Performance Incentives, Performance Pressure and Executive Turnover

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Abstract

We examine the relationship between the optimal incentive contract and the firm's decision to fire a manager for poor performance. We first derive some theoretical results using a simple principal-agent model, and then examine the empirical evidence on the incidence of forced turnover among CEOs with different compensation contracts. We find that CEOs with steeper compensation contracts (i.e., with greater incentives) are more likely to be fired following poor firm performance. Logit estimations indicate that among firms that make a net loss in a given year, a CEO receiving incentives at the 60th percentile level is 26.55% more likely to be fired than a CEO with incentives at the 40th percentile. The corresponding figure for firms whose ROA is below the industry average level is 15.07%, and for firms whose stock return is below the market return is 15.86%. The results are robust to various performance and incentive measures. Overall, our results indicate that CEOs with greater incentives also face greater performance pressures.

Keywords: Incentive Contracts, Executive Compensation, Stock Options, Equity-based compensation, Management Turnover.

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1 Introduction

Do executives who receive greater performance incentives face greater performance pressure, i.e., are they more likely to be fired for poor performance? We first study this question within the principal-agent framework, and derive some results on the relationship between the optimal incentive contract and the likelihood of forced turnover. We then examine the empirical evidence on the incidence of forced turnover among CEOs with different compensation contracts. We find that CEOs with higher incentives are also more likely to be fired for poor performance.

A simple analysis of the principal-agent problem suggests two quick answers to the question posed in the opening paragraph. First, firms offer incentives both directly through the compensation contract[1], as well as indirectly, through the threat of firing. These two kinds of incentives may be viewed as substitutes. In this case, firms that offer steeper incentive contracts, for example, with more shares and options, may be less likely to use the firing threat for incentive purposes. On the other hand, executive effort is only one of the factors influencing performance. Ability is another. Faced with poor performance, a firm might attribute it to either low effort or low ability. But while incentives may induce effort, they cannot induce ability. Thus, in light of poor performance, a firm that provides higher incentives to its managers is more likely to infer that the problem is one of ability rather than effort. In this case, firms providing higher incentives must be more likely to fire their managers for poor performance.

The two conflicting answers suggested above indicate that the issues of performance

[1]Firms offer incentives by linking the compensation of executives to firm performance. They may do this through performance-based bonuses, as well as through stocks and options. Over the last decade, equity based incentives have largely outweighed performance bonuses as documented by Hall and Liebman (1998), and Core, Guay, and Verrecchia (2000).

and turnover must be studied jointly with the issue of incentives, in an optimal contracting framework[2]. Prior research in the area of executive compensation, incentives and management turnover has, however, tended to deal separately with the two main issues - (i) executive compensation and whether it incentivizes better firm performance, and (ii) the relationship between firm performance and forced management turnover. Coughlan and Schmidt (1985), Murphy (1985, 1986), Abowd (1990), Jensen and Murphy (1990a) and Leonard (1990) study the relationship between executive compensation contracts, incentives and firm performance[3]. The papers show that firm performance is largely positively related to pay-performance sensitivity, after controlling for the risk, i.e., the variance of performance (Aggarwal and Samwick, 1999). Similarly Weisbach (1988), Warner, Watts and Wruck (1988), Murphy and Zimmerman (1993), Denis, Denis and Sarin (1997), Parrino (1997), and Goyal and Park (2002) are among the papers studying how firm performance affects forced executive turnover, and the role played by corporate governance factors such as board composition in determining this relationship. These papers indicate forced executive turnover is more likely following poor performance, and that greater insider share ownership and higher insider representation on the board deter forced turnovers.

In this paper, we recognize that executive incentives and firm performance are jointly related to executive turnover and analyze both jointly. First, we examine the properties

[2]Firms design executive compensation contracts to provide the right level of incentives for their executives, taking into account many features of the contracting environment such as the ease of monitoring the management, the importance of unobservable factors etc. These same contractual environment variables also endogenously determine whether and in what circumstances firms will fire their top executives for poor firm performance. Therefore, any empirical examination of how compensation is related to performance and turnover must control for the incentive effects of compensation. A related point is made by Himmelberg, Hubbard and Palia (1999), who argue that both managerial ownership and performance are endogenously determined in an optimal contracting framework.

[3]See Murphy, 1999 and Core, Guay and Larcker, 2001 for extensive surveys on this literature.

of the optimal incentive contract in a simple multi-period principal-agent setting that explicitly incorporates forced turnover, i.e., firing in the event of poor performance. To our knowledge, this is the first model to study how the firing option influences the design of the incentive contract. (Holmstrom, 1982, 1999, and Gibbons and Murphy, 1992 are related papers[4]) We examine how the slope of the optimal compensation contract changes between the regime with firing and the regime without firing. Then, using data on CEO compensation, we empirically test whether steeper compensation contracts are associated with a greater probability of firing in the event of poor performance. We summarize our model and the empirical results below.

