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STOCK OPTION INCENTIVES AND FIRM PERFORMANCE

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Abstract:

This paper analyzes the performance consequences of employee stock options for a broad sample of firms during the period 1996-1999. Our tests are performed separately for the top 5 executives and all other employees. We estimate the expected level of option incentives based on each firm's economic characteristics. We examine the association between the unexpected level of option incentives and firm performance as measured by future abnormal returns, future return on assets, and current and future firm value (Tobin's Q). We find consistent evidence that firms with unexpectedly high levels of option incentives exhibit significantly higher levels of firm performance. The results hold for both Executives and Employees and are consistent across each of our three measures of firm performance.

JEL classification: G32; J33; L14; L22; M41

Keywords: Employee stock options; financial performance; corporate governance

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1. Introduction

In return for giving up part of their equity stake in the firm, shareholders expect to receive a number of benefits from providing their employees with stock options, including reduced agency costs and higher levels of incentives, as well as recruiting and retention benefits. While economic theory suggests that option-based incentives will be used until they reach the point where their marginal benefit equals their marginal costs, it is not clear that this equilibrium is always obtained in practice (Core and Guay, 2001). In addition to the possibility that managers may use their power to extract economic rents, the difficulty of forecasting and quantifying the expected benefits from options implies an unclear relation between stock option incentives and firm performance. Using a wide variety of methodologies, prior research provides mixed evidence on the relation between equity-based incentives and firm performance.[1] This paper empirically explores the relation between option-based incentives and firm performance for both executive and non-executive employees.

The use of options as a method to provide incentives has generated considerable controversy. Recent enormous growth in the use of options has amplified this controversy. Such growth encompasses the number of firms granting options, the number and value of options granted, and how far down the organizational ladder they are granted (Murphy, 1999). The controversy revolves around a central question: Do shareholders benefit when employees hold stock options? The answer is of fundamental importance to issues relating to corporate governance, financial reporting, and regulatory policies.

To provide evidence concerning this question, we analyze the role of option incentives, which are defined as the change in the dollar value of an option for a 1% change in stock price. Rather than the value of options held or granted, we use the incentive value of options in our tests (Core and Guay, 1999, 2001), since we expect that it is an option's sensitivity to stock price which determines its incentive effects, and hence, value to shareholders. To control for the endogenous nature of compensation plan design, we base our analyses on the unexpected level of option incentives. The unexpected level is measured as the residual from a first stage regression that predicts the expected level of option incentives as a function of the firm's economic characteristics.[2] The residual represents the extent to which a firm's employees hold more or fewer option incentives compared to the average level for similar firms.

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[1] For example, Morck et al. (1988) and McConnell and Servaes (1990) show that firm performance (measured as Tobin's Q) is first increasing and then decreasing with managerial ownership. Himmelberg et al. (1999) and Palia (2001) find no evidence that equity-based incentives for top executives and directors are related to firm value.

[2] A similar approach is taken in Core and Guay (1999, 2001), Hanlon et al. (2003), and Ittner et al. (2003).

With few exceptions, the prior literature has focused on the performance consequences of equity-based incentives for the CEO and/or top level executives (Core et al., 1999; Core and Larcker, 2002; Himmelberg et al., 1999; Mehran, 1995).[3] For two main reasons, we focus on the role of option-based incentives for both the top 5 executives (Executives) and all other employees (Employees). First, since just over 75% of all options are held by Employees for the median firm in our sample, a study examining the performance consequences of options held by just the top executives would be substantially incomplete. Second, as Section 6 discusses, the expected relation between option incentives and firm performance will vary depending on whether Executives or Employees hold the options and on the underlying process that determines the level of option incentives. Separately analyzing the performance consequences associated with each group provides evidence on how firms determine the levels of option incentives. Therefore, all of our tests distinguish between the unexpected level of option incentives held by Executives and Employees.

Our empirical tests are based on a large and well-diversified sample of firms (2,479 firm-years representing 727 individual firms) over the 1996-1999 period. We perform three sets of complementary analyses to assess the relation between firm performance and the level of unexpected option incentives. The first set of tests examines the association between the unexpected level of option incentives and the level of abnormal returns over the next 30 months after controlling for the three factors in Fama and French (1993) and a momentum factor. The second set of tests uses Tobin's Q as the measure of firm performance, while the third set relies on an accounting-based measure of performance: the future return on assets (ROA). To the extent that results for the market-based and accounting-based performance measures agree, it increases our confidence that neither measurement error nor model specification errors drive our results.

Our results consistently show that firm performance is significantly and positively related to the extent to which both Executives and Employees hold more option incentives than the average firm with similar economic characteristics. We find that a portfolio composed of firms ranked in the highest quintile of unexpected option incentives held by Employees (Executives) has equally-weighted monthly abnormal returns that are 78 (36) basis points higher than a comparable portfolio composed of firms in the lowest quintile. These differences are significant at the 1% and 10% level, respectively. We find that firms in the highest quintile have significantly higher current and one year ahead values of Tobin's Q compared to firms in the lowest quintile. Additionally, firms in the highest quintile experience significantly higher accounting ROA over the following one and two years compared to firms in the lowest quintile. The Tobin's Q and ROA hold regardless of whether the amount of unexpected option incentives is based on option incentives held by Executives or Employees.

While our empirical methodology is designed to yield reliable and robust results, a number of factors could still render them spurious. Since we only examine the incentive effects of options, our results may be biased to the extent that the determinants of other forms of equity-based incentives differ from the determinants of option-based incentives. The validity of our results also depends on our cross-sectional models of option incentives being correctly specified. While we have attempted to control for the economic determinants of option incentives, we cannot rule out the possibility of some omitted variable(s) that is (are) correlated both with firm performance and the incentive residual, causing our results to be spurious. By historical standards, our sample period is characterized by extremely high

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[3] Ittner et al. (2003) and Core and Guay (2001) are notable exceptions.

average stock returns. If the higher returns represent market mispricing and the extent of mispricing is increasing with the level of unexpected option incentives, our results may not extend to other time periods. However, additional evidence discussed in Section 5 indicates that this scenario is unlikely.

The next section discusses several methodological issues that are important to our study while Section 3 discusses our sample. Section 4 develops our measures of the expected level of option incentives. Section 5 presents our empirical evidence on the association between the unexpected level of option incentives and firm performance. In Section 6, we discuss how our empirical evidence accords with alternative economic theories that explain how option incentives are determined within firms. Section 7 summarizes and concludes the paper.

2. Methodological issues

In this section, we discuss several methodological issues that must be addressed in order to assess the relation between option incentives and firm performance reliably. These issues include the time period over which we measure performance, methods to control for the endogenous nature of compensation plan design, and the question of whether to control for unobserved heterogeneity using firm fixed effects.

If markets are fully efficient and can perfectly infer the performance consequences of employee incentives, then an analysis of short-run returns around the announcement of an employee stock option program would be an appropriate means to determine the relation between firm performance and option-based incentives. Many early studies in the compensation literature adopt this approach, including Brickley et al. (1985) and DeFusco et al. (1990).[4] Generally, these studies find small but significantly positive excess returns around the adoption of an equity-based incentive program.

We doubt that the market is fully and immediately able to anticipate all of the performance consequences of a stock option plan, and expect that the announcement date abnormal returns only represent a fraction of the total market response. Perhaps the main reason for questioning whether stock prices immediately reflect options' full performance implications is that relatively little historical data guides investors about their expected performance consequences. Murphy (1999) reports that it was increasingly common for firms to adopt broad-based option plans during our sample period. Hall and Liebman (1998) describe the sustained and rapid growth over the past few decades in equity-based compensation for executives. Given the novelty of broad-based option plans, it is doubtful that the market could correctly anticipate their long-term impact on performance.[5] Additionally, the continuing debates about the value of options to risk-averse employees (Carpenter, 1998) and the claims that granting options is an inefficient means to provide incentives (Hall and Murphy, 2003) suggest that the performance consequences of options are

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[4] Two main shortcomings characterize this approach. First, it can be difficult to identify the precise date(s) on which the market becomes aware of the new compensation plan. Second, the adoption of the plan may be driven by contemporary conditions at the firm, which yield both the decision to adopt the compensation plan and the market's reassessment of the firm's future performance.

[5] The fierce debates in the business press about whether stock options are beneficial to shareholders and the appropriate accounting treatment for stock options further suggest that options' long-term impact on firm performance is unclear. For example, see Bryant (1998), McGough (2000a, 2000b), and Morgenson (1998).

at least initially unclear. Instead, stock prices partially incorporate the expected economic effects of incentives when they are granted, and the market updates its assessment regarding the optimal level of option incentives slowly over time as it learns more about their performance consequences.

By examining the effects of option incentives on future firm performance, we are essentially relying on a long-window event study. This approach allows us to discern more of the total performance consequences of using options as their implications and results become increasingly transparent over time. Our results will understate the association between option incentives and firm performance to the extent that this relation is reflected during the announcement period. Our analyses notably do not constitute a test of market efficiency since, as Section 6 explains, economic theories provide no clear prediction of the expected relation between option incentives and firm performance.

Another important consideration to control for is the endogenous nature of compensation plan design, since economic theory suggests that the level of equity incentives will be related to the extent of agency problems within the firm (Demsetz and Lehn, 1985). If markets are perfectly efficient and if firms are constantly optimizing with respect to option-based incentives, then no statistical association should emerge between stock options and firms' stock performance once researchers have controlled for the exogenous determinants of the optimal level of options (Demsetz and Lehn, 1985). As Section 4 discusses, we control for differences in option incentives using a cross-sectional regression model to estimate the expected level of option incentives. We interpret the residual from this incentive regression as the unexpected level of option incentives relative to other firms with similar characteristics.[6]

Himmelberg et al. (1999) and Palia (2001) examine the association between firm performance (as proxied by Tobin's Q) and equity-based incentives held by top managers and CEOs, respectively.[7] They argue that the omission of unobservable (to the econometrician) determinants of managers' equity and incentive holdings will bias the associated coefficients in the performance regressions. After controlling for unobserved heterogeneity using a firm fixed-effects framework, they find no significant association between managerial holdings of equity incentives and firm performance.

