

Corporate Share Repurchases: What Role Do Stock Options Play?

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ABSTRACT

This paper investigates how the growth of employee stock option programs has affected corporate payout policy. Given that earnings per share (EPS) is widely used in equity valuation, some corporations may opt to repurchase shares to avoid the dilution of EPS that may result from past stock option grants. Executives may also prefer distributing cash by repurchasing shares or retaining more earnings, as opposed to increasing dividends, to enhance the value of their own stock options. This paper tests the importance of these two hypotheses using both cross-sectional and panel data on stock option programs. Employee stock options in general are associated with increased share repurchases and increased total payouts. Further, the positive relationship between options and share repurchases is stronger for firms with high stock returns (high stock returns lead to greater dilution of EPS from options). Analysis of panel data for a sample of large firms suggests that firms conduct an ongoing repurchase of shares over the life of an option that undoes much of the dilution to EPS that results from past stock option grants. Once total outstanding options are controlled for, there is no relationship between repurchases and the number of options held by upper management. However, the larger is the executives' holding of stock options, the more apt the firm is to retain more earnings and curtail cash distributions. These findings are consistent with recent survey evidence regarding payout policy.

JEL Classification: G30, G35

Key Words: share repurchase, stock option, payout policy, earnings management

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The past two decades have seen a dramatic change in corporate payout policy, as firms are increasingly using share repurchases to distribute cash (Fama and French (2001) and Grullon and Michaely (2002)). For the S&P 500, stock buybacks have grown from 10% of dividends in 1980 to actually surpassing dividend payments since 1997. Particularly striking is the surge in share buybacks in the mid-1990s, as share repurchases doubled from 1994 to 1996. Why did firms repurchase so much of their stock, and why did firms keep buying back shares despite soaring valuations?

At the same time repurchases have risen, the use of stock-based compensation has taken off. Three quarters of the members of the S&P 500 from 1994 to 1998 increased stock option grants over the period. For the S&P 500 as a whole, stock option grants rose from 1.0% of shares outstanding in 1994 to 1.6% of shares outstanding in 1998. The size of stock option programs grew over 40% over the four-year span, with outstanding stock options representing 6.3% of shares outstanding at the end of 1998 (based on 10-K filings).

Jolls (1998), Dittmar (2000), Fenn and Liang (2001), and Kahle (2002) have established a link between option programs and stock buybacks, primarily focusing on executive stock option awards. This paper extends this literature by focusing on whether the dilution of accounting earnings per share (EPS), which results from option programs, is a contributing factor to stock repurchases. Further, the use of panel data allows this paper to directly address the usual criticism that a cross-sectional relationship between executive holdings and payout policy may reflect unobservable characteristics, such as managerial quality or corporate governance, that generate both option compensation and dividend policy.

While current accounting standards do not require a firm's earnings to reflect the value of stock options granted to employees during the current year, they do attempt to account for the

potential dilutive effect of outstanding options on an existing shareholder's claim on the firm. Reported EPS divides the level of earnings by the sum of common shares outstanding and common stock equivalents, which are added to reflect outstanding dilutive securities like options. The granting of stock options will increase the number of shares over which earnings are divided, thus diluting EPS. The cost of an option program is therefore ultimately reflected by an erosion of earnings per share. This is important, as the EPS number is widely used to evaluate firm performance and determine stock valuation.¹ Further, executive compensation may also be tied in part to accounting measures, such as earnings per share.

In order to counter this dilution, the firm can repurchase stock. Repurchasing shares reduces shares outstanding, and the cash used to purchase the stock is not deducted from earnings. In many circumstances, EPS will be boosted when a firm repurchases stock. Thus, an ongoing share buyback program can at least partially undo the dilution that results from stock option grants, making the real costs firms are incurring from stock options less apparent. This illustrates why Charles Clough, chief investment strategist at Merrill Lynch, refers to share repurchases as “a pure earnings management scheme” (*The Wall Street Journal*, February 22, 1999). To the extent that stock prices are sensitive to reported earnings per share, some firms may have an incentive to repurchase shares to undo the dilutive effect of option programs (Bens, Nagar, Skinner, and Wong (2003)). I'll refer to this motivation as the “undo dilution” hypothesis.

Stock option programs could potentially influence corporate payout policy through other channels as well. Jolls (1998) and Fenn and Liang (2001) focus on executive compensation as an explanation for the growth in share repurchases. Since very few options are dividend-protected (Murphy (1998)), a dividend payment will reduce the value of outstanding options,

whereas a repurchase of shares or greater earnings retention will not. Thus, firms whose executives hold more options may repurchase more stock and/or retain more earnings to maximize the value of their option holdings. I'll refer to this motivation as the "agency" hypothesis. Finally, firms may simply repurchase stock following the exercise of options to distribute to shareholders the new cash received when options are exercised.

It is important to establish what is driving the link between stock options and payout policy. For example, corporations are increasingly granting stock options to non-executives.² Under the agency hypothesis, this development would not substantially affect payouts. However, it would have important implications for future stock repurchases and earnings retention if firms care about share dilution and preventing erosion in earnings per share.

This paper exploits a broad cross-sectional data set on both total options outstanding and the fraction held by top executives at the end of 1994 to test what effect option programs have upon payout policy and to determine the relative importance of the two hypotheses. To provide additional support for the undo dilution hypothesis, the paper also utilizes a decade-long panel data set on stock option grants, exercises, and outstandings for 144 large firms. The use of panel data to study the adjustment of payout policy to stock option grants, exercises, and outstandings distinguishes this paper from previous work in this area.

The overall size of a firm's option program is a strong predictor of subsequent share repurchases both in the cross-section and in the panel data. This relationship does not appear to be driven by the agency hypothesis, as previous studies have found, as once total outstanding options are controlled for, there is no correlation between upper management option holdings and stock buybacks. Consistent with the undo dilution hypothesis, the link between options and stock repurchases is strongest for firms with higher stock returns. This holds both in the cross-

section and the panel data set. A rising stock price makes stock options deeper in-the-money, and thus incrementally increases their dilutive effect upon EPS. This finding may also help partially explain why firms were regularly buying back shares despite soaring valuations in the late 1990s.

Stock options do not dilute accounting earnings per share immediately when granted, nor when the options are exercised, but rather gradually over the life of the option, as the price of the stock rises above the exercise price (the option is deeper in-the-money). If firms are concerned with undoing the erosion to earnings per share resulting from stock options, this leads to a testable prediction for the timing of stock buybacks. Indeed, analysis of the panel of large firms suggests a gradual repurchase of shares over the life of the option to undo much of the dilution to earnings per share that results from past stock option grants. This result is broadly consistent with survey evidence that suggests that CFOs are concerned about EPS dilution (Graham and Harvey (2001)) and that eliminating the earnings dilution from stock option compensation and employee stock plans is an important factor affecting their share repurchase decision (Bens, Nagar, Skinner, and Wong (2003) and Brav, Graham, Harvey, and Michaely (2004)). Estimates suggest that the presence of stock option programs has boosted the fraction of shares repurchased by roughly 1/2 percentage point annually on average for these large firms in the mid to late 1990s (the average fraction of shares repurchased is 1.7%). Roughly a third of the 0.5 percentage point increase in the repurchase rate from 1994-98 can be attributed to the increase in stock option grants over that period.

While option programs in general are associated with increased payouts and decreased earnings retention, I find the larger is the *executives'* holding of stock options, the more apt the firm is to retain more earnings and curtail cash distributions. This finding is consistent with the

well-documented negative relationship between dividends and managerial stock options (Lambert, Larcker, and Larcker (1989) and Fenn and Liang (2001)). The relationship does not appear to be explained by differences in investment opportunities across firms. This result suggests that any option-induced dividend reductions to enhance the value of executives' options have primarily been used to retain more earnings.

The paper will proceed as follows. Previous work on stock options and their effect on payout policy is discussed in Section 1. Section 2 describes the accounting treatment of stock options in more detail. There I also review the relevant literature on earnings management, discuss whether accounting measures like earnings per share “matter” to investors and managers, and illustrate the potential dilutive effect of stock option programs on EPS. The estimation strategy and data set details are provided in Section 3. Section 4 presents and discusses empirical cross-sectional relationships between option programs, executive option holdings, and payout policy. An analysis of the timing of share repurchases in response to stock option grants and exercises, the key contribution of the paper, is presented in Section 5. Section 6 concludes.

1. Previous Research on Options and Their Effect on Payout Policy

Most of the previous literature has focused on whether executive compensation affects payout policy. This is the agency hypothesis outlined in the introduction. Upper management may care about payout policy because firms rarely offer dividend-protected stock options.³ This means that any dividends paid on a stock will not be paid out to those holding options on that stock. This can have a non-trivial effect on stock option value. For example, assuming an option life of ten years, stock volatility of 30%, and a risk-free rate of 5%, reducing the dividend yield from 0.02 to 0.01 would increase the Black-Scholes value of a stock option 18 percent and

eliminating the dividend entirely would increase its value by 39 percent. Lambert, Larcker, and Larcker (1989) point out that since most executive stock option plans are not dividend-protected, the value of the option will decline with future dividend payments. The authors provide evidence that this affects payout decisions, as they find that dividends are reduced relative to their expected levels after the adoption of an executive stock option plan.

Jolls (1998) and Fenn and Liang (2001) also test the agency hypothesis. Fenn and Liang (2001) find that top management options are positively correlated with share repurchases and negatively correlated with dividend payments in a broad cross-section of 1100 nonfinancial firms. They interpret this evidence as suggesting that executive compensation influences payout policy. Jolls also concludes that firms that rely on stock options to compensate their top executives are more apt to repurchase stock by comparing a sample of firms announcing share repurchases or dividend increases and comparing them to a random sample of firms that did not announce a repurchase or dividend increase.

It is worth noting that the value of an executive's outstanding options will be the same whether an option-induced reduction in dividends is used to repurchase stock or retain more earnings (assuming no signaling effect). Thus, the agency hypothesis predicts a negative correlation between management options and dividends, but does not necessarily predict a positive correlation between management options and share repurchases (the firm may reduce dividends and retain more earnings instead). If management has a target level of cash payouts, then any reduction in dividends would likely be offset by increased stock repurchases. If management does not have a target level of cash payouts or believes its stock is overvalued, it may instead retain more earnings.

Dittmar (2000) also hypothesizes that firms that grant more options to upper management will repurchase more stock. To test for this, Dittmar estimates cross-sectional regressions of share repurchases on the Compustat variable shares reserved for options (this includes options outstanding as well as options available to be granted in the future under existing plans) along with many other financial characteristics each year from 1989-1996. She finds that the shares reserved for options coefficient is significant in only half of the yearly regressions.

Kahle (2002) examines how stock options affect the decision to repurchase shares and the market reaction to share repurchases. Similar to this paper, and unlike previous work, Kahle collects data on both total and top executive option holdings from 1993-96. Kahle finds that options held by the top executives are a strong predictor of the decision to repurchase and that the amount of options exercisable are a strong predictor of the level of repurchases. She further finds that the market reacts less positively to repurchases announced by firms with high levels of options outstanding.