Our theoretical model examines the optimal incentive contract in the presence of career concerns when the firm can fire the manager for poor performance. In our model, executive effort and ability jointly determine output. Effort is unverifiable which makes incentive contracts necessary. Executive ability is uncertain, and the firm learns the ability of the manager by observing his performance, i.e., firm output. Bayesian learning implies that a higher level of effort in the first period leads to a lower posterior estimate of ability in the event of a poor outcome (*the learning effect*). If the posterior estimate of the manager's ability is sufficiently low, the firm fires him and switches to an interim CEO until another full time CEO is hired. In equilibrium, firms offer contracts that link pay to performance, as well as specify whether the executive will be fired or not in the event of poor performance. The firing threat (*the stick*) acts as a partial substitute for incentives (*the carrot*) in the

[4]Holmstrom (1982, 1999) shows that contracts may be necessary even in multiperiod settings where career concerns may be expected to play a similar role. Gibbons and Murphy (1992) characterize optimal incentive contracts in the presence of career concerns. They predict and verify that the optimal incentive contracts should be steeper for executives who are closer to retirement. However, in their model, executive tenure is deterministic - the executive is hired for a fixed number of periods and retires at the end of her tenure. In reality, executives are often fired for poor performance, and thus, the executive's tenure length may be uncertain.

first period. If it increases first period effort sufficiently, and if the learning effect is strong enough, then the slope of the optimal incentive contract with firing will be less than that without firing. If, however, the threat does not increase effort sufficiently, then the optimal incentive contract with firing will be steeper than that without firing. It is a matter for empirical analysis to determine whether a contract that specifies firing is steeper than one that does not.

In the empirical section of this paper, we examine whether CEOs with steeper incentive contracts are more likely to be fired following poor performance than CEOs with flatter contracts. We use data on CEO changes during the period 1993-1999 from the ExecuComp database and, through an exhaustive news search, identify the reasons for the change. We use two measures of incentives - the first measure is the change in the dollar value of the CEO's stock and option holdings for a one percent change in the stock price (the *Return Sensitivity*). It is a comprehensive measure of the sensitivity of the CEO's wealth to firm performance. We use the Core and Guay (1999a) method to calculate this measure, which allows us to calculate incentives even using the partial details on the CEO's stock option portfolio contained in the annual proxy statements (see Appendix B). Our second measure of incentives is the *Dollar Sensitivity* of CEO compensation, defined as the change in the dollar value of the CEO's stock and option holdings for a dollar change in firm equity value.

For both measures of incentives, and for seven measures of poor performance, we find that CEOs with steeper incentive contracts are more likely to be fired than those with flatter contracts, among poorly performing firms. Among firms that make a net loss in a given year, a CEO receiving incentives at the 60th percentile level is 26.55% more likely to be fired than a CEO with incentives at the 40th percentile. The corresponding figure for firms whose ROA is below the industry average level is 15.07%, and for firms whose stock return is below the market return is 15.86%. The results are robust to various performance and incentive measures. Overall, our results indicate that CEOs with greater incentives also face greater performance pressures.

Overall, our results indicate that CEOs with greater incentives also face greater performance pressures. We do not argue that these effects are very important from the manager's point of view. As Jensen and Murphy (1990a) point out, dismissals are not an important source of managerial incentives. However, we do observe firms firing their CEOs following poor performance, and our intention is to understand how this is related to the issue of incentives. We argue that if firms learn sufficiently about the ability of a manager from observing performance, then, they may fire managers who perform poorly after being incentivized. Our empirical analysis bears this out. Firms do seem to consider the level of incentives offered in deciding on whether to penalize a CEO for poor performance.

The paper is organized as follows - section 2 presents our model of optimal incentive contracts incorporating the firing decision, section 3 describes the data set and our measures of incentives and performance, section 4 describes the estimation and results, and section 5 concludes. Appendix A has the proofs of results derived in section 2 and appendix B describes the method used in calculating portfolio sensitivities.

2 Optimal Incentive Contracts with Forced Turnover

Consider a simple model of interaction between an infinitely lived firm and an agent who lives for two periods[5]. The firm output y_t in any period t is either zero or one with the

[5]The main intuition regarding the relationship between the slopes of the first period contracts in the two cases of firing and rehiring, may be derived by comparing the first order conditions (FOCs) for the agent and the firm in the two cases. In this paper, while we derive these FOCs for each case and compare them, we do not solve for the exact contract in each case, since that does not add to the intuition required for the empirical analysis to follow. Subramanian, Chakraborty and Sheikh (2002b) contains the full solution to

agent's ability and effort determining the probability that the output is one. We may refer to the event $y = 1$ as "success" and $y = 0$ as "failure"[6]. There are two types of agents, those of high ability (type H) and those of low ability (type L). If the agent's effort level in a given period is e_t, then,

$$\text{P(Output } y_t = 1) = \begin{cases} e_t & \text{if type = H} \\ \alpha e_t & \text{if type = L,} \end{cases} \tag{1}$$

where $\alpha \in [0, 1)$. α is thus a measure of the importance of ability over effort in being a successful manager. The closer α is to one, the less important is ability in determining managerial success.

