"Do Broad-Based Option Compensation Plans Improve Future Firm Performance For Technology and Non-Technology Firms?"

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Abstract

Although stock option grants to non-executives account for over 90 percent of all options granted, there is little evidence regarding the return to shareholders for such grants. We examine the relation between non-executive option compensation and future firm performance. We find no future earnings or cash flow benefit to *non-executive* option compensation. We extend prior research by documenting a positive earnings and cash flow payoff to *executive* option compensation. The cash flow analyses provide support for other research linking executive option compensation to stock price and returns.

We also separately study technology and non-technology firms and find that payoffs to executives are positive only in the non-technology sector. However, we do not find a positive payoff to non-executive options in either sector. Thus, we document the importance of distinguishing between technology and non-technology firms when evaluating option compensation particularly for executives.

1. Introduction

Over the past decade the use of stock options in compensation plans has rapidly increased for both executives and non-executives. Hall and Murphy (2003) report that Standard and Poor's 500 firms granted a total of $11 billion in options in 1992; this increased to $119 billion in 2000, before declining to $71 billion in 2002.[1] In addition, more than 90 percent of options granted in 2002 were granted to employees at ranks *below* the top-five executive level (Hall and Murphy 2003). Employers argue that broad-based grants to lower-level employees allow them to attract, retain, and motivate employees without expending cash. Yet, despite the widespread use of broad-based option compensation, there is little evidence that these programs provide positive payoffs. This study provides evidence on the relation between both non-executive and executive option compensation and future operating performance, measured as earnings and operating cash flows. For the purpose of this study, we define "executive" as the top-five executives reported in the proxy statement and "non-executive" as all employees below the top-five rank.[2]

Several studies have examined the relation between executive options and stock price and/or stock returns.[3] Although executives likely have the ability to influence both stock prices and future earnings, it is less likely that lower-level employees' influence stock prices. Thus, we use operating earnings and cash flow to measure shareholder payoff.[4] Specifically, we examine the relation between option compensation and future earnings (cash flow) for up to five-years using a variety of model specifications.

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[1] Simlar growth in option grants was also experienced by the broader sample of firms covered by ExecuComp.

[2] Our definition is similar to Core and Guay (2001) and Murphy (2003). To the extent that our non-executive sample includes some executives, our estimated payoff to *non-executive* options may be overstated.

[3] See, for example, Hanlon et al. (2003), Aboody (1996), Chamberlain and Hsieh (1999), Aboddy, et al. (2004), Bell et al. (2002), Reese and Stott (2001), Core and Guay (1999), Ittner et al. (2003), Hillergiest and Penalva (2004), Murphy (2002, 2003), and Brown and Krull (2005).

[4] Hanlon et al. (2003) and Larcker (2003) also measure shareholder payoff to executive options with future earnings while Lev and Sougiannis (1996) and Hand (2001) use future earnings to measure shareholder payoff in other settings.

We also investigate the relation between future firm performance and option compensation in technology and non-technology firms. Relative to other firms, technology firms are more aggressive in the level of option compensation and their option grants extend to a broader-base of employees (Ittner, Lambert and Larcker, 2003; Murphy, 2003; Anderson, Banker, and Ravindran, 2000). Consistent with this, technology firms argue that their liberal use of option compensation is necessary for incentive, attraction and retention purposes. Thus, we separately investigate the relation between executive and non-executive option compensation and future performance for both technology and non-technology firms.

Our sample consists of all non-financial firms included in both the S&P ExecuComp Database and COMPUSTAT for the period 1996 to 2003. In our primary analysis, we obtain the value of annual executive option grants from the 2003 ExecuComp database and measure the value of option grants to non-executives as the option expense reported under SFAS 123 less the ExecuComp estimate of the value of options granted to top-five executives.[5]

Consistent with prior research we find a significant positive payoff to executive stock options for both operating income and cash flows for all firms. These findings provide support for evidence, in other studies, of a relation between stock prices and executive option compensation. However, when we partition the sample between technology and non-technology firms we find that the payoff to executives is only significantly positive for non-technology firms. Our evidence that the payoff to technology executives is insignificant highlights the importance of distinguishing between technology and non-technology firms when evaluating option compensation and is consistent with criticism in the popular press that technology firms over-utilize option compensation

[5] The appendix provides a detailed discussion of significant measurement issues related to estimating non-executive option compensation with ExecuComp data.

for executives. As demonstrated in prior research, these findings are sensitive to linear versus non-linear model specifications.

For non-executives, one dollar of option compensation expense is associated with significantly less than a dollar of undiscounted future earnings, suggesting a negative payoff, on average, to broad-based option compensation plans. This is true in both the technology and non-technology sectors. When we examine cash flows, the payoff to non-executive options is significantly negative for non-technology firms and insignificant for technology firms suggesting there is little or no benefit to firms in terms of future operating performance for non-executive options. These results are consistent with arguments by Hall and Murphy (2003) and Oyer and Shaeffer (2005), among others, that broad-based option grants are an ineffective means of providing incentives to lower-level employees. This finding also has practical implications as the percentage of large firms granting stock options to at least half of their employees increased steadily from 17% in 1993 to 39% in 1999 (William M. Mercer, USA Today, October 6, 1999, p. 1B). Similarly, Oyer and Shaeffer (2005) find that, in 1999, 43 percent of public firms granted options to more than half of their employees.

In summary, the evidence is consistent with firms succeeding in linking *executive* option compensation to future earnings and cash flows in a manner that leads to a positive (undiscounted) payoff to shareholders on average. However, the payoff is sensitive to model specification and is not uniform across technology and non-technology firms. Specifically, non-technology firms experience a positive payoff for executive options but technology firms do not. Further, we observe a negative earnings payoff for *non-executives* in both sectors, suggesting that broad based options plans do not provide a positive shareholder payoff. Consistent with this, we do not observer a positive cash flow payoff for non-executive option compensation in either sector. These inferences are robust to several model specifications, alternate proxies for non-executive option compensation, and econometric tests.

This study contributes to our understanding of the benefits of option compensation in several ways. First, we provide evidence on the relation between non-executives option grants and future firm performance. Over 90 percent of the value of option grants is in the form of broad-based option compensation plans yet prior research does not examine the earnings or cash flow payoff to non-executive options. Thus, understanding the relation between non-executive option compensation and future performance may help shareholders and others evaluate the appropriateness of these plans. However, our evidence of a zero or negative payoff suggests there may be other reasons for broad based option plans. Murphy (2002, 2003) suggest firms focus on the perceived cost of options rather than their economic cost. Brown and Krull (2005) examine whether the tax benefit associated with R&D stock options reduces the cost of non-option R&D expenditures. Similarly, Ittner, et al. (2003) finds that technology firms use employee options for retention, reward, and attraction.

Second, we separately examine the payoff to executive and non-executive option grants for technology and non-technology firms. Some argue that option compensation in the technology sector may be over-utilized and inefficient (Hall and Murphy 2003). Our findings support this contention and highlight the importance of distinguishing between technology and non-technology firms when evaluating option compensation especially for executives. Third, our evidence of a positive cash flow payoff to executive option compensation provides support for research linking executive option compensation to stock prices and returns.

Finally, we provide researchers guidance with respect to the use of ExecuComp versus SFAS 133 data to estimate non-executive option compensation. Our appendix provides a detailed discussion of significant measurement issues related to estimating non-executive option compensation with ExecuComp data. This analysis suggests that SFAS 133 data may provide a more reliable estimate of the value of non-executive or options granted in broad based plans. Future revisions will also compare SFAS 133 data to actual grant values.