This paper differs from the previous literature in several respects. Differing from Jolls (1998), Dittmar (2000), and Fenn and Liang (2001), the use of data on both total options outstanding and those held by top executives allows me to empirically differentiate between the undo dilution hypothesis and the agency hypothesis. Unlike Kahle (2002), I also examine how option programs affect earnings retention, as well as repurchases. I also buttress the cross-sectional results with regression evidence from a decade-long panel data set. All the previous empirical work is solely based on cross-sectional analyses, and is thus subject to the critique that any relationship between options and repurchases could be due to an omitted firm-specific variable such as management skill, investment opportunities, corporate governance, etc.. The

use of panel data is unique to this paper, and allows the results obtained to be viewed with less skepticism by addressing the omitted variable concerns raised above.

None of the previous papers directly test the undo dilution hypothesis and its implications for payout policy.⁴ The primary contribution of this paper is to test whether option overhang and EPS dilution have a significant effect on repurchase activity. To do this, I first conduct a standard cross-sectional analysis of repurchase activity, relating stock buybacks to both total options outstanding and those held by upper management. I then exploit panel data to study the adjustment of payout policy to stock option programs by estimating share dilution regressions. The use of panel data to study the adjustment of payout policy to stock option grants, exercises, and outstandings distinguishes this paper from previous work in this area.

2. Accounting for Options, Earnings Management, and the Undo Dilution Hypothesis

While stock option grants to employees may not depress current earnings directly, they will reduce future earnings per share.⁵ Accounting standards have long recognized that stock options and convertible securities dilute existing shareholders' claims on a firm's earnings. Diluted earnings per share (or primary EPS prior to enactment of SFAS 128) is the EPS measure typically used by analysts and investors. It increases the number of shares in the denominator to reflect the dilutive effects of convertible securities and stock options.

The treasury stock method for computing the dilution resulting from options is used when calculating diluted EPS, and was also used when calculating primary EPS. This method assumes that the proceeds received from the exercise of options are used to repurchase stock. It adds to the denominator the difference between the number of shares that would be issued upon exercise of all in-the-money options and the number of common shares that could be purchased with the

proceeds received when the options are exercised.⁶ In other words, when calculating the number of shares over which earnings are to be divided for EPS, each outstanding share of stock is given a weight of one, and each in-the-money outstanding stock option is given a weight of $(P-X)/P$, where P is the stock price and X is the option's exercise price.⁷

Thus, barring any repurchase of shares, stock options will have a direct dilutive effect upon subsequent earnings per share, which will make the cost of option-based compensation more explicit.⁸ This dilution does not occur immediately at the time of grant, nor when the option is exercised, but gradually over the life of the option as the price of the stock rises above the option's exercise price. When the firm repurchases stock, it shrinks the number of shares over which earnings are divided. The cash used to finance the repurchase will reduce paid-in capital, but will not directly affect earnings. The repurchase may depress the level of future earnings by reducing cash on hand, but such effects will often be minimal. For example, if the funds used to repurchase stock would have instead been distributed to shareholders in another form, perhaps via dividends as suggested by Grullon and Michaely (2002), then the level of earnings will not be changed. If the share repurchase is financed by a reduction in holdings of cash or other low-return liquid assets, the interest income foregone is also minimal.⁹ In these circumstances, the share repurchase will boost earnings per share. As will be discussed below, some firms may have incentives to combine an ongoing share repurchase program with an option program to at least partially undo the erosion to EPS.

This raises the question: Why should firms care about dilution and accounting earnings per share? Is there any evidence that firms manage accounting earnings per share? After all, a traditional valuation model in corporate finance would say a firm's value is based on the present discounted value of expected future cash flows. Differences in reported earnings per share due

to accounting conventions rather than fundamentals should be irrelevant to the market and should not affect valuation.

EPS is a key statistic used to evaluate a firm's performance and valuation. There is much anecdotal evidence on the importance of EPS to investors, financial advisors, and managers. Wasserstein (1998) states, "With many investors focused on earnings, companies often hesitate to take on dilutive transactions." Consistent with this, Graham and Harvey (2001) survey CFOs and find that these CFOs rank earnings per share dilution as the *most* important factor influencing their decision to issue equity, even ahead of such factors as the perceived magnitude of stock price overvaluation and the market reaction to the equity offering. Corporations often emphasize earnings per share and growth in EPS in their annual report to shareholders and the market punishes firms severely for breaking a pattern of consistent EPS growth (Barth, Elliot, and Finn (1995), DeAngelo, DeAngelo, and Skinner (1996), and Burgstahler and Dichev (1997)).

Firms seem to care about earnings per share, especially relative to benchmarks such as last year's earnings or analysts' expectations. To the extent that stock prices are sensitive to reported earnings per share, some firms may have an incentive to manage EPS. Relative to EPS a year earlier, Burgstahler and Dichev (1997) and DeGeorge, Patel, and Zeckhauser (1999) both find an unusually small occurrence of small EPS decreases and an unusually high frequency of small increases in EPS. The latter study also finds a similar pattern around analysts' earnings forecasts. Such discontinuities in the distribution of reported earnings suggest firms have incentives to avoid dilutive transactions and manage earnings per share.

Andrade (1999) provides some evidence that transactions that boost earnings per share, or conversely dilute EPS, affect stock returns even if the change in EPS merely reflects

accounting practices as opposed to real cash flow.¹⁰ The method of accounting for an acquisition (pooling-of-interest vs. purchase) and the method of payment (cash vs. stock) can lead to different EPS numbers post merger. He tests whether the part of future EPS changes that is due to accounting conventions and acquisition financing decisions, rather than fundamentals or synergies, affects acquirer stock prices. Using a sample of 224 mergers/acquisitions, he finds that EPS accretion attributable to accounting has a positive and significant effect upon abnormal returns of the acquirer for up to 18 months after the deal.

It is also worth pointing out that the structure of executive compensation may provide incentives to manage earnings and EPS.¹¹ A 1993 survey by the Hay Group, Inc., reports that one quarter of surveyed corporations base annual bonuses at least in part on earnings per share and 30% tie long-term performance based plans to earnings per share. Healy (1985), Holthausen, Larker, and Sloan (1995), and Guidry, Leone, and Rock (1999) provide some evidence that managers manipulate earnings to maximize the present value of bonus plan payments.

Summing up, these studies seem to indicate that reported EPS matters, and can influence corporate decisions (Graham and Harvey (2001)). Corporations seem to avoid transactions that will dilute earnings per share, perhaps because of the reaction from analysts and investors. Granted, the potential dilution resulting from stock option programs may be slight for many firms. However, the typical difference in earnings per share relative to last year or relative to analysts' expectations is fairly small. For example, Degeorge, Patel, and Zeckhauser (1999) report that the median difference from analysts' forecast is zero cents. Past research into earnings management has generally focused on managers manipulating discretionary accruals (i.e., the numerator of EPS). However, it is not unreasonable to believe managers may also focus

on the denominator (i.e., shares outstanding) as well when managing EPS. Indeed, three-quarters of financial executives surveyed in Brav, Graham, Harvey, and Michaely (2004) indicate that increasing EPS is an important factor affecting their share repurchase decisions. Moreover, a sizeable fraction of surveyed executives express the view that repurchasing shares reduces the total number of shares outstanding and, therefore, automatically increases earnings per share EPS.

One way to measure the erosion to EPS that results from dilutive securities, primarily options, is to compute how much lower diluted earnings per share is relative to basic earnings per share (the dilution wedge). Basic EPS normalizes earnings by shares actually outstanding, making no adjustment for options. Core, Guay, and Kothari (1999) report that stock options make up more than 80% of the additional shares added to outstanding shares when computing diluted earnings per share. The upper panel of Table 1 displays estimates of the dilution from option programs at the end of 1998. Outstanding dilutive securities reduce reported EPS by 2.2% for the S&P SuperComposite 1500 firms with positive earnings.¹² One eighth of corporations have a dilution wedge exceeding 5 percent. Dilutive securities reduce reported EPS for mid- and small-capitalization firms by 2.7%, compared with 2.2% for the members of the S&P 500. The dilution wedge is twice as large in the technology sector, where the use of stock options is more intensive.

This discussion illustrates that option programs can potentially erode EPS. For example, common stock equivalents boosted the denominator of diluted EPS by 14% for Merrill Lynch and 10% for Microsoft in 1998. However, Merrill Lynch has repurchased 15% of its shares, and Microsoft has repurchased 7% of its shares since 1996. A survey of 1600 chief financial officers in the November 1999 issue of *Institutional Investor* reports that three out of five CFOs conduct

an ongoing share repurchase program to prepare for the exercise of stock options. Undoing the dilutive effect of stock options through a share repurchase program could be an earnings management tool. The importance of this motivation for payout policy is an empirical question to be addressed.

3. Empirical Strategy and Data

3.1 Empirical Strategy

I now employ a variety of estimation techniques to disentangle what is driving the link, if any, between option programs and firm payout policy. There are also many other motivations to repurchase stock (e.g., signaling undervaluation or strong future earnings prospects, distributing free cash flow – particularly transitory earnings, minimizing the tax burden of shareholders, adjusting the capital structure of the firm, etc.), for which my estimation strategy must control. Dittmar (2000) provides a good survey of the literature.¹³

Similar to Jagannathan, Stephens, and Weisbach (2000), Dittmar (2000), Bagwell and Shoven (1988), and others, I will estimate reduced form regressions of a firm's payout policy of the form:

$$(1) \quad (\text{Payout Policy}_i) = \beta_0 + \beta_1 * \text{TOTAL OPTIONS}_i + \beta_2 * \text{EXECUTIVE OPTIONS}_i + \\ \beta_3 * \text{INDIV. OWNERSHIP}_i + \beta_4 * \text{FINANCIAL CHARACTERISTICS}_i + \\ \text{INDUSTRY EFFECTS}_i + \varepsilon_i$$

Payout Policy will be defined primarily as the level of share repurchases, but regressions of total payouts and earnings retention will also be estimated. Since a number of firms do not

repurchase shares or make any distributions, a Tobit model will often be assumed to estimate specification (1).

Guided by the previous literature on repurchases cited above, the following explanatory variables are included in the regression: fraction of individual ownership, operating income, non-operating income, capital expenditures, market-to-book ratio, long-term debt, previous stock return, and the log of the book value of assets. I break cash flow into operating and non-operating income, because Jagannathan, Stephens, and Weisbach (2000) hypothesize that repurchases will be more closely tied to temporary cash flow, proxied for by non-operating income, than permanent cash flow, proxied for by operating income. The decision to repurchase shares should depend upon the marginal investment opportunities of the firm (proxied for by the ratio of the market value to the book value of assets). Firms with good investment opportunities may enhance firm value by using cash flow to finance investment as opposed to distributing it to shareholders, and vice versa (Jensen (1986)). Firm size (book value of total assets) serves as a proxy for financing costs, asymmetric information, variance in cash flows, etc.. Since there may be industry-specific differences in growth opportunities or corporate governance that may influence payout policy, specifications include controls for the three-digit SIC group classification.