Both the firm and the worker are risk-neutral, and have an intertemporal discount rate of δ. The worker has a quadratic disutility of effort $g(e) = 0.5re^2$, where r is a shift parameter. The agent's effort is not verifiable, even if the firm can deduce the equilibrium level of effort. In order to induce effort, the firm offers incentive contracts of the form $w_t = b_t y_t$, where w_t is the wage in period t. The firm incurs a fixed cost F in each period that it operates. If the agent is fired, we assume that the firm has to wait for one period before hiring a new agent. During this period, the firm works with an interim CEO and makes a net profit of zero. Thus, the normal profits of the firm may be interpreted as being measured relative to the potential profits under an interim CEO (such as a retired CEO who is on the board of directors). Equivalently, the fixed cost F may be interpreted as the revenue under a back-up CEO. The assumption that the firm waits for one full period before hiring a new CEO simplifies the dynamic optimization framework, without much loss of generality[7].

the model.

[6]In the empirical analysis, we use a binary measure of performance in correspondence with the binary nature of output in this model.

[7]It implies that in making the decision of the whether to fire the agent or not, the firm has to consider only the profits in the agent's second period and not in any of the future periods, since all agents retire after two periods.

The Contract: At hiring, the firm offers a contract that specifies: (1) Slopes $\{b_1, b_{21}\}$ where b_{21} is the slope of the second period contract when $y_1 = 1$; and (2) Whether the manager will be fired or not if $y_1 = 0$, and if not, the slope b_{20}. Note that while the manager could be fired even if $y_1 = 1$, condition 8 below will rule out this possibility. We will derive the optimal contract in a subgame perfect Nash equilibrium. We are primarily interested in the properties of the slope b_1 of this contract.

We begin with the Bayesian learning process by which a firm updates its beliefs about the manager's ability.

2.1 *Bayesian Learning*

As in Gibbons and Murphy (1992) and Holmstrom (1982, 1999), there is symmetric, but imperfect, information about the agent's ability. The firm and the agent alike believe at the beginning of the first period that the agent is of type H with probability $q > 0$. Subsequently, they update their beliefs based on the output observed in the first period. Let q_{2j} denote the posterior probability that the agent is of type H when the first period output is j. Given the prior q, the effort level e_1, and the technology 1 above, we have

$$q_{20} = \mathrm{P}(\mathrm{H} \mid y_1 = 0) = \frac{q(1-e_1)}{q(1-e_1) + (1-q)(1-\alpha e_1)} = \frac{q(1-e_1)}{1 - z_1 e_1} \quad (2)$$

$$q_{21} = \mathrm{P}(\mathrm{H} \mid y_1 = 1) = \frac{qe_1}{qe_1 + (1-q)\alpha e_1} = \frac{q}{q + \alpha(1-q)} \quad (3)$$

where $z_1 = q + (1-q)\alpha$. It is easy to observe from equations 2 and 3 that (i) $q_{20} \leq q < q_{21}$, (ii) $\frac{dq_{21}}{de_1} = 0$, and

$$\frac{dq_{20}}{de_1} < 0 \quad (4)$$

Condition 4 implies that higher first period effort has a negative impact on the posterior estimate of the agent's ability in the event of failure. As we see below, this might play an important role in the optimization decision of the agent and the firm. If the effect is sufficiently strong, then the firm might fire the agent after the first period, rather than rehire him.

Next, we derive the optimal contract that the firm would offer any rehired agent in the second period, given the above learning process.

2.2 *The Second Period Contract*

Let $j \in \{0, 1\}$ denote the first period output. The firm offers a second period incentive contract b_{2j} conditional on the first period output. Let y_{2j} denote the output in the second period when $y_1 = j$. Define z_{2j} as follows:

$$z_{2j} = q_{2j} + (1 - q_{2j})\alpha = q_{2j}(1 - \alpha) + \alpha. \tag{5}$$

The expected utility of the agent in the second period, conditional on first period output, is

$$u_{2j} = -g(e_2) + \mathrm{P}(y_{2j} = 1).b_{2j} + \mathrm{P}(y_{2j} = 0).0 = -0.5re_2^2 + z_{2j}b_{2j}e_2.$$

The agent's second period effort solves the problem:

$$\max_{e_2} u_{2j} = -0.5re_2^2 + z_{2j}b_{2j}e_2. \tag{6}$$

It follows that the optimal second period effort level $e_{2j}^* = \frac{z_{2j}b_{2j}}{r}$.

The firm's second period profit Π_{2j} conditional on first period output is

$$\Pi_{2j} = -F + \mathrm{P}(y_{2j} = 1).(1 - b_{2j}) + \mathrm{P}(y_{2j} = 0).0 = -F + z_{2j}e_{2j}^*(1 - b_{2j}).$$

Substituting for e_{2j}^* from above, the firm chooses b_{2j} to solve

$$\max_{b_{2j}} \Pi_{2j} = -F + \frac{z_{2j}^2}{r}(b_{2j} - b_{2j}^2). \tag{7}$$

The following result characterizes the optimal second period contract.

Result 1 *The optimal contract in the second period is independent of first period output and is given by $b_2^* = 0.50$. The optimal second period effort level $e_{2j}^* = \frac{z_{2j}}{2r}$. firm's expected second period profit is $\Pi_{2j}^* = \frac{z_{2j}^2}{4r} - F$, and the worker's expected utility is $u_{2j}^* = \frac{z_{2j}^2}{8r}$, where $j \in \{0, 1\}$ is the first period output.*

Result 1 has two implications. First, it implies that the firm would not rehire the agent if the first period output is j and $z_{2j}^2 < 4rF$. From equation 5 and condition 4, we may see that $z_{20} \leq z_1 < z_{21}$. In the following analysis, we will assume that:

$$z_{21}^2 > 4rF \tag{8}$$

in order to make the model interesting[8]. This ensures that all firms rehire the agent if the first period output is one.

