
45% of these households are covered by just one plan and 31% have a DB plan as well
(2) household participates in DC plan but none allow investment choice, referred to as NOCHOICE (12% of remaining sample, 12% weighted)
65% of these households are covered by just one plan and 25% have a DB plan as well
(3) only have DB plan and not offered DC

(9% of remaining sample, 9% weighted)
(4) only have DB, turned down DC (6% of remaining sample, 7% weighted)
(5) no retirement plan (40% of remaining sample, 40% weighted)

Note that groups (1)-(4) could be covered by multiple plans. This is because the unit of observation is the household. For example, both spouses may work and be covered. Also, some employers offer multiple pension plans to individual workers. To belong to group (1), the household must be covered by a pension plan in which they have control over investments. The household may also be covered by DB plans or DC plans without choice. NOCHOICE households participate in DC plan(s), none of which allow participants to direct investments, and may also have a formula based pension.

A priori, a natural way to study if participant choice in retirement plans has any spillover effect on own-account finances would be to compare households who participate in a DC plan with choice to households who participate in a DC plan without choice in investments. Thus, to best answer the question I am considering, I will focus attention on groups 1 and 2 and subsets of these groups. For example, since households covered by multiple types of plans may allocate assets in their portfolio differently that those without such protection, I also examine households covered by just one DC plan (with or without participant-directed investments).

Due to the different nature of the pensions, one would expect the financial decisions of DC with choice vs. DB only households to differ regardless of any education effect. For example, a household with a generous DB plan may be more aggressive in own-account portfolio decisions than a household with a 401 (k) only. The larger is the component of wealth composed of "guaranteed" benefits (since future wages are stochastic the actual level of DB benefits is not really guaranteed), the more a household may wish to increase exposure to risk through own-account investment in stocks. Including households which have a DB plan and turn

down a DC plan in a control group is especially troublesome, as they have revealed a preference not to participate. Finally, households with no pension plan coverage either are not offered a retirement plan or choose not to participate in a firm's plan. Any conclusions drawn by comparing the subpopulation of workers with no pension plan coverage to workers with coverage are dubious given the clear differences between the two groups (both observable and unobservable).

Table 2 shows the financial and demographic characteristics of households with various types of retirement plan coverage. Statistics are weighted using 1995 population weights in the SCF. The variables for the most part should be self-explanatory. The # of households represents the number of households in the U.S. the specific subsample represents. Income represents family income before any deductions or credits. Net worth represents the sum of financial and non-financial assets less all debt outstanding. It does not include the PDV of defined benefit plans, retirement account assets, or Social Security wealth. Financial assets refers to own-account financial assets. It includes IRA assets but excludes DC plan assets. Stock is defined as direct ownership of stock or stock mutual funds, excluding ownership through retirement accounts (DC plans). As with financial assets, own-account stock includes IRA equity holdings. Even though it may include IRA assets, I will occasionally refer to own-account assets or stock holdings as non-retirement holdings. For purposes of this paper, retirement assets will be defined as assets held in a DC pension plan. The ownership of stock on own-account is the key variable of interest.

Age represents the maximum age of the spouses in the household. Female indicates whether the household is headed by a female. College indicates whether either spouse has attended at least four years of college.

The SCF asks how DC plan assets are invested. If the respondent answers "mostly or all in stock" or "split between stock or interest earning assets," 100% or 50%, respectively, of the account balance is assumed to be invested in stock. I report IRA assets conditional on having an IRA. IRA stock holdings are determined in the same manner as DC plan stock holdings. The reported mean share of financial assets, DC plan assets, or IRA assets invested in stock is the average of each household's share (it is not weighted by assets).

I also create four variables to measure saving preferences and attitudes towards risk, both of which may influence the willingness of a household to invest in stock. The SCF records whether or not you have any IRA assets (the stock not the flow), and thus whether the household has *ever* made any contributions. The SCF (Kennickell (1997)) also asks the following question which concerns risk-aversion and thus willingness to invest in equities:

> Which of the statements on this page comes closest to the amount of financial risk that you and your (spouse/partner) are willing to take when you save or make investments?
>
> 1. TAKE SUBSTANTIAL FINANCIAL RISKS EXPECTING TO EARN SUBSTANTIAL RETURNS
> 2. TAKE ABOVE AVERAGE FINANCIAL RISKS EXPECTING TO EARN ABOVE AVERAGE RETURNS
> 3. TAKE AVERAGE FINANCIAL RISKS EXPECTING TO EARN AVERAGE RETURNS
> 4. NOT WILLING TO TAKE ANY FINANCIAL RISKS

I define the following three dummy variables: HAVEIRA (IRA assets > 0), LOVERISK (answers 1 or 2 to the question), HATERISK (answers 4 to the question). Clearly HAVEIRA indicates a predisposition to save. LOVERISK (HATERISK) represents a strong willingness (aversion) to investing in risky assets like stocks.

The variable NOSAVER represents households that do not have IRA assets and are not willing to take above average risks for above average returns. Thus,

$$\text{NOSAVER} = 1 - \max(\text{HAVEIRA}, \text{LOVERISK}).$$

Not surprisingly, Table 2 demonstrates that households without any retirement plan coverage have considerably less income and wealth, and are less apt to have a college education or be headed by a married couple. The SCF reports whether or not households covered by a DB plan have the option of participating in a supplemental DC plan. Somewhat surprisingly, among DB plan covered households, households which turn down a supplemental DC plan are essentially identical to those which are not offered one.

Households which participate in at least one pension plan in which they determine the investments (CHOICE DC PLAN) are wealthier than households with DC plans without choice (NO CHOICE DC PLAN), but have wealth levels comparable to households covered by defined benefit plans only. Some differences in income and net worth across CHOICE vs. NOCHOICE households is by construction, as CHOICE households will by definition be more apt to be covered by multiple plans (1.8 vs. 1.4 plans for NOCHOICE), and will more likely be a two-earner family. (Recall, a CHOICE household may also be covered by additional DB plans and DC plans without participant choice, whereas a NOCHOICE household may have supplemental DB plans but no DC plan which allows the participant to control investments.) However, differences in mean income ($13.6K) and net worth ($65.5K) are still evident when the sample is restricted to households with only one pension plan. There are no significant differences in age, marital status, or college attainment across the households with different pension plans.

While households that have choice in how assets are allocated in pension plans hold more equities on own account, which is consistent with the education hypothesis, they also differ in important ways from no choice DC plan households. While the two groups are fairly similar along demographic measures, households that participate in a DC plan with choice are somewhat more well off than families whose DC plan does not allow investment choice. Restricting

attention to the subgroup of households covered by only one pension, 75th percentile income and net worth levels for the two groups are \$60K vs. 50 and \$113K vs. 79, respectively. However, most stark are differences in IRA assets and saving preferences. For example, CHOICE households are 70% more likely than NOCHOICE households to report being willing to take above average risks to earn above average returns. They are also up to 50% more likely to have set up an IRA account. These are obviously major concerns, which my estimation strategy must address.

IV. Estimation Strategy and Results

Recall that the question of interest is whether there is an education component to DC plans which require employees to choose how to invest retirement account assets which causes households to change their own-account composition of financial assets. The basic regression model I have in mind is:

$$(\textit{own stock}) \text{ or } (\textit{stock share}) = \beta_0 + \beta_1 * \textit{CHOICE} + \beta_2 * (\textit{SAVING/RISK preferences}) + \beta_3 * \textit{Finances} + \beta_4 * \textit{Demographics} + \varepsilon$$

Own stock is a dummy which is one if non-retirement account stock and stock mutual fund holdings exceed \$1000 and *stock share* is the share of non-retirement financial assets held in stocks or stock mutual funds. *CHOICE* indicates whether the household participates in at least one plan where investments are participant-directed.

The basic "experiment" I'm considering is whether, among households with a DC pension, those who direct investment of plan assets are more apt to own stock on own-account

relative to those who do not. In the broadest test, CHOICE households are those which are covered by at least one pension plan where they determine how funds are invested. They may have additional DC plans with or without choice and supplemental DB plan coverage as well. The "control" group, for whom CHOICE is zero, will be households participating in at least one DC plan and perhaps covered by a defined benefit plan. However, none of these DC plans allow the participant to direct the investment of assets. Thus, both CHOICE and NOCHOICE households have some provision for retirement through work, but only CHOICE households have input into how the retirement account is managed. As a more refined "experiment", I will also test if there is any education or spillover effect on own-account investing by focussing on households with only one pension plan which is either a DC plan with investment choice or a DC plan without investment choice.

Net worth and current income are included in the specification to reflect that wealthier households can absorb more risk. The same reasoning justifies the inclusion of a "have DB plan" dummy to reflect that having a defined benefit package in addition to the DC plan may alter risk-taking and desired own-account portfolios. Age should also be a key explanator. A popular rule of thumb is that the percentage of one's portfolio invested in equities should be 100 minus one's age (Bodie, Merton, & Samuelson (1992) provide theoretical support for decline in exposure with age). Stock ownership may also decline with age because of cohort effects such as proximity to the Great Depression. College education, marital status, and the sex of the head of the household may also influence saving preferences and risk tolerance.

The key difficulty is how do we measure saving/risk tolerance preferences properly? By omitting controls for them, we introduce a serious omitted variable bias into the results. Perhaps the correlation between CHOICE and equity ownership on own-account reflects a correlation

between omitted saving/risk taking preferences, which manifests itself in the CHOICE coefficient. This endogeneity could result from workers either selecting jobs which offer or demanding current employers provide retirement plans matching their saving preferences.

Papke (1998) finds that participant choice and plan knowledge are not strongly or significantly correlated among NLS Mature Women respondents. She offers this as evidence that choice is not endogenous. However, the differences in saving and risk tolerance preferences across pension types warrant concern about endogeneity.

There are two related econometric strategies one can pursue.

(1) Find proxies that account for saving/risk tolerance preferences
(2) In essence create a "natural experiment" by defining a control group that is otherwise similar to the experimental group, except for exposure to choice in pension plans

4.1 Regressions of Stock Ownership

I first adopt strategy (1), and estimate regressions of stock ownership as a function of demographic and financial characteristics of the household, with HAVEIRA, LOVERISK, & HATERISK serving as proxies for saving preferences and risk tolerance.

Tables 3 & 4 display the estimation results for the ownership and share of financial assets regressions, respectively. Because Probit coefficients are difficult to interpret, coefficients are transformed to reflect marginal changes in probability for a household with "average" characteristics. The reported results are not weighted (weighting observations with the population weights change the coefficients very little).

From looking at simple tabs, heterogeneity in households across pension types was evident (notable difference in saving/risk tolerance measures), suggesting some selection may be going on. This is manifested somewhat in Table 3, as we see how the inclusion of saving

measures and financial and demographic factors reduces the impact of the CHOICE variable by a third when the control and experimental groups are defined most broadly. The marginal effect of CHOICE on the probability of owning equity on own-account falls from 25 percentage points to 17 after including saving, risk tolerance, financial, and demographic explanators. Nonetheless, investment choice in the DC plan still appears to have a substantive impact on households' own-account portfolios. The estimated marginal effect of CHOICE, which is .17, is still not much less than the *observed* difference in the probability of owning stock on own-account between the choice and NOCHOICE households, which is .23.