The paper proceeds as follows. Section two summarizes the prior literature and develops our research questions. Section three describes the empirical specification and the sample while section four discusses the results. Section five concludes.

2. Background and Prior Literature

The use of option compensation exploded in the 1990s, with the dollar value of option grants by S&P 500 firms increasing ten-fold over the period 1992 to 2000. In the mid-nineties, grants to employees below the top-five executive ranks accounted for approximately 85 percent of the total options granted. This proportion increased to more than 90 percent by 2002 (Hall and Murphy 2003). In addition, option compensation spread from the technology sector to other sectors of the economy. At the same time, the accounting for option compensation became increasingly controversial. In 1995, the FASB issued SFAS 123 which encourages firms to account for option grants at fair value using the Black-Scholes option pricing model or a similar model. However, SFAS 123 allows firms to use the intrinsic value method for options on the income statement if firms incrementally provide *pro forma* disclosures of the effect of fair value accounting on net income and earnings per share.[6]

In March 2004, the FASB issued an exposure draft requiring fair value accounting for option compensation expense on the income statement, thus eliminating the intrinsic value method

[6] Prior to 2003 only a handful of firms reported the fair value of the options granted in the financial statements. The rest used the intrinsic method and opted to disclose the fair value in the footnotes.

altogether.[7] Congressional testimony followed asserting that many firms planned to reduce the level of option grants to non-executive employees if the FASB mandated income statement recognition of option compensation. In response, the House of Representatives passed legislation requiring this FASB standard apply only to option compensation for top-five executives. Members of Congress claimed that legislation limiting income statement recognition to executive options promotes economic growth by encouraging option compensation for lower-level employees. However, little evidence exists as to the economic effect of these broad-based plans. In fact, if the payoff to non-executive options is negative, encouraging their usage may actually slow economic growth.

Proponents of option compensation argue that options align managers' and shareholders' interests and mitigate executive risk aversion. Consistent with this argument, theoretical and empirical research view stock options as part of an optimal incentive compensation package for executives. Although executives likely have the ability to influence both stock prices and future earnings, it is less likely that lower-level employees have similar influence. Yet, employers argue that broad-based grants to lower-level employees allow them to attract, retain, and motivate employees without expending cash. Oyer and Shaeffer (2005) provide some support for this proposition. They contend that, rather than incentive alignment, broad based plans are used primarily to sort prospective employees and to retain high quality employees.

Opponents of option compensation argue that employee stock options lead to excessive risk taking and a fixation on stock price. In addition, Bebchuk, Fried and Walker (2002), and Bebchuk and Fried (2003) argue that increased use of option compensation is a result of entrenched top managers exercising influence over the board or the committee responsible for setting executive compensation. Hanlon et al. (2003) empirically investigate whether option payoffs are associated

[7] SFAS 123R was passed in December 2004 requiring firms to expense the grant date amortized fair value of option compensation but the effective date has been postponed.

with incentive alignment effects or rent extraction; their evidence supports the incentive alignment hypothesis for executives. Although the 'rent extraction' or 'managerial power' argument may be a valid explanation for increased executive options grants, it fails to explain the increased use of option compensation for non-executive employees.

Broad based plans have also been criticized as a poor incentive mechanism for lower-level employees whose actions may have little direct impact on stock price or firm performance. For example, Hall and Murphy (2003) argue that stock options are an ineffective means of compensating lower-level employees, and that other compensation mechanisms are better at sorting and retaining these employees. At the same time, option compensation potentially dilutes existing shareholder positions and, in the case of a negative payoff, results in economic dilution to the firm. Murphy (2002, 2003) provides an alternative explanation for firms' decision to grant options, especially broad based plans. He suggests that firms' focus on the "perceived cost" of options rather than their economic cost. Because firms bear no accounting charge, incur no cash outlay, receive a cash inflow equivalent to the exercise price and a tax deduction for the spread between exercise and stock price when the option is exercised, the "perceived cost" of options may be much lower than their economic cost. Murphy (2003) suggests that firms tend to grant too many options to too many employees because they focus on "perceived costs" in making this decision. Given these opposing views on the cost-benefit tradeoff of option compensation, it remains unclear whether and how shareholders benefit from granting options to lower level employees. We focus on earnings and cash flow payoffs to option compensation. At the same time, we recognize there are potentially other benefits to executive and broad based option compensation, i.e., Murphy (2002, 2003), Ittner et al. (2003) and Brown and Krull (2005).

Researchers have used several approaches to evaluate executive option compensation. Some studies examine the valuation of executive option grants by regressing stock price onto option values. Aboody (1996), Chamberlain and Hsieh (1999) and Aboody, Barth, and Kaznik (2004) find a negative relation between option values and stock price and conclude that options are viewed as an expense. To the contrary, Bell, Landsman, Miller, and Yeh (2002), and Rees and Stott (2001) document a positive relation and conclude that options are viewed as assets. These studies focus on the reliability and relevance of amounts reported as option compensation rather than on future firm performance. This approach can be problematic because option grants are intended to affect stock price by inducing managerial effort. At the same time, stock price reflects shareholder expectations regarding these effects. Thus, in a stock price study it is difficult to control for the future payoff to options and this mechanical relation may bias the coefficient on option expense (see Bell et al., 2002, p 991). Hanlon et al. (2003) provides further discussion of the advantages of using earnings rather than stock price or returns to measure the shareholder payoff to option compensation.

A second stream of research examines the incentive effects of option compensation on stock returns (Core and Guay 1999, Ittner et al. 2003, Hillergiest and Penalva 2004). Incentive effects are measured as the change in the dollar value of unexpected option grants for a one percent change in stock price. Under this stream of research all options are assumed to be granted for the purpose of incentive alignment. However, Murphy (2002, 2003) and Brown and Krull (2005) suggest that options are granted for other reasons. Moreover, even if incentive effects are related to future performance, as evidenced by Hillergeist and Penalva (2004), this research method provides no information about the cost-benefit tradeoff for the firm. Thus, our study of earnings and cash flow payoffs complements this stream of research by documenting the earnings and cash flow payoff.

Our first research question investigates whether option grants to both non-executive employees and executives result in positive future earnings and/or cash flow payoffs to the firm. Concurrent research investigates different aspects of firms' decision to grant options to executives and non-executives. Hillergeist and Penalva (2004) separately test incentive effects for executives and non-executives. They find that the incentives provided by option grants to non-executives lead to greater stock returns than incentives provided by grants to top-five executives. Landsman, Lang, and Yeh (2005) find that firms with weaker corporate governance grant a greater proportion of options to executive than non-executives. In addition, the relation between option expense and both operating income and market value is *weaker* for executives than non-executives. The finding in both these studies that non-executive option grants have a greater association with valuation and performance is puzzling given non-executive's limited role in decision making.

Hanlon et al. (2003) investigate the earnings payoff to options granted to top-five executives. Using methodology developed by Lev and Sougiannis (1996), they find that one dollar of Black-Scholes option value granted to executives during the previous five years leads to $3.88 of undiscounted future operating earnings. They further investigate a related research issue, whether this positive relation is due to incentive alignment effects or to rent extraction and conclude in favor of incentive alignment. Larcker (2003) provides a discussion of Hanlon et al. and mixed evidence on the relation between executive options and future earnings using several different research designs.