In a comment on Himmelberg et al. (1999), Zhou (2001) suggests that controlling for firm fixed effects severely decreases the power of tests to detect any performance consequences of equity-based incentives. Zhou observes that managerial ownership varies considerably in the cross-section but typically changes quite slowly within a firm across time. If managers maximize their long-run expected utility, then relatively small, year-to-year changes in ownership are unlikely to induce large changes in incentives and hence, large within-year changes in firm performance. Since using firm fixed-effects essentially removes all cross-sectional variation from the data, Zhou concludes that the findings in Himmelberg et al. (1999) (and, by extension, those in Palia, 2001) "do not provide strong evidence against the view that managerial ownership incentives are important for firm performance." Following Zhou's argument, we do not control for firm fixed-effects, although we do control

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[6] If firms are always in equilibrium, then the residual simply represents measurement or specification errors and should not be related to firm performance. However, a number of factors, such as transaction costs, will prevent firms from always being in equilibrium. Consistent with the arguments in Milgrom and Roberts (1992), we assume that firms in the cross-section will vary with respect to both the optimal aggregate level of option incentives and the distribution of option incentives within the firm.

[7] Himmelberg et al. (1999) examine stock ownership while Palia (2001) examines both stock- and option-based equity incentives.

for industry fixed-effects. To the extent that unobserved heterogeneity exists within our sample, our results must be interpreted accordingly.

3. Sample selection and options data

Our sample is drawn from firms comprising the S&P 500, the S&P Midcap 400, and the S&P Smallcap 600 as of the end of 1999. To balance the data-gathering costs of hand-collected items with the benefits of obtaining a broad, widely-representative sample, we include the 400 firms with the highest sales from the Midcap and Smallcap firms that have December fiscal year-ends in addition to all of the S&P 500 firms. We exclude firm-years with no options outstanding, with negative book values of equity, and with missing data items.[8] In order to ensure that the financial statement data was publicly available at the time of portfolio formation (see Section 5), we exclude firms with fiscal years ending in April or May from the sample. The final sample consists of 2,479 firm-year observations representing 727 firms for the 1996-1999 fiscal years. Consistent with our sample selection procedures, 62% of sample firms come from the S&P 500, and 16% and 22% come from the MidCap and SmallCap indices, respectively.

We hand-collected information about the details of each firm's employee stock options from the annual 10-K reports. Execucomp provided option data pertaining exclusively to Executives. The difference between the total amount and the amounts for the Executives was used to estimate the option amounts for the Employees. We collected data on the number and weighted-average exercise price for options outstanding and exercisable at the end of each fiscal year, along with the weighted-average remaining contractual life for stock options outstanding, and exercisable. We also collected the number and weighted-average exercise price of options granted during the current year and the expected time to maturity. Compustat provided accounting data not related to options, and CRSP provided stock price and return data. Analysts' forecasts of the long-term growth rate in earnings per share were obtained from the I/B/E/S Summary files.

Table 1 presents summary univariate statistics of the option variables. To mitigate any undue influence from outliers, we winsorize all variables used in this study by setting the bottom (top) one percent of the values equal to the value corresponding to the 1st (99th) percentile. The mean (median) firm has 19.91 (6.18) million options outstanding, which represents 7.9% (6.6%) of total shares outstanding. The mean (median) value of outstanding options, measured using the Black-Scholes formula, is over $368 million ($78 million), which represents 4.1% (2.8%) of the mean (median) firm's market capitalization.

Table 1 also presents information on option holdings separately for Executives and Employees. The median fraction of option held by Executives (Employees) is approximately 25% (75%) of all outstanding options. The mean (median) top 5 executive holds 624,767 (306,044) stock options that are worth over $10 million ($4 million). While the total number and value of options held by Employees collectively are much higher than for those held by the top 5 executives, the amounts per Employee are much smaller given the large number of employees at the typical firm in our sample.

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[8] Approximately 7 percent of firm-years in our initial sample have no stock options outstanding. In eliminating these firms, we may introduce a sample selection bias. To address this possibility, we replicate our analyses including the inverse Mills ratio from a probit model of firms' choice to use stock options (Heckman, 1979). The results are virtually identical to those reported below.

4. The expected level of option incentives

Consistent with Core and Guay (1999, 2001), we measure the incentive value of an employee stock option as the dollar change in the fair value of the option due to a 1% change in stock price. We measure the fair value of stock options using the Black-Scholes formula modified for dividends. Accordingly, the incentive value for a single option is measured as the option's "delta" computed at the end of the fiscal year multiplied by 1% of the firm's end-of-year stock price.[9] We use the method in Core and Guay (2002) to estimate the incentives of the entire portfolio of options held by Executives and Employees, respectively, at the end of each fiscal year.

We control for differences in the level of option incentives related to the firm's economic characteristics using two cross-sectional regression models: one for Executives and the other for Employees. We estimate separate models because, as described below, we expect the determinants of option incentives to vary between the two groups of employees. We scale the total value of option incentives for the entire portfolio of options each group holds by the number of executives/employees in each group. We take the natural log of the value because, as Table 2 indicates, the distribution of these values is highly skewed.

We interpret the systematic portion of the model simply as the average or benchmark level of option incentives for similar firms. In this context, the *residual* from the incentive model represents the extent to which a firm's employees hold more or fewer option incentives than the average firm with similar characteristics. We refer to the fitted values from the two incentive regressions as the expected level and to the residuals as the unexpected level of option incentives.

4.1. Economic determinants of option incentives for executives

Demsetz and Lehn (1985) argue that the optimal level of managerial ownership is positively related to firm size and monitoring difficulty. Smith and Watts (1992) hypothesize that larger firms require more talented managers who demand higher compensation. Thus, we expect that size will be positively related to the level of option incentives. Baker and Hall (2002) and Himmelberg et al. (1999) find that the portfolios of top managers' equity incentives increase at a decreasing rate with firm size. Accordingly, our proxy for size is the log of the firm's annual sales, *log(sales)*.

Demsetz and Lehn (1985) suggest that the amount of noise in the firm's operating environment is expected to increase the costs of direct monitoring, which in turn increases the relative benefits of using option incentives. These costs are expected to increase at a decreasing rate with the difficulty in monitoring. Hence, we use the logarithmic transformation of the firm's idiosyncratic risk to control for the effects of employee risk aversion. *Idiosyncratic Risk* is defined as the log of the standard deviation of the residual return from a 36-month market model regression. Consistent with Core and Guay (1999), we expect the level of option incentives to increase with *log(Idiosyncratic Risk)*.[10]

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[9] An alternative approach is to measure the dollar change in the fair value of the option for a (thousand) dollar change in firm value (Demsetz and Lehn, 1985; Jensen and Murphy, 1990; Yermack, 1995). See Baker and Hall (2002) and Core et al. (2003) for discussions of the distinctions between the two approaches.

[10] Additionally, Oyer and Schaefer (2002) suggest that if the variance of employees' beliefs about the future value of the options increases with Idiosyncratic Risk, then the number of options granted will increase with risk.

Smith and Watts (1992) suggest that the firm's growth opportunities will be positively associated with option incentives, since the presence of growth opportunities makes it more difficult to monitor managerial actions. In addition, options' incentive and retention features are especially important for growth firms. Core et al. (1999), Hanlon et al. (2003), and Ittner et al. (2003) find empirical evidence consistent with a positive association between growth opportunities and equity-based compensation. We use three variables as proxies for the firm's level of growth opportunities: *Book to Market*, *R&D to Sales* and *Growth Forecast*. *Book to Market* is the ratio of the book value of equity to the market value of equity at the fiscal year-end, and we expect firms with higher growth opportunities (i.e., lower *Book to Market*) to have higher option incentives. *R&D to Sales* is the ratio of annual research and development expenditures to sales. *Growth Forecast* captures the market's expectations about the future growth in earnings per share and is measured as the I/B/E/S consensus analyst forecast of long-term growth in earnings per share. We expect that the use of option incentives will increase with the intensity of R&D activities and expected earnings growth.

High free cash flow poses a problem for firms with low growth opportunities, since managers may invest the excess cash in negative net present value projects or engage in empire-building acquisitions. Jensen (1986) suggests that using stock-based incentives can mitigate this agency problem. Following Lang et al. (1991) and Core and Guay (1999), our proxy to capture this determinant of option incentives, *FCF Problem*, is the three-year average of [(operating cash flow minus preferred and common dividends)/total assets] if the book-to-market ratio is greater than or equal to one, and zero otherwise. Firms with book-to-market ratios greater than one are expected to have low growth opportunities.

We include two additional proxies to capture differences in corporate governance, following the claim in Bebchuk et al. (2002) that managers of firms with weak governance structures will extract economic rents in the form of additional options. We measure the quality of a firm's corporate governance using the governance measure (*Gov. Index*) developed by Gompers et al. (2003). *Gov. Index* is an inverse measure of shareholders' rights based on reports compiled by the Investor Responsibility Research Center (IRRC).[11] Since the index is not available for 15 percent of the firms in our sample, we use a governance indicator variable (*Gov. Indicator*) that is set to one (zero) if the firm-year observation has (does not have) a governance index value. Consistent with Gompers et al. (2003), we expect *Gov. Index* to be positively associated with option incentives.

4.2. Economic determinants of option incentives for employees

The prior literature suggests that many of the same determinants shape the level of option incentives for Employees as for Executives. Accordingly, we include *Size*, *Idiosyncratic Risk*, *Book to Market*, *R&D to Sales*, and *Growth Forecast* in the Employee incentive model. We do not expect the free cash flow problem to affect the use of option incentives for Employees since we only expect this to pertain to the firm's top executives. Likewise, the relative ability of top executives to extract rents for themselves should be unrelated to the level of option incentives provided to non-executive employees. Accordingly, we do not include *FCF Problem*, *Gov. Index*, and *Gov. Indicator* in the Employee incentive model.

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[11] Since *Gov. Index* in not available each year, we align *Gov. Index* for 1995 with option data for 1996, *Gov. Index* for 1998 with option data for 1997 and 1998, and *Gov. Index* for 2000 with option data for 1999. This procedure should not bias the results since *Gov. Index* exhibits little time series variation (Gompers et al., 2003).

We include five additional variables that we expect to determine the level of option incentives per employee. Following Core and Guay (2001), we assume that the number of growth options per employee (*Growth Options per Employee*) reflects the importance of human capital in capturing the firm's growth opportunities. This variable is defined as the difference between the market and book values of equity, divided by the total number of Employees. We expect that the retention aspects of options provide more benefits in settings where human capital is relatively more important in exploiting available growth opportunities.