Estimates for the financial and demographic characteristics are generally as expected in the ownership regressions of Table 3. Age, financial status, and college education are consistently important determinants of equity ownership. The estimates imply that, relative to the 30-39 cohort, 60-64 households are nearly 19% points less likely to hold stock on own-account. This could reflect an age effect and/or a cohort effect (see Poterba & Samwick (1997) for evidence on this issue). We see monotonic increases in equity ownership as income and net worth increase. For example, a household with income exceeding $150K is 11% points more likely to own equity relative to a household in the 50-75K bracket and a household with wealth exceeding $500K is 30% points more likely to own equity relative to a household in the 50-100K bracket. A college educated household is significantly more likely to own stock outside of the retirement account. Having defined benefit plan coverage as well increases equity ownership, but the effect is somewhat small and insignificant. IRA ownership is a very strong and significant predictor of owning stock outside of one's pension plan. The estimated marginal increase in stock ownership probability associated with having an IRA is 40% points! Similar conclusions are drawn when I focus on households with one pension plan.

The net worth and income variables are to some extent endogenous. Equity ownership may lead to higher income through dividends and capital gain realizations. I thus included labor income as opposed to total income in the regressions and obtained virtually identical results. The coefficients on net worth dummies are difficult to interpret as they reflect both that wealthy households are more apt to hold stock and that, given the equity premium, households that invested in stock are wealthier. However, the inclusion of the net worth variables does not alter the coefficient of interest, namely the impact of CHOICE.

In some couples, the husband has exposure to a retirement plan with investment choice, while in others the wife does. Are there differential impacts on a household's asset allocation depending on which spouse has the DC plan with CHOICE? Focussing on married couples covered by one pension plan, the marginal effect on the probability of own-account stock ownership is .215 (.075) when the husband has the DC plan with CHOICE, controlling for all other household characteristics. This is very similar to the effect when the wife has the DC plan with choice (marginal effect is .227 (.091)).

4.2 Regressions of Share of Assets in Equities

Table 4 presents regression estimates for the share of financial assets held in equities. I present both marginal effects derived from a Tobit specification and estimates of a linear model conditional on ownership of stock. I report both because the education hypothesis I have outlined above has predictions regarding the *ownership* decision, but offers no prediction regarding the amount of stock held *conditional* on ownership. The education hypothesis suggests investing retirement funds at work may have spillover effects which cause households to start to invest own-account assets in the stock market. Unless stock holdings were inherited and left unattended, it is doubtful, *conditional* on owning stock, that having a say in how pension

assets are allocated will provide much additional education. Thus, conditional on ownership we should not expect CHOICE to matter. The type of DC plan may impact stock holdings, conditional on ownership, if DC plans without choice invest funds in a systematically undesirable way that is offset by households adjusting own-account portfolios. I address this possibility below in Section 5.

This prediction is born out both in the summary statistics of Table 2 and in the regression results of Table 4. Back in Table 2, the CHOICE households were more than twice as likely as NOCHOICE households to own stock on own-account, however, the stock share conditional on ownership was the same across the two groups. Analogously, while the Tobit specification yields significant positive impacts of CHOICE, this is totally driven by the ownership decision. Conditional on ownership, participation in a CHOICE plan has no significant effect on the level of non-retirement account equity holdings, and the effect estimated over one plan households is negative. I obtained qualitatively similar results when the net worth controls were excluded. For the remainder of the paper I will focus on stock ownership, as that is where we would predict educational spillovers to occur.

4.3 Results Focussing on "Financially Unsavvy"

Even after including the other controls in the specification, the estimated impact of CHOICE on equity ownership is still significant and substantive. The open question is do the other variables, particularly HAVEIRA, soak up all of the "financial savvy" which could explain a correlation between CHOICE and stock ownership? In other words, does the estimated CHOICE coefficient in the full specification represent a pure education effect, or is it still contaminated by endogeneity?

To obtain results which are less apt to suffer from the endogeneity argument, I follow the second econometric strategy. I estimate regressions only on the subgroup households for whom NOSAVER is one. A priori we would expect these households to be "financially unsavvy." Thus, I drop all observations of households that report IRA assets (HAVEIRA=1) or report they are willing to take above average risks to obtain above average returns (LOVERISK=1). These households, for whom NOSAVER is zero, are likely to have a predisposition to save and a willingness to invest in equities, even without exposure to participant-directed retirement plans.

This strategy may seem dubious at best, as I am selecting on preferences which are potentially endogenous. Isn't this going to bias the results obtained on the selected sample? The answer is probably yes. However, I argue that the bias works *against* detecting any education effect, as it will tend to bias the estimates downward.

Consider the following thought experiment. Suppose DC plans with participant choice do provide education which impacts household portfolios and changes saving preferences and risk tolerance. Further suppose that the household has no pension plan coverage in 1989, but is covered by a DC plan with participant choice in 1992. The researcher only observes the household in 1995.

1989	1995	Comment
saver	saver	this is group of households predisposed to save, want to exclude
nosaver	saver	this is group of households for whom "education" effect is largest
nosaver	**nosaver**	**this is group for whom "education" effect is smallest**
saver	nosaver	unlikely

What I am essentially doing by selecting on the NOSAVER variable is throwing out those predisposed to save (which confound interpretation of the CHOICE coefficient) and throwing out those for whom the "education" effect of the retirement plan is the largest. I am left with households for whom the potential education effect of participant choice plans is smaller. Remember, these are people with no IRA assets who also report they do not take above average risks to earn above average returns. Thus, the results I obtain for this group should be downwardly biased. A zero coefficient on the choice variable does not imply there is no educational component from DC plans with CHOICE as we are looking at individuals who are predisposed not to save and not to invest in stock. Narrowing the sample to this group, however, makes extrapolating the results to the whole population for policy purposes difficult.

Table 5 reports characteristics of households across the different types of pension plans (CHOICE and NOCHOICE households in general and then among households with just one plan). The sample is again weighted using 1995 population weights in the SCF. Notice how the CHOICE and NOCHOICE groups are much more comparable in virtually every category except equity ownership on own-account (but this is OK because this is the variable we are trying to explain). Among households covered by one DC plan, the average values of income, net worth, DC plan assets, and all demographic characteristics of households in participant-directed plans are statistically indistinguishable from those in plans without choice. Particularly striking is that the level of stock holdings in retirement accounts are very similar across DC plans with and without choice.

Table 6 reports regression results, analogous to Table 3 but estimated on the "financially unsavvy" only. The point estimates still suggest big education spillover effects from participant choice (7-8 percentage point change in probability of owning equity on own-account) for this

subpopulation. The marginal impact of the CHOICE variable changes by only 2.2 (.8 when focus on one plan group) percentage points when I add financial and demographic characteristics to the specification (the regression with CHOICE as the only regressor is not reported in Table 6). The financial and demographic explanators are statistically important to the model (p-value of .00 for exclusion test), but their impact on equity holdings is largely independent of the CHOICE effect. This is not a shock, given the similarities across groups shown in Table 5.

How do we interpret the various estimates of CHOICE upon equity ownership obtained using the full sample vs. the "financially unsavvy" subsample? That depends on the question at hand. If you are concerned about what effect switching to a retirement plan with investment choice is likely to have upon household portfolios for households *without a predisposition to save*, then the results in Table 6 likely provide a lower bound for the "true" education effect.

If instead you are concerned with the average effect of CHOICE on equity ownership for the population of DC plan participants *as a whole*, then the results in Table 6 are less informative and Table 3 is most relevant. By focussing solely on NOSAVERS during the estimation, Table 6 excludes households for whom the education effect is the strongest, but also excludes households which already are predisposed to save and thus receive no additional education from a retirement plan with choice. It is also difficult, if not impossible, to extrapolate these results to the fragment of the population not covered by a pension. Nonetheless, regardless of the specific magnitude, CHOICE accounts do appear to potentially impact the financial decisions of households in a substantive way.

V. Robustness Checks

While suggestive of an education effect, legitimate concerns can be raised with the results and their interpretation. Robustness checks and a discussion of possible pitfalls follow below.

5.1 Other Relevant Differences Across Choice and No-Choice Plans?

The key argument I can raise against the results is that DC plans can differ along other margins besides whether investment choice is allowed. For example, there may be a difference in the decision to participate across DC plans with and without choice. Suppose firms which offer plans without investment choice require mandatory participation (e.g., a certain % of salary is invested in company stock). Suppose firms which offer DC plans with participant-directed investments allow the employee to choose whether he participates. This could obviously present a problem, as the CHOICE coefficient could simply reflect the unobservables of *who* selects into the plan more so than the presence of investment choice. Perhaps these differences in DC plan characteristics vary across industry or occupation groups in a way that biases the CHOICE coefficient. However, including industry and occupation dummies in the regressions (results not reported) reduces the marginal impact of CHOICE by less than two percentage points for the whole population and less than one point when focusing on the "financially unsavvy."

One has to argue that there is an unobserved heterogeneity among this financially unsavvy group which is uncorrelated with demographic and financial characteristics of the household which caused the worker to voluntarily participate in the DC plan with choice. Nonetheless, comparing a worker who voluntarily participates in a retirement plan with one who is forced to is less convincing than comparing two workers who voluntarily decided to contribute to a retirement plan, one of which happened to allow participants to make investment decisions while the other did not.

Tables 7a & 7b list the prevalence of various DC plans by whether the participant controls investments. Differences emerge once we categorize plans by participant choice. For example, 401 (k) / 403 (b) plans comprise 68-77% of plans offering investment choice, but only 37-45% of plans without choice, depending on the population we examine. Profit sharing plans and employee stock ownership plans comprise a larger share of no choice plans relative to choice plans. To the extent that these plans differ systematically along other margins besides whether investment choice is allowed, this could potentially present a problem.

To address this concern, I restrict attention from the universe of DC plans to focus just on 401 (k) plans. The majority of 401 (k) plans offer employees multiple investment options in order to avoid liability and attract contributions. However, as detailed earlier in Section 1, 27% of 401 (k) s weighted by participants do not allow employees to direct investments. For the four samples I consider, the percent of 401 (k) plans without investment choice ranges from 22-28%. "The essential feature of a 401 (k) plan is the right of an eligible employee to elect to have the employer make contributions to the plan (elective contributions) or to receive them in cash" (*The 401 (k) Plan Handbook*, p. 336). Thus, by focussing on 401 (k) plans, worker discretion in deciding whether or not to participate should not vary across plans which do or do not allow participants to direct investments. It is worth mentioning that non-elective contributions may occur to satisfy non-discrimination rules (firm makes contributions for non-contributing low-income workers to ease constraint on high-income workers). I would not expect this activity to vary systematically across plans with or without investment choice.

Table 8 presents stock ownership regression results when I require that a DC plan be a 401 (k) / 403 (b). Results are generally similar to those obtained by looking at all types of account based plans, however precision is sacrificed on many covariates due to the substantial

reduction in sample size. The probability of equity ownership is estimated to be 12-14 percentage points higher for "financially unsavvy" 401 (k) participants who direct investments relative to 401 (k) participants with no choice, with the marginal effects being significant.

5.2 Portfolio Rebalancing

To this point I have ignored that households may want to balance their holdings of asset types across retirement and non-retirement accounts. This could be tax-motivated, because taxes on accrued income in retirement accounts are deferred until withdrawal (see Shoven (1997)). Or it could simply reflect that households have target levels of interest bearing assets and equity they wish to achieve, and they are willing to adjust retirement account assets and/or own-account balances to achieve the desired targets. For example, suppose all households have the same desired holding of stock. Also suppose pension plans in which the worker has no choice how funds are invested put all the money into company stock. We would then expect the own-account holdings of households with pension plans with participant choice to be composed more of equities relative to those covered by the pension plans controlled by the employer. The correlation between CHOICE and own-account stock holdings need not reflect any education spillover, but could simply occur due to such portfolio rebalancing.