Second, it follows from result 1, condition 4, and equations 2 and 5 that

$$\frac{du_{20}^*}{de_1} = 0.5 \left(\frac{d\Pi_{20}^*}{de_1} \right) = \left(\frac{z_{20}}{4r} \right) (1 - \alpha) \frac{dq_{20}}{de_1} < 0. \tag{9}$$

We may call this **the learning effect**, as condition 9 highlights the effect of learning on the conditional expected second period utility and profits. A higher first period effort biases ability downward to a greater extent in the event of poor performance, leading to lower conditional expected utility and profits[9]. A strong enough learning effect will imply that $\Pi_{20} < 0$, so that it is optimal for the firm to fire the agent for poor performance.

Next we solve for the optimal contract in the first period. This depends on whether the contract is accompanied by a firing threat or by a commitment not to fire. We solve for the

[8]Otherwise, the firm would fire the agent even if the first period output was one, which reduces the model to a trivial case of a one period model.

[9]While the firm does not observe e_1, it infers e_1 from the equilibrium response of the agent to the contract offered.

contract in the case with firing in the following subsection, and deal with the "no firing" case in the next one.

2.3 *The First Period Contract with Firing*

Assume first that the firm offers a contract specifiying that the agent would be fired if $y_1 = 0$. The threat of firing will be credible if it induces first period effort level e_1 such that $\Pi_{20} < 0$. In this case, the agent's expected discounted utility u_1 is

$$\begin{aligned} u_1 &= -g(e_1) + \mathrm{P}(y_1 = 1)(b_1 + \delta u_{21}^*) + \mathrm{P}(y_1 = 0)(0) \\ &= -0.5 r e_1^2 + z_1 e_1 (b_1 + \delta u_{21}^*), \end{aligned}$$

where u_{21}^* is given in result 1. The agent's optimal first period effort, e_{1F}, therefore solves the first order condition (FOC)

$$g'(e_1) = r e_1 = z_1 (b_1 + \delta u_{21}^*) \tag{10}$$

The firm's expected discounted profit is

$$\begin{aligned} \Pi_1 &= -F + \mathrm{P}(y_1 = 1)(1 - b_1 + \delta \Pi_{21}^*) + \mathrm{P}(y_1 = 0)(0) \\ &= -F + z_1 (1 - b_1 + \delta \Pi_{21}^*) e_{1F}. \end{aligned}$$

The optimal first period contract, b_{1F}, therefore solves the FOC

$$b_1 = 1 + \delta u_{21}^* - \left[\frac{e_{1F}}{\left(\frac{de_{1F}}{db_1} \right)} - \delta F \right]. \tag{11}$$

Next, we consider the case where the firm does not fire the agent even in the case of poor first period performance.

2.4 *The First Period Contract without Firing*

Assume that the firm offers a contract specfiying that the agent would not be fired even if $y_1 = 0$. A commitment not to fire will be credible if it induces first period effort level e_1

such that $\Pi_{20} \geq 0$. In this case, the agent's expected discounted utility u_1 is

$$\begin{aligned} u_1 &= -g(e_1) + \mathrm{P}(y_1 = 1)(b_1 + \delta u_{21}^*) + \mathrm{P}(y_1 = 0)(0 + \delta u_{20}^*) \\ &= -0.5 r e_1^2 + z_1 e_1 (b_1 + \delta u_{21}^*) + \delta(1 - z_1 e_1) u_{20}^*, \end{aligned}$$

where u_{20}^* is given in result 1. The agent's optimal first period effort, e_{1R}, therefore solves the first order condition (FOC)

$$g'(e_1) = r e_1 = z_1(b_1 + \delta u_{21}^*) - \delta z_1 u_{20}^* + \delta(1 - z_1 e_1)\frac{du_{20}^*}{de_1}. \tag{12}$$

Comparing the first order conditions for the agent with and without firing (equations 10 and 12), we get the following results:

Result 2 *(i) Any first period contract b_1 induces greater effort when accompanied by a firing threat rather than a commitment not to fire.*
(ii) If the second order effect $\frac{d^2 u_{20}}{de_1^2}$ is small, the marginal impact of a given incentive contract b_1 on the agent's effort is lower when accompanied by a firing threat rather than a commitment not to fire, i.e., $\frac{de_{1R}}{db_1} > \frac{de_{1F}}{db_1}$. However, the difference decreases as the learning effect weakens.

A commitment to rehire implies a lower marginal benefit to effort (in comparison to a commitment to fire) for two reasons. Firstly, higher effort lowers the probability of failure and hence of getting a second period utility of u_{20}^*. This is the incentive effect (i.e. the firing threat (*the stick*) acts as a partial substitute for incentives (*the carrot*) in the first period.). Secondly, higher first period effort reduces this minimum second period utility u_{20}^* through its effect on the posterior estimate of the agent's ability. This is the learning effect. These two effects imply that the agent's marginal benefit to effort is lower and this, combined with the increasing marginal disutility, implies that effort is lower with rehiring.