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. The undo dilution hypothesis predicts a positive correlation between *total* options outstanding, normalized by shares outstanding, and share repurchases. The agency hypothesis predicts a positive correlation between *upper management* options and share repurchases and/or earnings retention. Executives concerned about the value of their stock options may prefer substituting share repurchases and/or greater earnings retention

for dividends. Therefore, the option holdings of the top five executives, normalized by common shares outstanding, are also included in the regressions. This variable can loosely be interpreted as how much the total value of the stock underlying the executives' option holdings is reduced if the firm pays out an additional dollar of dividends.¹⁴ The inclusion of the other covariates in the regression is meant to control for additional factors that may influence payout policy. Payout policy is measured during year t , with the explanatory variables measured at the end of year $t-1$.

This paper will utilize two data sets. First, I estimate specification (1) using data on employee stock option programs and option holdings of top executives for a cross-section of over 800 firms at the end of 1994. This data set is discussed below in Section 3.3, and empirical results are presented in Section 4. I also test the robustness of these results with additional cross-sectional evidence from 1996-98.

A criticism of any cross-sectional analysis is that it cannot rule out that some omitted firm-specific effect is driving the results. For example, omitted factors such as management skill or corporate governance could influence both payout policy and the use of stock options, perhaps explaining the correlation between the two in the data. Therefore, data on stock option grants and exercises were collected for the 144 current non-bank members of the S&P 100, Dow Jones Industrial index, and S&P 500 technology sector over the past decade. This enables estimation of specification (2):

$$(2) \quad (\text{Change in Shares Outstanding}_{i,t}) = \alpha_0 + \alpha_1 * \text{OPTION EXERCISES}_{i,t} + \\ \alpha_2 * \text{OPTION GRANTS}_{i,t} + \alpha_4 * \text{FINANCIAL CHARACTERISTICS}_{i,t} + \\ \text{FIRM EFFECTS}_i + \text{YEAR EFFECTS}_t + \varepsilon_{i,t}$$

There are two basic motivations for estimating specification (2). First, the use of panel data in Section 5 allows me to examine the timing of share repurchases in response to stock option grants and exercises, and to test whether the timing is consistent with the undo dilution hypothesis. A prediction of the undo dilution hypothesis is that firms should repurchase shares in response to past option grants, but not exercises (more on this in Section 5). Thus, past option grants should result in a fall in shares outstanding, while exercises during the year should lead to a one-for-one increase in shares outstanding. Secondly, the linear specification, which is appropriate for the change in shares outstanding regression, allows me to control for firm-specific effects on payout policy. Assuming the firm-fixed effects are correlated with the other financial characteristics of the firm, these firm-effects cannot be estimated consistently in a censored dependent variable model like the Tobit. They can be estimated in a linear model.

3.2 Interpretation of Causality

Caution must be exercised when interpreting the relationship between firm payouts and other financial variables such as investment, cash flow, and debt that may be partly endogenous. While the effect of the non-option variables upon payout policy is of interest, this is not the focus of this paper. The estimated link between option programs and payout policy, which is the focus, is robust to the inclusion/exclusion of the firm financial variables in the regression.

If the compensation board wants to distribute a fixed 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 in a cross-sectional regression could also be clouded by reverse causality. However, to the extent it is present, this endogeneity would bias downward the options coefficient in a share repurchase reduced form. For example, suppose there are two firms that 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.

Nonetheless, a cross-sectional analysis cannot rule out that some difficult to measure firm-specific effect, like investment opportunities or management skill, is driving the correlation between options and payout policy. This is an important criticism of past empirical work in this area, which has focused on cross-sectional regressions. Analysis of a panel data set of firms allows me to control for firm-specific differences that could potentially influence the decision to repurchase stock, and thus address many of the concerns raised above.

3.3 Overview of Cross-Section Data

The sample consists of all publicly traded companies that belonged to 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 that do not have an observation in Compustat in 1995 are dropped, as are firms for which data on executive options and/or total outstanding options are not available either through the annual report, 10-K, or the proxy statement. The remaining sample consists of 826 firms, which in the aggregate represents 70% of the capitalization of the NYSE and 90% of share repurchases during 1994.

Table 2 summarizes the option programs, direct individual ownership, and payout policy for these firms. Other characteristics of the sample are reported in the Appendix. Stock option-related data were collected for firms at the end of fiscal year 1994 from proxy statements, annual reports, and 10-Ks filed by U. S. corporations. Data on institutional ownership, and hence direct

individual ownership, of companies' equity are taken from Standard and Poor's *Security Owner's Stock Guides*. The Center for Research in Securities Prices (CRSP) tapes provide stock returns. All other variables are constructed from Compustat and are explained in detail in the notes in the Appendix.

Total options outstanding represent on average 5.7% of common shares outstanding at the end of 1994. Forty-five percent of firms in the sample have outstanding stock options representing over 5% of outstanding shares at the end of 1994, and fourteen percent have outstanding options representing over 10% of shares outstanding. Thirty-two firms have no stock option programs.

Proxy statements report compensation and stock option holdings for top executives. The number of executive officers covered by the proxy statement reporting requirements is usually five.¹⁵ The five reported executives have close ties to the actual operations of the firm, and thus may be able to influence the payout policy of the firm. On average, CEOs held about 12% of all outstanding options and the top five executive officers held about 28%. The top five executive officers held over half of a firm's stock options in 12% of the sample and held less than a tenth of all options in 13% of the sample. Forty-six firms had stock option programs in which the CEO had no holdings. Figure 1 contains three histograms displaying the variation in the size of option programs and the fraction of outstanding options held by the CEO and the top five executive officers.¹⁶ The correlation between total options outstanding and the outstanding options held by the top five executives is 0.6 in the sample.

Most of the firms make distributions of some sort, as three quarters pay dividends and half repurchased stock in 1995 (nearly a third repurchased more than one percent of market value). Throughout the paper, the repurchase payout rate is calculated by dividing share

repurchases by the average of the beginning and end of year market value. The repurchase payout rate can be interpreted as an estimate of the fraction of shares a company repurchases. The average repurchase payout for the sample in 1995 is 1.4%.

My measure of dollars spent to repurchase stock warrants some discussion. Compustat reports dollars spent on repurchases of the firm's own securities (annual data item 115), which is obtained from the firm's Flow of Funds Statement. Stephens and Weisbach (1998) and Jagannathan, Stephens, and Weisbach (2000) note that the Compustat measure will overstate actual repurchases of common stock because it also includes repurchases of other securities. The Compustat measure 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 of redeemable preferred stock. I subtract any decreases in the par value of preferred stock (annual data item 130) from this repurchase measure so it is more reflective of repurchases of common stock. This adjustment reduces aggregate share repurchases by 9%. Cook, Krigman, and Leach (1997a,b) collected data from 64 firms on actual dollars spent on repurchases of common stock. Jagannathan, Stephens, and Weisbach (2000) report, using the Cook, Krigman, and Leach data, that the median Compustat measure overstates actual repurchases of common stock by 13%. This suggests my amended Compustat measure should be fairly accurate.

4. Relationship between Option Programs and Payout Policy in Cross-Section

4.1 Basic Results of Share Repurchase Regressions

The first three columns of Table 3 present estimates of specification (1), outlined in Section 3.1, for the level of share repurchases in 1995 (normalized by market value). I estimate a Tobit model in this case because there is a substantial mass point at zero, as half of the firms do not repurchase any stock in 1995. Consistent with Jolls (1998) and Fenn and Liang (2001), I initially find a strong correlation between *executive* option holdings and stock buybacks. However, once the total size of the option program is also included in the specification, there is no relationship between executive option holdings and share repurchases. This result is consistent with Brav, Graham, Harvey, and Michaely (2004) that report, based on survey evidence, that there is virtually no support for the idea that executives repurchase stock rather than use dividends because their stock options are not dividend-protected.

Similar to Kahle (2002), I find that *total, firm-wide* options are significantly and substantively related to stock buybacks. The marginal effect of stock options evaluated at the sample average indicates that a five percentage point increase in outstanding options normalized by shares outstanding is associated with a 0.4 percentage point increase in the repurchase payout rate the next year (the average repurchase payout rate for the sample is 1.4% of market value). If stock options are exercised five years after granted on average, consistent with exercise patterns documented in Huddart and Lang (1996), the estimates would imply that firms repurchase roughly two-fifths to a half of the shares in an option grant over the life of the option (0.088 marginal effect multiplied by five years).

The other covariates generally have the predicted effect. Share repurchases respond more to “temporary” non-operating income than “permanent” operating income. This is consistent with the financial flexibility of share repurchases and the results in Guay and Harford (2000) and Jagannathan, Stephens, and Weisbach (2000). Highly leveraged firms are found to

be less likely to repurchase stock. Firms with greater investment opportunities, as proxied for by the firm's market-to-book ratio, are significantly less likely to repurchase stock. This is consistent with explanations for payout policy that focus on agency problems and free cash flow. Nohel and Tarhan (1998) find that the positive investor reaction to tender offer share repurchases is also best explained by the free cash flow hypothesis as opposed to signaling.

Given the tax preference for individual shareholders for distributions made via stock repurchases as opposed to dividends, it is somewhat surprising that there is no cross-sectional relationship between direct individual ownership and the magnitude of stock buybacks.¹⁷ Dhaliwal, Erickson, and Trezevant (1999) provide evidence that taxes do matter in a different context, as they find that the proportion of institutional ownership changes around events such as a dividend initiation. These results are not necessarily incompatible, though, as omitted variables such as information differences across investors, heterogeneity in the valuation of dividends, and capital gains lock-in could potentially explain why the *level* of individual ownership is not correlated with payout policy at any point in time.

At first blush, the small and insignificant lagged return coefficient may seem contrary to predictions of the undo dilution hypothesis. A rise in stock price will incrementally increase the option overhang and its associated EPS dilution. However, the lagged return is likely a "catch-all" variable that picks up past dilution, degree of undervaluation, investment opportunities, etc. that affect the level of repurchases in opposite directions. This could explain the zero coefficient.

To gain more insight into what is driving the link between stock option and share repurchases during 1995, and provide a more refined test of the undo dilution hypothesis, I included stock price appreciation during the current year in the regression and interacted the total

options variable by an indicator variable for whether the firm's price appreciation was above the sample median (median was 20% in 1995). The interaction term tests whether the recently created incremental option overhang and its associated EPS dilution, which is larger for the firms with above average returns in 1995, leads to more repurchasing activity in 1995. I also included interactions of the total options variable with whether the firm's market-to-book ratio and size (book value of assets) were above the sample median. The results are shown in Table 4.