We extend the research on option compensation by investigating whether non-executive option compensation is associated with a positive future earnings payoff. We also extend the analysis of shareholder payoffs to include operating cash flows as an alternate payoff measure of operating performance. Our cash flow analysis controls for potential earnings manipulation and provides support for research linking option compensation to stock prices and returns.

Our second research question investigates whether the payoff to option compensation differs between technology and non-technology firms. Relative to other firms, technology firms are more aggressive in the use of option compensation (Ittner et al., 2003; Murphy, 2003; Anderson et al., 2000). Technology firms claim that option compensation is necessary for attraction, retention and incentive purposes. Consistent with this, Core and Guay (2001) find that the level of outstanding options is related to economic determinants of firms' use of equity incentives. Ittner, et al. (2003) use proprietary survey data to provide evidence that technology firms consider "retention" the primary role of option grants, followed closely by "reward for prior performance" and "attraction." They also document differences in the economic determinants of equity grants for technology and non-technology firms and for executives and non-executives. They find that technology firms with smaller than expected executive option grants earn a lower return on assets and exhibit lower stock returns. Interestingly, they find no evidence that larger than expected executive option grants lead to improved future performance (based on either return on assets or stock returns). Given this body of research, we investigate whether the earnings and cash flow payoffs differ for technology and non-technology firms while continuing to allow the payoff to differ for executive and non-executive option compensation.

In summary, we focus on the following two research questions. First, do options granted to non-executives versus executives lead to future earnings and/or cash flow payoffs that exceed the value of the option grant? Second, does the level of future earnings and/or cash flows associated with option grants for executives and non-executives differ in technology versus non-technology firms?

3. Empirical specification, sample selection and description

We conduct two tests of the association between future operating performance and option compensation. First, following Larcker (2003), we use a forward looking design in which the sum of future earnings is regressed onto instrumental variables for executive and non-executive option compensation. We allow options to affect earnings for up to five years by summing earnings over years t+1 to t+5. Second, following Hanlon et al. (2003), we use a backward looking design in which current year earnings (cash flow) are regressed onto instrumental variables for executive and non-executive option compensation for the past five years. Because both research designs use instrumental variables to mitigate endogeneity problems we begin this section with a discussion of our instrumental variable estimation followed by a discussion of the two research designs.

Both Larcker (2003) and Hanlon et al. (2003) note that an exogenous shock may affect both future earnings and current option grants. For example, improved growth opportunities may lead to increased future earnings and may motivate firms to grant additional options. Hanlon et al. (2003) suggest an instrumental variables or two-stage approach to deal with this endogeneity; a similar approach is used in Landsman et al. (2005).[8] Murphy (1999) suggests that firms are influenced by industry-wide option granting practices. Thus, we expect the industry-average stock option grant value to be highly correlated with the firm's grant value. Consistent with this, we compute the instrumental variable as follows:[9]

$$(Option/Sales)_{jt} = \delta_0 + \delta_1 [Industry\ Average\ Option\ (excluding\ firm\text{-}year\ jt)/Sales_{jt}] + error_{jt} \quad (1)$$

[8] However, Larcker (2003) discusses weaknesses in the instrumental variables approach for dealing with endogeneity but notes that these weaknesses apply to "…the vast majority of empirical accounting research" (p92).
[9] We define industry as the four-digit SIC code unless there are fewer than four firms in a particular SIC in which case we use the three-digit or two-digit SIC with at least four firms.

We estimate Equation (1) using firm-year observations from 1996 through 2003 to obtain firm-specific predicted values for both executives (ESO) and non-executives (NESO) employed by firm j in year t. We measure the value of annual option grants as follows: We obtain the annual value of option grants to executives from the 2003 ExecuComp database. In this database, option value is estimated using a conventional Black-Scholes model except that the maturity period of the option grant is reduced by 30% to account for the likelihood of early exercise. We derive the option value for non-executive employees by subtracting the grant value for executives from the implied SFAS 123 option expense reported by the firm (COMPUSTAT item #399).[10,11] Implied option expense represents the amount that would have been expensed if the company had reported under the fair value method. SFAS 123 requires that all firms use the Black-Scholes valuation method to calculate the implied option expense for fiscal years beginning December 15, 1996. Note that our non-executive variable is defined as option compensation to all employees below the top-five rank. Thus, we attribute the influence of executives below the top-five rank to non-executives, possibly overstating the relation between non-executive option compensation and future performance. We delete observations for our non-executive model if the implied option expense for all employees is less than the value of option grants to the top-five executives alone. Section 5 describes alternate measures of non-executive option values.

Following Larcker (2003), our first test is forward looking in that it allows current year option compensation to affect future performance for five years. We substitute the fitted value for $(Option/Sales)_{jt}$ from Equation (1) into Equation (2) to determine the payoff function.

[10] We recognize that SFAS 123 expense does not reflect the value of options granted in the current year but rather the amortization of past and current options grants amortized over the vesting period. Section 5 reports results of repeating our analysis using ExecuComp data (PCTTOTOP) to proxy for the value of total option grants. The appendix discusses deficiencies in this proxy.

[11] Since the implied option expense reported in the footnotes use after tax numbers, we convert this amount to before tax implied option compensation expense by dividing the after-tax number by (1- tax rate). If pretax income is negative

$$\sum_{k=t+1}^{t+5} (OI/S)_{j,k} = \beta_0 + \beta_1(TA/S)_{j,t} + \beta_2(ESO/S)_{j,t} + \beta_3(ESO/S)^2{}_{j,t}$$

$$+ \beta_4(NESO/S)_{j,t} + \beta_5(NESO/S)^2{}_{j,t} + \beta_6(R\&D)_{j,t} + \beta_7\sigma(OI/S)_{j,t-1} + e_{j,t} \qquad (2)$$

Where:

OI = operating income before R&D expense (Compustat item #13 + item #46) for firm j in year t,

S = total sales (Compustat item #12) for year t,

TA = total assets (Compustat item #6) at the end of year t,

ESO/S = the fitted value for executives from Equation (1) for year t,

NESO/S = the fitted value for non-executives from Equation (1) for year t,

R&D = research and development expense (Compustat item #46) for year t, missing values in Compustat set to zero, and

σ(Performance/S) = standard deviation of OI/S or CFO/S estimated over the prior five years.

The coefficients β_1 and β_3 provide evidence on the relation between executive and non-executive option compensation and future earnings. Coefficients greater than one suggest that granting one dollar of options generates more than one dollar future earnings, a positive payoff to shareholders. Coefficients greater than zero but less than one suggest that although the option generates future earnings over the next five years the amount of earnings is less than the value of option grant. Coefficients less than zero suggest a negative payoff to shareholders.

Bebchuk, et al. (2002) and Bebchuk and Fried (2003) argue that the increasing use of option compensation is the result of entrenched top managers exercising influence over the board and

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we use the reported implied option expense. Our inferences do not change when we allow for zero tax rates or when we compensation committee to set their own pay. Although this argument may be valid for executives, it does not provide a compelling explanation for the escalation of option grants for non-executive employees. For non-executives, a value less than one may imply that firms are willing to bear the cost of granting options for other benefits such as sorting and retention purposes rather than motivation and incentive alignment (Oyer and Shaeffer, 2005). It may also reflect a perception that the cost of granting options is below their economic costs (Murphy, 2002, 2003). We do not test these contentions.