While the marginal benefit to effort without firing is lower, in contrast, the rate of change of the marginal benefit with respect to effort is higher in the “no firing” case, due to learning effect. This leads to the larger marginal impact of incentives on effort when there is rehiring.

The firm’s expected discounted profit without firing is

$$\begin{aligned}\Pi_1 &= -F(1+\delta) + \mathrm{P}(y_1 = 1)(1 - b_1 + \delta R^*_{21}) + \mathrm{P}(y_1 = 0)(0 + R^*_{20}) \\ &= -F(1+\delta) + z_1 e_{1R}(1 - b_1 + 2\delta u^*_{21}) + 2\delta(1 - z_1 e_{1R})u^*_{20},\end{aligned}$$

where $R^*_{20} = \Pi^*_{20} + F = 2u^*_{20}$ from result 1. The optimal first period contract, b_{1R}, therefore solves the FOC

$$b_1 = 1 + 2\delta u^*_{21} - 2\delta u^*_{20} + 2\delta\left(\frac{1 - z_1 e_{1R}}{z_1}\right)\frac{du^*_{20}}{de_{1R}} - \frac{e_{1R}}{\left(\frac{de_{1R}}{db_1}\right)}. \tag{13}$$

2.5 *Comparing Slopes*

It is clear from result 2(i) that for the same parameters δ, r, F and q, both firing and rehiring may be subgame perfect equilibrium strategies for the firm. For example, the firm might induce such high effort, e_{1F}, under firing that the learning effect makes $\Pi_{20} < 0$. The same firm might, under rehiring, induce a low enough effort e_{1R}, that the learning effect is weak and $\Pi_{20} > 0$. We are interested in how the slope of the first-period contract, b_1, differs between the two regimes.

Comparing the firm’s FOCs in the two cases (equations 11 and 13), we note that the first two terms are identical. The next two terms in 13 are negative and are absent from 11. Of these, the first term represents the weakening of incentives as a result of the rehiring commitment (the incentive effect metioned earlier) and the second term represents the learning effect. These two effects thus lower b_{1R} relative to b_{1F}. But, since result 2 implies that $\left(e_{1F}/\frac{de_{1F}}{db_1}\right) > \left(e_{1R}/\frac{de_{1R}}{db_1}\right)$, the net effect is indeterminate. However, the following result gives a sufficient condition for the optimal contract with firing to be steeper than the contract without firing, assuming that both equilibria exist.

Result 3 *The first period contract under the firing regime is steeper than the contract under the "no firing" regime, i.e.* $b_{1F} > b_{1R}$*, if* $z_1 e_{1R} < \frac{1}{3}$*.*

Thus, the incentive contract with firing is steeper if the unconditional probability of success under rehiring is sufficiently small. The basic intuition is as follows: a strong incentive effect implies that a rehiring commitment will decrease effort substantially relative to the effort under a firing threat. This low effort implies that the impact of the learning effect is also weakened. This, in turn, implies that $\left(\frac{de_{1F}}{db_1} - \frac{de_{1R}}{db_1}\right)$ is small, leading to a higher slope b_{1R} relative to b_{1F} .

While the optimal contract in the firing case is easily characterized, the contract in the rehiring case is the solution to a quartic equation in effort (see Subramanian, Chakraborty and Sheikh, 2002b). Therefore, result 3 does not lend itself easily to a direct interpretation in terms of the underlying parameters. We therefore do not present the optimal solutions here. However, given result 3, it would be interesting to see if the firms that fire their executives for poor performance are those offering relatively steeper contracts. In the following empirical analysis, we examine this question and find affirmative results.

3 Data

The data on CEO turnover used in this study is collected from *Standard and Poor's ExecuComp* database, for the period 1993-1999. We searched the database for instances where the identity of the CEO has changed. We were careful not to include those instances where the identity change was purely short-term and reverses within a year of the change. We also conducted a detailed search of news items on the Lexis-Nexis Academic Universe database in order to verify that such changes were genuine CEO changes. We dropped CEO identity changes in the ExecuComp database which were not corroborated by any corresponding news item in the Lexis-Nexis database. Finally, we omitted firms in the financial sector and regulated firms (SIC codes in the range 4910-4949 and 6000-7000).

3.1 *Reasons for CEO Change*

For each CEO change, we collected information on the date of the CEO change announcement and the reason specified for the change, from the databases of the Lexis-Nexis Academic Universe. Based on this search, we found that CEO changes could be classified by the cited reason for the change into: (i) Retirement and regular succession related; (ii) Resignations and other changes explicitly related to poor performance, including those changes forced by board of directors; (iii) career-related moves to other firms by the CEO; (iv) turnover associated with mergers and acquisitions; (v) health related changes; and (vi) unexplained (in the news) changes. We grouped the changes into three categories, namely *Retirement*, *Forced Turnover*, and *Other Changes*. Table 1 summarizes these changes by year and reason. Our final sample consists of 8621 firm-year observations with 705 instances of CEO change (which is a turnover rate of 8.18%). We are interested mainly in the "Forced Turnover" category, under which are grouped those cases where the news item either explicitly states or speculates that the CEO was forced out or resigned in light of poor performance. There are 92 such instances in our sample.