The first column just adds price appreciation during 1995 to the basic regression, with no interactions. The zero coefficient on price appreciation may seem like evidence against the undo dilution hypothesis, but the coefficient on the return variable likely reflects many things that affect the level of repurchases in opposite directions.

To better isolate the role of rising prices, through increasing dilution from options, in explaining share repurchases, total options outstanding is interacted with the dummy variables in the second column of Table 4. The interaction of the above median stock return with total options is 0.170 (standard error = 0.069) and the interaction of the above median market-to-book dummy with total options is 0.124 (standard error = 0.063), while the interaction with firm size is insignificant. Thus, the funding of option programs with repurchased shares is stronger in the cross-section for firms that underwent greater price appreciation during the year, and hence had a greater erosion to EPS resulting from options. The positive interactive term for the stock return and the total options variable is consistent with the undo dilution hypothesis.¹⁸ Rising prices make outstanding stock options deeper in-the-money, thus increasing the dilutive effect of outstanding stock options upon EPS.

It is also worth noting that interacting the price appreciation dummy with total options allows the negative correlation between stock price appreciation and stock buybacks in the same

year to come through, and the coefficient increases from 0.000 to -0.009 (standard error is 0.006). This is consistent with the negative relationship between stock performance and repurchases found by Stephens and Weisbach (1998) (*ceteris paribus*, firms tend to buy back stock after price declines).

4.2 Earnings Retention

Grullon and Michaely (2002) investigate whether firms are substituting share repurchases for dividends. Of interest is whether the option-induced increase in share repurchases documented in Table 3 is associated with reduced earnings retention or is instead offset by a reduction in dividends. To test this, I estimate regressions of the rate of retention of earnings over 1995-96 for firms with positive earnings over that period. To help smooth yearly fluctuations in earnings, I focus on the two-year horizon. The retention rate is defined as income before extraordinary items available for common less cash used to finance common dividends and share repurchases, divided by earnings. I estimate robust regressions because cash distributions greatly exceed earnings for some corporations over this period.¹⁹ There is an interesting dichotomy when both total options and option holdings of the top five executives are included in the specification (column (2) of Table 5).

Overall, as shown in Table 5 column (2), the larger is a firm's option program at the end of 1994, the smaller is the fraction of earnings retained over 1995-96. A firm with options outstanding representing 5% of shares outstanding, none being held by the top executives, would retain five percent *less* of earnings than a firm with no option program. This suggests that at least part of the option-induced increase in repurchases is financed by reduced earnings retention.²⁰ This reduction in retained earnings could potentially translate into depressed future investment, which would affect future cash flows.

Interestingly, the results also suggest payout policy is affected by *who* holds the stock options (e.g., whether executives hold many options). Holding the overall size of the option program constant, firms in which the top five executives have large holdings of stock options retain significantly and substantially more of their earnings over 1995-96 relative to firms whose executives have small option holdings. For example, a firm with options representing 5% of shares outstanding, none held by upper management, is predicted to retain 5 percentage points *less* of earnings. If all of the options are instead held by upper management, then the coefficient estimates suggest the firm will retain 8.5 percentage points *more* of earnings ($[2.7-1]* 5$).

Recall, Lambert, Larcker, and Larcker (1989) and Fenn and Liang (2001) find a strong negative correlation between dividend payouts and executive stock options. If management does not have a target level of cash payouts or believes its stock is overvalued, it may use an option-induced cut in dividend growth to retain more earnings. Indeed, the positive effect of executive option holdings upon earnings retention is consistent with both the lack of a correlation between executive options and stock buybacks shown in Table 3 and the previous work on dividends.

There is an alternative explanation for the executive option coefficient. Firms with strong growth opportunities will likely retain more earnings. The executives of these firms may wish to have more of their compensation in stock options because the good investment opportunities may translate into high future stock returns. Thus, the positive correlation between executive options and earnings retention may reflect that executives in firms with good growth prospects are granted more stock-based compensation, rather than an adjustment of payout policy by top management to increase the value of their option holdings.

One way to address the interpretation of the executive options coefficient is to test whether the relationship between executive options and earnings retention varies with firm size

or a firm's market-to-book ratio. The last column of Table 5 presents the results for a regression that interacts whether a firm has a market-to-book ratio above or below the sample median and whether firm size is above or below the sample median with the executive option variable. The market-to-book ratio and firm size are both significant and substantive predictor of future earnings retention, however, the increased retention of earnings associated with executive option holdings does not vary with the market-to-book ratio or size of the firm (the interaction terms are small and insignificant).

4.3 Robustness of Repurchase Cross-Section Results

In table 3, I find that if both total options and management options are included in the share repurchases regression, then only total options matter. However, this finding has to be viewed with some caution for two reasons. First, the correlation in the sample between total options and upper management options is 0.6, which makes isolating the effect of the two variables difficult in any cross-section. This helps explain the large standard error on the executive option coefficient. Second, the results in Table 3 are based on one year of data. To help address these concerns, I collected firm-wide option data from 10-Ks for the members of the S&P 500 during 1998. I also used the Execucomp database to obtain stock option holdings for the top five executives. I then estimated share repurchase regressions for this sample of firms for 1996, 1997, and 1998, including all the financial controls that were present in Table 3, to corroborate the earlier findings. In unreported results, the same pattern observed back in the 1995 cross-section also holds over the period 1996-98. Total outstanding options are a significant predictor of subsequent share repurchases, while top executive options are not, over the pooled sample and for two of the three individual years.

Nonetheless, to the extent that cross-sectional differences in investment opportunities and financial conditions are not properly controlled for, the interpretation of the correlation between options and stock repurchases remains clouded. Further, the cross-sectional analysis sheds no light on the timing of share repurchases in response to stock option grants and exercises, and whether the timing is consistent with the undo dilution hypothesis. For example, firms may not care how stock option grants will affect EPS, and may simply repurchase shares when options are exercised to distribute the exercise proceeds to shareholders. The next section addresses these concerns.

5. Stock Option Grants and Timing of Share Repurchases for Large Firms

To build upon the findings obtained in the cross-section, I obtain data on employee stock option programs from 10-K filings for all the non-bank corporations that belong to the S&P 100, Dow Jones Industrials, or S&P 500 technology sector (as of July 1999).²¹ The Disclosure Inc. database that I use contains 10-K filings back to fiscal year 1988 or 1989 (depending on which month the firm's fiscal year ends), allowing me to construct an unbalanced panel of 144 firms. Nearly 90% of the firms have at least nine years of data (i.e., firm is in existence and data are available from 1990-98), and all but four firms have five or more years of data.

The sample is clearly not randomly selected, nor is it representative of the whole corporate sector. Given that data on option programs must be collected by hand, the number of firms in the decade-long sample is limited. Thus, the results obtained will shed light on whether these firms adjusted share buybacks in response to stock option programs, but should not be extrapolated beyond this group of firms. Nonetheless, the behavior of these firms is of interest. The sample consistently comprises 30% of the market capitalization and between 30-40% of

share repurchases of all U. S. publicly traded firms in the 1990s. The sample also includes many option-intensive firms.

Table 6 provides summary statistics for the sample. Figure 2 augments the table by illustrating the growth in employee stock options and share repurchases for the 127 firms in the sample that were in existence and had complete option plan data during 1990-98. Stock option programs have grown steadily in the 1990s. The ratio of outstanding options to shares outstanding has grown two percentage points on average over the decade. The median program has grown from four to six percent of shares outstanding from 1990 to 1998, as stock option grants have increased from one to 1.5 percent of shares outstanding over the period. The increased granting of options today is reflected by an increased exercise of options tomorrow. The median number of stock options exercised more than doubled from 1990 to 98, averaging 1.1% of shares outstanding over all the firm-years. Because of the lag between when an option is granted and when it is exercised, exercises should continue to grow in the near term, even if grant rates level off. Firms repurchased stock 60% of the firm-years, with the average repurchase comprising 1.7% of market value from 1990 to 98. After falling sharply in 1991, share repurchases have grown fairly steadily. The median firm repurchased one percent of its stock in both 1997 and 1998, compared with only 0.4% back in 1990. Regression analysis is necessary to disentangle how stock option programs contribute to share repurchases.

To directly measure the timing of the share dilution/repurchase that results from stock option programs, I estimate regressions of the change in common shares outstanding, similar to specification (2) discussed in Section 3.1. The specifications include the same financial variables from Compustat that were included in the cross-sectional payout policy regressions.²² Since there is no mass at a single point, a linear specification is appropriate in this context. This

is beneficial, as the linear model also allows firm-fixed effects to be controlled for in the regressions. Since the firm-specific control may be correlated with financial characteristics that are included in the regression, a fixed-effect estimator is appropriate in this context. It is also worth emphasizing that the coefficients are identified by *within-firm* variation in the covariates. Similar to the retention of earnings regressions, I use a robust regression technique so that the estimates will not be sensitive to any outlier observations.

If firms are concerned with undoing the erosion of earnings per share that results from stock options, this leads to a testable prediction for the timing of share repurchases/dilution. There are no points in time when EPS has a sudden drop due to stock options, rather all effects are due to gradual dilution. Stock options will not dilute accounting EPS immediately at the time of grant, nor all at once when the stock option is exercised. Instead, the erosion to EPS will occur gradually over the life of the option (recall the weight given to an outstanding option when calculating the denominator of EPS is $(P-X)/P$ where P is the stock price and X is the exercise price of the option). Indeed, when the stock option is exercised, EPS will generally be unaffected.²³ The dilutive effect of options is already built into the EPS number. This suggests that the firm will repurchase shares in response to grants, not exercises. In other words, firms concerned about dilution will repurchase shares *before* the options are exercised, and the coefficient on option exercises in the share dilution regression should be near one (the firm issues or re-issues one share when the option is exercised).

Stock option grants made over the past few years should have predictive power for current period repurchases. Further, one should expect the relationship between stock option grants and share repurchases to change with the age of the grant. Since options are typically granted at-the-money, grants during the current year will usually not have as large a dilutive

effect on EPS over the year as would option grants which were granted previously and outstanding the whole year. For example, option grants made at the end of 1998 would have no dilutive effect on 1998 EPS. This implies that share repurchases in the current year should be more strongly correlated with the number of options granted a year ago relative to the number of grants in the current period. Since options typically become exercisable ratably one through four years after the grant date, the fraction of grants made a year ago that are still outstanding will be higher than the fraction of grants made four years ago which are still outstanding.²⁴ This observation suggests that share repurchases in the current year should be most strongly associated with the number of options granted a year ago, with the correlation somewhat less with the number of grants made more than a year ago. Some of these older grants are no longer outstanding as they have already been exercised or canceled.

On the other hand, consider the alternative hypothesis mentioned in the introduction. Suppose that firms do not care how stock option grants will affect EPS. When options are exercised, the firm will receive an influx of cash. If the firm has no good use for this additional, transitory cash flow, it may wish to distribute the proceeds from option exercises to shareholders via share repurchases. In this case, repurchases should respond more to option exercises than option grants. This implies that the coefficient on option exercises would be substantially less than one, and past option grants should have little explanatory power. This alternative hypothesis is testable, and can be differentiated from the undo dilution hypothesis.