Option incentives cause employee wealth to vary with aggregate firm performance, as reflected by its stock price. We expect that the relation between employee wealth and aggregate firm performance will vary with employee monitoring costs and the benefits of aggregate performance measures (Bushman et al., 1995; Core and Guay, 2001; Smith and Watts, 1992). Bushman et al. (1995) find that aggregate performance measures are used less frequently when product and geographic diversification are high, and are used more frequently in firms with high levels of intersegment sales. We use the Bushman et al. (1995) entropy measures to proxy for product diversification and geographic diversification. *Product Diversification* is measured as $\sum P_i \, log(1/ P_i)$, where P_i is the dollar sales of principal product i scaled by total sales. *Geographic Diversification* is measured as $\sum G_i \log(1/ G_i)$, where G_i is the dollar sales for geographic segment i scaled by total sales. Our proxy for operational interdependencies *(Intersegment Sales*) is defined as intersegment sales scaled by total net sales. We expect that the use of option incentives is decreasing in the extent of product and geographic diversification and is increasing in the importance of intra-firm trade (Core and Guay, 2001). Since, however, the extent of geographic diversification is also a proxy for firm decentralization – which calls for more option incentives – the expected relation between Employee option incentives and *Geographic Diversification* is ambiguous.

While the above variables are designed to capture the systematic determinants of option incentives, certain firm-specific determinants are not reflected in these variables. Consistent with Core and Guay (2001), we expect these firm-specific determinants to also determine the level of option incentives held by Executives. Thus, we include the residual from the Executive incentive model (*Executive Residual*) to control for these firm-specific factors and expect it to have a positive coefficient.

4.3 Estimation results for option incentive models

Table 2 presents descriptive statistics for Executives' and Employees' option incentives along with the variables in the incentive models described above. The results show that Executive wealth is significantly tied to stock prices. The mean (median) change in the fair value of option holdings per executive for a 1 percent change in share price is $161,575 ($71,441). The corresponding amounts for each Employee are orders of magnitude smaller in comparison ($424 and $99, respectively). While this discrepancy partly arises because pay-to-performance sensitivities are lower for Employees, another substantial part stems from our inability to determine the percentage of Employees in each firm that actually holds options. In the majority of firms, only executives and upper level managers are granted options; while only in a small minority of publicly-traded firms do more than half of all employees hold options (Blasi et al., 2003). Thus, the values per Employee substantially understate the wealth effects of stock price changes for the Employees who actually hold options. Consistent with Table 1's results that most options are held by Employees, the mean (median) aggregate option incentives held by Employees are 86 percent (73 percent) of the total option incentives.

We estimate the option incentive models annually to avoid using future information in the construction of the unexpected level of option incentives. In addition to the economic determinants discussed above, we include a constant and 55 two-digit SIC industry indicator variables in each regression in order to control for unmodelled effects on option incentives unrelated to the hypothesized determinants that may covary with industry membership. For expositional purposes, we only report the results using the pooled sample in Table 3.

Table 3 indicates that both the pooled Executive and Employee models have good explanatory power, with adjusted-R^2s of 0.66 and 0.75, respectively. In the Executive model, five of the eight coefficients are significant, and all of the significant coefficients have the expected sign. Interestingly, we find no evidence that the quality of corporate governance is incrementally associated with Executive option incentives. This finding is inconsistent with the notion that top executives exploit poor governance provisions to extract excessive amounts of stock options. The results for the Employee model demonstrate that each explanatory variable is significant and has the expected sign. Consistent with Core and Guay (2001), we find that the sensitivity of employee wealth to stock prices is higher in firms whose executives hold unexpectedly high levels of option incentives. Overall, our results are consistent with prior literature in terms of the coefficients' sign, size, and significance.

5. Option Incentives and Firm Performance

In this section, we empirically examine the relation between option incentives and firm performance. We use the unexpected level of option incentives, as measured by the residual from the incentive regressions described in Section 4, to assess the impact of option incentives on firm performance. Doing so allows us to control the extent to which economic factors, which capture firms' characteristics and contracting environment, determine the level of option incentives. We do not expect option incentives related to these factors to be associated with cross-sectional differences in firm performance (Demsetz and Lehn, 1985). We measure firm performance in three different ways: future abnormal returns, the current and one-year-ahead value of Tobin's Q, and future accounting return on assets.

5.1 Unexpected option incentives and future returns

If the level of unexpected option incentives matters for firm performance but the effects are not incorporated immediately into stock prices, then realized returns will differ systematically across otherwise equivalent securities. In this section, we examine the relation between unexpected option incentives and subsequent market returns.

At the end of each year between 1996 and 1999, we rank firms in decreasing order by the magnitude of unexpected option incentives held by Executives (Employees) and form five portfolios. Firms in the Top (Bottom) portfolio comprise the quintile with the most (least) unexpected option incentives. We implement the following trading strategy: at the end of June of 1997, we buy the five portfolios based on unexpected option holdings at the end of fiscal year 1996 and hold them for 30 months.[12] We repeat the strategy in June of 1998, 1999 and 2000.

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[12] Firms with a Compustat fiscal year 1996 by definition closed their books between the end of June 1996 and the end of May 1997. We exclude firms with fiscal years ending in April or May so that by the end of June 1997, at least three months have passed since the end of the fiscal year. This procedure ensures that the data used to construct the portfolios are publicly available by the portfolio formation date.

We examine whether a trading strategy based on the level of unexpected option incentives generates abnormal returns in excess of those generated by passive investments in mimicking portfolios of well-known factors that predict stock returns. An advantage of the calendar-time specification in Eq. (1) compared to other methods of calculating abnormal returns is that it not only produces well-specified test statistics – as it takes the cross-correlation in stock returns into account – but that it also reflects the experience of a hypothetical investor over our sample period (Fama, 1998).

We use the Fama and French (1993) three-factor model augmented with the momentum factor to control for the expected level of returns (Jegadeesh and Titman, 1993; Fama and French, 1996; Carhart, 1997; Brennan, et al., 1998). The cited empirical evidence has shown that those four factors exhibit reliable power to explain the cross-section of average returns:

$$R_t = \alpha + \beta_1 * RMRF_t + \beta_2 * SMB_t + \beta_3 * HML_t + \beta_4 * UMD_t + \varepsilon_t \qquad (1)$$

The dependent variable, R_t, is the equally-weighted (or value-weighted) monthly return for a portfolio of firms minus the one-month Treasury bill rate. $RMRF_t$ (the market factor) is the month t value-weighted market return minus the month t Treasury bill rate. The variables SMB_t (small minus big), HML_t (high minus low), and UMD_t (up minus down) are the month t returns on zero-investment factor-mimicking portfolios designed to capture the size, book-to-market, and momentum effects, respectively.[13] While a debate as to whether these factors are actually priced risk factors persists in the literature, we remain neutral and simply view the four-factor model as a method of performance attribution. Thus, we interpret the estimated intercept, α, as the abnormal return in excess of what passive investments could have achieved in mimicking factor portfolios. Since we have four years of data, each regression contains 120 monthly return observations.

Table 4 shows the results of tests designed to assess the impact of the unexpected level of option incentives on future abnormal returns after controlling for well-known determinants of stock returns. Panel A presents the results for both Executives and Employees using equally-weighted portfolios when we estimate Eq. (1) separately for each unexpected option incentives quintile. Interestingly, we find that all of the intercepts are significantly positive (at the 1% level), indicating that each portfolio earns significantly positive abnormal returns beyond what their underlying factors would predict. The first five rows contain the estimation for each of the five Executive portfolios. The first row indicates that the abnormal return to buying and holding the Top Portfolio for 30 months generates abnormal returns of 87.1 basis points per month, or about 11.0 percent per year. The intercepts decline monotonically across the five portfolios as the level of unexpected option incentives decreases. The α coefficient for the Bottom Portfolio demonstrates that this portfolio earns abnormal returns of 51 basis points per month on average, or roughly 6.3 percent annually.

The next row in Panel A, *Top – Bottom*, shows the return on a zero-investment strategy that buys the Top Portfolio and sells short the Bottom Portfolio. This portfolio generates an average monthly return of 36.1 basis points or 4.4 percent per year, which is

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[13] Details on the construction of the four factors can be found in Ken French's web page from where the datasets containing the four factors were downloaded (mba.tuck.dartmouth.edu/pages/faculty/ken.french/data_library.html). We are grateful to Prof. French for making the data available.

significant at the 10% level (p-value = 0.076). This result indicates that, on average, firms experience significantly higher returns over the following 30-month period when their top executives hold unexpectedly high levels of option incentives compared to the average firm with similar characteristics.

The bottom half of Panel A presents the analogous results for regressions where firms are sorted into portfolios based on the level of unexpected level of option incentives held by Employees. Overall, the results are very similar to, although generally stronger than, the results for Executives. The estimated value of α declines almost monotonically as one proceeds from the Top Portfolio to the Bottom Portfolio, and all of the estimated intercepts are significantly positive at the 1% level. The intercept for the Top (Bottom) Portfolio indicates that the firms with the most (fewest) unexpected option incentives earn abnormal returns of 118.4 (40.4) basis points per month, or 15.2 (5.0) percent annually. The last row in Panel A, *Top – Bottom*, shows the return on a zero-investment strategy that goes long in the Top Portfolio and short in the Bottom Portfolio. This portfolio generates an average monthly return of 78 basis points, or 9.8 percent per year, which is significantly different from zero at the 1% level.

The returns on the zero-investment strategy for the Employees are higher than the returns for the Executives. Such a difference could result if option incentives for Executives produce a smaller impact on firm performance compared to Employee option incentives. An alternative explanation is that the market more accurately understands the performance consequences of option incentives held by Executives. Most firms instituted option plans for their top executives many years prior to their extensive use of options for non-executive employees.[14] Since the market has had more time to learn about the performance consequences of option incentives for Executives, it has presumably incorporated more of this information into stock prices for the Executives compared to the Employees by the beginning of the return accumulation period.

Panel B contains the results for the same set of regressions except where the portfolios are value-weighted. The results are similar to those for the equally-weighted portfolios but are generally weaker. All but one of the α coefficients are smaller than their equally-weighted counterparts. While all of the intercepts are positive, the values are only significantly different from zero for the top 2 (3) portfolios in the Executive (Employee) regressions. Additionally, the returns to the zero-investment portfolios for both the Executives and Employees are positive but not significantly different from zero. The differences between the equally-weighted and value-weighted results indicate that the performance consequences of the unexpected level of option incentives are concentrated in smaller firms.