[TABLE 1 HERE]

For each of these firm-year observations, we collected data on firm characteristics such as revenue, income, assets and performance ratios, and CEO characteristics such as the CEO's age, tenure with the firm and comprehensive compensation details from the ExecuComp database. Table 2 summarizes these variables. As the table shows, forced CEO changes occur in firms that, on average, have a low profitability, as measured by the ratio of net income to sales (NIS), as well as the return on assets (ROA). Such firms also have poor stock performance, as indicated by the negative average stock return. Also, the average CEO who is forced out has had a shorter tenure, is several years younger and owns a smaller precentage of the the firm than the average CEO who continues in office. As documented in Aggarwal and Samwick (1999) and in other studies, there is a substantial skewness in the data, with the medians being much lower than the means. However, we run robustness checks to make sure that our estimation results are not driven by outliers.

[TABLE 2 HERE]

3.2 *Measuring Performance*

We define poor firm performance in several different ways and estimate the impact of incentives on turnover using each of them. In addition to the usual market-based measure of performance, namely, stock returns, we also use accounting based measures. As Murphy (1999) documents, companies use accounting based measures of performance to a great extent in annual incentive plans. We are therefore interested in examining how incentives based on such measures affect CEO turnover. Our first measure is based on the company's net income before extraordinary items (NIBEX) in the previous fiscal year. While this is an absolute measure, it is appropriate to the extent that a firm is unique within an industry. We believe that such a measure is relevant since running losses or being "in the red" is often a highly visible signal to the markets and shareholders of poor managerial performance. The other six definitions are all relative measures, based on the firm's net income to sales ratio (NIS), the return on assets (ROA) and the one-year stock return (RET1) relative to the two-digit SIC industry of the firm.

In our basic analysis, we use the following definitions of poor performance (for firm i in year t).

- $\text{NIBEX}_{it} < 0$.
- $NIS_{it} < NISAVG_{it}$, where $NISAVG_{it}$ stands for the average NIS among firms with the same 2 digit SIC code as firm i.
- $ROA_{it} < ROAAVG_{it}$, where $ROAAVG_{it}$ stands for the average ROA among firms with the same 2 digit SIC code as firm i.
- $RET1_{it} < MRET1_t$, where $MRET1_t$ stands for the return on a market index. The market index we use is the NASDAQ Composite index if the company is traded on the NASDAQ market, and the S&P 500 Composite index otherwise.

In addition, we check the robustness of our results to the following definitions of firm performance

- $NIS_{it} < NISQ25_{it}$, where $NISQ25_{it}$ stands for the 25th percentile level of NIS among firms with the same 2 digit SIC code as firm i.
- $ROA_{it} < ROAQ25_{it}$, where $ROAQ25_{it}$ stands for the 25th percentile level of ROA among firms with the same 2 digit SIC code as firm i.
- $RET1_{it} < RET1Q25_{it}$, where $RET1Q25_{it}$ stands for the 25th percentile level of one-year stock returns among firms with the same 2 digit SIC code as firm i.

Table 3 gives summary measures of firm performance around CEO turnovers. As the table shows, the average firm whose CEO is forced out has lower profitablility as measured by ratio of net income before extraordinary items to sales, underperforms the industry in terms of return on assets and vastly underperforms the market in terms of stock returns, in the year preceding the CEO change. The distribution of stock returns among the firms in our sample is highly skewed as indicated by the wide difference between the mean and median returns.

[TABLE 3 HERE]

3.3 *Incentives - Return Sensitivity and Dollar Sensitivity*

We concentrate on equity based incentives for measuring CEO incentives. Core, Guay, and Verrecchia (2000) show, the bulk of the average CEO's total incentives are equity-based. Similarly, Hall and Liebman (1998) show that fluctuations in the value of stocks and options account for about 98% of CEO pay-performance sensitivity. In our data, OLS regressions similar to regression 1 in Jensen and Murphy (1990a)[10] indicate that, for a $1000 change in firm value, CEO salary and bonus changes 1.28¢ while total CEO compensation including stock and option grants changes 22.11¢, indicating the importance of equity based incentives. There is an ongoing debate in the literature on how to measure equity-based incentives[11]. Demsetz and Lehn (1985), Jensen and Murphy (1990a) and Yermack (1995) use the dollar change in CEO wealth for a dollar change in firm value (the *Dollar Sensitivity*), while Core and Guay (1999b) use the dollar change in CEO wealth for a percentage change in firm value (the *Return Sensitivity*). Baker and Hall (1998) argue that the latter measure is the appropriate one to use when CEO actions affect firm percentage returns through control of firm strategy. We estimate our regressions on each of the two measures of incentives and find similar results.

[10]The regressions are of the form $\Delta C_t = a + b\Delta V_t + e_t$, where ΔC_t is the change in CEO compensation and ΔV_t is the change in the market value of the firm over the year t. CEO compensation is measured by the sum of salary and bonus in the first regression, and by the sum of salary, bonus and stock and option grants in the second regression.

[11]See Core, Guay and Larcker (2001) for a discussion on the different approaches.