I don't believe this could be driving the CHOICE coefficient. First, the equitization of pension plan assets is actually fairly similar whether or not the worker gets to direct the investment (see Tables 2 and 5). Roughly 30% of CHOICE and NOCHOICE households report most or all of their retirement plan is invested in stock. Second, I included as extra covariates the fraction of retirement account assets held in the form of stock and dummies for the size of a household's DC plan balance relative to its non-retirement account financial assets. Besides picking up a substitution effect, the coefficient on the degree of equitization of DC plan assets

could also reflect household preferences and risk tolerance. The dummies for the ratio of retirement to non-retirement financial assets are included because the larger is this ratio, the less important it is for a household to worry about how it handles its own-account portfolio and perhaps the less likely it is to own stock outside its pension plan.

I find (results are reported in Tables 9) that the marginal effect of CHOICE is essentially unchanged after adding the new regressors. Bodie & Crane (1997) document a positive correlation in asset composition across accounts when examining TIAA-CREF participants. I also find little evidence for portfolio rebalancing as the equitization of retirement account assets is positively and significantly correlated with non-retirement stock ownership. The strong correlation disappears, however, when we focus on the NOSAVER or financially unsavvy households. This suggests that the extent of equitization in retirement plans helps proxy for preferences and risk tolerance that carry over to own-account portfolios. The results also indicate that for households for whom the DC plan is a large component (>80%) of total financial wealth, the less apt is stock ownership on own-account (10 - 30% points). Of course, this could just be a mechanical result as near zero non-retirement account holdings will imply a large DC plan / financial assets ratio and zero own-account stock ownership. To combat this built in correlation I re-estimated the regression for households with non-retirement financial assets in excess of $20K and found the same pattern in coefficients.

5.3 Results using Health and Retirement Study

To corroborate my findings using the SCF, I conducted the same analysis using the 1992 Wave 1 Health and Retirement Study (HRS). The HRS is a panel study conducted every two years starting in 1992. In 1992 the households it interviewed had respondents in the age range 51 - 61. The households in the HRS will be older than those in the SCF and generally not as

well-off. Table 10 displays the marginal effect of CHOICE over various samples. The results generally confirm earlier findings with the SCF. It is important to note that the HRS stock outside DC plan measure also includes stock held through investment trusts but *omits stock held in IRA accounts*. This omission likely explains the lack of precision, relative to the results using the SCF, for the CHOICE coefficient in some of the regressions estimated over the whole sample. Among "financially unsavvy" households, the marginal effect of allowing participant investment choice on stock ownership is 5-16 percentage points.

5.4 Other Concerns

Finally, my last two concerns cannot be addressed by re-examining the data. They concern the generalizability of the results obtained. First, is the apparent "education" unique to this period? Do/will we see similar spillover effects in other periods? "Learning" is likely enhanced when annual stock returns are 25%+. Second, how well can the results be extrapolated beyond the narrow segment of the population I focus on ("financially unsavvy" households covered by pension plans). How should we expect the segment of the workforce currently not covered by any retirement plan to respond if partial privatization of Social Security occurs and universal 401 (k)-type accounts are introduced?

Throughout the paper, marginal effects evaluated at the "average" household have been reported and discussed. Table 11 shows the *distribution* of the predicted impact of directing pension plan investments upon the probability of holding stock on own-account across "financially unsavvy" households covered by a DC plan. Rather than use the estimated coefficients to compute a marginal effect for the "average" household as before, I instead calculate the implied impact of CHOICE for each household who currently does not direct investments. The estimated mean and median increases in probability suggest that a large

fraction of the difference in own-account stock ownership between households in participant-directed plans vs. households in DC plans without choice may be do to an education/spillover effect.

VI. Conclusion

Motivated by Social Security privatization proposals and the equity premium, this paper studies whether DC plans with participant choice of investments offer financial education. Specifically, are households that make decisions regarding pension plan investments more apt to hold more equity on own account relative to households whose pension plan assets are controlled by the employer? Evidence from the 1995 Survey of Consumer Finances suggests the answer is yes. Robustness checks were made to test whether hypotheses other than the education effect could explain the observed correlation between CHOICE and own-account stock ownership. None could explain the results.

If this education/spillover effect is real, what is driving it? Are workers able to self-educate simply by observing the repercussions of their investment choices (learning by doing)? Or do participant-directed plans also provide more or better retirement education through seminars and reading materials which facilitates changes in financial behavior both inside and outside the retirement plan? Somewhat surprisingly, seminars, newsletters, and summary plan descriptions are nearly as common among firms with defined benefit plans as firms offering 401 (k)s in the sample of firms Bayer, Bernheim, & Scholz (1996) examine. Better understanding of what really educates plan participants and drives changes in financial behavior is needed.

This paper has focussed attention on one specific component of pension plans, namely control of pension plan investments. Another relatively new development in retirement plans is the ability to borrow against the account balance. The 1995 SCF suggests that 55% of account based pension plans allow such loans. Future work will study to what extent participants borrow against account balances and whether such an allowance eases liquidity constraints or simply leads to imprudent borrowing against provisions for retirement.

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Table 1: Long-term performance of stocks vs. other securities

	Stocks vs. short-term bills (1871-1996)		Stocks vs. corporate bonds (1926-1996)	
	Stocks Win	Median diff. in value / (Median value of bills)	Stocks Win	Median diff. in value / (Median value of bonds)
5 years	86/122	.28	52/67	.28
10 years	92/117	.45	50/62	.67
20 years	103/107	.82	49/52	2.21
40 years	87/87	6.0	32/32	14.8

Sources: Ibbotson (1996) provides returns 1926-96 and Shiller (1989) provides returns 1871-1925.
Stock return is return on S & P Index. "Stocks Win" is the fraction of time stocks outperform fixed-income securities. The median difference in terminal values of the portfolios (stocks less fixed-income) normalized by the median value of the fixed-income portfolio is also reported.

Table 2: Income, Net Worth, & Demographics of Households with Various Pension Plans

	CHOICE DC PLAN	NO CHOICE DC PLAN	1 CHOICE DC PLAN	1 NO CHOICE DC PLAN	DB ONLY	DB, TURN DOWN DC	NO PLAN
# obs	779	272	344	174	200	143	920
# households	19.8 M	7.1 M	8.9 M	4.6 M	5.5 M	4.1 M	24.5 M
Income	65.0	45.2	54.8	41.3	51.2	52.8	32.9
	(3.4)	(2.3)	(5.7)	(3.0)	(4.8)	(3.4)	(2.2)
25th–75th %	35 – 74	26 – 57	30 – 60	22 – 50	28 – 63	31 – 68	14 – 40
Net Worth	155.0	96.5	142.6	78.3	140.8	137.5	103.2
	(21.5)	(17.8)	(38.2)	(23.9)	(29.7)	(37.2)	(25.5)
25th-75th %	18 – 134	12 – 98	14 – 113	8.5 – 79	21 – 165	23 – 144	2.5 – 72
Financial	71.2	34.4	66.1	26.7	49.5	55.0	36.2
	(15.0)	(11.8)	(26.7)	(16.9)	(10.4)	(30.7)	(13.6)
25th-75th %	3.1 – 49	1.4 – 23	2.1 – 29	1.1 – 18	2.5 – 37	1.7 – 34	2.6 – 11
Own Stock > $1000	.39	.16	.33	.12	.23	.24	.15
	(.02)	(.02)	(.03)	(.02)	(.03)	(.04)	(.01)
Stock/Fin	.20	.10	.18	.08	.11	.13	.09
	(.01)	(.01)	(.02)	(.02)	(.02)	(.02)	(.01)
Stock/Fin given own stock	.45	.41	.48	.42	.43	.48	.47
	(.01)	(.04)	(.02)	(.05)	(.03)	(.05)	(.02)
Age	41.3	40.6	40.6	39.5	44.0	43.0	38.9
	(.4)	(.6)	(.6)	(.7)	(.7)	(.8)	(.4)
Married	.74	.73	.64	.67	.71	.66	.61
	(.02)	(.03)	(.03)	(.04)	(.03)	(.04)	(.02)
Female	.17	.19	.24	.22	.19	.19	.25
	(.01)	(.02)	(.02)	(.03)	(.03)	(.03)	(.01)
College	.47	.39	.41	.37	.36	.47	.26
	(.02)	(.03)	(.03)	(.04)	(.03)	(.04)	(.01)

Data source is the 1995 Survey of Consumer Finances and reported statistics are weighted to reflect the population. See text for variable definitions.
Mean is reported for all variables and the standard error of the mean is in parentheses.
"Stock/Fin" is the average of the ratio of stock holdings to financial assets.
Note: IRA assets are reported *conditional* on ownership.

Table 2 (continued): Retirement Plan Assets and Saving Preferences of Households with Various Pension Plans

	CHOICE DC PLAN	NO CHOICE DC PLAN	1 CHOICE DC PLAN	1 NO CHOICE DC PLAN	DB ONLY	DB, TURN DOWN DC	NO PLAN
# obs	779	272	344	174	200	143	920
# households	19.8 M	7.1 M	8.9 M	4.6 M	5.5 M	4.1 M	24.5 M
DC Plan Assets	38.6	16.8	18.7	12.2	-	-	-
	(4.7)	(2.0)	(3.6)	(1.6)			
25^{th}–75^{th} %	3.1 – 38	1.6 – 20	2.2 – 20	1.3 – 12			
Share plan in stock	.60	.53	.57	.49	-	-	-
	(.01)	(.02)	(.02)	(.03)			
% plans mostly or all stock	.32	.33	.38	.31	-	-	-
	(.02)	(.03)	(.03)	(.04)			
# Pension Plans	1.8	1.4	1	1	1.2	1.2	-
	(.03)	(.04)			(.03)	(.04)	
Have DB	.31	.25	0	0	1	1	-
	(.02)	(.03)					
IRA Assets	42.6	20.8	50.9	19.4	33.0	29.7	35.5
	(9.9)	(7.3)	(22.0)	(10.7)	(5.5)	(9.5)	(6.8)
25^{th}–75^{th} %	5.0 – 38	3.0 – 20	4.0 – 30	3.0 – 20	6.0 – 35	3.5 – 28	3.2 – 30
Share IRA in stock	.57	.31	.58	.21	.40	.38	.49
	(.03)	(.05)	(.04)	(.06)	(.06)	(.07)	(.03)
Have IRA	.36	.24	.34	.25	.29	.26	.18
	(.02)	(.03)	(.03)	(.03)	(.03)	(.04)	(.01)
Love Risk	.29	.16	.29	.17	.17	.09	.17
	(.02)	(.02)	(.02)	(.03)	(.03)	(.02)	(.01)
Hate Risk	.23	.39	.25	.39	.40	.31	.49
	(.01)	(.03)	(.02)	(.04)	(.03)	(.04)	(.02)
NOSAVER	**.48**	**.65**	**.50**	**.63**	**.64**	**.69**	**.70**
	(.02)	**(.03)**	**(.03)**	**(.04)**	**(.03)**	**(.04)**	**(.02)**