5.2. Unexpected option incentives and firm value

Another method to assess the performance consequences of option incentives is to examine their effect on firm value as measured by Tobin's Q. Tobin's Q is defined as the market value of assets divided by the book value of assets, where the market value of assets is measured as the sum of the market value of equity measured at the fiscal year end plus the book value of liabilities. Many studies have adopted this approach, including Demsetz and Lehn (1985), Lang and Stulz (1994), La Porta et al. (2002), and Morck et al. (1988).

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[14] Additionally, disclosures about option holdings by Employees are much less detailed, making it less likely that the market has fully impounded this information into stock prices.

Since Tobin's Q measures the present value of expected future cash flows divided by the replacement cost of recognized assets, there is no need to adjust for risk in the comparisons of Tobin's Q across firms or portfolios. However, we must control for other factors that are expected to affect the level of Tobin's Q. To ascertain whether cross-sectional differences in Tobin's Q are related to the unexpected level of option incentives, we use the following regression model, where firm subscripts are understood:

$$\textit{Tobin's } Q_{t\,(t+1)} = \alpha + \beta_1 * \textit{Executive Residual}_t^{+} + \beta_2 * \textit{Executive Residual}_t^{-}$$

$$+ \beta_3 * \textit{Employee Residual}_t^{+} + \beta_4 * \textit{Employee Residual}_t^{-} + \phi * \textit{Controls}_t + \varepsilon_t \qquad (2)$$

The dependent variable is the industry-adjusted Tobin's Q at time *t* or *t+1* depending on the specification. The industry adjustment is performed by subtracting the industry median for the corresponding two-digit SIC code industry group. The explanatory variable, *Residual*$^{+}$ (*Residual*$^{-}$), takes on the value of the residual from the respective incentives model if the residual is positive (negative), and zero otherwise. We include separate variables for positive and negative residuals to allow for potential differences across firms that have more or fewer option incentives than expected (Ittner et al., 2003).

Controls represents a vector of firm characteristics that are expected to be associated with Tobin's *Q*. We use the log of market value of equity (*Log(market value of equity)*) measured at the end of the fiscal year to control for size effects.[15] We use two variables to control for growth opportunities. The first is *R&D to Sales*, which is defined as the three-year average of the research and development expenditures to sales ratio. The second is *Growth Forecast*, which is the I/B/E/S consensus forecast of long-term growth in earnings per share measured four months after fiscal year-end. The advantage of this proxy is that it constitutes an *ex ante* measure of the firm's future performance. Following Shin and Stulz (2000), we include the age of the firm, defined as the log of the number of years in which the firm has data on CRSP, *log(Firm Age)*. Based on the results in Gompers et al. (2003), we include two variables to control for differences in corporate governance, *Gov. Index* and *Gov. Indicator*.

Following the approach in Fama and MacBeth (1973), we estimate annual cross-sectional regressions of Eq. (2) and report the mean annual coefficient and assess its significance using the corresponding time-series standard error. This approach is intended to reduce measurement and sampling errors. As an alternative specification, we also estimate Eq. (2), pooling all firm-year observations, and we include three calendar-year indicator variables to control for time effects. Table 5, Panel A presents the results of these regressions.

Focusing on the Fama-MacBeth results, the *Residual*$^{+}$ coefficients for both Executives and Employees are positive and significant at the 1% level. The magnitude of the coefficients indicate that a firm with a positive Executive (Employee) residual that is one standard deviation above the median has a Tobin's Q value that is 12 percent (10 percent) higher than the median firm in its industry. The results indicate that these valuation differences for positive incentive residual firms continue to hold one year later as the *Residual*$^{+}$ coefficients in the *t+1* regressions are also significantly positive. The year *t* and *t+1* results remain virtually unchanged in the pooled regressions. None of the *Residual*$^{-}$ coefficients are significant in Panel A. These results indicate that firms with levels of option incentives well below the average amount for similar firms do not receive a valuation discount relative to similar firms with small (absolute) amounts of unexpected option incentives (Portfolios 2, 3, and 4).

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[15] Our inferences remain unchanged if we use the book value of assets as our proxy for size.

As an alternative approach, we restrict the sample to only those firms in the Top and Bottom quintiles of firms as ranked by their level of unexpected Executive (Employee) option incentives. We include an indicator variable, *Top Executive (Employee) Portfolio*, which takes on a value of one if the firm belongs to the Top Portfolio for Executives (Employees) and zero otherwise:

$$Tobin's\ Q_{t\,(t+1)} = \alpha + \beta * Top\ Portfolio_t + \phi * Controls_t + \varepsilon \qquad (3)$$

Controls consists of the same vector of control variables used in Panel A above. As before, we estimate Eq. (3) using both Fama-MacBeth and pooled regressions.

The results in Table 5, Panel B, for the time *t* Executive regressions show that firms with the most positive incentive residuals have significantly higher market valuations compared to firms with the lowest residuals. The mean coefficient is 0.273, indicating that these firms experience a 27 percentage point valuation premium relative to the firms with the most negative incentive residuals. The results are similar when we use the pooled sample, where the coefficient equals 0.245 and is significant at the 1% level. Furthermore, these coefficients are very close to the Executive Residual+ coefficients in Panel A.

The results are similar for the year *t+1* Executive regressions (Table 5, Panel C) except that the significance level for the *Top Executive Portfolio* coefficient in the pooled regression is reduced from the 5% level to the 10% level ($p = 0.09$). The two *Top Executive Portfolio* coefficients are also slightly smaller than their year *t* counterparts (0.194 and 0.195 versus 0.273 and 0.245, respectively). These results indicate that the valuation effects of option incentives are sustained for at least one year and are consistent with the abnormal returns results in Table 4.

The results for the Employee regressions are similar to those for the Executives. The *Employee Residual+* coefficients in Table 5, Panel A, are all positive and statistically significant, and the year *t* and *t+1 Top Portfolio* coefficients in Panels B and C are all positive and – with one exception – significant. This one exception is that the year *t* pooled coefficient is no longer significant, although its magnitude is similar to the mean coefficient from the annual regressions (0.132 and 0.112, respectively). Overall, the Tobin's Q results indicate that firms where Executives and Employees hold more option incentives than expected experience significantly higher contemporaneous and future valuations compared to other firms.

The *Gov. Index* coefficient is not significantly different from zero in any of our specifications. This result is unexpected given the variable's significance in similar tests reported in Gompers et al. (2003).[16] One possible explanation for the different results is that the proxies for growth opportunities have already captured much of the information in the governance index if governance structures are tailored to the firm's growth environment (Hermalin and Weisbach, 2003). To investigate this possibility, we reproduce the results of Table VIII, column (1) in Gompers et al. (2003, page 127), using their specification, where the sample is restricted to firms that have a governance index score:

$$Tobin's\ Q = \alpha + \beta * Gov.\ Index + \phi * Controls + \varepsilon \qquad (4)$$

where *Controls* consists of the log of firm's assets, the log of firm age, an indicator variable that equals one if the firm is included in the S&P 500 index, and an indicator variable that

[16] However, it is consistent with the lack of significance for *Gov. Index* in the option incentive regressions.

equals one if the firm was incorporated in Delaware. The average *Gov. Index* coefficient is highly significant and equals –0.072, which is similar to but larger than the average coefficient of –0.043 in Gompers et al. (2003). However, when we add proxies for growth opportunities (*R&D to Sales* and *Growth Forecast*) to Eq. (4), the average coefficient on the governance index declines by almost 60 percent to –0.030, and its level of significance also declines, although it remains significant at conventional levels. Thus, the difference in controls for growth opportunities appears to drive some but not all of the differences between our results and those in Gompers et al. (2003).

5.3. Unexpected option incentives and accounting returns

In this section, we analyze the association between firms' future accounting performance and unexpected option incentives. This approach offers two advantages compared to the previous market-based approaches. First, accounting returns are likely to reflect the actual changes in operational performance that the option incentives are designed to promote. Second, much speculation has arisen about the (absence of) efficiency of stock prices during our sample period, and examining an accounting measure of performance provides an alternative benchmark. The drawbacks of this approach include accounting profits' susceptibility to manipulation and the possibility that the incentives to manipulate earnings are increasing in the absolute level of option incentives. Nevertheless, since accounting manipulations typically reverse themselves relatively quickly, it is increasingly difficult to artificially enhance firm performance over several consecutive periods. Consistent results across the market- and accounting-based approaches are more likely to reflect the actual differences in firm performance as opposed to measurement errors or mis-specification.

We measure accounting performance based on the future return on assets over the next one and two years, inclusive. To the extent that the performance consequences of option incentives are not fully reflected in net income within two years, these measures will underestimate their total impact. We follow the same methodological approach used in the Tobin's Q regressions described in Section 5.2 above, and we base our analyses on the following two regression models, where firm subscripts are understood:

$$ROA_{t+1\,(t+2)} = \alpha + \beta_1 * Executive\ Residual_t^{+} + \beta_2 * Executive\ Residual_t^{-} + \beta_3 * Employee\ Residual_t^{+} + \beta_4 * Employee\ Residual_t^{-} + \phi * Controls_t + \varepsilon_t \quad (5)$$

$$ROA_{t+1\,(t+2)} = \alpha + \beta_1 * Top\ Portfolio_t + \phi * Controls_t + \varepsilon_t \quad (6)$$

The dependent variable in both regressions is the future industry-adjusted return on assets (*ROA*) defined as operating income measured over the next one or two years deflated by the current book value of assets. The industry adjustment is performed by subtracting the industry median of the corresponding two-digit SIC code industry group. *Residual*$^{+}$, *Residual*$^{-}$, and *Top Portfolio* are defined above. The vector *Controls* includes a number of control variables that the prior literature has used. In addition to the size and corporate governance variables (*log(Market Value of Equity)*, *Gov. Index*, *Gov. Indicator*), we include three proxies for growth opportunities: *R&D to Sales*, *Book to Market*, and *Growth Forecast*. We include the standard deviation of the return on assets (*Five-year ROA Standard Deviation*), defined as the standard deviation of the ratio of operating income to beginning-of-year assets for the period *t* to *t-4,* to control for any relation between firm risk and future earnings (Core et al., 1999).

Table 6, Panel A shows the results of the estimation of Eq. (5) using both the Fama-MacBeth approach and a pooled specification that includes three calendar-year indicators in the regression. The findings are very similar for the two return periods and for both estimation methods. For both the Executives and the Employees, the one-year and two-year $Residual^{+}$ coefficients are positive and highly significant. The two-year coefficients are roughly twice the magnitude of the one-year coefficients, a proportion which is consistent with options providing long-term incentives. These results are consistent with the Tobin's Q results discussed above, where firms with more option incentives than expected are valued significantly higher. The results here suggest that one of the reasons these firms are valued more highly is that they exhibit significantly better future earnings performance.[17]

While the $Residual^{-}$ coefficients in the Executive regressions are all insignificant, they are positive and significant in both the one-year and two-year Employee regressions. The positive coefficients indicate that firms with negative residuals in the incentive regressions have significantly lower future ROA compared to the median firm in their industry. These results contrast with the Tobin's Q results, where the $Residual^{-}$ coefficients are all insignificant.