Following Core and Guay (1999b), we calculate incentives in year t as the sum of three components - (i) portfolio incentives from the CEO's holdings of shares (ii) incentives from the CEO's holdings of unexercised options carried over from past years, and (iii) incentives from options granted during year t. Incentives from options are measured using Black-Scholes option sensitivities to stock price. While the disclosures on each year's grants are sufficiently detailed to enable the calculation of the option sensitivities, those on the options carried over from past grants are not. For the latter options, we use the Core and Guay (1999a) method to calculate sensitivities. This method uses estimates of the average exercise price and the average time to maturity, the details of which are summarized in Appendix B.

[TABLES 4 AND 5 HERE.]

Table 4 gives the summary statistics of the different components of CEO incentives, namely, incentives from stocks held, incentives from options granted in the year of the proxy statement, and incentives from the portfolio of unexercised options carried over from past years. The distribution of the return sensitivity in our sample closely matches the distribution given in table 1 of Core and Guay (1999b) for the period 1992-1996 during which the two samples overlap[12]. As in Hall and Liebman (1998), there is a substantial skewness in CEO incentives, with the medians being much lower than the means. The median change in CEO wealth for a 1% change in firm value is $191,461. Equivalently, the median change in CEO wealth is $28.92 for each $1000 change in firm value[13].

[12] For our raw data, including non-CEO observations, the mean, median and standard deviation of return sensitivity are $558,205, $122,765 and $3,440,578, while the corresponding numbers from table 1 of Core and Guay (1999b) are $557,732, $117,434 and $3,680,516 respectively.

[13] These figures are substantially higher than the estimates in Jensen and Murphy, 1990a, reflecting partly the huge increase in equity based compensation since 1986, the end of their study period, and partly, the

Table 5 presents a more detailed analysis of CEO incentives, controlling for performance and turnover. It gives the break down of the median incentive levels by category of exit, when the firm performs poorly and otherwise. As the table shows, the ratio of incentive levels when firm performance is good and otherwise is mostly lower for CEOs who are forced out relative to continuing CEOs, for both measures of sensitivity. Let I_b (I_g) denote the incentives of a CEO whose firm performs poorly (well). Table 5 shows that

$$\left(\frac{I_g}{I_b}\right) \text{ for Continuing CEOs } > \left(\frac{I_g}{I_b}\right) \text{ for Forced CEOs}$$

which implies that

$$\left(\frac{I_g \text{ Forced}}{I_g \text{ No Chg.}}\right) < \left(\frac{I_b \text{ Forced}}{I_b \text{ No Chg.}}\right).$$

This indicates that when the firm's performance is poor, CEOs who are forced out are relatively more incentivized than the continuing CEOs, in comparison to firms that perform well. Our regression analysis will examine whether this holds even after controlling for covariates such as CEO tenure and age.

4 Estimation and Results

We wish to examine whether, conditioning on poor performance, the incidence of forced turnover increases with the incentive level of CEOs. Therefore, we estimate logit models of the determinants of forced CEO change among firms that perform poorly by our various measures.

$$\text{P(Forced Turnover)} = \text{F(Incentives, CEO Specific and Firm Specific Variables)} \quad (14)$$

We are primarily interested in the ceofficient on the incentives variable. The dependent

stock market boom of the '90s. Indeed, our estimates are closer to those of Hall and Liebman (1998), who estimate the median return sensitivity to be about \$125,000 for the year 1994, compared to \$133,352 in our sample.

variable in these regressions is an indicator of forced CEO change[14]. It is an anticipatory variable measured at fiscal year end. Thus, if the CEO change variable is one for a certain year, it implies that the company's CEO at the next year end is not the same as the incumbent. We restrict the estimation to CEOs who have held the office for at least 3 years prior to the year of change (as in Parrino, 1997). Since the model we use is one of a firm learning the CEO's ability by looking the performance, we believe that the CEO must have been in office for at least a few years for the firm to be able to make a judgment on his or her abilities[15].

In estimating equation 14 above, we control for several factors that jointly affect incentives and turnover. These are:
(i) Firm Size has been shown in the literature to be linked to pay-performance sensitivities or incentives[16]. However, larger firms might also have greater turnover propensity following poor performance since they tend to have more independent outside directors on their boards, as well as a larger talent pool from which to choose a successor (Parrino, 1997). Warner, Watts and Wruck (1988) also suggest that larger firms have higher turnover rates. Thus, firm size effects must be controlled for, so as to avoid a spurious correlation between incentives and turnover. We use the natural log of sales as the measure of firm size.

[14]In these regressions, we include only observations with either no CEO change or a forced change, and drop instances of CEO change that are for retirement and other reasons. The results are even stronger when we group the dropped instances in the "no change" category.

[15]The results do not change when we restrict the estimation to CEOs who have held the office for at least 2 years prior to the year of change, with dollar sensitivity as the incentive measure. With this restriction, the results are weaker than those reported with return sensitivity as the incentive measure , but they mostly retain their signs and significance.

[16]While Jensen and Murphy (1990a) show that this relationship is negative for their measure of incentives, Core, Guay and Larcker (2001, pp.14) argue that larger firms might require more talented managers, who are more highly compensated and are therefore wealthier. This, combined with decreasing absolute risk aversion leads to higher incentives for CEOs of larger firms.