Equation (2) includes several control variables. We include the squared terms for ESO and NESO to control for the concave relation, documented by Hanlon et al. (2003), between option compensation and future earnings and to facilitate comparisons with our second test. We include R&D to control for research related payoffs (Hall, Cummins, Laderman and Mundy, 1998 and Chan, Lakonishok, and Sougiannis, 2001). Consistent with Lev and Sougiannis (1996), we expect this coefficient to be positive. Finally, we include the standard deviation of the performance measure to control for the effect of firm risk on future earnings. We expect risk to be negatively related to future income (Core et al. 1999).

Following Hanlon et al. (2003), our second test is backward looking in that it allows past option compensation to affect current year performance. We substitute the fitted value for *(Option/Sales)*$_{jt}$ from Equation (1) into Equation (3) to determine the payoff function.

$$(Performance/S)_{jt} = \alpha_0 + \alpha_1(TA/S)_{j,t-1} + \sum_{k=0}^{5}\alpha_{2,k}(ESO/S)_{j,t-k} + \sum_{k=0}^{5}\alpha_{3,k}(ESO/S)^2{}_{j,t-k}$$

$$+ \sum_{k=0}^{5}\alpha_{4,k}(R\&D/S)_{j,t-k} + \alpha_5\sigma(Performance/S)_{j,t-1} + n_{jt} \qquad (3)$$

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use marginal tax rates rather than annual tax rates.

Where:

Performance = operating income before R&D expense (Compustat item #13 + item #46), labeled OI, or cash flow from operations before R&D expense (Compustat item #308 + item #46), labeled CFO, for firm j in year t,

S = total sales (Compustat item #12) for year t,

TA = total assets (Compustat item #6) at the end of year t,

ESO/S = the fitted value for excutives from Equation (1) for year t-k (k=0 to 5),

NESO/S = the fitted value for non-excutives from Equation (1) for year t-k (k=0 to 5),

R&D = research and development expense (Compustat item #46) for year t-k (k=0 to 5), missing values in Compustat set to zero, and

σ(Performance/S) = standard deviation of OI/S or CFO/S estimated over the prior five years.

The sum of the $\alpha_{2,k}$ coefficients in Equation (2) represents the undiscounted current payoff to one dollar of Black-Scholes option value expensed over the current and past five years. A sum greater than one is consistent with option compensation motivating employees to perform in a manner that increases future earnings above the Black-Scholes option value. A sum less than one suggest that the five year payoff to options is less than the value of the option grant.

Equation (3) includes the same control variables as equation (2). We include the squared terms for ESO and NESO to control for the concave relation between option compensation and future earnings documented by Hanlon et al. (2003). The sum of the $\alpha_{3,k}$ coefficients represents the undiscounted second-order effects of one dollar of Black-Scholes option value. Consistent with Hanlon et al. (2003), we expect the sum of these coefficients to be negative. Consistent with Lev and Sougiannis (1996), the coefficients on R&D reflect the current payoff to intangible assets associated with research activities over the past five years. The sum of the $\alpha_{4,k}$ coefficients represents the current earnings payoff to one dollar invested in research and development over the previous five years. Consistent with Lev and Sougiannis (1996), we expect the sum of these coefficients to be positive. Finally, we include the standard deviation of the performance measure to control for the effect of firm risk on future earnings. We expect risk to be negatively related to future income (Core et al. 1999).

Larcker (2003) raises concerns about the sensitivity of Hanlon et al.'s inferences to the inclusion of the squared ESO term. Thus, we estimate both equation (2) and (3) with and without the squared terms for ESO and NESO. In section 5 we report additional robustness tests and alternate variable definitions. A third approach to addressing endogeneity is to employ a matched sample; future revisions to this paper will employ this research design.

4. Empirical results

Table 1 summarizes the sample selection. We identify all firms in the S&P's ExecuComp Database with reported Black-Scholes values for executive option grants. We exclude financial institutions and firms with missing or incomplete ExecuComp or COMPUSTAT financial data. COMPUSTAT reports implied option expense for all employees for 1996 and all subsequent years. Thus, our sample period includes 1996 through 2003.

We estimate Equation (2), our option compensation payoff regression, for executives (non-executives) with 3,527 (3,163) firm-year observations representing 1,265 (1,123) firms over a three-year period, 2001-2003. Recall that we include five prior years of compensation data on the right hand side of Equation (2); thus, 2001 is the first testable year. We also estimate Equation (2) separately for technology versus non-technology firms. Consistent with Ittner et al. (2003), we define technology firms as firms whose primary SIC code, assigned by COMPUSTAT, is within the following ranges: 2833 to 2836, 3570 to 3679, 4800 to 4899, and 7370 to 7377. Firms not assigned these SIC codes are coded as non-technology firms.

Table 2 reports descriptive statistics for the 290 technology firms (783 firm years) and 975 non-technology firms (2,744 firm years) included in the sample. As expected, the average (median) Black-Scholes option value for top-five executives in technology firms exceeds that of non-technology firms, $12.93 ($5.02) versus $4.65 ($2.03) million. We observe a similar pattern for non-executive employees in technology firms, $120.40 ($18.41) versus $20.99 ($3.91) million in non-technology firms. Technology firms have significantly more shares outstanding, 425.02 versus 166.16 million, and the percentage of shares held by executives is lower for the technology firms, 3.3% versus 4.0%. As expected, the technology firms are smaller (mean and median annual sales and total assets) with mean sales of $3.84 versus $5.49 billion for non-technology firms.

Based on Lev and Sougiannis (1996), we compute profit margin as operating income *before* R&D scaled by sales (OI/S). The mean (median) profit margin is 27.1% (26.4%) and 16.8% (14.4%) for technology and non-technology firms, respectively. This difference is significant. Note that OI is defined as income from operations before R&D expense. Thus, the higher median profit margin for technology firms excludes a potentially significant expense, evidenced by a higher R&D to sales ratio and a lower (at the median) operating income after R&D but before depreciation, OIBDP. Similarly, the higher operating cash flow before R&D expense, CFO/S, for the technology firms is also due to excluding R&D expense.

Table 3 reports results of estimating equation (2) with earnings summed over the period 1999 through 2003. The ESO and NESO values included in the regression are the fitted values from Equation (1) for executives and non-executives for 1998. In column (1), which includes the squared terms for ESO and NESO, the coefficient on ESO is 11.296 which is significantly greater than one (t=7.78) suggesting a positive payoff to executive options. The coefficient on the ESO squared is significantly negative, consistent with diminishing marginal returns. The coefficient on NESO is 4.04 which is not significantly different from one (t=1.64) and the coefficient on the squared NESO term is negative but not insignificant. Column (2) reports results of estimating equation (3) without the squared terms. Similar to Hanlon et al. (2003), inferences are quite different when the squared terms are omitted. In contrast to the non-linear model, the coefficient on ESO is 2.15, significantly greater than zero (t=2.33) but not significantly different from one (t=1.55). Similarly, the coefficient on NESO, 2.97, is significantly greater than one (t=5.85) when the squared terms are omitted. These results suggest that it is important to consider non-linear specifications in evaluating option compensation. Consistent with prior research, the coefficients on R&D are significantly positive in both specifications. The coefficient on risk is significantly negative only in the non-linear model.