We obtain similar results in estimating Eq. (6) when we restrict the sample to firms in the top and bottom quintiles based on the incentive residuals. The results in Panels B and C in Table 6 demonstrate that firms in the Top Portfolio produce significantly higher accounting returns than firms in the Bottom Portfolio over the next one and two years. The results are consistent regardless of whether firms are sorted into portfolios based on the Executive residuals or the Employee residuals. Based on the mean coefficient of the annual regressions, the estimated difference in subsequent year's ROA between the two extreme incentive portfolios is 3.9% (4.9%) for the Executives (Employees).[18] These amounts are economically significant considering that the median ROA over the next year in our sample is 11.1%.

In summary, the results from the three analyses discussed above present a consistent description of the relation between the unexpected level of option incentives and firm performance. After controlling for the economic determinants of option incentives, we find that firms with unexpectedly high levels of incentives exhibit significantly higher performance and that this higher level of performance is sustained for up to 30 months. This sustained association between option incentives and firm performance suggests that options provide long-lasting incentives, perhaps through their vesting requirements. We do not find much evidence to suggest that firms with levels of option incentives below the average level for similar firms perform significantly worse than similar firms with small (absolute) levels of unexpected option incentives. The Employee results suggest that, in aggregate, incentives provided to lower ranked employees can significantly affect firm performance, and these results lend some support to the practice of providing option-based incentives below the top executive ranks.[19]

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[17] These results are generally consistent with those in Hayes and Schaefer (2000), Hanlon et al. (2003), and Ittner et al. (2003).

[18] An alternative explanation is that firms with excess option incentives are more likely to manage their earnings upwards. We believe that this explanation can, at best, only explain a small part of the association we document, given the extremely large amount of manipulation necessary to lead the differences in ROA implied by the coefficient estimates. Furthermore, we expect that earnings management would not be related to the option incentives held by Employees, so the significant Employee coefficients are inconsistent with this explanation.

[19] This interpretation contrasts with Hall and Murphy (2003) and Oyer and Schaefer (2002), who suggest that providing options for non-executive employees is either inefficient given risk aversion or ineffective in providing meaningful incentives. Our results do not provide evidence on the efficiency of option-based incentives versus other types of equity incentives.

5.4. Artifact of the bull market?

The level of unexpected incentives is based on options outstanding at the end of fiscal years between 1996 and 1999, a period characterized by rapidly rising stock prices. Many market commentators have speculated that stock prices were irrationally high during this "bubble" period (Ofek and Richardson, 2003). If the degree of any market mispricing were positively associated with the level of unexpected option incentives, then our results may be an artifact of our sample period and thus, are not generalizable to other time periods. Such a positive correlation is not unreasonable if the incentive residuals are positively associated with the absolute intensity of options use, since a widespread belief holds that the mispricing (as judged by post-bubble returns) was concentrated in firms and industries characterized by high options use (Keating et al., 2003). We note that the ROA analyses are not affected by the degree of market mispricing.

We do not believe that our tests are unduly affected by any possible mispricing during the late 1990s. Since we measure returns over a 30-month period, many of our return observations take place during the "market correction" period that began in April 2000 (the last monthly return observation is for December 2002). To provide additional evidence on this matter, we replicate the abnormal returns tests described in Section 5.1 and we exclude firms whose return accumulation period ends before April 2000. The untabulated findings are essentially unchanged from those reported in Table 4. We also replicate our Tobin's Q analyses where Tobin's Q is measured at time *t+1* and the sample is limited to firm-year observations where Tobin's Q_{t+1} is measured after the end of March 2000. Untabulated results show that the Residual^{+} coefficients for both Executives and Employees are positive and significant, consistent with our previous findings. The Residual^{-} coefficients continue to be insignificant. Thus, it is unlikely that our results are just an artifact of mispricing during our sample period unless the relative amount of mispricing has continued through the end of 2002, a possibility we consider highly unlikely.

5.5. Direction of causality

Above we describe empirical evidence of a positive association between the unexpected level of option incentives and firm performance. Our evidence is consistent with the joint hypothesis that options provide employees with incentives that lead to increased future performance, and the incentive effects of stock options are only gradually incorporated into stock prices. In this section, we provide some preliminary evidence on the issue of causality. These analyses are inherently limited because our setting is not a natural experiment with random selection.

Kole (1996) suggests that the causality does not run from option incentives to future performance but rather from (anticipated) future performance to option incentives. That is, while option incentives do not affect firm performance, firms that anticipate good future performance tend to use options more intensively, i.e., have positive incentive residuals. To investigate this reverse-causality explanation, we require an *ex ante* proxy for the firm's expectations about its future returns. We use analyst forecasts of earnings growth (*Growth Forecast*) as a proxy for the firm's unobservable information about its future performance. The use of this proxy assumes that managers pass on their private information to analysts, who then incorporate it into their forecasts. While it is a noisy proxy, we note that communications with managers are a key source of private information for analysts (Mahoney, 1991; Marcus and Wallace, 1991).

We focus our analysis on the Executives since any "reverse causality" effect will be strongest for the Executives as they exert far more influence over the form and timing of their compensation and have greater access to private information relative to Employees.[20] If the reverse causality explanation is correct, then the residuals at time *t* should be positively associated with the lagged growth forecasts. We use the following regression specification to examine this prediction, where *Residual* refers to the residual from the Executive incentive regressions. We include the lagged values of *Residual* to control for other, firm-specific determinants of option incentive intensity. By construction, the incentive residual in a particular year will be orthogonal to the contemporaneous *Growth Forecast* since *Growth Forecast* is one of the explanatory variables in the incentives model.

$$Residual_{it} = \alpha + \beta_1 * Growth\ Forecast_{it-1} + \beta_2 * Growth\ Forecast_{it-2} + \gamma_1 * Residual_{it-1} + \gamma_2 * Residual_{it-2} + \varepsilon_{it} \quad (7)$$

Table 7 presents the results from estimating Eq. (7). After controlling for the unexpected level of option incentives held by Executives in the two prior years, we find no significant association between the unexpected level of option incentives and prior expectations about future earnings growth. The β_1 and β_2 coefficients are not statistically different from zero, either individually or jointly, and neither is the sum of the coefficients. Thus, we find no evidence suggesting that firms who "opportunistically" increase their option incentives in anticipation of good future performance drive the positive relation between option incentives and future firm performance. While not conclusive, this finding is not consistent with reverse causality driving our empirical results.

6. Relation to alternative economic theories

In this section, we discuss how the results from our empirical analyses pertain to alternative economic theories about how the level of option incentives is determined within firms. This discussion, of course, is conditional on the reliability of the evidence presented in Section 5 and should be interpreted accordingly. We assess the extent to which the predictions from the Optimal Contracting Hypothesis with Transaction Costs (OCH-TC), the Rent Extraction Hypothesis (REH), and what we designate the Dynamic Evolution Hypothesis (DEH), which is suggested in Core and Guay (2001) and further discussed in Core, Guay, and Larcker (2003), are consistent with our evidence. Evidence distinguishing among the three hypotheses facilitates the interpretation of our results.

According to the Optimal Contracting Hypothesis (OCH), which is derived from agency theory, firms continuously adjust the level of incentives so that their employees always hold the optimal level of incentives, where the marginal cost of the incentives just equals their marginal benefits (Demsetz and Lehn, 1985).[21] A variation of the OCH, which we call the Optimal Contracting Hypothesis with Transaction Costs (OCH-TC), suggests that firms are only in equilibrium on average, instead of at every point in time (Zingales, 1998; Core and Larcker, 2002). According to this view, transaction costs associated with the re-

[20] The results are qualitatively unchanged when we base the analysis on Employees.

[21] The OCH implies that no association will exist between the residuals and firms' stock-based performance because the residuals from the incentives models are only the result of measurement and/or specification errors.

contracting process will prevent firms from immediately re-contracting whenever the actual level of incentives deviates from the optimal level. While employees of particular firms at particular times will hold non-optimal levels of incentives, employees will hold on average the correct quantity of incentives across firms and across time.

Under the OCH-TC, the fitted values (residuals) from the incentive regressions represent (deviations from) the optimal level of option incentives if the incentive models are correctly specified. Firms further from the optimum are expected to perform relatively worse than firms nearer to the optimum. This under-performance is expected to occur whether the level of incentives is above or below the optimal level and whether the Executives or Employees hold the "wrong" level of incentives or not.

According to the Rent Extraction Hypothesis (REH) developed in Bebchuk et al. (2002), executives frequently use their power to extract economic rents at the expense of shareholders, and the "excessive" granting of stock options is one of the primary means by which they extract these rents. While not denying that equity-based incentives can provide a cost-effective means of reducing agency costs, they argue that the actual level of incentives goes well beyond the optimal level of incentives. Under the REH, the fitted values from the Executive incentive regressions represent the optimal level of incentives plus the average amount of rent extraction for similar firms. Positive (negative) residuals result when the top executives have extracted more (less) rents than average, and firms with positive (negative) Executive residuals are thus expected to be further away from (closer to) the optimal level, on average. The REH implies that firms with positive Executive residuals should perform worse than firms with negative Executive residuals. As top executives are not expected to use their power to extract rents for lower level employees, the level of option incentives for Employees should be set optimally, subject to transaction costs. Accordingly, positive and negative residuals for Employees are expected to demonstrate the same negative associations with firm performance as under the OCH-TC.

A third alternative suggests that most firms were still experimenting and learning about the optimal level of option incentives as their use of options was evolving dynamically over the sample period (Hall and Liebman, 1998; Liang and Weisbenner, 2002). Core and Guay (2001) find that firms with unexpectedly high levels of non-executive option incentives tend to grant unexpectedly high levels of option incentives the following year. They suggest one possible explanation for this unexpected result (unexpected from the viewpoint that firms were already in equilibrium): that firms are not yet in equilibrium; that is, Employees at the average firm do not hold enough option incentives.[22] This explanation is plausible as broad-based option plans were still a relatively new phenomenon during our sample period. In this case, firms with above (below) average levels of option incentives will be closer to (farther from) the optimal level and should perform relatively better (worse).