Table 3: Regressions of equity ownership outside DC plan

Dep. Variable = have own-account stock > $1000
Marginal changes in probability from Probit model reported

	Households may have more than 1 plan			Households with only one plan		
CHOICE	**.246**	**.180**	**.167**	**.220**	**.170**	**.177**
	(.031)	**(.037)**	**(.040)**	**(.040)**	**(.045)**	**(.047)**
Have Ira		.511	.375		.508	.404
		(.028)	(.037)		(.041)	(.054)
Love Risk		.057	.011		.025	-.029
		(.040)	(.043)		(.053)	(.056)
Hate Risk		-.214	-.135		-.128	-.029
		(.040)	(.046)		(.053)	(.064)
Have DB			.027			-
			(.041)			
Income 25-50			.129			.058
			(.073)			(.079)
Income 50-75			.160			.127
			(.084)			(.104)
Income			.238			.178
75-150			(.091)			(.128)
Income 150+			.265			.340
			(.105)			(.148)
NW 50-100			.143			.114
			(.056)			(.077)
NW 100-250			.226			.199
			(.056)			(.086)
NW 250-500			.281			.171
			(.070)			(.128)
NW 500+			.447			.406
			(.066)			(.116)
Age 30-39			-.066			-.073
			(.060)			(.072)
Age 40-49			-.095			-.153
			(.062)			(.071)
Age 50-59			-.127			-.196
			(.068)			(.070)
Age 60-64			-.256			-.244
			(.064)			(.055)
Married			-.031			-.072
			(.065)			(.080)
Female			.001			.009
			(.075)			(.087)
College			.125			.123
			(.040)			(.053)
Log Likelihood	-687.8	-517.4	-459.4	-319.5	-239.5	-210.2
Sample Size	1051	1051	1051	518	518	518
Observed Probability	.418	.418	.418	.342	.342	.342

Note: All regressors are indicator variables, so the marginal effect of variable i is estimated by $\Phi(X_{-i} \beta_{-i} + \beta_i) - \Phi(X_{-i} \beta_{-i})$ where β_i is the Probit coefficient corresponding to variable i and X_{-i} and β_{-i} are vectors of regressor means and the corresponding Probit coefficients excluding variable i. This transformation is done to all Probit coefficients in subsequent tables.
In left panel, sample is all households with a DC plan (can have multiple plans and DB plan). In right panel, sample is restricted to households covered by only one pension plan which is a DC plan. CHOICE = 1 if the household participates in a plan where they choose investments.

Table 4: Regressions of equity holdings outside DC plan

Dep. Variable = share of financial assets held in stock
Marginal effect evaluated at sample means reported for Tobit model

	May have more than one plan		Households with only one plan	
	Tobit	Cond. on Eq. > 0	Tobit	Cond. on Eq. > 0
CHOICE	**.059**	**.044**	**.059**	**-.069**
	(.009)	**(.052)**	**(.008)**	**(.091)**
Have Ira	.172	.108	.162	-.203
	(.010)	(.125)	(.013)	(.218)
Love Risk	.018	.036	.009	.102
	(.014)	(.030)	(.018)	(.057)
Hate Risk	-.078	-.083	-.036	.023
	(.021)	(.074)	(.026)	(.087)
Have DB	.011	-.008	-	-
	(.017)	(.030)		
Income 25-50	.068	.070	.036	-.022
	(.023)	(.076)	(.024)	(.094)
Income 50-75	.077	.048	.032	-.005
	(.028)	(.088)	(.032)	(.111)
Income	.107	.110	.047	.011
75-150	(.024)	(.099)	(.029)	(.133)
Income 150+	.103	.098	.081	-.032
	(.040)	(.108)	(.049)	(.171)
NW 50-100	.056	-.024	.054	-.134
	(.020)	(.067)	(.022)	(.109)
NW 100-250	.065	-.073	.057	-.225
	(.017)	(.078)	(.032)	(.124)
NW 250-500	.082	-.038	.054	-.151
	(.038)	(.089)	(.074)	(.135)
NW 500+	.130	.003	.111	-.269
	(.034)	(.118)	(.046)	(.193)
Age 30-39	-.018	.025	.003	.062
	(.029)	(.056)	(.037)	(.083)
Age 40-49	-.059	.003	-.060	.103
	(.032)	(.072)	(.040)	(.123)
Age 50-59	-.074	.000	-.087	.108
	(.035)	(.083)	(.047)	(.147)
Age 60-64	-.148	-.083	-.138	.137
	(.046)	(.124)	(.060)	(.217)
Married	-.015	-.103	-.003	-.015
	(.031)	(.054)	(.037)	(.081)
Female	.030	-.027	.051	.054
	(.034)	(.067)	(.037)	(.103)
College	.059	.064	.061	-.022
	(.016)	(.046)	(.024)	(.082)
Inv. Mills Ratio	-	.108	-	-.335
		(.212)		(.311)
Log Likelihood	-583.0	Adjusted R^2 = .017	-284.0	Adjusted R^2 = -.032
Sample Size	1051	497	518	206

In left panel, sample is all households with a DC plan (can have multiple plans and DB plan). In right panel, sample is restricted to households covered by only one pension plan which is a DC plan. CHOICE = 1 if the household participates in a plan where they choose investments.

Table 5: Income, Net Worth, & Demographics of NOSAVERS with Various Pension Plans

	CHOICE DC PLAN	NO CHOICE DC PLAN	1 CHOICE DC PLAN	1 NO CHOICE DC PLAN
# obs	313	162	145	102
# households	9.5 M	4.6 M	4.4 M	2.9 M
Income	49.5	40.3	40.0	35.6
	(2.1)	(2.6)	(1.5)	(3.6)
25^{th}–75^{th} %	30 – 60	22 – 51	27 – 47	20 – 44
Net Worth	71.4	61.0	65.3	46.4
	(16.0)	(15.8)	(33.6)	(20.4)
25^{th}–75^{th} %	11 – 86	8.7 – 67	6.2 – 71	6.8 – 58
Financial	27.3	16.0	27.6	10.5
	(15.6)	(8.6)	(33.4)	(11.8)
25^{th}–75^{th} %	1.4 – 19	1.0 – 14	1.1 – 12	.8 – 11
Own Stock > $1000	.17	.07	.14	.05
	(.02)	(.02)	(.03)	(.02)
Stock/Fin	.10	.04	.09	.03
	(.01)	(.01)	(.02)	(.01)
Stock/Fin given own stock	.42	.32	.46	.32
	(.04)	(.06)	(.06)	(.07)
Age	40.6	40.0	39.5	38.9
	(.6)	(.8)	(.8)	(.9)
Married	.70	.69	.60	.61
	(.03)	(.04)	(.04)	(.05)
Female	.19	.21	.27	.27
	(.02)	(.03)	(.04)	(.04)
College	.31	.35	.28	.32
	(.03)	(.04)	(.04)	(.05)

Data source is the 1995 Survey of Consumer Finances and reported statistics are weighted to reflect the population. See text for variable definitions.
A household is a NOSAVER if it has no IRA assets and does not report it is willing to take above average risks to earn above average returns.
Mean is reported for all variables and the standard error of the mean is in parentheses.
"Stock/Fin" is the average of the ratio of stock holdings to financial assets.

Table 5 (continued): Retirement Plan Assets and Saving Preferences for NOSAVER with Various Pension Plans

	CHOICE DC PLAN	NO CHOICE DC PLAN	1 CHOICE DC PLAN	1 NO CHOICE DC PLAN
# obs	313	162	145	102
# households	9.5 M	4.6 M	4.4 M	2.9 M
DC Plan Assets	24.8	15.7	12.2	10.4
	(2.8)	(2.5)	(1.3)	(1.6)
25^{th}–75^{th} %	2.5 – 30	1.7 – 20	2.0 – 15	1.2 – 12
Share plan in stock	.55	.52	.51	.49
	(.02)	(.03)	(.03)	(.04)
% plans mostly or all stock	.24	.30	.29	.29
	(.02)	(.04)	(.04)	(.05)
# Pension Plans	1.8	1.5	1	1
	(.05)	(.05)		
Have DB	.29	.25	0	0
	(.03)	(.03)		
IRA Assets	-	-	-	-
25^{th}–75^{th} %				
Share IRA in stock	-	-	-	-
Have IRA	0	0	0	0
Love Risk	0	0	0	0
Hate Risk	.38	.51	.40	.52
	(.03)	(.04)	(.04)	(.05)
NOSAVER	**1**	**1**	**1**	**1**

Note: IRA assets are reported *conditional* on ownership.

Table 6: Regressions of equity ownership outside DC plan for "NOSAVERS" (NOSAVERS have no IRA assets and are not willing to take above average risks)

Dep. Variable = have own-account stock > $1000
Marginal changes in probability from Probit model reported

	May have more than one plan	Households with one plan
CHOICE	**.077**	**.072**
	(.031)	**(.037)**
Have Ira	-	-
Love Risk	-	-
Hate Risk	-.032	.008
	(.033)	(.038)
Have DB	-.002	-
	(.035)	
Income 25-50	.098	.065
	(.056)	(.052)
Income 50-75	.135	.172
	(.087)	(.120)
Income 75-150	.262	.170
	(.124)	(.168)
Income 150+	.088	.330
	(.149)	(.341)
NW 50-100	.133	.088
	(.057)	(.065)
NW 100-250	.204	.151
	(.068)	(.100)
NW 250-500	.400	.272
	(.131)	(.334)
NW 500+	.532	.433
	(.159)	(.236)
Age 30-39	-.027	-.005
	(.045)	(.050)
Age 40-49	-.091	-.097
	(.043)	(.044)
Age 50-59	-.079	-.056
	(.039)	(.045)
Age 60-64	-.089	-.067
	(.041)	(.052)
Married	.041	.016
	(.050)	(.056)
Female	.075	.059
	(.082)	(.080)
College	.072	.067
	(.038)	(.049)
Log Likelihood	-173.7	-77.2
Sample Size	475	247
Observed Probability	.164	.126

In left panel, sample is all households with a DC plan (can have multiple plans and DB plan). In right panel, sample is restricted to households covered by only one pension plan which is a DC plan. CHOICE = 1 if the household participates in a plan where they choose investments.

Table 7a: Prevalence of various DC plans by whether participant controls investments

	All DC plans		Plan is household's only pension	
	CHOICE	NOCHOICE	CHOICE	NOCHOICE
401 (k) / 403 (b)	68%	40%	75%	45%
Thrift / Saving	12	18	8	13
Profit Sharing	9	19	8	20
Employee Stock Ownership	4	11	2	8
Other	6	12	6	13

Table 7b: Prevalence of various DC plans by whether participant controls investments for "NOSAVER" households (NOSAVERS have no IRA assets and are not willing to take above average risks)

	All DC plans		Plan is household's only pension	
	CHOICE	NOCHOICE	CHOICE	NOCHOICE
401 (k) / 403 (b)	68%	37%	77%	40%
Thrift / Saving	13	19	11	17
Profit Sharing	9	20	7	22
Employee Stock Ownership	5	12	2	10
Other	5	12	3	12

Other includes such DC plans as IRA-SEP, TIAA-CREF, money purchase plans, and tax-deferred annuities.