Tables 7 and 8 test these predictions. The dependent variable is the change in outstanding shares during the year divided by the number of common shares outstanding at the beginning of the year, thus a negative value indicates a repurchase of stock and a positive value an issuance of stock. The financial variables that were expected to be negatively correlated with

share repurchases in the earlier analyses, are expected to be positively correlated with equity issuance using similar reasoning. The option variables are all normalized by shares outstanding. I dropped 92 observations in which a large merger or spin-off during the year made option data incompatible with previous years. Observations were dropped when the number of options assumed due to mergers/acquisitions or adjusted due to a spin-off represented five percent of total options (the results are not sensitive to the cutoff point chosen). All the robust regressions include firm-specific and time-specific controls.

Table 7 reveals the two countervailing effects of stock options, as options cause both a repurchase and later issuance/reissuance of shares.²⁵ One cannot statistically reject that stock option exercises increase shares outstanding on a one-for-one basis, indicating that firms do not time the repurchase of stock to correspond with option exercises. This provides strong evidence against the alternative hypothesis that firms repurchase stock simply to purge themselves of the proceeds from option exercises.

However, there is evidence that firms partially pre-fund option programs by repurchasing shares. Assuming an option is held on average five years, the coefficient of -0.076 on outstanding options implies that a firm repurchases roughly 38% of the shares underlying an option grant prior to exercise (column (2) Table 7). This is in the ballpark of the 44% implied by the estimate obtained earlier from the cross-section, which employed a different estimation technique. Consistent with the earlier results, a higher market-to-book ratio and higher debt are associated with greater share dilution (firms with good investment opportunities and more leverage repurchase less stock or issue more equity). Highlighting the importance of their inclusion, the firm-fixed effects are jointly highly significant in the share dilution regressions.

The third column of Table 7 tests whether the link between outstanding options and share repurchases is stronger for firms that have had bigger price increases over the sample period. Specifically, I interact the outstanding options variable with a dummy variable of whether the firm's average price appreciation over the period is greater than the sample median.²⁶ Consistent with the cross-sectional results, the option-induced repurchase of stock is strongest for the firms with the higher returns. Recall, these are the firms for which the motivation to repurchase stock to counter option dilution would be the strongest. The regularity that firms appear to repurchase stock over the life of an option, rather than when it is exercised, is likely not that surprising. While consistent with firms repurchasing to counter erosion to EPS, this finding by itself may not provide that much support for the undo dilution hypothesis over alternatives. However, the result that the effect is stronger the more prices have increased provides more telling evidence that option overhang and EPS dilution may affect repurchase activity.

Table 8 presents further evidence on how firms respond to stock option grants and exercises by including grants during the year and over the past four years in the share dilution/repurchase regression. To be included in the regression a firm must have data on option grants over the previous four years, so the sample size is reduced. Since the 1988 10-K statement will often report option grants from 1986-88, some firms will have data on option grants the past four years starting in 1990. The time series of grants is a highly significant predictor of share repurchases. Firms appear to gradually repurchase shares over the life of an option, as grants made three years ago are still significant predictors of current period share repurchases. The pattern in the option grants coefficient is consistent with the predictions of the undo dilution hypothesis. Option grants made last year are more associated with stock buybacks

than are current year option grants. Recall options granted in the current year have been outstanding for only a portion of the year, and thus have a limited dilutive effect on EPS during the year. Further, the estimated increase in share repurchases attributable to grants 2-4 years ago tapers off somewhat from the effect of options granted just last year. The coefficient on total outstanding options, once option grants over the current year and previous four years are included in the specification, is small and insignificant. This likely reflects that most of the options granted more than four years ago have already been exercised, and thus do not affect current payout policy. The number of stock option grants made during the current year and the previous four years exceeds options outstanding at the end of the year for 70% of the firm-year observations.

A few conclusions can be drawn from the analysis in this section. Firms do not simply repurchase shares when options are exercised to distribute the proceeds received from option exercises. Nor do firms repurchase shares on a one-for-one basis to satisfy option exercises. They rather seem to gradually repurchase stock in a manner consistent with undoing the dilution that occurs to EPS.

For example, the ultimate dilution an option grant will have on EPS is $(P-X)/P$ where P is the stock price when the option is exercised and X is the option's exercise price. Over the past five years, both the mean and median ratio of the exercise price of exercised options to the average of the firm's beginning and end of year stock prices have been 0.52 in the sample. Thus, the ultimate dilution resulting from a stock option grant is roughly half a share on average. Given annual stock price appreciation of 16%, the sample median, the stock price would grow to twice the exercise price of an option granted at-the-money in 4.4 years. The sum of the coefficients on the option grants made during the current year and the previous four years ranges

from -0.52 to -0.55 across the three specifications in Table 8. Assuming an option is held on average five years, the estimates from the cross-section in Section 4.1 implied that a firm repurchases roughly two fifths of the shares underlying an option grant prior to exercise. Thus, the estimates suggest that the sampled firms repurchase about two-fifths to a half of the shares underlying a stock option grant over a four to five year period. This essentially undoes the dilutive effect a stock option would have on EPS over that same period.²⁷ This finding supports survey evidence in Brav, Graham, Harvey, and Michaely (2004). They report that two-thirds of surveyed executives tie the magnitude of their share repurchases to the amount necessary to eliminate earnings dilution from stock option compensation.

Taking the coefficients from Tables 7 and 8 at face value, the presence of stock option programs has boosted the fraction of shares repurchased by roughly ½ percentage point annually on average for these large firms in the mid to late 1990s. Further, roughly a third of the 0.5 percentage point increase in the repurchase rate from 1994-98 can be attributed to the increase in stock option grants over that period.

One should keep in mind a key caveat when interpreting the results of this section. Any study that uses an extensive panel data set naturally imposes some survivorship bias. The current members of the S&P 100, Dow Jones Industrials, and S&P 500 Tech sector have performed better on average over the years and are by definition larger than a random sample of firms. Since these firms also generally have earnings and cash on hand to repurchase stock, the incentive and ability to repurchase shares to undo the dilution from option programs may be greater for this sample than for the corporate sector as a whole.

6. Conclusion

The use of stock options increased steadily in the 1990s. This development could have implications for corporate payout policy. This paper presents evidence that the overall size of a firm's option program and past option grants are strong predictors of subsequent share repurchases. Why are outstanding stock options a strong predictor of future repurchases? Why do option grants seem to cause limited share dilution for large firms?

One potential explanation involves earnings per share management. Stock options will ultimately dilute earnings per share. There is both anecdotal and empirical evidence of the importance placed upon reported earnings per share by investors, financial advisors, and managers. Survey evidence also suggests that managers of firms are reluctant to take on dilutive transactions. Further, some corporations tie annual bonuses to earnings per share (EPS). For some firms, a share repurchase program may undo the erosion to EPS that results from a stock option program, and potentially make it more difficult to observe the cost of stock-based compensation.

This paper presents evidence that stock option programs in general are associated with increased stock buybacks and decreased earnings retention. The analysis in this paper also suggests that large firms conduct a gradual repurchase of shares to undo much of the dilution to earnings per share that results from stock option grants. Further, the link between stock options and share repurchases is found to be stronger for firms with higher stock returns – the firms for which the dilutive effect of options is the greatest.

This paper has focused on stock options directly diluting EPS by increasing the number of shares over which earnings are divided. Indeed, a notable portion of surveyed executives express the view that repurchasing shares reduces the total number of shares outstanding and, therefore, automatically increases earnings per share EPS (Brav, Graham, Harvey, and Michaely

(2004)). It is difficult to gauge whether the granting of stock options has at the same time increased the *numerator*. Stock-based compensation may help better align the incentives of firm employees, particularly upper management, with those of shareholders. This could potentially increase a firm's profitability. In other words, the granting of stock options divides the pie into more pieces, but it may also increase the size of the pie to be divided. Another possibility is that firms have reduced cash-based compensation in response to the granting of stock-based compensation. Since stock options are generally not counted as an expense against *reported* earnings, but cash wages are, this would have the effect of boosting reported earnings. To the extent that either of these occurs in practice, or is likely to occur in the future, the dilutive effect of stock options on reported EPS would be mitigated. These are two topics left for future research.

Fama and French (2001) examine reasons for the disappearance of dividends. They document a decline in the propensity to pay dividends over time, after controlling for firm characteristics. This paper and others have highlighted executive stock options as a potential reason for this change in payout policy, focusing on the lack of dividend-protection in most option programs. However, the link between executive option holdings and lower dividends need not be driven by this angle alone. By aligning the incentives of shareholders and managers, stock options could be viewed as a substitute to dividends as a means of reducing asymmetric information problems. Testing whether option grants serve as a substitute for high dividend yields is a potentially interesting question for future research.

Finally, accounting changes that would make the value of stock option grants explicit in reported earnings would likely reduce future option grants. This accounting change, in addition to the lower stock returns realized since the bull market of the late 1990s, suggests less of a need

for share repurchases to undo the dilutive effects of option programs. Coupled with the 2003 tax cut that substantially reduced the cost of paying dividends to individual shareholders, a decline in importance of stock option-induced share repurchases suggests that the future payout policy decisions of firms may reverse the long-term trend away from dividends and towards share repurchases (Grullon and Michaely (2002)).

¹ There is both anecdotal and empirical evidence of the importance placed upon reported EPS by investors, financial advisors, and managers (examples include Barth, Elliot, and Finn (1995), Burgstahler and Dichev (1997), Andrade (1999), Degeorge, Patel, and Zeckhauser (1999), and Bens, Nagar, Skinner, and Wong (2003)).

² A recent survey by ShareData indicates that the number of companies that grant options to all of their workers has increased substantially over the past three years (*Forbes*, May 18, 1998). Only 15% of corporations currently award stock options to senior management only (*Institutional Investor*, November 1999).

³ Murphy (1998) reports that about one percent of CEOs with options have dividend protection. Fenn and Liang (2001) note that firms may not dividend-protect options because they would have to realize the accruing dividend as a compensation expense. The firm may also have an incentive to not dividend-protect options if shareholders wish to encourage upper management to substitute repurchases for dividends.

⁴ In work done concurrently with this paper, Bens, Nagar, Skinner, and Wong (2003) also find that corporate managers' stock repurchase decisions are affected by their incentives to manage reported EPS, including undoing the dilutive effects of stock option programs. Unlike Bens, Nagar, Skinner, and Wong (2003), I exploit panel data to study the adjustment of payout policy to stock option programs by estimating share dilution regressions. The use of panel data allows me to study the adjustment of payout policy to stock option grants, exercises, and outstandings, which distinguishes this paper from previous work in this area.

⁵ The firm does not recognize any compensation expense if the exercise price of a fixed-plan stock option equals or exceeds the current market price of the stock under Accounting Principles Board Opinion 25 (APB 25). If the exercise price is less than the current market price, then the difference is recorded as an expense. The terms of a fixed-plan option, such as the exercise price, life, and vesting schedule, are known when granted and not contingent upon future events.