Figure 1 summarizes the expected relation between the unexpected level of option incentives (after controlling for their economic determinants) and firm performance under each hypothesis. While acknowledging that our setting does not represent a natural experiment, and thus does not provide direct evidence, we consider how well our evidence conforms to the predictions of each hypothesis. Our results are generally inconsistent with the OCH-TC since we find that firms with positive Executive and Employee residuals tend to

[22] "One scenario that is consistent with our results is a type of leader/follower game in which firms gradually decide to grant options deeper into the organization, and the firms that begin this process earlier have more options outstanding and make larger grants each year" (Core and Guay, 2001, p. 277).

perform significantly better in terms of abnormal returns, market valuation, and accounting returns. In fact, only two of our results are even moderately consistent with the OCH-TC. First, firms with negative Employee residuals experience significantly lower future accounting returns.[23] Second, the intercepts in the abnormal returns regressions are lower for the Bottom Portfolio 1 compared to Portfolio 3. Portfolio 3 consists of the firms with the residuals closest to zero and thus, these firms should be closest to the optimal level of incentives under the OCH-TC. However, the differences in abnormal returns between the two portfolios are not significant. Overall, our results do not conform to the basic implications of the OCH-TC.

While the central implication of the REH is that firms with positive residuals should perform significantly worse than firms with negative residuals, our results consistently show that positive residual firms outperform negative residual firms. In not a single regression do the firms with the highest levels of unexpected option incentives perform worse than their counterparts with either the most negative residuals or the smallest (absolute) residuals (Portfolio 3). These results contradict what would be expected if the REH held in practice. Thus, our evidence is not in accordance with the REH.

Overall, the evidence conforms most to the implications of the Dynamic Evolution Hypothesis, which posits that most employees hold too few option incentives. The DEH implies that firms with the most positive (negative) residuals are the closest to (farthest from) the optimal level of incentives and should therefore perform relatively better (worse). The results for the positive residuals conform to the DEH for both the Executives and Employees. However, the evidence does not completely accord with the DEH. Firms with the most negative residuals are expected to be further from the optimum compared to firms with the smallest (absolute) residuals and are expected to perform worse. However, the coefficients for the negative residuals in the Tobin's Q regressions and for the Executives in the ROA regressions are not significantly different from zero. With respect to the Executives, these findings are incongruent with the business press's numerous statements that executive compensation is "excessive," "out-of-control," and "harmful to shareholders." While our results do not rule out the possibility that some executives hold "too many" option incentives, they are – taken at face value – consistent with the average executive (and employee) holding too few option incentives.

7. Summary and conclusion

We examine the performance consequences of option incentives for a broad sample of firms between 1996 and 1999. We measure incentive effects of options as the dollar change in the option's value for a 1% change in stock price and perform our tests separately for option incentives held by the top-5 Executives and by all other Employees. We examine the relation between the unexpected level of option incentives and firm performance measured by future abnormal returns, future return on assets, and current and future firm valuation (Tobin's Q). After controlling for the economic determinants of option incentives, our results consistently show that firm performance is significantly and positively related to the extent to which both Executives and Employees hold more option incentives than the average firm with similar economic characteristics. Our results are consistent across all three measures of firm performance.

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[23] This result also conforms to the REH and DEH.

As with all empirical work in this area, our results are subject to several caveats. First, our sample period is relatively short, and the associations we document may not hold in future time periods. Second, we assume that the option incentive models adequately capture the economic determinants of option incentives. To the extent that this is not the case, our inferences may be spurious. However, our empirical methodology is designed to minimize this possibility. Third, we do not take other equity-based incentives (restricted stock, stock appreciation rights, warrants, etc.) into account apart from stock options. If these other forms of compensation are economically significant and are correlated with the option incentive residuals, then our results may be biased. Despite these potential shortcomings, we believe that our findings contribute new evidence on the performance consequences of option-based incentives.

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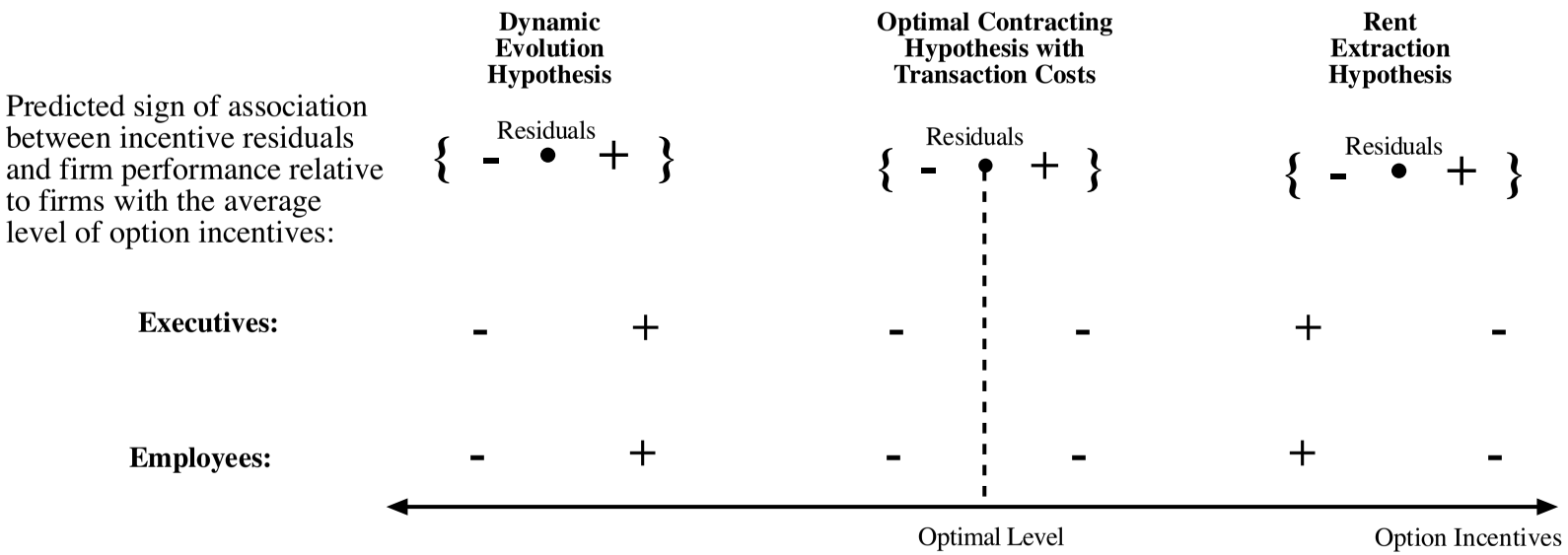
Figure 1. Relation between Incentive Residuals and Firm Performance



- represents the average level of option incentives for firms with similar economic characteristics. Under the OCH and the REH for Employees, it represents the optimal level of option incentives. Under the REH for Executives, the average level is above the optimal level. Under the DEH for both Executives and Employees, the average level is below the optimal level.

- (+) residual represents option incentives below (above) the average level for similar firms.

Under the OCT-TC and REH for Employees, all deviations from the average = optimal level result in relatively worse performance. Under the REH for Executives, firms with above (below) average levels of option incentives are farther from (closer to) the optimal level and should perform relatively worse (better). Under the DEH, firms with above (below) average levels of option incentives are closer to (farther from) the optimal level and should perform relatively better (worse).

Table 1
Descriptive Statistics for Employee Stock Options

Variable	Mean	Std. Dev.	p1	p25	Median	p75	p99
For Entire Firm:							
Outstanding Options (million)	19.91	38.45	0.35	2.65	6.18	17.23	205.44
Outstanding Options per Share (%)	7.9%	5.5%	0.6%	4.0%	6.6%	10.2%	28.0%
Fair Value of Outstanding Options ($million)	368.47	970.15	1.36	25.03	78.73	257.86	5,005.2
Fair Value to Market Value of Equity (%)	4.1%	3.9%	0.1%	1.4%	2.8%	5.4%	20.3%
For Executives:							
Outstanding Options per Executive	624,767	936,662	11,067	149,000	306,044	683,780	5,.278,500
Outstanding Executive Options per Share (%)	2.1%	2.0%	0.1%	0.7%	1.5%	2.8%	10.4%
Fair Value of Options per Executive ($ million)	10.84	20.44	0.09	1.60	4.09	10.60	122.76
Fair Value of Options per Share ($)	0.32	0.42	0.01	0.09	0.18	0.39	1.99
% of Options Held by Executives	27.6%	16.8%	3.%	15.0%	24.7%	37.1%	78.0%
For Employees:							
Number of Employees	27,490	47,286	177	3,420	10,154	29,495	269,460
Outstanding Options Held by Employees (million)	16.78	35.25	0.18	1.73	4.31	13.52	184.11
Outstanding Options per Employee	2,102	5,649	18	166	438	1,421	34,380
Outstanding Employee Options per Share (%)	5.7%	4.4%	0.3%	2.7%	4.6%	7.3%	21.8%
Fair Value of Employee Options ($million)	312.54	887.53	0.00	14.65	53.08	197.77	4,488.6
Fair Value of Options per Employee ($)	0.03	0.08	0.00	0.00	0,01	0.02	0.40
Fair Value of Options per Share ($)	0.87	1.16	0,00	0.24	0,54	1.07	5.35
% of Options Held by Employees	72.4%	16.8%	22.0%	62.9%	75.3%	85.0%	96.9%

Descriptive statistics are based on 2,479 firm-year observations between 1996 and 1999. Outstanding options consist of all outstanding employee stock options at the end of the fiscal year. Fair value of options is determined using the Black-Scholes formula modified for dividends. Market value of equity is the market capitalization at the fiscal year end. Executives consist of the firm's top 5 executives as identified by the proxy statement; Employees consist of all non-Executive employees. Firm-wide data on options are hand-collected from various 10-K statements; options data for Executives come from Execucomp. Employee option data are based on the difference between the firm-wide data and the Executive data.