In untabulated analyses, we also estimated equation (2) using a pooled regression with operating income in year t+1 regressed onto the independent variables measured in year t. In other words, allowing current year options to affect earnings in year plus one. The inferences are the same as those reported in Table 3, a positive payoff to executive options and no payoff to non-executive options in the non-linear model. Also, consistent with Table 3, the inferences change when the squared terms are left out.

Overall, results of estimating the non-linear forward looking model suggest that a dollar of option value given to executives generates $11.30 of operating income over the next five years, a significant positive payoff to shareholders. However, a dollar of options given to non-executives generates approximately one dollar of future income, at best a zero payoff to shareholders. Future revisions will provide evidence on the technology and non-technology sectors using this research design.

Table 4 Panel A reports results of estimating Equation (3) using operating income, OI, as the performance measure. The ESO and NESO values included in the regression are the fitted values from Equation (1) for executives and non-executives. The primary focus is the sum of the α_2 and α_4 coefficients. Each of these coefficients represents the undiscounted current operating earnings that are associated with option compensation in a given year. The sum of these coefficients represents the total current year operating income that is associated with the level of option compensation in the prior five years. A sum greater than one (less than one) indicates that the undiscounted payoff to option compensation is positive (negative) suggesting that the associated future earnings exceed (fall below) the value of option grants. Because an annual option grant is unlikely to affect earnings or cash flow only in a single year focusing on the sum of the coefficients allows us to measure the payoff across multiple years without making assumptions as to when the payoff occurs.

Columns (1) of Panel A report the payoff to options for all firms. The sum of the α_2 coefficients, the payoff to executive options, is 2.92 which is significantly greater than one (F=18.87). Similar to Hanlon et al. (2003), this finding suggests that a dollar of Black-Scholes option value granted to executives is associated with a positive payoff of $2.92 in undiscounted future earnings. In Columns (2) and (3), we partition the sample into technology and non-technology firms, and observe that the sum of the α_2 coefficients, is significantly greater than one only for the non-technology sub-samples, 7.61 (F=98.17, p<0.001). The coefficient sum for technology firms is 2.51 (F=2.51, p=0.0905) is positive but only marginally different from one. Thus, for technology firms we cannot clearly reject that the earnings benefit associated with a dollar of non-executive option compensation is equal to one dollar, implying a zero payoff to shareholders. This evidence highlights the importance of distinguishing between technology and non-technology firms when examining option compensation. Consistent with Hanlon et al. (2003) the coefficient sums on the squared ESO term are significantly negative with (p-values less than .06) for all models, consistent with decreasing marginal returns to executive options.

The sum of the α_5 coefficients, the payoff to non-executive options, is –0.26 which is significantly *less* than one (F =18.21). This result suggests that a dollar of option compensation to non-executive employees is associated with *less* than one dollar of undiscounted future earnings, a negative payoff. When the sample is partitioned into technology and non-technology firms, we observe that the sum of the α_5 coefficients is again less than one for both technology (-2.04) and non-technology firms (-2.14). These values are *significantly* less than one for both sub-samples, consistent with arguments against broad based option plans (Hall and Murphy 2003).

For each of the models in Table 4, the signs and significance of the control variables and the adjusted R^2s are consistent with prior research. The sum of the coefficients on current and prior five years R&D is positive and significant in each model, indicating a positive payoff to R&D (Lev and Sougiannis 1996). Our proxy for risk, σ(OI/S), is negatively related to future earnings (Core et al. 1999). Finally, the coefficient sums for the squared NESO term is significant only in the technology sub-sample.

Panel B of Table 4 presents results of estimating equation (3) without the squared terms for ESO and NESO. Inferences for non-executive options are consistent with those in Panel A. The sum of the sum of the α_5 coefficients is significantly negative for the overall sample and the non-technology sub-sample but insignificantly different from one for the technology sub-sample. These results are consistent with a zero or negative payoff to non-executive options. Consistent with Table 3, the results for executive options are sensitive to the model specification. Results in panel A, the non-linear model, suggest significantly positive payoffs to executive options. Results, in panel B, the linear model, suggest significantly negative payoffs to executive options.

In Table 5, we repeat our analysis using cash flow from operations before R&D expense, CFO, to measure firm performance. Similar to our earnings results, the sum of the α_2 coefficients is significantly greater than one, 1.99, suggesting a positive payoff to the firm from option grants to executives for all firms. In Columns (2) and (3) we partition the executive sample between technology and non-technology firms. We observe that the sum of the α_2 coefficients is again significantly greater than one only for the non-technology firms, 7.70 (F=87.19). The coefficient sum for the technology firms is not significantly different form one (F=0.18) in the cash flow model. Overall, the results for executive option compensation are similar for both measures of performance, operating income and cash flows.

In Table 5, the sum of the α_5 coefficients is 0.64 for all firms, which is not significantly different from one (F = 1.35). Partitioning the non-executive sample, we observe that the sum of the α_5 coefficients is 0.36 for technology, not significantly different from one, and -2.64 for non-technology firms, significantly less than one (F=70.38). In contrast to the results in Table 4, the cash flow payoff for option grants to non-executives in technology firms is approximately equal to the option value. However, we observe a significant negative cash flow payoff to options granted to non-executives only in non-technology firms. Again, this result is not apparent without the technology partition.

Panel B of Table 5 presents results of estimating equation (3) without the squared terms for ESO and NESO. As in Table 4, inferences for non-executive options are consistent with those in Panel A. The sum of the sum of the α_5 coefficients is significantly negative for the overall sample and the non-technology sub-sample but insignificantly different from one for the technology sub-sample. These results are consistent with a zero or negative payoff to non-executive options. Consistent with Tables 3 and 4, the results for executive options are sensitive to the model specification. Results in panel A of Table 5, the non-linear model, suggest significantly positive payoffs to executive options. Results, in panel B of Table 5, the linear model, suggest significantly negative payoffs to executive options.

In summary, the analyses in Tables 3 through 5 lead to a consistent conclusion that executive option compensation leads to positive future (undiscounted) earnings and cash flows for non-technology firms. However, these conclusions are sensitive to whether or not a non-linear model is employed. By contrast, option compensation for non-executives leads to a negative earnings payoff for both technology and non-technology firms and a negative cash flow payoff for non-technology firms. Again, these differences in payoffs suggest that distinguishing between technology and non-technology firms is important when evaluating option compensation.

5. Sensitivity Analysis

Ideally we would like to measure the value of options granted to non-executives in the current period. In the primary analyses, we use the SFAS 123 expense data as a proxy for annual grant values to all employees. Because this proxy does not reflect the value of options granted in the current year but rather an amortization of option grants over a vesting period, we also consider whether ExecuComp data can provide a more direct measure of option value. ExecuComp provides a variable, PCTTOTOP, representing the annual proportion of total options granted to top five executives. Thus, we first estimate the value of total option grants (to both executives and non-executives) as the Black Scholes value associated with grants to the top-five executives divided by the proportion of options granted this year to executives. Since most of the variables in the Black-

Scholes valuation model are common to both executives and non-executives within the firm, we assume that the Black Scholes value of a single option is the same for executives and non-executives in a given year. To derive an estimate of the value of grants to non-executives, we subtract the value of executive grants from this estimate of total grant value. When we replicate the analyses reported in Tables 4 and 5 using this estimate, inferences for the full executive and non-executive samples remain the same.