⁶ The shares added to common shares outstanding when calculating the denominator of EPS are referred to as incremental shares or common stock equivalents. Only in-the-money options are counted as incremental shares. Thus, diluted EPS is not affected by options granted recently at or above the current market price, or previously granted options that have fallen out-of-the-money. Core, Guay, and Kothari (1999) discuss how SFAS 128 fails to adequately take into account the *economic* dilutive effect of stock options, and propose an alternative method to calculate the dilutive effect of outstanding stock options upon EPS. This paper tests whether firms appear to repurchase stock in a pattern that is consistent with countering the *accounting* dilution to EPS that results from stock options.

⁷ The treasury stock method assumes that the proceeds received upon exercise are used to repurchase a company's stock, reducing the number of shares to be added to outstanding common stock. The exercise price that the employee pays represents the primary proceeds received. In some circumstances, the exercise of an option will result in additional proceeds, such as a tax benefit that is credited to additional paid-in capital, which would allow the firm to repurchase more stock. Hence, the weight given to the outstanding option may be less than $(P-X)/P$.

⁸ While increasing the denominator of EPS, stock options could at the same time potentially *boost* the numerator (the level of earnings) if they increase worker productivity and/or are a substitute for cash wages. This paper just focuses on the direct dilutive effect on the denominator of EPS.

⁹ How a share repurchase impacts EPS will depend upon the marginal source of funds for the repurchase. If the stock buyback is financed by reducing holdings of cash or cash equivalents or by issuing debt, then EPS will be boosted with the repurchase if:

$$[(1 - \text{corporate tax rate}) * \text{interest rate}] < [\text{earnings-price ratio}].$$

Presumably, the corporation uses liquid assets with a low rate of return to finance the repurchase program, suggesting a minimal loss of interest income, and thus a likely increase in EPS. However, given a sufficiently high P/E ratio or interest rate, a stock buyback may actually lower EPS for some firms.

¹⁰ If there were points in time that EPS had sudden drops due solely to stock options, then one could examine stock returns around this event to see if stock prices decline. However, stock options only cause a gradual dilution to EPS over time.

¹¹ An interesting avenue for future research would be to examine the payout policy of firms whose executives' bonuses are tied to diluted earnings per share relative to firms where executive compensation is not directly tied to EPS. Unfortunately, the Execucomp database does not provide data on the determinants of the annual bonus and such details are also not typically provided in the company's proxy statement.

¹² Firms that suffer a net loss do not add incremental shares to shares outstanding when calculating diluted EPS since doing so would be antidilutive (would make EPS less negative). Theoretically, option holders participate in both increases and decreases in firm value, suggesting there should be no asymmetry in treatment.

¹³ Dann (1981), Vermaelen (1981), Asquith and Mullins (1986), Comment and Jarrell (1991), Ikenberry, Lakonishok, and Vermaelen (1995), and Stephens and Weisbach (1998) focus on asymmetric information/stock undervaluation, Guay and Harford (2000) and Jagannathan, Stephens, and Weisbach (2000) focus on the flexibility of share repurchases in distributing temporary cash flows, Bagwell and Shoven (1988) discuss adjusting capital structure, and Grullon and Michaely (2002) suggest reducing individual shareholders' taxes as motivations for repurchasing stock.

¹⁴ If the executives' options are not deep-in-the-money, this will overstate the decline in value of outstanding options from a \$1 dividend paid by the firm. Since I only have data on executive options for one year, I do not have sufficient data on the characteristics of the option portfolio to construct the slope of the option value curve.

¹⁵ These five executive officers include the CEO, and the four other most highly compensated officers (e.g., the chief operating officer, the chief financial officer, and two senior vice presidents). In the few cases when more or less than five are reported, total option holdings for the group are scaled to reflect five officers.

¹⁶ Specifications throughout the paper will focus on options outstanding for all employees and option holdings of the top five executives. The qualitative results presented in the paper also hold when "upper management" is defined as the CEO only, rather than the top five executives.

¹⁷ Pension plans will have no tax preference for capital gains or dividends. Corporations generally pay tax on only 30% of dividends, but 100% of realized capital gains. See Dickson and Shoven (1995) for a discussion of whether mutual fund managers take into account the tax liability of their investors.

¹⁸ Another explanation for the correlation between total outstanding options and stock buybacks is that executives may wish to fund option programs with repurchased shares, rather than issue new stock, so they do not have to ask

shareholders to approve an increase in authorized shares. However, this hypothesis does not have the implication that option-induced repurchases will be higher during periods of rising stock prices.

¹⁹ This estimation procedure uses ordinary least squares estimates to exclude gross outliers and then works iteratively. Weighted least square regressions are performed using weights based on absolute residuals from the previous iteration. Huber weights are used until the estimates converge, at which point biweights are used until the estimates converge again. See the Stata Reference Manual Release 5, 1997:3, 168-173, Hamilton (1991), and Street, Carroll, and Ruppert (1988) for details. A median regression yields similar results. For example, the coefficient on total options was -1.570 (p-value = 0.066) and the coefficient on top executive options was 3.118 (p-value = 0.078).

²⁰ One quarter of the firms in the sample have never paid a dividend. Thus, increased repurchases cannot be offset by cutting dividends for these firms, and must be offset by retaining fewer earnings. I also estimated regressions of total payouts, defined as dividends plus share repurchases. The estimated marginal effect of total outstanding options upon total payouts was three quarters of the marginal effect upon share repurchases. This suggests that most of the option-induced increase in stock buybacks is not offset by a reduction in dividends, and thus total payouts are boosted. Similar results are obtained if firms that have never paid dividends are excluded from the analysis.

²¹ Banks are excluded from the sample because Compustat does not report as much financial information for banks as for non-bank corporations. For example, Compustat does not report dollars spent on share repurchases for banks. As a practical matter, most of the large banks have undergone significant mergers recently. This makes constructing a meaningful time series of observations difficult.

²² The executive option holdings and individual ownership variables are excluded from the regressions of share dilution, as data on executive option holdings and individual ownership were not collected. Given their lack of explanatory power in the cross-sectional repurchase regressions, their omission should not materially affect the results. I later did merge the data with Execucomp to obtain outstanding options held by the top executives for the mid to late 1990s part of my sample. I found top executive option holdings had no effect in the share dilution regressions in Table 7, and their inclusion did not materially change the coefficient on the other option variables.

²³ If Earnings / Price equals the return earned on the proceeds received when the option is exercised, then EPS will not be affected.

²⁴ This reflects an increased likelihood that an option awarded four years ago will be canceled or exercised relative to an option awarded a year ago. Huddart and Lang (1996) find that exercise activity is strongly associated with the proximity to vesting dates.

²⁵ OLS estimates are 1.133 (standard error of 0.266) for option exercises and -0.296 (standard error of 0.105) for options outstanding. A median regression yields coefficients of 0.993 (standard error of 0.109) for option exercises and -0.096 (standard error of 0.057) for options outstanding.

²⁶ Ideally, if the exercise or strike price of the options were available, I could test whether firms whose options are out of the money (and hence dilution to EPS is not a concern) conduct less stock repurchases than firms whose options are deep in the money (dilution is a concern). However, the average exercise price is only available at the very end of my sample. Also, given the bull market of the 1990s, very few firms had an average exercise price over their outstanding options that exceeded their current stock price. The price appreciation variable at least gets at the idea that the firms with greater returns have more dilution from options, and hence may repurchase more stock.

²⁷ Firms typically grant both nonqualified and incentive stock options, but they do not report how many of each type were granted. In addition to the exercise proceeds X , the firm also receives a tax benefit of $\tau(P-X)$ when a nonqualified stock option is exercised (where τ is the corporate tax rate and P and X are the stock price and exercise price, respectively). The firm receives no tax benefit when an incentive stock option is exercised, assuming that the stock is held at least two years after the option is granted and one year after the option is exercised. Thus, given the stock price is twice the exercise price, the weight given to an outstanding stock option when calculating the denominator of EPS will be between 0.325 and 0.5, assuming a tax rate of 0.35.

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Table 1: Dilution from Stock Option Programs at end of 1998

*How much do dilutive securities reduce earnings per share
for firms with EPS>0 in fiscal year 1998?
(percent reduction in EPS)*

	Average reduction for firms in group	Reduction for group as a whole	Fraction of firms with > 5% reduction	Fraction of firms with > 10% reduction
S&P 1500	2.5	2.2	12.8	2.8
Mid/Small Caps	2.6	2.7	15.2	3.3
S&P 500	2.1	2.2	8.1	1.9
S&P 500 Tech	4.2	4.4	27.7	8.5

The reduction to EPS due to outstanding dilutive securities is simply one less the ratio of diluted EPS to basic EPS. Basic EPS normalizes earnings by shares actually outstanding, making no adjustment for options.

Table 2: Summary Statistics for Option Programs and Distributions for S&P 500, MidCap 400, and *Forbes* 500 firms at end of 1994

	Mean & Standard Deviation	Median	10 th – 90 th percentile
Total Options Outstanding / shares outstanding end of 1994	0.057 (0.047)	0.046	0.013 – 0.115
CEO Options Outstanding / shares outstanding end of 1994	0.007 (0.011)	0.004	0.000 – 0.016
CEO Options / Total Options	0.124 (0.116)	0.091	0.018 – 0.256
Top 5 Executives Options Outstanding / shares outstanding end of 1994	0.016 (0.018)	0.011	0.002 – 0.035
Top 5 Options / Total Options	0.278 (0.180)	0.237	0.080 – 0.530
Direct Individual Ownership end of 94	0.38 (0.19)	0.36	0.16 – 0.64
Probability (Repurchase > 0) in 1995	0.50 (0.50)		
Probability (Repurchase > 0.01*Market Value)	0.29 (0.45)		
Repurchases in 1995 / Market Value	0.014 (0.030)	0	0 – 0.041
Probability (Dividend > 0) in 1995	0.75 (0.43)		
Dividends in 95 / Market Value	0.017 (0.014)	0.016	0 – 0.036
Total Payout / Market Value	0.030 (0.035)	0.024	0 – 0.065
Repurchases / (Total Cash Payouts) in 1995	0.31 (0.35)	0.15	0 – 0.90

The sample consists of non-bank and non-utility members of the S&P 500, MidCap 400, and/or *Forbes* 500 at the end of fiscal year 1994 (826 firms). Data on total outstanding options were obtained from 10-Ks or annual reports. Executive option holdings were obtained from proxy statements. Market Value is the average of a firm's market value at the beginning and end of 1995.