Table 8: Regressions of equity ownership outside DC plan (require that DC plan must be a 401 (k) / 403 (b))

Dep. Variable = have own-account stock > $1000
Marginal changes in probability from Probit model reported

	May have more than one plan		Households with only one plan	
	All	NOSAVERS	All	NOSAVERS
CHOICE	**.274**	**.135**	**.227**	**.115**
	(.055)	**(.032)**	**(.061)**	**(.037)**
Have Ira	.428	-	.442	-
	(.049)		(.062)	
Love Risk	.027	-	.019	-
	(.058)		(.070)	
Hate Risk	-.178	-.040	-.104	-.029
	(.064)	(.033)	(.078)	(.035)
Have DB	.091	.000	-	-
	(.059)	(.038)		
Income 25-50	.225	.138	.170	.096
	(.101)	(.073)	(.107)	(.063)
Income 50-75	.203	.179	.148	.159
	(.117)	(.152)	(.138)	(.174)
Income	.260	.308	.199	.262
75-150	(.124)	(.208)	(.158)	(.259)
Income 150+	.325	.473	.319	.605
	(.141)	(.321)	(.187)	(.448)
NW 50-100	.162	.076	.081	.015
	(.079)	(.063)	(.098)	(.052)
NW 100-250	.140	.101	.180	.025
	(.077)	(.076)	(.103)	(.069)
NW 250-500	.096	.360	.107	.348
	(.108)	(.234)	(.148)	(.454)
NW 500+	.364	.171	.362	.164
	(.110)	(.241)	(.157)	(.300)
Age 30-39	-.129	-.050	-.035	.005
	(.077)	(.038)	(.091)	(.049)
Age 40-49	-.167	-.095	-.157	-.037
	(.079)	(.041)	(.087)	(.046)
Age 50-59	-.112	-.037	-.133	.020
	(.093)	(.045)	(.100)	(.081)
Age 60-64	-.250	-.063	-.256	-
	(.090)	(.031)	(.070)	
Married	-.021	.011	-.018	-.009
	(.091)	(.054)	(.105)	(.064)
Female	-.005	.001	.051	.003
	(.102)	(.068)	(.119)	(.066)
College	.154	.052	.127	.042
	(.055)	(.043)	(.067)	(.049)
Log Likelihood	-239.7	-76.9	-141.0	-44.1
Sample Size	551	233	337	152
Observed Probability	.425	.150	.362	.12

Table 9: Regressions of equity ownership outside DC plan (controls for % of DC plan invested in stock & size of DC plan relative to own-account financial assets)

Dep. Variable = have own-account stock > $1000
Marginal changes in probability from Probit model reported

	May have more than one plan		Households with only one plan	
	All	NOSAVERS	All	NOSAVERS
CHOICE	**.170**	**.078**	**.168**	**.063**
	(.040)	**(.028)**	**(.046)**	**(.033)**
Stock / balance	.182	.056	.146	.021
for DC plan	(.052)	(.041)	(.063)	(.045)
DC plan assets /				
Financial assets				
> .25 & < 1	.014	.021	-.041	-.019
	(.047)	(.042)	(.056)	(.039)
> 1 & < 4	-.066	-.004	-.123	-.041
	(.050)	(.040)	(.055)	(.036)
> 4	-.236	-.114	-.254	-.115
	(.051)	(.034)	(.054)	(.038)
Sample Size	1051	475	518	247

HOUSEHOLD MUST HAVE OWN-ACCOUNT FINANCIAL ASSETS > $20K

Dep. Variable = have own-account stock > $1000
Marginal changes in probability from Probit model reported

	May have more than one plan		Households with only one plan	
	All	NOSAVERS	All	NOSAVERS
CHOICE	**.169**	**.161**	**.188**	**.083**
	(.058)	**(.060)**	**(.086)**	**(.109)**
Stock / balance	.206	.133	.260	.118
for DC plan	(.063)	(.094)	(.102)	(.151)
DC plan assets /				
Financial assets				
> .25 & < 1	.093	.118	.072	.197
	(.056)	(.101)	(.093)	(.192)
> 1 & < 4	.006	.085	.007	.055
	(.064)	(.099)	(.114)	(.176)
> 4	-.275	-.233	-.303	-.251
	(.079)	(.078)	(.133)	(.120)
Sample Size	672	217	271	82

Full specification was estimated. Coefficients for other explanators are not reported.
Note: Financial assets do not include DC plan assets.

Table 10: Regressions of equity ownership outside DC plan
(data source is 1992 Wave 1 Health & Retirement Study (HRS))

Dep. Variable = have own-account stock > $1000

Only the marginal change in ownership probability from CHOICE is reported
Probit model is assumed

Estimates from full specification over all households

	May have more than one plan		Households with only one plan	
	Any DC plan	401 (k) only	Any DC plan	401 (k) only
CHOICE	**.046** **(.031)**	**.091** **(.050)**	**.040** **(.046)**	**.124** **(.073)**
Sample Size	1317	555	393	185

Estimates from full specification over *NOSAVER* households

	May have more than one plan		Households with only one plan	
	Any DC Plan	401 (k) only	Any DC Plan	401 (k) only
CHOICE	**.074** **(.036)**	**.156** **(.052)**	**.052** **(.043)**	**.097** **(.048)**
Sample Size	570	228	214	93

CHOICE = 1 if the household participates in a plan where they choose investments.

All sample inclusion rules used earlier apply here as well. HRS variables are generally defined exactly the same as those constructed from the SCF. The HRS stock outside DC plan measure also includes stock held through investment trusts but *omits stock held in IRA accounts.* The omission of stock ownership through IRAs likely explains the lack of significance of the CHOICE coefficient in some of the regressions estimated above over the whole sample. The HRS does not ask a question regarding risk-tolerance, so the variables LOVERISK and HATERISK cannot be constructed. Thus, in the HRS sample, a NOSAVER is a household with no IRA assets.

Table 11: Ownership of stock outside of DC plan for NOSAVERS
The implied marginal impact of CHOICE for the "financially unsavvy"

	Difference in ownership prob. relative to households with CHOICE	Estimated effect of CHOICE on ownership for household which currently does not direct DC plan investments		
		Mean	Median	$25^{th} - 75^{th}$ %
May have more than one plan				
Any DC plan	.097	.068	.059	.034 - .100
401 (k) only	.177	.137	.079	.033 - .211
Households with just one plan				
Any DC plan	.093	.068	.063	.031 - .096
401 (k) only	.137	.106	.074	.021 - .156

Marginal effects are calculated for each NOCHOICE household using underlying Probit coefficients obtained from full specifications reported in Tables 6 & 8. The reported distribution of marginal effects is weighted to reflect the relevant population.
Recall a NOSAVER or "financially unsavvy" household by my definition has no IRA assets and reports it is not willing to take above average risks to earn above average returns.

ESSAY THREE

Capital Gains Tax Rules, Tax-Loss Trading, and Turn-Of-The-Year Returns

(joint with James M. Poterba)

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The unusual behavior of stock returns at the turn of the calendar year is one of the most-studied empirical regularities in financial economics. A variety of explanations have been offered for the abnormally high returns that have been observed historically on the last days of December and first days of January. Some focus on the annual cash flow patterns to institutional investors or on the incentives that year-end reporting requirements place on these investors. Others suggest that the income tax system facing individual investors may induce tax-loss selling and therefore affect turn-of-the-year returns. Because realized capital losses can be used to reduce taxes on realized gains or other income in the calendar year in which they are realized, taxpayers have an incentive to realize capital losses before year-end. Such tax-loss selling could produce year-end selling pressure in shares that have experienced losses before year-end; if this selling pressure abates after the turn of the year, the prices of these shares might rise, thereby contributing to higher returns after the turn of the year.

In one of the classic studies of the turn-of-the-year effect, Roll (1983) describes this tax-loss selling explanation. He then notes that "If investors realized that such a pattern were persistent, they would bid up prices before the end of the year and there would be no significant positive returns after January first... [however], we are obliged to test every theory, even one so patently absurd as this, by the empirical strength of its predictions... (p. 20)" His empirical evidence suggests that the turn-of-the-year return is related to the return over the previous year, as the tax-loss-selling explanation would suggest. Firms that experience more negative returns in one year display larger January returns in the next. There is now a substantial body of research, including Dyl (1977), Branch (1977), Slemrod (1982), Reinganum (1983), Lakonishok and Smidt (1986), Ritter (1988), Dyl and Maberly (1992), Eakins and Sewell (1993), Sias and Starks (1997), and Reese (1998), that suggests that individual investors are sensitive to tax

considerations in their year-end stock trading. These empirical findings suggest that the "absurd" tax-based explanation must be given serious consideration, even though a definitive link between tax-motivated trading behavior and turn-of-the-year stock returns has yet to be established.

For example, a number of studies have tested for turn-of-the-year return anomalies in countries without capital gains taxes. These include pre-1973 Canada (Berges, McConnell, and Schlarbaum (1984)), pre-1965 Great Britain (Reinganum and Shapiro (1987)), and the pre-1917 United States (Schultz (1985), Jones, Pearce, and Wilson (1987), and Jones, Lee, and Apenbrink (1991)). These studies provide mixed evidence on the importance of tax-loss selling in contributing to turn-of-the-year return behavior. However, the finding a turn-of-the-year return effect in a country without a capital gains tax does not imply that tax-loss selling does not contribute to observed turn-of-the-year returns in countries with a capital gains tax. It simply implies that other factors also contribute to such return patterns.

One difficulty in evaluating the tax-loss-selling hypothesis is that many of its predictions coincide with an alternative model, the "window dressing" hypothesis for institutional investors. In particular, the tax-loss-selling hypothesis and the "window dressing" hypothesis suggested by Haugen and Lakonishok (1987) and Lakonishok, et al. (1991) yield similar predictions for stock returns and volume around the turn of the year. The window dressing hypothesis suggests that institutional investors sell shares with recent price declines prior to year-end or quarter-end, when they must disclose their portfolio holdings, so they are not shown holding poorly performing stocks.

This paper presents new evidence on the link between tax-loss selling and turn-of-the-year returns. It exploits changes over time in the structure of capital gains taxes to generate

predictions about the correlation between previous losses and year-end tax loss selling. A substantial previous literature, including Constantinides (1984), Chan (1986), and Sims (1995), discusses optimal stock trading strategies when short- and long-term capital gains are taxed differently. Constantinides (1984) demonstrates that when there are no distinctions between long-term and short-term gains, and when there are no transaction costs, there should be no increase in tax-loss selling at year-end. Losses should be realized as they occur. In the presence of transactions costs, however, and under tax regimes that make short-term losses more valuable to investors than long-term losses, it may be optimal for investors to realize their losses just before they become long-term, or just before the turn of the year, whichever comes first.

There have been changes over time in the length of time that assets must be held to qualify for long-term capital gains treatment and in the incentive to realize short-term losses in excess of realized gains. Over the past three decades, the holding period for long-term gains and losses has fluctuated between 6 and 12 months, with changes occurring in 1977, 1978, 1984, and 1988. The fraction of long-term losses that can be deducted from non-gain Adjusted Gross Income (AGI) has changed twice in the postwar period. The 1969 tax reform reduced the fraction from 100% to 50%. It was raised from 50% to 100% in the Tax Reform Act of 1986. In a setting with transaction costs, such tax changes would affect optimal tax-loss-selling behavior. Changes in the holding period alter the set of previous returns that would be most important for determining the amount of year-end tax-loss selling. Lowering the fraction of long-term losses deductible against AGI strengthens investors' incentive to realize short-term losses. If tax-motivated trading is an important determinant of turn-of-the-year stock returns, then the tax changes may provide an opportunity to uncover a link between such trading and these returns.