The advantage of this measure is that it provides a more direct estimate of the value of annual option grants to non-executives than the SFAS 123 expense data. The disadvantage is this data is only available for about 60% of our sample firms, and more importantly, the PCTTOTOP variable reported by ExecuComp has significant measurement issues as detailed in the Appendix. Because the magnitude and the direction of the resulting biases in the data are unclear, we hesitate to emphasize our analyses using this alternate measure of option grant value.

Larcker (2003) discusses potential problems with the backward looking research design in Hanlon et al. (2003). In particular, the earnings regressions are subject to an endogeneity bias if firms' decision to grant options is affected by profitability. Larcker (2003) criticizes the industry based first-stage regression as potentially suffering from the same source of endogeneity and suggests reporting descriptive statistics for these regressions. For our data, the mean and standard deviation for actual and predicted option compensation are similar; a mean (standard deviation) of 0.007 (0.030) for actual executive options versus 0.016 (0.031) for predicted executive options. Similarly, the mean (standard deviation) is 0.027 (0.189) for actual non-executive options and 0.034 (0.056) for predicted non-executive options. The correlation between actual and predicted option compensation is 0.195 (significant at 0.001) for executives and 0.170 (significant at 0.001) for non-executives. Finally, the adjusted R^2 for our industry specific estimations of Equation (1) ranges from a negative value to 22%. While the means and standard deviations are similar, higher observed correlations would reduce concerns regarding the quality of the instruments. However, we note that inferences in Landsman, Lang and Yeh (2005) are not influenced when they employ a more complex first stage model that includes the number of employees, sales, research and development, book to market ratios and governance proxies. In addition, low power in the first-stage model biases against finding significant results for the option compensation variables in the second stage, thus mitigating concerns that the low power in our first stage leads to invalid conclusions.

Finally, Larcker argues that the lagged ESO and ESO^2 are likely highly correlated and may induce multicollinearity. The correlation between actual executive option compensation in years t and t-n, is 0.41, 0.38, 0.25, 0.22, and 0.16 for n=1 to 5. The correlation for actual non-executive option compensation in years t and t-n, is 0.44, 0.22, 0.12, 0.04, and 0.07. Interestingly, our evidence suggests that option compensation is not as highly serially correlated as suggested in previous papers. We do find larger correlations for predicted option compensation estimated with Equation (1); however, this likely biases against finding significant results in our second stage regressions. In addition, the analysis presented in Table 3 does not suffer from this econometric problem.

In future research we plan to pursue additional research designs, such as a matched pair design, and to compare results for actual grant values to SAFS 123 amounts for non-executive options.

6. Summary and conclusions

Although the use of option compensation for employees below the executive level has greatly increased over the last decade, there is little prior evidence of an earnings or cash flow payoff to shareholders. We examine the relation between both executive and non-executive option compensation and future operating performance. Our findings may help managers and shareholders evaluate the potential benefits of providing more inclusive option compensation plans. We document a positive payoff to firms from executive option grants and zero or negative payoff to firms from non-executive option grants.

We also extend prior research linking executive option compensation to future operating performance by extending the definition of performance to include both earnings and cash flows. Our cash flow analyses provide support for other research linking executive option compensation to stock price and returns. In addition, by utilizing several different research designs we hope to overcome criticism of prior research.

We separately study technology and non-technology firms and find that payoffs to executives differ by sector. Options granted to executives in technology firms, provide no financial payoff, i.e., future earnings and cash flows are not significantly different from the value of the option. In contrast, options granted to executives in non-technology firms provide significant postive payoff; undiscounted future earnings and cash flows are significantly greater than the option value. However, these conclusions are sensitive to whether or not a non-linear model is employed.

Options granted to non-executives provide a negative earnings payoff in both sectors and a negative cash flow payoff in non-technology firms. Overall, we are unable to document a positive payoff to non-executive options in any of our analyses. These results are robust to alternative estimates of non-executive option grant values and to alternate model specifications.

Table 1

Our initial sample includes 8,954 firms and 2,451 firms included in the 2004 COMPUSTAT and ExecuComp databases. COMPUSTAT reports option expense for all employees since 1996. ExecuComp reports option compensation for top five executives since 1992. The payoff regression requires the current year and five prior contiguous years of data. Thus, the option compensation payoff regression using Black-Scholes ESO grant values includes operating income observations for three years (2001-2003) with 3,527 firm-year observations from 1265 firms.

Sample is obtained COMPUSTAT and ExecuComp databases for the years 1996 through 2003.

	Firm-years	Firms
COMPUSTAT observations	49,782	8,954
ExecuComp observations	14,827	2,451
Merged sample for the period 1999 through 2003	4,177	1,615
Less: Missing executive option expense	(471)	(291)
Less: Missing COMPUSTAT information		
including stock option expense for al employees	(179)	(59)
	3,527	1,265

	Firm-years	Firms
Observations from technology firms	783	290
Observations from non-technology firms	2,744	975
Total	3,527	1,265

For the non-executive employee regression we delete observations when option expense from COMPUSTAT for all employees is less than option expense for top five executives reported in ExecuComp.

Observations from technology firms	735	270
Observations from non-technology firms	2,428	853
Total	3,163	1,123

Table 2
Descriptive Statistics for firms with COMPUSTAT and ExecuComp information for executive and non-executive employees in technology and non-technology firms over the period 2001 through 2003. Test of differences use the parametric t-test and the non-parametric Wilcoxon two-sample test.

Variables[a]	Technology	Non - technology	Difference of means (t-value)	Difference of medians (z-value)
N	783	2,744		
ESO ($millions)	12.934 (5.024)	4.650 (2.027)	7.50	14.1
NESO ($millions)	120.403 (18.411)	20.993 (3.907)	7.47	16.91
ExecOwn (millions)	12.920 (0.679)	2.976 (0.511)	2.78	3.12
Total outstanding shares (millions)	425.018 (83.900)	166.162 (52.640)	6.63	8.72
ExecPCT	0.033 (0.006)	0.040 (0.008)	-2.35	-2.99
Sales ($billions)	3.844 (0.651)	5.491 (1.512)	-3.52	-12.94
Assets ($billions)	6.458 (0.932)	6.817 (1.505)	-0.43	-6.91
OI ($billions)	1.233 (0.146)	0.810 (0.199)	3.08	-4.47
OIBDP ($billions)	0.920 (0.083)	0.744 (0.188)	1.51	-11.18
CFO ($billions)	1.107 (0.142)	0.617 (0.153)	14.59	-0.33
OI/sales	0.271 (0.264)	0.168 (0.144)	11.34	16.90
CFO/sales	0.278 (0.259)	0.134 (0.112)	4.10	21.37
R&D/sales	0.197 (0.124)	0.018 (0.000)	11.20	31.75
ESO/Sales	0.020 (0.007)	0.003 (0.001)	7.95	22.20
NESO/sales	0.097 (0.027)	0.006 (0.002)	7.39	27.17
ESO Grant (shares in millions)	1.224 (0.602)	0.464 (0.260)	10.48	15.82

[a] Variables are defined as follows: ESO = Black-Scholes value of stock option grants top-five executives, NESO = SFAS 123 implied total option compensation expense less ESO, ExecOwn = number of shares held by top-five executives, ExecPCT = percent of shares held by top-five executives, S = total sales, TA = total assets at the end of year t, OI = operating income before option and R&D expense, OIBDP = operating income before depreciation, CFO = cash flow from operations plus R&D expense, R&D = research and development expense for year t.