**Table 3: Regressions of Share Repurchases in 1995
Coefficients from Tobit Model Reported**

Dependent Variable =
Repurchases in 95 / Market Value

	(1)	(2)	(3)
Total Outstanding Options / Shares Outstanding	0.200^{***} (0.048)		0.205^{***} (0.062)
Top 5 Executives Options / Shares Outstanding		0.326^{***} (0.127)	-0.020 (0.165)
Individual Ownership of Firm	-0.001 (0.012)	-0.004 (0.012)	-0.001 (0.012)
Capital Expenditures	-0.051 (0.054)	-0.034 (0.054)	-0.051 (0.054)
Operating Income	0.227 ^{***} (0.041)	0.209 ^{***} (0.041)	0.227 ^{***} (0.041)
Non-Operating Income	0.728 ^{***} (0.196)	0.755 ^{***} (0.196)	0.728 ^{***} (0.196)
Market-to-book ratio	-0.015 ^{***} (0.004)	-0.014 ^{***} (0.004)	-0.015 ^{***} (0.004)
Long-term Debt end of 94	-0.059 ^{***} (0.017)	-0.056 ^{***} (0.016)	-0.059 ^{***} (0.017)
Return in 1994	0.003 (0.008)	0.002 (0.008)	0.003 (0.008)
Log(Assets in millions of \$)	0.006 ^{***} (0.002)	0.006 ^{***} (0.002)	0.006 ^{***} (0.002)
Industry Controls	Yes	Yes	Yes
Log Likelihood	554.6	549.2	554.6
Sample Size	783	783	783

See text and Appendix for variable descriptions. The sample consists of non-bank and non-utility members of the S&P 500, MidCap 400, and/or *Forbes* 500 at the end of fiscal year 1994 (826 firms). Forty-three of the 826 observations are lost with the inclusion of the non-option covariates. Capital expenditures, operating income, non-operating income, and long-term debt are measured during 1994 and are normalized by total assets at the end 1994. The option variables, individual ownership, market-to-book ratio, and the book value of assets are all measured at the end of 1994. Share repurchases during 1995 are normalized by the average of firm value at the beginning and end of 1995. Evaluated at the means of the covariates, the scaling factor to convert coefficients to marginal effects in the Tobit model is 0.43 for the repurchase regressions. Standard errors are reported in parentheses.

^{***}, ^{**}, ^{*} denote significance at the 1 percent, 5 percent, and 10 percent levels, respectively.

**Table 4: Regression of Share Repurchases in 1995
Interaction of Total Outstanding Options with Price Appreciation and Other Variables**

	<i>Dependent Variable = Repurchases in 95 / Market Value</i>	
	(1)	(2)
Total Outstanding Options	0.203 *** (0.064)	0.010 (0.091)
Total Outstanding Options * (Is price appreciation > sample median?)		0.170 *** (0.069)
Total Outstanding Options * (Is market-to-book > sample median?)		0.124 ** (0.063)
Total Outstanding Options * (Is firm size > sample median?)		0.049 (0.070)
Price appreciation during 1995	0.000 (0.005)	-0.009 (0.006)

In the first column, stock price appreciation during 1995 is added to repurchase specification (3) of Table 3. The other variables in specification (3) are included in the regression, but are not reported. In the second column, the total outstanding options variable (normalized by shares outstanding) is interacted with three dummy variables. The dummy variables are whether the firm's stock price appreciation, market-to-book ratio, and asset value were above the sample median, respectively. Coefficients are reported with the standard errors in parentheses.

***, **, * denote significance at the 1 percent, 5 percent, and 10 percent levels, respectively.

Table 5: Regression of Retention Rate of Earnings over 1995-96*Dependent Variable = 1 - (Dividends and Repurchases in 1995-96) / (Earnings in 1995-96)***Estimated by Robust Regression**

	(1)	(2)	(3)
Total Outstanding Options / Shares Outstanding	-0.177 (0.388)	-1.007[*] (0.530)	-1.019[*] (0.527)
Top 5 Executive Options / Shares Outstanding		2.710^{**} (1.257)	2.662 (1.672)
Executive Options * (Is market-to-book > sample median?)			0.399 (1.639)
Executive Options * (Is firm size > sample median?)			-0.157 (1.671)
Individual Ownership of Firm	-0.084 (0.084)	-0.095 (0.085)	-0.095 (0.084)
Market-to-book ratio	0.033 (0.021)	0.039 [*] (0.021)	0.038 [*] (0.022)
Long-term Debt at end of 1994	0.407 ^{***} (0.116)	0.411 ^{***} (0.117)	0.405 ^{***} (0.116)
Return in 1994	0.010 (0.057)	0.008 (0.057)	0.008 (0.057)
Log (Assets in \$millions)	-0.061 ^{***} (0.012)	-0.052 ^{***} (0.013)	-0.051 ^{***} (0.014)
Industry Controls	Yes	Yes	Yes
Sample Size	682	682	682

The sample consists of non-bank and non-utility members of the S&P 500, MidCap 400, and/or *Forbes* 500 at the end of fiscal year 1994. “Earnings” is income before extraordinary items available for common (annual data item 237 in Compustat). Firms with negative earnings over the two-year period are excluded. See the text and Appendix for variable descriptions. Debt is normalized by total assets at the end of 1994. The option variables, individual ownership, market-to-book ratio, and firm size (total assets) are measured at the end of 1994. Standard errors are reported in parentheses.

***, **, * denote significance at the 1 percent, 5 percent, and 10 percent levels, respectively.

**Table 6: Summary Statistics for Option Programs and Distributions
S&P 100, Dow Jones Industrials, and S&P 500 Tech Firms 1990-98**

	Mean & Standard Deviation	Median	10 th – 90 th percentile
Stock Option Grants normalized by shares outstanding	0.019 (0.023)	0.012	0.003 – 0.043
Change in Option Grants normalized by shares outstanding	0.005 (0.028)	0.004	-0.010 – 0.020
Stock Option Exercises normalized by shares outstanding	0.011 (0.012)	0.006	0.000 – 0.026
Change in Options Exercises normalized by shares outstanding	0.004 (0.011)	0.004	-0.006 – 0.015
Options Outstanding normalized by shares outstanding	0.065 (0.052)	0.051	0.016 – 0.131
Change in Options Outstanding normalized by shares outstanding	0.018 (0.044)	0.015	-0.022 – 0.061
Probability (Repurchase > 0)	0.61 (0.49)		
Repurchases / Market Value	0.017 (0.031)	0.004	0 – 0.047
Change in Shares Outstanding normalized by shares beginning of year	0.013 (0.067)	0.004	-0.028 – 0.054

The sample consists of the 144 current (as of July 1999) non-bank S&P 100, Dow Jones Industrials, or S&P 500 Technology firms from 1990-1998. Data on total option programs were obtained from 10-Ks or annual reports. There are a total of 1,089 firm-year observations.

**Table 7: Stock Option Programs and Share Dilution 1990-98
for S&P 100, Dow Jones Industrials, and S&P 500 Tech Firms**

Dependent Variable = Change in Shares Outstanding / Shares Outstanding Beginning of Year

Coefficients from robust regression over pooled data 1990-98 reported

	(1)	(2)	(3)
Options Outstanding / Shares Outstanding	-0.010 (0.028)	-0.076 ^{***} (0.023)	-0.005 (0.035)
Options Outstanding * (Is firm's price appreciation > sample median?)			-0.080 ^{**} (0.041)
Option Exercises / Shares Outstanding		0.916 ^{***} (0.058)	0.938 ^{***} (0.058)
Capital Expenditures / Assets	-0.018 (0.021)	0.007 (0.017)	0.008 (0.017)
Operating Income / Assets	-0.035 ^{***} (0.014)	-0.040 ^{***} (0.011)	-0.042 ^{***} (0.011)
Non-Operating Income / Assets	-0.078 (0.054)	-0.055 (0.045)	-0.059 (0.045)
Market-to-book ratio	0.002 ^{***} (0.001)	0.002 ^{***} (0.001)	0.002 ^{***} (0.001)
Long-term Debt / Assets	0.035 ^{***} (0.011)	0.021 ^{**} (0.009)	0.021 ^{**} (0.009)
Stock Return	0.001 (0.001)	-0.001 (0.001)	-0.001 (0.001)
Log(Assets in millions of \$)	-0.005 ^{**} (0.002)	-0.002 (0.001)	-0.001 (0.001)
Year Effects	Yes	Yes	Yes
Firm Effects	Yes	Yes	Yes
Sample Size	1,089	1,087	1,087

Sample consists of the 144 current non-bank S&P 100, Dow Jones Industrials, or S&P 500 Technology firms from 1990-1998. Capital expenditures, income, and debt are measured at year t-1. Market-to-book ratio and total assets are measured at the end of year t-1. In specification (3), a dummy variable of whether the firm's average price appreciation over the period is greater than the sample median is interacted with the outstanding options variable. Standard errors are reported in parentheses.

***, **, * denote significance at the 1 percent, 5 percent, and 10 percent levels, respectively.

**Table 8: Stock Option Grants and Share Dilution 1990-98
for S&P 100, Dow Jones Industrials, and S&P 500 Tech Firms**

Dependent Variable = Change in Shares Outstanding / Shares Outstanding Beginning of Year