Chan (1986), DeBondt and Thaler (1985, 1987), and Simms (1995) also study the link between January returns and both recent and historical losses. Our study extends this work by focussing on differences in the coefficients on long-term and short-term loss realization potential under different tax regimes. We also investigate how the definition of the holding period for short-term gains and losses affects the link between past returns and turn-of-the-year returns.

Our empirical strategy is to use changes in the capital gains tax rules to generate testable predictions in the relationship between lagged returns and turn-of-the-year returns. Unlike many previous studies, our tests have some power to distinguish between window dressing and tax-loss selling. Changes in capital gains taxation apply to individual investors but not to the untaxed institutions such as pension funds and universities. If tax loss selling by individual investors does not contribute to year-end selling pressure, then changes in the capital gains tax rules should be inconsequential for turn-of-the-year returns. A relationship between these tax rules and turn-of-the-year returns, however, provides some evidence that tax loss selling contributes to January returns.

The paper is divided into four sections. Section one describes the capital gains tax provisions in the federal income tax code that bear on realization decisions. Section two describes the data that we analyze and presents summary information on turn-of-the-year returns over the time period 1963-1996. The third section presents our results on the effect of holding period changes, and changes in the share of long-term losses that can be deducted from AGI, on the relationship between lagged returns and turn-of-the-year returns. There is a brief conclusion.

I. Capital Gains Taxation and Tax Loss Selling

The capital gains tax in the United States has changed many times in the postwar period. Tax rates, the length of the holding period that qualifies assets for long-term gains treatment, the fraction of long- and short-term losses that can be deducted against non-gain AGI, and the dollar limit on the losses that can be deducted from AGI have all been modified. This section begins by summarizing the tax incentives for realizing short-term losses at year-end, then describes changes in the capital gains tax law, and concludes with a discussion of the number of taxpayers who were most affected by the reforms.

1.1 Incentives for Tax Loss Selling

Previous studies, notably Chan (1986) and Reese (1998), have derived conditions under which an investor will find it optimal to realize a short-term capital loss before year-end, rather than wait until after the turn of the year and realize the loss, possibly as a long-term loss. Realization timing decisions will depend upon the magnitude of the loss, the expected turn-of-the-year return, the discount factor reflecting deferring realization, and short-term and long-term capital gains tax rates. The larger the difference between the short-term and long-term capital gains tax rates, the greater the incentive for short-term realization before the turn of the year.

However, the end of December does not mark the switch from short to long-term tax status for the majority of investors. So why should loss realizations, particularly short-term, be concentrated at year-end? First, the investor may have realized gains that allow full use of the tax deduction which results from a loss realization. If the investor has both short and long-term gains to offset, it may be worthwhile to realize short-term losses before the end of December. The investor may not have short-term gains to offset next year (short-term losses are less valuable if deducted against long-term gains). Second, the failure to realize a loss by the end of the calendar year delays the tax savings by a year. For those investors who are able to

distinguish short and long-term losses on their tax returns, the higher tax rate on short-term assets suggests short-term losses are more likely to be worth realizing at year-end than long-term losses.

1.2 Capital Gains Tax History

Table 1 summarizes the income tax provisions that affect capital gains taxation over the period 1942-1996. It focuses on changes in the long-term holding period and the percentage of long-term losses deductible against AGI. The 1969 Tax Reform Act reduced the fraction of long-term capital losses that could be deducted from AGI from 100 percent to 50 percent effective January 1, 1970. Short-term losses were fully deductible against AGI both before and after the 1969 tax reform, and there was a $1000 limit on the total losses that any taxpayer could claim. The 1969 rule was in force until 1986, when another tax reform returned to the pre-1969 rule on loss deductibility. This limit probably makes the long-term loss provision more important for small investors than for large ones.

The 1969 restriction on losses offsetting other income was weakened in 1976. When the 1969 reform took effect, long-term losses were defined as those on assets held for more than six months. This definition was modified by the 1976 Tax Reform Act, which raised this holding period to nine months for 1977 and twelve months for years after 1978. This holding period change was reversed in the Deficit Reduction Act of 1984, which reduced the long-term holding period to six months for assets purchased between June 22, 1984 and the end of 1987. As a result of changes enacted in the Tax Reform Act of 1986, the long term holding period has been twelve months since 1988.

Restrictions on the use of long-term losses to offset other types of income, such as those in effect from 1970 to 1986, give investors incentives to recognize losses while they are short-

term. In the presence of transaction costs, changes in the definition of the holding period, and in the nature of the loss-offset rules should affect investor behavior.

Our empirical results relate turn-of-the-year returns to previous-year stock performance over the period 1963-1996. We divide this thirty-four-year span into three regimes with regard to capital gains taxation, and then test whether the pattern of turn-of-the-year returns over the three regimes is consistent with tax-motivated trading.

Regime I includes years when the long-term holding period was six months and long-term losses were just as valuable as short-term losses for reducing AGI. This covers Januaries in 1963 through 1969, as well as 1988, since 1987 has similar tax rules to the earlier period. Regime II includes January returns from 1970-1976 and 1985-1986, when the holding period was six months, and long-term losses were only half as valuable as short-term losses for reducing AGI. In this regime, the tax loss-selling hypothesis predicts that losses during the second half of the calendar year should have a larger effect on turn-of-the-year returns than losses that accrued earlier in the year. Regime III includes the years with a twelve month holding period. This includes the Januaries in 1979-1984 and 1989-1996. In this regime, six-month and six-to-twelve month lagged returns should both help to predict December selling and subsequent turn-of–the-year returns. Losses on securities purchased during the first as well as the second half of the year can be realized as a short-term loss at year-end when the holding period is twelve months.

We leave the January returns for three years out of our analysis. January 1977 and January 1978 mark transitions from six to nine, and nine to twelve month holding periods, respectively. These transitions reduce the selling pressure in December 1976 and December 1977 that would otherwise have been associated with six and then nine-month holding periods. January 1987 is a transition from 50% to 100% deductibility of long-term losses. This transition

reduced the selling pressure in December of 1986 that would otherwise have been associated with 50% deductibility of long-term losses.

The tax loss-selling hypothesis predicts that when the holding period is six months and long-term losses are only partially deductible, losses in the first half of the year should have a weaker effect on turn-of-the-year returns than losses between July and December. One reason returns from the first half of the year would have less of an impact on January returns when the holding period is six months is that losers from the first half of the year would have had to have been sold much earlier than year-end to obtain short-term tax treatment. The hypothesis also predicts that when the holding period is twelve months, losses in the first and second halves of the year should have more similar effects on turn-of-the-year returns. Our empirical work is directed at evaluating these predictions. Recall that these changes in capital gains taxation apply to individual investors but not to the untaxed institutions such as pension funds and universities. If tax loss selling by individual investors does not contribute to year-end selling pressure, then these changes in the capital gains tax rules should be inconsequential for turn-of-the-year returns.

1.3 Number of Taxpayers Impacted by Reforms

The substantive importance of differential deductibility for long-term and short-term losses depends on the pattern of loss realizations, because capital gains and losses are "netted" against each other before they are added to, or subtracted from, adjusted gross income. For some taxpayers, this "netting" makes the different statutory treatment of long-term and short-term losses irrelevant. For example, consider a taxpayer with long-term gains in excess of short-term losses. This taxpayer would effectively face the long-term capital gains tax rate on incremental short-term loss realizations, since such losses would reduce net taxable long-term gains. The only taxpayers who face different tax rates on short-term losses and long-term losses are those

who have both net short-term and net long-term losses, or those who have both net short-term and net long-term gains.

The Treasury Tax Model data provide some information on the importance of such taxpayers. In 1970, for example, the first year when long-term losses were only 50% deductible, taxpayers with both long- and short-term gains or long- and short-term losses reported 14 percent of the dividends reported by taxpayers with gains or losses. This fraction has increased slowly over time. It remained reasonably stable throughout the 1970s, rose in the early 1980s, for example to 22 percent in 1981, and rose again in the mid-1980s. There was a sharp increase in 1986, to 33 percent, but the values in the late 1980s were also higher than in previous years. In 1989, for example, this fraction was 31 percent. In 1994, the most recent year for which data are available, taxpayers with both long- and short-term gains or long- and short-term losses reported 24.7 percent of the dividends reported by taxpayers with gains or losses.

Our discussion so far has not emphasized the role of the limit on the amount of capital losses deducted from ordinary taxable income. Investors with taxable losses in excess of loss-offset limits can carry forward losses, indefinitely but without adjustment for inflation, for use in future years. Because future deductions are worth less than immediate deductions, however, taxpayers with loss carryforwards face smaller differences between the effective tax rates on long-term and short-term losses than taxpayers who can deduct the losses against AGI when they are realized. Tabulations from the Treasury Individual Tax Model show substantial variation over time in the fraction of dividend income (a proxy for holdings of corporate stock) that is reported on tax returns with capital losses in excess of the loss limit. This fraction is never greater than one third, and is often considerably less.

These tabulations suggest that a nontrivial share of individual investors had gain and loss realizations that led them to face different marginal tax rates on short-term and long-term losses. Our empirical analysis implicitly provides evidence on whether these investors are substantively important for asset pricing.

II. Data Description

Our empirical tests analyze returns on common stocks that are classified as "ordinary common shares" on the Center for Research in Security Prices (CRSP) return files. Computing a stock's loss potential requires at least twelve months of previous returns. LOSS, defined as the percentage difference between its price at the beginning of a time period (say on July 1) and its price at the end of the period (say on December 30), is used to measure the loss potential of a stock. We construct LOSS measures for the first and second halves of the calendar year:

(1a) $$LOSS_{July\text{-}Dec} = (P_{Dec\ 24}/P_{July\ 1} - 1)$$

and

(1b) $$LOSS_{Jan\text{-}June} = (P_{June\ 30}/P_{Jan\ 1} - 1).$$

$LOSS_{July\text{-}Dec}$ excludes returns on the last five trading days of December, on the grounds that they may already reflect some of the turn-of-the-year return effects. We set LOSS equal to zero if the firm experienced a capital gain over the relevant interval. We define a complementary pair of variables, $GAIN_{July\text{-}Dec}$ and $GAIN_{Jan\text{-}June}$, for firms that experienced capital appreciation.

The CRSP NYSE and AMEX daily return files begin in July 1962. Since the NASDAQ files begin in 1973, after some of the tax reforms we consider, we do not analyze returns for NASDAQ firms. We can obtain beginning-of-1962 prices for NYSE stocks from the monthly

CRSP file, so we can define LOSS and GAIN and study of turn-of-the-year returns for NYSE stocks beginning in January 1963. For AMEX stocks, we must begin in 1964.

The turn-of-the-year return is defined following Roll (1983), Sims (1995), and others as the dividend-inclusive return on the last trading day in December and the first five days in January. When we exclude the return on the last trading day in December from our analysis, the results are very similar to those presented below.

Table 2 shows mean and median turn-of-the-year returns for each of the three tax regimes that we defined above. Turn-of-the-year returns are substantial in all three regimes. The turn-of-the-year returns are largest for the tax regime that includes 1970-1976 and 1985-86, when the tax incentives to realize losses while they were short-term were the greatest. The large average turn-of-the-year effect in this period may also be due in part to the prevalence of accrued losses in this regime. For the 1970-76 and 1985-86 regime, the median stock experienced a July-December capital loss 7.4 percent, compared with a capital gain of 0.9 percent in 1963-69 and 1988 tax regime, and a capital loss of 0.4 percent in the 1979-84 and 1989-96 regime. Using regression analysis in the next section, we will explore the possible impact of different return experience in explaining differences in turn-of-the-year returns across regimes.