Table 3

Regression of the sum of future earnings on Black Scholes values of option grants to executives and SFAS 123 option expense for non-executive employees. Earnings are summed over the period 1999 to 2003.

$$\sum_{k=t+1}^{t+5} (OI/S)_{j,k} = \alpha_0 + \alpha_1 (TA/S)_{j,t} + \alpha_2 (ESO/S)_{j,t} + \alpha_3 (ESO/S)^2{}_{j,t}$$

$$+\alpha_4 (NESO/S)_{j,t} + \alpha_5 (NESO/S)^2{}_{j,t} + \alpha_6 (R\&D/S)_{j,t} + \alpha_7 \sigma(OI/S)_{j,t-1} + e_{j,t}$$

Panel A	Non-Linear Model	Linear Model
Variable [a]		
N	1084	1561
$TA/S_{i,t}$	0.279 (14.45)	0.282 (14.76)
$ESO/S_{i,t}$	11.296 (3.06) [7.78]	2.150 (2.33) [1.55]
$(ESO/S_{i,t})^2$	-80.07 (-2.61)	
$NESO/S_{i,t}$	4.040 (1.70) [1.64]	2.969 (3.65) [5.85]
$(NESO/S_{i,t})^2$	-30.978 (-1.49)	
$R\&D/ S_{i,t}$	1.632 (5.70)	1.615 (5.78)
$\sigma(OI/S)_{i,t}$	-0.147 (-3.90)	-0.042 (-0.17)
Adj R^2	0.3306	0.3250

[a] Variables are defined in Table 2 except that ESO values are the fitted values from estimating Equation (1) for executive and NESO are the fitted values for non-executives.

OLS coefficients are presented with t-statistics in parenthesis test for coefficients equal to zero. For ESO and NESO t-statistics reported in square brackets test for coefficients equal to one.

Table 4

Regression of current earnings on Black Scholes values of option grants to executives and SFAS 123 option expense for non-executive employees for the period 1996 to 2003. We allow options from the current and five previous years to influence earnings in the current year. OLS coefficients are presented with t-statistics in parenthesis and F-statistics are presented for coefficient sums.

$$(OI/S)_{jt} = \alpha_0 + \alpha_1 (TA/S)_{j,t-1} + \sum_{k=1}^{5} \alpha_{2,k} (ESO/S)_{j,t-k} + \sum_{k=1}^{5} \alpha_{3,k} (ESO/S)^2_{j,t-k}$$
$$+ \sum_{k=1}^{5} \alpha_{4,k} (NESO/S)_{j,t-k} + \sum_{k=1}^{5} \alpha_{5,k} (NESO/S)^2_{j,t-k} + \sum_{k=1}^{5} \alpha_{6,k} (R\&D/S)_{j,t-k}$$
$$+ \alpha_7 \sigma (OI/S)_{j,t-1} + e_{jt}$$

Panel A – Non-Linear Full Model			
Variable [a]	All firms	Tech firms	Non-tech
$TA/S_{i,t-1}$	0.069 (27.61)	0.039 (6.29)	0.065 (28.61)
$\sum_{k=1}^{5} \alpha_{3,k}(ESO/S)_{i,t-k}$	2.917 (F=18.87)	2.506 (F=2.87)	7.608 (F=98.17)
$\sum_{k=1}^{5} \alpha_{3,k}(ESO/S)^2_{i,t-k}$	-13.178 (F=23.76)	-8.7518 (F=3.56)	-61.310 (F=69.35)
$\sum_{k=1}^{5} \alpha_{5,k}(NESO/S)_{i,t-k}$	-0.255 (F=18.21)	-2.04 (F=20.14)	-2.14 (F=60.47)
$\sum_{k=1}^{5} \alpha_{5,k}(NESO/S)^2_{i,t-k}$	-0.818 (F=0.46)	15.417 (F=6.69)	3.2415 (F=0.33)
$\sum_{k=1}^{5} \alpha_{6,k}(RD/S)_{i,t-k}$	0.156 (F=619.32)	0.387 (F=101.23)	0.410 (F=98.15)
$\sigma(OI/S)_{i,t-1}$	-0.147 (-3.90)	-0.664 (-9.75)	0.274 (7.08)
Adj R^2	0.3443	0.3066	0.3863

Panel B – Linear Model			
Variable [a]	All firms	Tech firms	Non-tech
$TA/S_{i,t-1}$	0.070 (28.17)	0.045 (7.49)	0.067 (29.16)
$\sum_{k=1}^{5} \alpha_{3,k}(ESO/S)_{i,t-k}$	0.6144 (F=9.54)	0.434 (F=9.30)	1.565 (F=3.47)
$\sum_{k=1}^{5} \alpha_{5,k}(NESO/S)_{i,t-k}$	0.491 (F=26.32)	0.954 (F=0.05)	-0.470 (F=92.7)
$\sum_{k=1}^{5} \alpha_{6,k}(RD/S)_{i,t-k}$	0.158 (F=620.5)	0.369 (F=110.47)	0.493 (F=77.6)
$\sigma(OI/S)_{i,t-1}$	-0.138 (-3.65)	-0.643 (-9.29)	0.317 (8.11)
Adj R^2	0.3359	0.2775	0.3635

[a] Variables are defined in Table 2 except that ESO values are the fitted values from estimating Equation (1) for executive and NESO are the fitted values for non-executives.

F-statistics are two-tailed and indicate whether the sum of the coefficient is statistically different from one. Critical values for these F-tests are 10.83, 6.63, and 3.84 for the 0.001, 0.01 and 0.05 significance levels respectively.

Table 5

Estimation of cash flow payoffs to options using Black Scholes values of option grants to executives and SFAS 123 option expense for non-executive employees for the period 1996 to 2003. We allow options from the current and five previous years to influence earnings in the current year. OLS coefficients are presented with t-statistics in parenthesis and F-statistics are presented for coefficient sums.

$$(CFO/S)_{jt} = \alpha_0 + \alpha_1(TA/S)_{j,t-1} + \sum_{k=1}^{5}\alpha_{2,k}(ESO/S)_{j,t-k} + \sum_{k=1}^{5}\alpha_{3,k}(ESO/S)^2_{j,t-k}$$
$$+ \sum_{k=1}^{5}\alpha_{4,k}(NESO/S)_{j,t-k} + \sum_{k=1}^{5}\alpha_{5,k}(NESO/S)^2_{j,t-k} + \sum_{k=1}^{5}\alpha_{6,k}(R\&D/S)_{j,t-k}$$
$$+ \alpha_7\sigma(OI/S)_{j,t-1} + e_{jt}$$

Panel A – Non-Linear Full Model			
Variable [a]	All firms	Tech firms	Non-tech
$TA/S_{i,t-1}$	0.057 (21.76)	0.045 (6.06)	0.051 (20.65)
$\sum_{k=1}^{5}\alpha_{3,k}(ESO/S)_{i,t-k}$	1.991 (F=4.57)	1.429 (F=0.18)	7.704 (F=87.19)
$\sum_{k=1}^{5}\alpha_{3,k}(ESO/S)^2_{i,t-k}$	-7.612 (F=7.93)	-5.113 (F=1.06)	-60.350 (F=59.55)
$\sum_{k=1}^{5}\alpha_{5,k}(NESO/S)_{i,t-k}$	0.640 (F=1.35)	0.357 (F=0.64)	-2.638 (F=70.38)
$\sum_{k=1}^{5}\alpha_{5,k}(NESO/S)^2_{i,t-k}$	-7.963 (F=10.04)	-0.783 (F=0.07)	6.315 (F=1.61)
$\sum_{k=1}^{5}\alpha_{6,k}(RD/S)_{i,t-k}$	0.316 (F=327.97)	0.471 (F=51.07)	0.445 (F=74.07)
$\sigma(OI/S)_{i,t-1}$	-0.161 (-3.71)	-0.621 (-7.50)	0.340 (6.73)
Adj R^2	0.3320	0.2559	0.3116