Table 2.
Descriptive Statistics for Variables in Option Incentive Models

Variable	mean	std. dev.	p1	p25	median	p75	p99
Option Incentives per Executive ($)	161,575	278,964	2,150	28,675	71,441	167,567	1,542,183
Log (Option Incentives per Executive)	11.13	1.36	7.90	10.26	11.18	12.03	14.25
Total Executive Option Incentives ($)	807,873	1,394,822	10,752	143,376	357,204	837,836	7,710,916
Option Incentives per Employee ($)	424.18	1,075.47	1.76	34.31	99.30	307.39	5,438.56
Log (Option Incentives per Employee)	4.68	1.65	0.80	3.54	4.60	5.73	8.60
Total Employee Option Incentives ($million)	5.16	13.90	0.01	0.29	0.98	3.47	66.60
Log (Sales)	7.70	1.53	3.77	6.63	7.71	8.83	10.91
Log (Idiosyncratic Risk)	-2.50	0.41	-3.27	-2.83	-2.54	-2.22	-1.51
Book to Market	0.41	0.27	0.04	0.21	0.35	0.53	1.35
R&D to Sales	0.04	0.10	0.00	0.00	0.00	0.04	0.42
Growth Forecast	0.15	0.07	0.04	0.11	0.14	0.19	0.45
FCF Problem	0.00	0.01	0.00	0.00	0.00	0.00	0.06
Gov. Index	9.48	2.76	4.00	8.00	10.00	11.00	15.00
Gov. Indicator	0.85	0.36	0.00	1.00	1.00	1.00	1.00
Growth Options per Employee	0.51	1.03	-0.03	0.07	0.19	0.49	5.34
Product Diversification	0.76	0.62	0.00	0.00	0.69	1.24	2.17
Intersegment Sales	0.01	0.02	0.00	0.00	0.00	0.00	0.05
Geographic Diversification	0.38	0.45	0.00	0.00	0.10	0.74	1.38

Descriptive statistics are based on 2,479 firm-year observations between 1996 and 1999. Option Incentives measure the dollar change in the value of the portfolio of options due to a one percent change in the stock price based on the Black-Scholes "delta." Executives consist of the firm's top 5 executives as identified by the proxy statement; Employees consist of all non-Executive employees. Sales is the firm's annual sales. Idiosyncratic Risk is the standard deviation of the residual return from a 36-month market model regression. Book to Market is the ratio of the book value to market value of equity at the fiscal year end. R&D to Sales is annual research and development expenditures over sales. Growth Forecast is the I/B/E/S consensus forecast of long-term growth in earnings per share measured four months after fiscal year end. FCF Problem is the three-year average of [(operating cash flow minus preferred and common dividends)/total assets] if the book-to-market ratio is greater than or equal to one, and zero otherwise. Gov. Index is an inverse measure of corporate governance developed in Gompers et al. (2003). Gov. Indicator takes on the value of one if the firm has a Gov. Index value, and zero otherwise. Growth Options per Employee is the difference between market value and book value of equity scaled by the number of employees. Product diversification is defined as $\sum P_i \log(1/P_i)$, where P_i is the dollar sales of principal product *i* scaled by total firm sales. Intersegment sales is defined as intersegment sales scaled by total net sales. Geographic diversification is equal to $\sum G_i \log(1/G_i)$, where Gi is the dollar sales for geographic segment *i* scaled by total firm sales.

Table 3
Option Incentive Models

Log (Option Incentives per	Predicted Sign	**Executive**	**Employee**
Log (Sales)	+	0.567 ***	0.059 ***
Log (Idiosyncratic Risk)	+	0.079	0.448 ***
Book to Market	-	-2.038 ***	-2.065 ***
R&D to Sales	+	1.724 ***	2.858 ***
Growth Forecast	+	4.295 ***	3.258 ***
FCF Problem	+	8.784 ***	-
Gov. Index	+	-0.006	-
Gov. Indicator		0.087	-
Growth Options per Employee	+	-	0.410 ***
Product Diversification	-	-	-0.199 ***
Intersegment Sales	+	-	1.855 **
Geographic Diversification	?	-	0.173 ***
Executive Residual	+	-	0.507 ***
Observations		2,479	2,479
Adjusted-R^2		0.66	0.75

The sample is based on 2,479 firm-year observations between 1996 and 1999. The reported results are based on a pooled, cross-sectional regression that includes 55 two-digit SIC industry indicator variables, three year indicator variables, and a constant that are not reported. The dependent variable is the log of the Option Incentives per Executive or Employee, depending on the specification, where Option Incentives measures the dollar change in the value of the portfolio of options due to a one percent change in the stock price based on the Black-Scholes "delta." Executive Residual is the residual from the Executive regression in column 1. The definitions for the other varibles are in Table 2. ***, **, * indicate statistical significance at the 1%, 5%, and 10% levels, respectively, based on a two-sided test.

Table 4
Abnormal Returns Regression for Unexpected Option Incentive Quintiles

Panel A
Executives: Equally-weighted monthly returns

Portfolio	α	*RMRF*	*SMB*	*HML*	*UMD*	Adj.-R^2
Top: 5	0.871***	1.342***	0.381***	0.543***	-0.203***	0.87
4	0.654***	1.199***	0.296***	0.502***	-0.220***	0.93
3	0.568***	1.159***	0.212***	0.589***	-0.175***	0.93
2	0.557***	1.086***	0.289***	0.609***	-0.147***	0.91
Bottom: 1	0.510***	1.105***	0.351***	0.613***	-0.189***	0.93
Top – Bottom	0.361*	0.237***	0.030	-0.070	-0.015	0.30

Employees: Equally-weighted monthly returns

Portfolio	α	*RMRF*	*SMB*	*HML*	*UMD*	Adj.-R^2
Top: 5	1.184***	1.261***	0.328***	0.392***	-0.155***	0.86
4	0.707***	1.160***	0.243***	0.490***	-0.167***	0.92
3	0.491***	1.080***	0.260***	0.584***	-0.206***	0.90
2	0.380***	1.167***	0.266***	0.700***	-0.226***	0.94
Bottom: 1	0.404**	1.223***	0.432***	0.688***	-0.181***	0.92
Top – Bottom	0.780***	0.038	-0.103*	-0.296***	0.026	0.23

Panel B
Executives: Value-weighted monthly returns

Portfolio	α	*RMRF*	*SMB*	*HML*	*UMD*	Adj.-R^2
Top: 5	0.535***	1.087***	-0.121***	-0.071	-0.223***	0.91
4	0.782***	0.987***	-0.169***	-0.082	-0.401***	0.83
3	0.423	1.108***	-0.257***	-0.027	-0.268***	0.83
2	0.294	0.871***	-0.087*	0.335***	-0.053*	0.77
Bottom: 1	0.287	0.939***	-0.246***	0.320***	-0.119***	0.82
Top – Bottom	0.248	0.148**	0.125*	-0.391***	-0.103**	0.51

Table 4 (continued)
Abnormal Returns Regression for Unexpected Option Incentive Quintiles

Employees: Value-weighted monthly returns

Portfolio	α	*RMRF*	*SMB*	*HML*	*UMD*	Adj.-R^2
Top: 5	0.644***	0.927***	-0.228***	-0.106 *	-0.222 ***	0.86
4	0.585**	1.021***	-0.219***	-0.018	-0.241 ***	0.84
3	0.402*	1.038***	-0.096*	0.280 ***	-0.258 ***	0.85
2	0.314	1.018***	-0.158***	0.122 **	-0.240 ***	0.89
Bottom: 1	0.269	1.050***	-0.098*	0.231 ***	-0.160 ***	0.83
Top – Bottom	0.374†	-0.123	-0.130*	-0.337 ***	-0.062	0.11

† Significant at the 0.14 level.

In Panel A, we estimate Eq. (1), the four-factor regression of equally-weighted monthly stock returns for five portfolios of firms ranked by the level of unexpected option incentives, which are measured by the residuals from the annual Executive or Employee option incentive models, depending on the specification. In Panel B, the analyses are based on value-weighted monthly returns. At the end of June for each year 1997-2000, we rank firms based on the residuals from the previous year's option incentive model. Firms are grouped into five equal-sized portfolios where the Top Portfolio consists of the firms with the most positive residuals and the Bottom Portfolio consists of the firms with the most negative residuals. For each portfolio, we measure the monthly buy-and-hold returns for the following 30 months. Each regression contains 120 monthly observations. The dependent variable is the monthly portfolio return minus the contemporaneous one-month Treasury bill rate. The independent variables consist of four factors: The market factor (RMRF) is the monthly market return minus the one-month Treasury bill rate. The size factor (SMB: small minus big) is the zero-investment return on a portfolio that mimics the factor in returns related to size. The book-to-market factor (HML: high minus low) is the zero-investment return on a portfolio that mimics the factor in returns related to the book-to-market ratio. The momentum factor (UMD: up minus down) is the average return on two high prior return portfolios minus the average return on two low prior return portfolios that mimics the momentum factor in stock returns. Details about the factors can be found at Kenneth French's web site. The rows labeled Top – Bottom contain the results for a zero-investment strategy that buys the Top Portfolio and sells short the Bottom Portfolio. ***, **, * indicate statistical significance at the 1%, 5%, and 10% levels, respectively, based on a two-sided test.

Table 5
Tobin's Q Regressions

Panel A	***Industry-adjusted Tobin's Q_t***		***Industry-adjusted Tobin's Q_{t+1}***	
	(1) Fama-MacBeth Regressions	(2) Pooled Regression	(3) Fama-MacBeth Regressions	(4) Pooled Regression
Explanatory variables at time *t*	Mean Coef.	Coef.	Mean Coef.	Coef.
Executive Residual+	0.282***	0.294***	0.205**	0.224 ***
Executive Residual$^-$	0.030	-0.003	0.063	0.038
Employee Residual+	0.232**	0.209**	0.231**	0.218 ***
Employee Residual$^-$	-0.071	-0.066	0.005	0.010
Log (Market Value of Equity)	0.360***	0.398***	0.314***	0.327 ***
R&D to Sales	2.756	2.210***	3.712***	3.030 ***
Growth Forecast	12.56***	12.70***	9.327***	9.889 ***
Log (Firm Age)	0.015	0.006	-0.024	-0.018
Gov. Index	0.012	0.009	0.005	0.004
Gov. Indicator	-0.488**	-0.379**	-0.372***	-0.327 **
Observations		2,479		2,479
Adjusted-R^2		0.36		0.30

Panel B
Restricting the sample to the Top and Bottom Portfolios:

	Executives		**Employees**	
	(1) Fama-MacBeth Regressions	(2) Pooled Regression	(3) Fama-MacBeth Regressions	(4) Pooled Regression
Dependent variable: *Industry-adjusted Tobin's Q_t*	Mean Coef.	Coef.	Mean Coef.	Coef.
Top Portfolio	0.273***	0.245**	0.112**	0.132
Log (Market Value of Equity)	0.396***	0.430***	0.377***	0.430 ***
R&D to Sales	2.715	1.862***	3.034	2.703 ***
Growth Forecast	12.30***	12.66***	12.95***	12.61 ***
Log (Firm Age)	-0.114	-0.129	-0.060*	-0.104
Gov. Index	0.021	0.019	0.021	0.025
Gov. Indicator	-0.463**	-0.338	-0.619**	-0.565 **
Observations		992		992
Adjusted-R^2		0.38		0.38

Table 5 (continued)
Tobin's Q Regressions

Panel C

	Executives		Employees	
	(1) Fama-MacBeth Regressions	(2) Pooled Regression	(3) Fama-MacBeth Regressions	(4) Pooled Regression
Dependent variable: *Industry-adjusted Tobin's* Q_{t+1}	Mean Coef.	Coef.	Mean Coef.	Coef.
Top Portfolio	0.194***	0.195*	0.334***	0.358 ***
Log (Market Value of Equity)	0.334***	0.346***	0.315***	0.329 ***
R&D to Sales	3.260**	2.266***	3.377*	2.789 ***
Growth Forecast	8.762***	9.977***	8.981***	9.993 ***
Log (Firm Age)	-0.123	-0.097	-0.115***	-0.106
Gov. Index	-0.010	-0.009	0.005	0.009
Gov. Indicator	-0.331	-0.284	-0.349	-0.378
Observations		992		992
Adjusted-R^2		0.31		0.34

The sample is based on 2,479 firm-year observations between 1996 and 1999. Tobin's Q is defined as the ratio of the market value of assets to the book value of assets measured at time *t* or *t+1* depending on the specification. Market value of assets is the sum of the market value of equity plus the book value of liabilities. The market value of equity is measured at the fiscal year end. The industry adjustment is performed by substracting the industry median of the corresponding two-digit SIC code industry group.

Panel A reports summary statistics from the estimation of Eq. (2) of industry-adjusted Tobin's Q on the residuals from the Executive and Employee option incentive models and control variables. Executive (Employee) Residual$^+$ takes on the value of the residual from the Executive (Employee) option incentive regression if that value is positive, and zero otherwise. Executive (Employee) Residual- is defined similarly. Market value of equity is market capitalization measured at the fiscal year end. Firm Age is the number of years since the firm's initial public offering. The other control variables are defined in Table 2. The Fama-MacBeth regressions report the mean coefficient from annual regressions where the constant is not reported. Standard errors are based on the time-series standard deviation of the annual coefficient estimates. The pooled regressions include three year indicator variables and a constant that are not reported.

Panels B and C report the results of estimating Eq. (3) where the sample is restricted to the top and bottom unexpected option incentive quintiles. Top Portfolio is an indicator variable that takes on a value of one if the firm's residual from the Executive or Employee incentive regression, depending on the specification, is in the most positive quintile, and zero otherwise. The dependent variable in Panel B (C) is the industry-adjusted Tobin's Q at time t (*t+1*). ***, **, * indicate statistical significance at the 1%, 5%, and 10% levels, respectively, based on a two-sided test.

Table 6
Return on Assets Regressions

Panel A

	Industry-adjusted ROA $_{t+1}$		*Industry-adjusted ROA$_{t+2}$*	
	(1) Fama-MacBeth Regressions	(2) Pooled Regression	(3) Fama-MacBeth Regressions	(4) Pooled Regression
Explanatory variables at time *t*	Mean Coef.	Coef.	Mean Coef.	Coef.
Executive Residual^{+}	0.035 ***	0.036 ***	0.030 ***	0.031***
Executive Residual^{-}	0.003	0.005	0.003	0.005
Employee Residual^{+}	0.028 ***	0.034 ***	0.031 ***	0.036***
Employee Residual^{-}	0.023 ***	0.019 **	0.020 ***	0.016*
Five-year ROA Standard Deviation	-0.037	-0.183 ***	-0.098	-0.231***
Book to Market	-0.369 ***	-0.342 ***	-0.310 ***	-0.285***
Log (Market Value of Equity)	-0.006 ***	-0.009 ***	0.002	0.000
R&D to Sales	-0.755 ***	-0.628 ***	-0.751 ***	-0.626***
Growth Forecast	0.291 **	0.301 ***	0.287 **	0.294***
Gov. Index	-0.003 ***	-0.003	-0.002 **	-0.002
Gov. Indicator	0.021	0.005	0.006	-0.007
Observations		2,479		2,479
Adjusted-R^2		0.22		0.20

Panel B

	Executives		**Employees**	
	(1) Fama-MacBeth Regressions	(2) Pooled Regression	(3) Fama-MacBeth Regressions	(4) Pooled Regression
Dependent variable: *Industry-adjusted ROA $_{t+1}$*	Mean Coef.	Coef.	Mean Coef.	Coef.
Top Portfolio	0.039 ***	0.041 ***	0.049 **	0.045***
Five-year ROA Standard Deviation	-0.104	-0.176	-0.100	-0.174
Book to Market	-0.325 ***	-0.311 ***	-0.323 ***	-0.307***
Log (Market Value of Equity)	-0.005	-0.007	-0.003	-0.005
R&D to Sales	-0.925 ***	-0.781 ***	-0.915 ***	-0.771***
Growth Forecast	0.310 *	0.272 **	0.326 **	0.291***
Gov. Index	-0.005 **	-0.005 *	-0.005 **	-0.004*
Gov. Indicator	0.022	-0.012	0.032	-0.007
Observations		992		992
Adjusted-R^2		0.22		0.22

Table 6 (continued)
Return on Assets Regressions

Panel C

	Executives		Employees	
	(1) Fama-MacBeth Regressions	(2) Pooled Regression	(3) Fama-MacBeth Regressions	(4) Pooled Regression
Dependent variable: *Industry-adjusted ROA* $_{t+2}$	Mean Coef.	Coef.	Mean Coef.	Coef.
Top Portfolio	0.034 ***	0.035 **	0.057 ***	0.054***
Five-year ROA Standard Deviation	-0.168	-0.244 **	-0.166 ***	-0.244**
Book to Market	-0.281 ***	-0.268 ***	-0.281 ***	-0.267***
Log (Market Value of Equity)	0.002	0.000	0.003	0.002
R&D to Sales	-0.916 ***	-0.767 ***	-0.909 ***	-0.758***
Growth Forecast	0.302 *	0.265 **	0.317 ***	0.281***
Gov. Index	-0.004	-0.004	-0.004 ***	-0.004
Gov. Indicator	0.008	-0.023	0.018	-0.017
Observations		992		992
Adjusted-R^2		0.20		0.20

The sample consists of 2,479 firm-year observations between 1996 and 1999. ROA is the accounting return on assets, defined as the sum of operating income over the next one or two years inclusive, depending on the specification, divided by the end of current year book value of assets. The industry adjustment is performed by substracting the industry median of the corresponding two-digit SIC code industry group.

Panel A reports summary statistics from the estimation of Eq. (5) of either industry-adjusted ROA_{t+1} or ROA_{t+2} on the residuals from the Executive and Employee option incentive models and control variables. Executive (Employee) Residual$^+$ takes on the value of the residual from the Executive (Employee) option incentive regression if that value is positive, or zero otherwise. Executive (Employee) Residual$^-$ is defined similarly. Five-year ROA Standard Deviation is the standard deviation of operating income over beginning-of-year assets for the years *t* to *t-4*. The other control variables are defined in Table 2. The Fama-MacBeth regressions report the mean coefficient from the annual regressions where the constant is not reported. Standard errors are based on the time-series standard deviation of the annual coefficient estimates. The pooled regressions include three year indicator variables and a constant that are not reported.

Panels B and C report the results of estimating Eq. (6) where the sample is restricted to the top and bottom unexpected option incentive quintiles. Top Portfolio is an indicator variable that takes on a value of one if the firm's residual from the Executive or Employee incentive regression, depending on the specification, is in the most positive quintile, and zero otherwise. The dependent variable in Panel B (C) is the industry-adjusted ROA_{t+1} (ROA_{t+2}). ***, **, * indicate statistical significance at the 1%, 5%, and 10% levels, respectively, based on a two-sided test.

Table 7
Direction of Causality between Performance and Unexpected Option Incentives

Executives		**Employees**	
Dependent variable: *Executive Residual*$_t$	Coefficient	Dependent variable: *Employee Residual*$_t$	Coefficient
Growth Forecast$_{t-1}$	0.237	*Growth Forecast*$_{t-1}$	- 0.557
	(0.379)		*(0.455)*
Growth Forecast$_{t-2}$	- 0.005	*Growth Forecast*$_{t-2}$	0.454
	(0.369)		*(0.438)*
Executive Residual$_{t-1}$	0.663 ***	*Employee Residual*$_{t-1}$	0.693 ***
	(0.032)		*(0.037)*
Executive Residual$_{t-1}$	0.165 ***	*Employee Residual*$_{t-2}$	0.158 ***
	(0.031)		*(0.037)*
Constant	- 0.030	*Constant*	0.015
	(0.032)		(0.039)
Observations	1,021	Observations	1,021
Adjusted-R^2	0.68	Adjusted-R^2	0.58
Tests on coefficients:		**Tests on coefficients:**	
Growth Forecast$_{t-1}$ *= 0 and Growth Forecast*$_{t-2}$ = 0		*Growth Forecast*$_{t-}$	

$_1$ = *0 and Growth Forecast*$_{t-2}$ = 0	F(2, 1016) = 0.80	F(2, 1016) = 0.75
Prob > F = 0.45	Prob > F = 0.47	
Growth Forecast$_{t-1}$ + *Growth Forecast*$_{t-2}$ = 0	*Growth Forecast*$_{t-1}$ + *Growth Forecast*$_{t-2}$ = 0	
F(1, 1016) = 1.53	F(1, 1016) = 0.20	
Prob > F = 0.22	Prob > F = 0.66	

The sample consists of 1,021 firm-year observations between 1998 and 1999. The dependent variables are the residual from the year *t* Executive or Employee option incentive model, depending on the specification. The independent variables are the years *t-1* and *t-2* values of Growth Forecast and two lags of the dependent variable. Growth Forecast is the I/B/E/S consensus forecast of long-term growth in earnings per share measured four months after fiscal year end. Standard errors are reported in parentheses below the coefficients. ***, **, * indicate statistical significance at the .01, .05, .10 levels, respectively, based on a two-sided test. *F*-tests regarding the joint significance of the Growth Forecast coefficients are presented below the regression results.