III. Tax Regimes and Turn-of-the-Year Effects

To investigate how tax law changes affect turn-of-the-year returns, we explore the link between turn-of-the-year returns and loss realization potential for individual firms. For example, we estimate:

$$(2) \quad R_{Jan,i,t} = \beta_1 * GAIN_{July\text{-}Dec,i,t-1} + \beta_2 * GAIN_{Jan\text{-}June,i,t-1} + \beta_3 * LOSS_{July\text{-}Dec,i,t-1}$$

$$+ \beta_4 * LOSS_{Jan\text{-}June,i,t-1} + \beta_5 * (1/PRICE_{i,t}) + \phi_i + \lambda_t + \varepsilon_{I,t.}$$

$R_{Jan,i,t}$ is the turn-of-the-year return defined above. The terms ϕ_i and λ_t correspond to firm-specific and year-specific intercepts. The firm-specific fixed effects capture return differentials that may be related to volatility, systematic risk, or other slowly changing firm characteristics. Since GAIN is positive and LOSS is negative, negative values of β_3 and β_4 imply larger turn-of-the-year returns on shares with larger losses in the previous year.

PRICE is the price of the stock at the close of the second to last trading day in December. The variable 1/PRICE serves as a simple proxy for trading costs and the coefficient β_5 should reflect the low-share price effect on turn-of-the-year returns documented by Bhardwaj and Brooks (1992). Ritter's (1988) parking-the-proceeds hypothesis posits that investors rebalance their portfolio at the turn-of-the-year, realizing losses in December and disproportionately reinvesting proceeds in small stocks in early January. This portfolio rebalancing effect may also be captured by the 1/ PRICE variable.

If tax-loss selling is an important factor in explaining turn-of-the-year returns, then we should observe a distinct pattern in the coefficients on the loss realization potential variables over the three tax regimes. This pattern is: (1) $\beta_3 \leq \beta_4 < 0$ in Regime I, with a six month holding period and long-term losses 100% deductible; (2) $\beta_3 < \beta_4 < 0$ in Regime II, with a six month holding period and long-term losses only 50% deductible; and (3) $\beta_3 = \beta_4 < 0$ in Regime III, with a twelve month holding period.

We test for differences between the effects of short-term and long-term losses by including both $LOSS_{July\text{-}Dec,i,t-1}$ and $LOSS_{Jan\text{-}June,i,t-1}$ in the regression models. The tax-loss-selling hypothesis predicts that the difference between the coefficients on the six- and twelve-month lagged returns should be greatest when there is both a six month holding period and 50%

deductibility of long-term losses. It also predicts that the difference should be smallest when the holding period is twelve months, as in Regime III.

3.1 Basic Results

Table 3 shows the results of estimating equation (2) for each of the three tax regimes. We report results both with and without firm-specific fixed effects. The table shows that losses in the previous year predict higher turn-of-the-year returns in each of the three regimes. Gains during the previous year predict much smaller absolute differences in turn-of-the-year returns. The coefficients on the lagged losses also differ across the three tax regimes. In particular, the coefficients are substantially different in Regime II (1970-1976 & 1985-86), the regime with the greatest incentives for short term loss realization.

The results for Regime II suggest that a 10% capital loss over the July-December period is associated with a 151 basis point increase in the turn-of-the-year return. A similar loss over the January-June period is associated with only a 53 basis point increase in turn-of-the-year returns. One reason returns from the first half of the year would have less of an impact on January returns when the holding period is six months is that losers from the first half of the year would have had to have been sold much earlier than year-end to obtain short-term tax treatment.

It is particularly striking that in Regime III, when there is a twelve-month holding period, the difference in the coefficients on the January-June and the July-December LOSSes is considerably reduced. Recall, losses on securities purchased during the first as well as the second half of the year can be realized as a short-term loss at year-end when the holding period is twelve months. When firm effects are included, this coefficient difference is statistically insignificant from zero.

Table 3 reports specifications that relate turn-of-the-year returns to losses and gains over the previous twelve months. We have also estimated equations with additional lagged returns, in the spirit of models estimated by DeBondt and Thaler (1985). Including further lagged returns does not affect the coefficients on the returns over the most recent twelve months. Losses over the period from 24 to 12 months prior to the turn-of-the-year do have some predictive power for turn-of-the-year returns. The estimated coefficients are –0.055 (0.009) for Regime I, -0.076 (0.007) for Regime II, and –0.053 (0.014) for Regime III. For the two six month holding period regimes, the effect of losses 6 to 12 months prior to the turn-of-the-year is not statistically different from that for losses which occurred 12 to 24 months ago.

Including returns more than twelve months before the realization date also provides an additional test of the link between the fraction of long-term losses that can be deducted from AGI and turn-of-the-year returns. In Regime III, when the long-term holding period was twelve months, the long-term loss deduction fraction was 50% from 1979-1984 and 100% from 1989-1996. For at least some investors, the incentive to realize a loss within one year of purchase is greater in the earlier period. To test this, we regressed turn-of-the-year returns on returns from the previous two years for the two periods. The estimated coefficients on losses over the previous year were -.070 (.009) for 1979-84 and -.071 (.016) for 1989-96. The effect of losses that accrued between twelve and twenty-four months before the turn-of-the-year was smaller for the 1979-84 period than for the latter period. The differences were -.030 (.011) and -.016 (.014), respectively. Since including returns lagged by more than twelve months does not appear to affect the coefficients on returns over the six and twelve month lags, the remainder of our analysis focuses on specifications that exclude further lagged returns.

One difficulty with results like those in Table 3 is that the capital gains tax law was not the only factor that varied across tax regimes. The early 1970s included a period of poor stock market returns, so the set of stocks with losses to realize at year-end was larger in this regime than in the other time periods. Other differences across regimes may be changes in trading costs, and a growing presence of foreign investors in U.S. equity markets. We provide three "tests" of whether the different pattern of turn-of-the-year returns is due to the changing distribution of previous returns, or to the link between past returns and turn-of-the-year returns for stocks with a given return experience.

First, we re-estimated our equations for Regime II excluding turn-of-the-year returns for 1974 and 1975. The resulting difference between the July-to-December and January-to-June loss coefficients is –0.094 (0.012). The difference was -0.097 when these years were included in the sample. Second, we estimate equation (4) for each year to look for differences across tax regimes. (We cannot estimate firm-specific expected returns in this case.) Table 4 presents these results. A July-December loss is associated with a significantly greater turn-of-the-year return relative to a January-June loss in five out of nine years in Regime II, but only two of the eight years in Regime I and three out of fourteen years in Regime III. These results provide support for our focus on tax regime differences as a key factor in the changing coefficient patterns.

Finally, we disaggregated the regressors in equation (2) to include separate variables for capital losses of less than 20 percent, 20-40 percent, and more than 40 percent. These three variables add up to the LOSS variable in equation (2), but they provide some evidence on the pattern of turn-of-the-year effects across stocks with accrued losses of different sizes. Table 5 shows the results of estimating this modified specification. While the fraction of firms in these

various loss categories changes significantly across tax regimes, the coefficients on losses in each category move in tandem with the aggregate coefficient for all losses (i.e., the coefficient in Table 3). Moreover, there are pronounced differences for sets of losses between the January-June and July-December loss effects when the holding period is six months, but no such differences when the holding period is one year. This evidence also suggests that the changing distribution of LOSS does not explain the divergent coefficients on losses that accrue between July-December and January-June across tax regimes.

3.2 Small Firms

Several previous studies, notably Rozeff and Kinney (1976) and Keim (1983), have suggested that large turn-of-the-year returns are concentrated among stocks with small market capitalization (although Ackert and Athanassakos (1998) question this conclusion). If small stocks are more apt to suffer large losses and/or have a higher percentage of individual ownership, then the small firm premium in January may be partly attributable to tax-loss selling. To address the relationship between firm size, lagged losses, and turn-of-the-year returns, we estimate (2) allowing the LOSS coefficients to vary by size deciles.

Table 6 presents the results of this analysis. To simplify interpretation, the table presents only the difference between the coefficients on the July-December and January-June loss variables (β_3 - β_4 above). The correlation between lagged losses and turn-of-the-year returns is strongest for small and medium size firms, as would be expected given their higher individual ownership. For Regime II, July-December losses are a stronger predictor of turn-of-the-year returns than losses over the first half of the year for eight of the ten size deciles. For Regime I, the analogous result emerges for three size deciles, and for Regime III, for only one size decile.

3.3 Other Tests for Robustness

We also performed two other tests for the robustness of our findings. In the interest of brevity, we discuss but do not report the results. More detailed results are available from the authors on request.

First, we re-estimate (2) with other measures of loss potential. LOSS and GAIN measure the return over the interval for investors who bought the security at the beginning of the interval. We also consider two alternative measure of loss potential that incorporates some information on a stock's price trajectory during each six-month period. The first weights the stock's holding period returns from each day within the interval to the end of the interval by the trading volume on the given day. The second incorporates volume-weighted returns over the entire year, but weights more recent returns more heavily. This allows for the possibility that price declines lead to more tax-loss-selling pressure when they occur later in the year.

The results using these alternative measures of loss potential are qualitatively similar to those in Table 3. The impact of July-to-December losses on turn-of-the year returns is greatest in Regime II, the 1970-1976 & 1985-86 period. The difference between the loss potential from the first half of the year, and that from the second half of the year, is also greatest for this period.

Second, we considered the role of bid-ask spreads in affecting our results. Keim (1989) and Bhardwaj and Brooks (1992) have suggested that turn-of-the-year return anomalies may simply be the result of changes in the location of transactions prices within the bid-asked price range. If trades at the end of the year are more likely to take place at the bid price, because they are "sell" orders, while trades in the early part of January are more likely to occur at the "ask" price, because they are buy orders, then part of the turn-of-the-year return could simply be the result of movement within the bid-ask spread. We investigated this possibility by defining an alternative turn-of-the-year return measure. CRSP reports low and high prices for the day if the

stock was traded, and the closing bid and ask quotes if no trades occurred. Trading spreads provide information about bid-ask spreads. Our alternative return measure is the difference between the bid (or low) price at the end of the fifth trading day in January, and the ask (or high) price at the beginning of the last trading day in December.

The estimated coefficients using this return specification are only slightly smaller than those in Table 3, and the conclusions about the importance of lagged losses and the difference between recent and further lagged loss effects across the different tax regimes are unaffected by this redefinition of returns. Apparently, 1/PRICE partially controls for the portion of the turn-of-the-year return that was due to movement within the bid-ask spread.

IV. Conclusion

Our results support the view that tax-related factors affect turn-of-the-year returns. Some explanations of why lagged returns are related to these turn-of-the-year returns, such as the institutional "window dressing" hypothesis, would not predict any relationship between the long-term capital gains holding period for individual investors and the correlation between past returns and the turn-of-the-year effect. Yet our empirical findings suggest that there is a substantial relationship in the U.S. equity markets. Our findings are consistent with the predictions of the tax-loss-selling hypothesis, and they suggest that this hypothesis may have some part in explaining the turn-of-the-year effect.