Panel B – Linear Model			
Variable [a]	All firms	Tech firms	Non-tech
$TA/S_{i,t-1}$	0.057 (22.04)	0.045 (6.34)	0.054 (21.56)
$\sum_{k=1}^{5} \alpha_{3,k}(ESO/S)_{i,t-k}$	0.663 (F=6.60)	0.511 (F=5.30)	1.510 (F=2.42)
$\sum_{k=1}^{5} \alpha_{5,k}(NESO/S)_{i,t-k}$	0.346 (F=39.73)	0.685 (F=1.69)	-0.634 (F=98.88)
$\sum_{k=1}^{5} \alpha_{6,k}(RD/S)_{i,t-k}$	0.325 (F=324.4)	0.471 (F=54.15)	0.532 (F=54.51)
$\sigma(OI/S)_{i,t-1}$	-0.167 (-3.85)	-0.615 (-7.57)	0.363 (7.07)
Adj R^2	0.3299	0.2621	0.2847

[a] Variables are defined in Table 2 except that ESO values are the fitted values from estimating Equation (1) for executive and NESO are the fitted values for non-executives.

F-statistics are two-tailed and indicate whether the sum of the coefficient is statistically different from one. Critical values for these F-tests are 10.83, 6.63, and 3.84 for the 0.001, 0.01 and 0.05 significance levels respectively.

APPENDIX

Our tests of the relation between option grants and future firm performance require a measure of the value of options granted to executive and non-executive employees. Because this information is not readily available for non-executives, we use firm provided SFAS 123 expense data to proxy for the value of options grants to all employees. We then estimate non-executive option value by subtracting the value of options grants to executives as reported by ExecuComp.

We acknowledge that this proxy has several limitations. Thus, we also considered whether data provided in Standard & Poor's ExecuComp database could provide a cleaner, more direct estimate. Specifically, we estimate annual grant values to all employees as the Black Scholes value associated with options granted to the top-five executives (BLK_VALU) divided by the percentage of options granted to these executives (PCTTOTOP). To derive an estimate of the value of grants to non-executives, we subtract the value of executive grants from this estimate of total grant value. However, we observe three significant deficiencies in the PCTTOTOP variable. The prevalence of these problems along with our inability to assess the level or direction of the resulting bias causes us to discount results using this measure and to rely on the SFAS 123 data as our measure of grant value. While there are also issues with the SFAS 123 data, we are better able to control and correct for these data limitations.

We identify three primary issues related to the PCTTOTOP variable - multiple stock option grants in a given year, fractional representation of the percent of options granted to top executives, and missing data. Each issue is discussed below along with our attempts to mitigate the impact.

Multiple Stock Option Plans

Many firms have more than one stock option plan in existence at a given time. These plans are generally named for the year in which they were created. In a typical year, a firm may make multiple option grants, either from the same or from more than one plan. The PCTTOTOP variable represents, on an annual basis, the percent of total options granted to each of the top five executives named in the proxy. The computation is straightforward if the firm distributes a single grant in a given year. However, the computation is mathematically flawed if there are multiple grants, either from one or from multiple plans, in a given year. Specifically, ExecuComp computes the percent of total options granted to an executive for each plan and then simply adds the percentages across all grants to that executive. The following example illustrates the problem:

> Assume the CEO is granted 50,000 shares from the 1987 plan, and that no other individual is granted options from the 1987 plan. The CEO is also granted 50,000 shares from the 1995 plan, with another 100,000 issued to other top executives and 350,000 grants issued to remaining employees. PCTTOTOP for the CEO is reported as 110%, calculated below, rather than 18% (100,000 / 550,000).

1987 Grant	50,000 / 50,000 shares	100%
1995 Grant	50,000/ 500,000 shares	10%
PCTTOTOP reported for CEO		110%
PCTTOTOP reported for non-CEO executives		20%

(See Fidelity National Financial, 1996; and NCT Group 1999, 2001)

Thus, in cases where there are multiple grants or multiple plans, PCTTOTOP is overstated, and our estimate of options granted to non-executives is proportionately understated. To reduce the impact of this error, for our analysis using ExecuComp data to proxy for total grant values we delete all observations where PCTTOTOP is greater than 100%, i.e., where the data is clearly misrepresented. This results in the deletion of 73 observations. However, we are unable to definitively detect instances where a flawed computation results in PCTOTOP less than 100% and these observations remain in our analysis.

Fractional Representation

The SEC requires firms to report details of executive option grants in the annual proxy filing. This disclosure includes the percentage of the total options granted that year to each of the top-five executives. However, we observe that several firms report in fractional rather than percentage form. For example, assume a firm grants an executive 1,000 out of 10,000 shares, i.e. 10

percent, and reports this in their proxy as 0.10. ExecuComp assumes that the firm is reporting the percent of options granted to executive and reports this as 0.10%. This leads to an estimate of total options granted of 1,000,000 (1,000 / .10%) rather than the actual grant of 10,000.

To understand the prevalence of this issue, we examine the proxy filing for a sub-sample of 100 firm-year observations where the value reported for PCTOTOP falls between zero and one, inclusive. In approximately 30% of the proxies examined, firms report fractions rather than percentages. In each of these cases, using PCTTOTOP to compute grant value will result in a 100 fold overstatement of total options granted, resulting in an overstatement in the calculated value for non-executive option grants. For our analysis, we delete all observation where PCTTOTOP is reported as less than 1%. (See DST Systems 2003.)

Missing Data

In approximately 13.3% of the observations in our initial sample, ExecuComp reports the total number of options issued to each of the top-five executives as zero. In these cases, PCTTOTOP is reported as missing data. It is possible that firms not issuing options to their top five executives do in fact issue options to lower level employees. To investigate this possibility, we examine a random sub-sample of 100 firm observations from the set of observations that report no grants issued to executives and missing values for PCTTOTOP. We review the original proxy filing for this sub-sample and find that in 69% of these firm-year observations, options were in deed granted to employees but not to executives. The non-executive grants for this sub-sample are as follows:

No options granted	31%
Less than 100,000 options granted	14%
100,000 to one million options granted	38%
More than one million options granted*	17%

(*Two firms issued more than 100 million options)

In our ExecuComp analysis we exclude any firm for which PCTTOTOP is reported as missing.

In summary, while the ExecuComp database has the potential to provide a more direct measure of the value of annual option grants, there are deficiencies in the data that lead us to conclude it is not reliable for the purpose of our analyses. As discussed above, we are only able to provide limited insight into the potential magnitude of the data problems and, more importantly, are unable to predict the overall direction of the resulting biases. Therefore, while the results and inferences using ExecuComp data are generally consistent with those using SFAS 123 expense data, we emphasize our results using SFAS 123 data to estimate annual grant values. Furthermore, we acknowledge the importance of the electronic data provided by ExecuComp and we encourage researcher to verify and understand the source of that data.

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