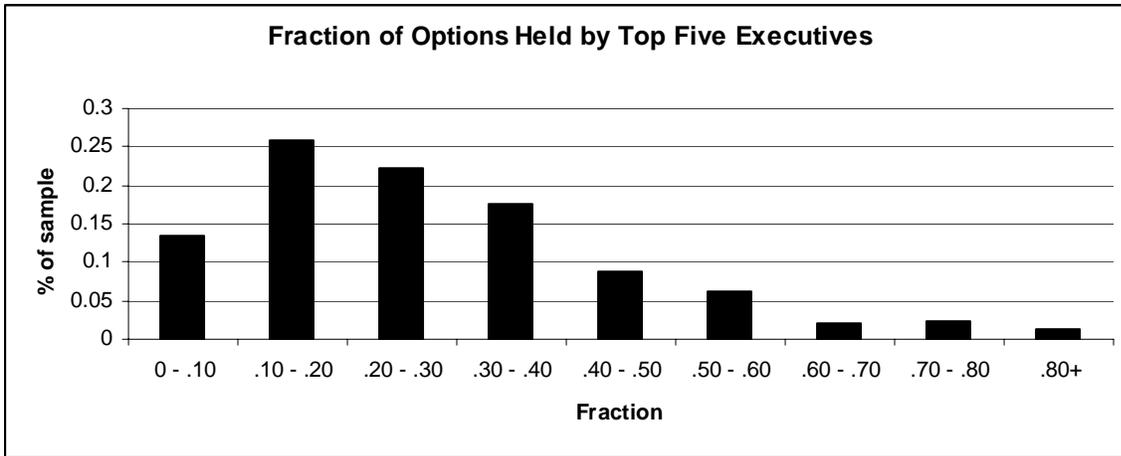
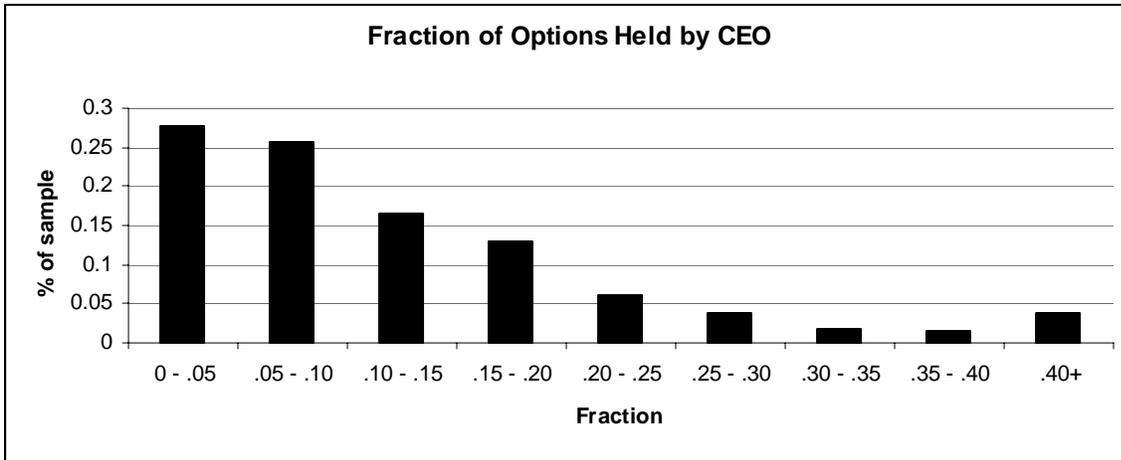
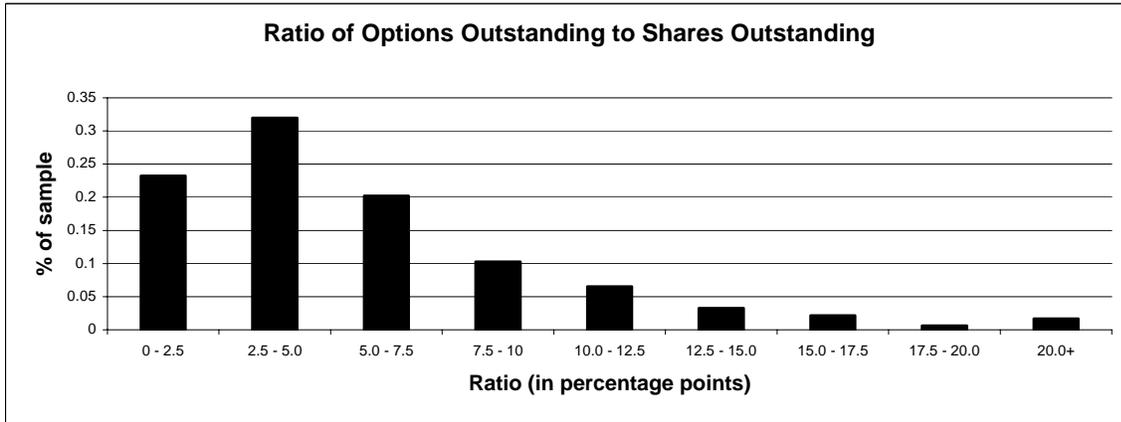
Coefficients from robust regression over pooled data 1990-98 reported

	(1)	(2)	(3)
Option Exercises in current year	0.998 ^{***} (0.067)	0.993 ^{***} (0.065)	0.977 ^{***} (0.064)
Options Outstanding at end of current year	-0.009 (0.041)		
Option Grants in current year	-0.084 ^{**} (0.041)	-0.092 ^{***} (0.029)	-0.093 ^{***} (0.029)
Option Grants in year t-1	-0.214 ^{***} (0.042)	-0.205 ^{***} (0.034)	-0.191 ^{***} (0.033)
Option Grants in year t-2	-0.093 ^{***} (0.037)	-0.092 ^{***} (0.032)	-0.091 ^{***} (0.032)
Option Grants in year t-3	-0.104 ^{***} (0.036)	-0.107 ^{***} (0.034)	-0.088 ^{***} (0.034)
Option Grants in year t-4	-0.051 (0.037)	-0.057 [*] (0.034)	-0.056 [*] (0.034)
Other Financial Covariates	Yes	Yes	No
Year Effects	Yes	Yes	Yes
Firm Effects	Yes	Yes	Yes
Sample Size	874	874	876
Sum of grant coefficients	-0.546 ^{***} (0.131)	-0.554 ^{***} (0.088)	-0.519 ^{***} (0.085)

Sample consists of the 144 current non-bank S&P 100, Dow Jones Industrials, or S&P 500 Technology firms from 1990-1998. Capital expenditures, operating and non-operating income, market-to-book ratio, debt, the stock-return, and firm size (book value of total assets) are the other financial covariates. The option variables are all normalized by shares outstanding. Standard errors are reported in parentheses.

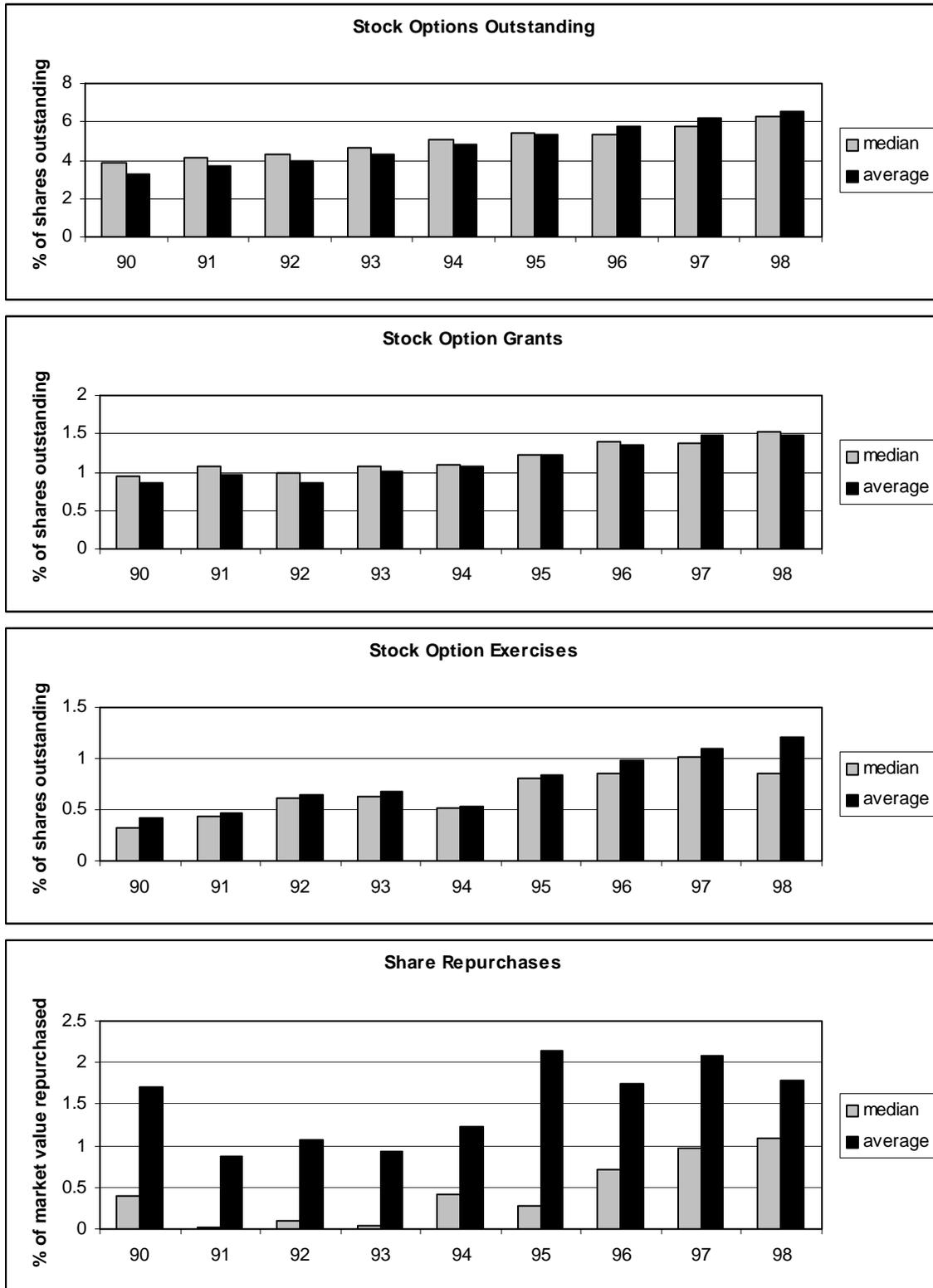
***, **, * denote significance at the 1 percent, 5 percent, and 10 percent levels, respectively.

Figure 1: Distribution of Option Programs at end of 1994



The sample consists of non-bank and non-utility members of the S&P 500, MidCap 400, and/or *Forbes* 500 at the end of 1994. Data on total outstanding options were obtained from 10-Ks or annual reports. Executive option holdings were obtained from proxy statements.

Figure 2: Option Programs and Share Repurchases 1990-98



Note: Sample consists of current S&P 100, Dow Jones Industrials, and S&P 500 Tech firms that have been in existence and have complete option data from 1990-98 (127 firms). The reported averages are weighted by the average of beginning and end of period firm market value.

Appendix

Other Characteristics of S&P 500, MidCap 400, and *Forbes* 500 firms at end of 1994

	Mean & Standard Deviation	Median	10 th – 90 th Percentile
Member of S&P 500 at end of 94	0.49 (0.50)		
Member of MidCap 400 at end of 94	0.37 (0.48)		
Market Capitalization at end of 1994 in \$M	4,051 (8,150)	1,552	418 – 8,569
Book Value of Assets at end of 1994 in \$M	7,512 (22,110)	1,829	407 – 13,873
Capital Expenditures / Assets	0.066 (0.052)	0.056	0.010 – 0.130
Operating Income / Assets	.0156 (0.089)	0.150	0.060 – 0.256
Non-Operating Income / Assets	0.006 (0.012)	0.004	-0.001 – 0.018
Market-to-book ratio	1.77 (0.93)	1.49	1.05 – 2.76
Long-term Debt / Assets	0.194 (0.172)	0.167	0.006 – 0.403
Stock Return over 1994	0.021 (0.296)	0.009	-0.289 – 0.321
Price Appreciation over 1995	0.246 (0.427)	0.208	-0.173 – 0.640

Notes:

Capital expenditures is Compustat annual data item 128. Operating income is Compustat annual data item 13. Non-operating income is Compustat annual data item 61. Long-term debt is Compustat annual data item 9. Capital expenditures, operating income, non-operating income, and debt outstanding are all measured in 1994 and are normalized by total assets at the end of 1994 (Compustat annual data item 6). Market-to-book ratio is the market value of common and preferred stock plus total liabilities divided by total assets, all measured at the end of 1994. Total liabilities and total assets reflect book values. The stock return includes both price appreciation and dividends and is calculated using the Center for Research in Securities Prices (CRSP) tapes.