Our analysis has not attempted to integrate the role of changing transaction costs for equity trading in the discussion of tax-loss-selling incentives. The change in the structure of NYSE commissions in 1975, summarized in Stoll (1979), could have important effects in this

regard. Unfortunately, it is difficult to determine the precise change in effective trading costs facing individual traders at this time, because the costs of different sized trades responded differently to deregulation. In addition, some of the most important changes, such as the growth of discount brokers, developed gradually after 1975. The development of derivatives markets could also have potentially important effects, as could variation over time in average bid-ask spreads, but we leave these issues for further work.

A related issue that bears further study is the effect of the supply of realizable losses on the nature of turn-of-the-year effects. There are some years, such as 1974, when the aggregate market experiences substantial losses and investors are likely to have many unrealized capital losses in their portfolios. In such years investors may have little need to engage in year-end tax loss trading, and this may affect the turn-of-year returns. Dhaliwal and Trezevant (1993) find that the positive January return to shares that declined during the previous year is larger in down-market years than in up-market years. Further work on the link between taxation and turn-of-the-year returns could usefully focus on the nature of individual investor behavior, particularly the relationship between involuntary gain and loss realizations during the year and voluntary year-end realizations.

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Table 1: Key Provisions of the Federal Capital Gains Tax, 1942-1996

Years	Long-Term Holding Period (months)	% of Long-Term Losses Deductible Against AGI	Loss Limit
1942-1969	6	100	$1000
1970-1976	6	50	$1000
1977	9	50	$2000
1978 – June 1984	12	50	$3000
July 1984-1986	6	50	$3000
1987	6	100	$3000
1988-1996	12	100	$3000

Source: U.S. Treasury Department (1985) and Pechman (1987).

Table 2: Turn-of-the-Year Returns: NYSE and AMEX
Mean and Median Returns Over Various Tax Regimes

Tax "Regime"	Regime I	Regime II	Regime III
Applicable Years	1963-1969, 1988	1970-1976, 1985-1986	1979-1984, 1989-1996
Capital Gains Tax Rules	6 month holding period, long-term losses 100% deductible against AGI	6 month holding period, long-term losses 50% deductible against AGI	12 month holding period
Median Return	0.020	0.044	0.014
Mean Return	0.033 (0.011)	0.074 (0.017)	0.030 (0.006)

Source: Authors' tabulations from daily CRSP files. Standard errors are shown in parentheses. Standard errors are corrected to account for contemporaneous correlation of returns.

Table 3: Regression Results Relating Returns on Last Day of December and First Five Trading Days of January to GAINS and LOSSES in Past Year, NYSE and AMEX Stocks

Explanatory Variable	Regime I		Regime II		Regime III	
$LOSS_{Jan\text{-}June,t\text{-}1}$	-0.084	-0.102	-0.053	-0.057	-0.068	-0.069
	(0.012)	(0.012)	(0.007)	(0.007)	(0.013)	(0.013)
$LOSS_{July\text{-}Dec,t\text{-}1}$	-0.143	-0.167	-0.151	-0.178	-0.086	-0.118
	(0.015)	(0.012)	(0.010)	(0.017)	(0.015)	(0.020)
$GAIN_{Jan\text{-}June,t\text{-}1}$	-0.016	-0.006	-0.001	0.003	0.003	0.008
	(0.005)	(0.003)	(0.003)	(0.003)	(0.006)	(0.003)
$GAIN_{July\text{-}Dec,t\text{-}1}$	-0.017	-0.013	-0.002	-0.011	-0.017	-0.015
	(0.004)	(0.003)	(0.005)	(0.004)	(0.004)	(0.003)
1/ PRICE	0.032	0.060	0.154	0.129	0.051	0.047
	(0.032)	(0.014)	(0.019)	(0.027)	(0.014)	(0.013)
Firm Effects	Yes	No	Yes	No	Yes	No
Diff. in LOSS coefficients	-0.059	-0.066	-0.097	-0.121	-0.018	-0.049
	(0.018)	(0.015)	(0.011)	(0.017)	(0.016)	(0.019)
Adjusted R^2	.384	.277	.430	.373	.317	.268
Sample Size	14,932		20,645		32,701	

Notes: Difference in LOSS coefficients is coefficient on $LOSS_{July\text{-}Dec,t\text{-}1}$ minus coefficient on $LOSS_{Jan\text{-}June,t\text{-}1}$. All equations include year-effects and equations without firm-effects contain an indicator variable for AMEX stocks. Values in parentheses are White (heteroscedasticity-consistent) standard errors.

Table 4: Regression Results for Each Year Relating Returns on Last Day of December and First Five Trading Days of January to GAINS and LOSSES in Past Year, NYSE & AMEX

Year	Cumulative Loss, July to Dec.	Cumulative Loss, Jan. to June	Difference in LOSS Coefficients	Year	Cumulative Loss, July to Dec.	Cumulative Loss, Jan. to June	Difference in LOSS Coefficients
Regime I				Regime III			
1963	-0.049	-0.101	0.052	1979	-0.125	-0.107	-0.018
	(0.049)	(0.013)	(0.050)		(0.016)	(0.035)	(0.039)
1964	-0.169	-0.154	-0.016	1980	-0.006	0.013	-0.019
	(0.033)	(0.057)	(0.067)		(0.021)	(0.042)	(0.049)
1965	-0.150	-0.190	0.040	1981*	-0.095	-0.012	-0.084
	(0.032)	(0.030)	(0.047)		(0.025)	(0.019)	(0.031)
1966	-0.040	-0.009	-0.031	1982*	-0.074	0.066	-0.140
	(0.044)	(0.026)	(0.048)		(0.012)	(0.017)	(0.022)
1967*	-0.235	-0.151	-0.084	1983	-0.147	-0.126	-0.021
	(0.020)	(0.021)	(0.031)		(0.048)	(0.013)	(0.051)
1968	-0.064	-0.079	0.015	1984	-0.132	-0.113	-0.019
	(0.030)	(0.057)	(0.068)		(0.021)	(0.084)	(0.082)
1969*	-0.113	-0.021	-0.091	1989	-0.082	-0.054	-0.029
	(0.020)	(0.014)	(0.026)		(0.031)	(0.047)	(0.059)
1988	-0.158	-0.111	-0.047	1990	-0.180	-0.176	-0.005
	(0.014)	(0.054)	(0.055)		(0.039)	(0.052)	(0.059)
				1991*	-0.096	-0.036	-0.060
Regime II					(0.019)	(0.032)	(0.039)
1970*	-0.140	-0.050	-0.090	1992	-0.180	-0.116	-0.063
	(0.015)	(0.013)	(0.020)		(0.078)	(0.104)	(0.127)
1971	-0.034	0.011	-0.046	1993	0.071	0.009	0.063
	(0.036)	(0.010)	(0.037)		(0.070)	(0.026)	(0.071)
1972*	-0.128	-0.056	-0.072	1994	-0.136	-0.107	-0.029
	(0.022)	(0.042)	(0.049)		(0.028)	(0.018)	(0.034)
1973	-0.038	-0.036	-0.002	1995	-0.052	-0.072	0.020
	(0.015)	(0.017)	(0.024)		(0.024)	(0.019)	(0.024)
1974*	-0.156	-0.056	-0.100	1996	-0.110	-0.072	-0.038
	(0.025)	(0.017)	(0.031)		(0.026)	(0.036)	(0.041)
1975*	-0.264	-0.125	-0.139				
	(0.023)	(0.030)	(0.032)	"Transition" Years			
1976	-0.142	-0.088	-0.053	1977	-0.025	-0.026	0.001
	(0.017)	(0.094)	(0.096)		(0.023)	(0.049)	(0.057)
1985	-0.011	-0.029	0.018	1978	-0.038	-0.014	-0.024
	(0.018)	(0.013)	(0.023)		(0.017)	(0.017)	(0.023)
1986*	-0.214	-0.056	-0.158	1987	-0.098	-0.061	-0.038
	(0.042)	(0.035)	(0.053)		(0.022)	(0.027)	(0.036)

Notes: Difference in LOSS coefficients is coefficient on $LOSS_{July\text{-}Dec,t\text{-}1}$ minus coefficient on $LOSS_{Jan\text{-}June,t\text{-}1}$. Values in parentheses are White (heteroscedasticity-consistent) standard errors. Coefficients on GAIN measures, 1/PRICE, and indicator for AMEX stocks are not reported.
* indicates that the difference in LOSS coefficients is significantly less than zero at .10 level.

Table 5: Regressions of Turn-of-Year Returns on Lagged Returns, NYSE & AMEX Stocks Pooled, Stratified by Lagged Gain or Loss and by Size of Loss

Explanatory Variable	Regime I	Regime II	Regime III
LOSS <20%	-0.058	-0.054	-0.083
Jan-June	(0.016)	(0.016)	(0.022)
LOSS <20%	-0.107*	-0.079	-0.089
July-Dec	(0.016)	(0.014)	(0.010)
LOSS 20-40%	-0.087	-0.065	-0.046
Jan-June	(0.013)	(0.009)	(0.013)
LOSS 20-40%	-0.112	-0.124*	-0.067
July-Dec	(0.014)	(0.009)	(0.008)
LOSS >40%	-0.089	-0.049	-0.083
Jan-June	(0.020)	(0.008)	(0.020)
LOSS >40%	-0.194*	-0.163*	-0.098
July-Dec	(0.026)	(0.012)	(0.023)
GAIN	-0.017	-0.001	0.003
Jan-June	(0.005)	(0.003)	(0.006)
GAIN	-0.019	-0.011	-0.018
July-Dec	(0.004)	(0.005)	(0.004)
1/ PRICE	0.028	0.150	0.050
	(0.032)	(0.019)	(0.014)
Adjusted R^2	.387	.431	.318

Estimates are similar to those in Table 3 but stratify securities by previous returns. All estimating equations include firm and year effects. Sample sizes are the same as those in Table 3. * indicates LOSS coefficient for July-Dec is significantly different from analogous coefficient for Jan-June interval at .05 significance level.

Table 6: Regression Results for Turn-of-Year Returns, NYSE & AMEX Stocks Pooled, Difference in LOSS coefficients over Market Capitalization Deciles

Size Decile	Regime I	Regime II	Regime III
1st (smallest)	-0.072 (0.056)	0.012 (0.036)	-0.030 (0.051)
2nd	-0.058 (0.047)	-0.107* (0.031)	0.016 (0.035)
3rd	-0.082* (0.040)	-0.116* (0.027)	-0.040 (0.030)
4th	-0.102* (0.035)	-0.058* (0.026)	0.003 (0.036)
5th	-0.059* (0.029)	-0.133* (0.022)	-0.119* (0.069)
6th	-0.004 (0.034)	-0.118* (0.024)	0.025 (0.022)
7th	0.007 (0.032)	-0.084* (0.022)	0.049 (0.024)
8th	0.032 (0.029)	-0.077* (0.020)	0.057 (0.021)
9th	0.019 (0.027)	-0.064* (0.020)	0.069 (0.019)
10th	0.050 (0.025)	-0.006 (0.022)	0.023 (0.018)
Adjusted R^2	.396	.447	.328

Note: Difference in LOSS coefficients is coefficient on $LOSS_{July\text{-}Dec,t\text{-}1}$ minus coefficient on $LOSS_{Jan\text{-}June,t\text{-}1}$. Market capitalization decile cutoffs for January of year t are formed at end of year t-2. * indicates that the difference in LOSS coefficients is significantly less than zero at .05 level.