(ii) Firms with higher growth opportunities might offer compensation packages with relatively more stock-options in order induce risk-taking by managers. These opportunities might also be correlated with performance, as well as with the rates of turnover following poor performance[17]. We use the ratio of book value to market value of assets of the firm as a proxy for the growth opportunities available to the firm.
(iii) Denis, Denis and Sarin (1997) find evidence that higher levels of stock ownership by top management imply lower sensitivities of turnover to performance. Higher stock ownership by the CEO may imply greater levels of entrenchment, making it more difficult for the board to fire the CEO. Since stock ownership also affects our measure of incentives, we include CEO stock ownership as a control variable.
(iv) Gibbons and Murphy (1992) show that incentive levels generally increase with the proximity to retirement of a CEO. This implies a positive relationship between the tenure or age of the CEO, and incentive levels. Since older CEOs are also more likely to retire rather than be forced out, we need to include CEO age and tenure as control variables.
(v) The ease of monitoring a firm's management, and therefore its CEO incentive levels, together with its CEO turnover rate, might jointly depend on industry and year-specific factors. Therefore we use industry and year dummies in the regressions.

4.1 Baseline Results

Table 6 presents the results using the dollar sensitivity of CEO pay as the measure of incentives, while table 7 gives the results using the return sensitivity of CEO pay as the measure of incentives. The first panel (columns 1 through 4) in each table gives the results for the full sample, while the second panel (columns 5 through 8) gives the rsults for the sample without outliers (discussed below). The four columns of each panel correspond to four different definitions of poor firm performance. Thus column 1 gives the estimates for

[17]For example, high growth firms might understand that there is greater risk of failure associated with new ventures, and therefore, may not punish the manager for failure as readily as a low growth firm.

firms whose net income before extraordinary items was negative over the previous year, column 2 gives the estimates for firms with $NIS_t < NISAVG_t$, column 3 for firms with $ROA < ROAAVG$ and column 4 for firms with $RET1 < MRET1$.

The tables show that incentives have a positive effect on the likelihood of forced turnover. The coefficient on the dollar sensitivity of CEO pay is significant at the 5% level for the NIS measure of performance, and at the 1% level for the other three measures. The results may be best understood in terms of the percentage change in probability of firing at different incentive levels in the distribution. Table 8 presents these calculations for the median firm in the sample. As the table shows, the probability that the CEO will be fired following a year in which the firm's profitability (NIS) is below the industry mean level is 16.39% higher for CEOs at the 60th percentile level of dollar sensitivity as compared to CEOs at the 40th percentile level. Similarly, at a firm whose stock underperforms the market in a given year, the probability that the CEO will be fired is 15.86% higher for CEOs at the 60th percentile level of dollar sensitivity as compared to CEOs at the 40th percentile level. These effects are quite strong, even if the absolute probabilities of firing are low. Corresponding effects for a change in incentive level from the median level to 60th percentile level are 10.71% at a firm with an ROA below the industry average, and 10.28% at a firm whose stock underperforms the market.

[TABLES 6 AND 7 HERE.]

The estimates using return sensitivity (table 7) also indicate the positive impact of incentives on forced turnover. The coefficient on incentives is significant at the 10% level for firms making a net loss and for firms with below industry levels of ROA. While the coefficient with performance based on stock returns is of the opposite sign, it is not significant (p-value=0.92). Table 8 presents the corresponding marginal impact calculations for the median firm in the sample. The table indicates that the probability that the CEO will be fired is 2.07% higher for CEOs at the 60th percentile level of return sensitivity as compared to CEOs at the 40th percentile level, at a poor profitability firm (NIS). The corresponding figure is 1.11% at a firm with ROA below industry average. Table 8 demonstrates that the results are weaker when incentives are measured using return sensitivity rather than dollar sensitivity. One interpretation of this might be that the dollar sensitivity of CEO pay is a more accurate measure of the performance pressure faced by a CEO.

The coefficients on the control variables in these regressions are generally of the expected signs. The book to market ratio has a positive effect on the likelihood of forced turnover, which supports the argument that firms with higher growth opportunities (and lower BTM) understand the inherent risks in these opportunities and do not fire CEOs as readily as more stable firms. CEO stock ownership has a negative effect on the likelihood of being fired for poor performance, a result that echoes Denis, Denis and Sarin (1997). CEOs with longer tenure are also less likely to be fired for poor performance, which is another indicator of entrenchment effects. Firm size and CEO age do not seem to have a significant impact on forced turnover.

4.2 Effect of Outliers

One concern that naturally arises given the skewness of the distribution of incentives in the sample is the effect of outliers. Are the results mainly due a few CEOs with extreme incentive levels who were fired for poor performance or are they valid for the entire sample? To address this issue, we drop those observations at the 1% tails of the sample, which cuts the skewness in third, and repeat the estimations. These estimates, given in the second panels ((columns 5 through 8) of tables 6 and 7, show that dropping the outliers only reinforces the baseline results. Incentives have significantly positive impact on the likelihood of forced turnover - the coefficients on the dollar sensitivity of CEO pay are significant at the 1% level for all four measures of firm performance, while those on the return sensitivity are significant at the 5% level for the three accounting measures and inconclusive with the stock return measure. Thus, outliers do not seem to be driving the main result.

4.3 Results for the Worst Performers

In order to further check whether our results are dependent on our definition of poor performance, we examine the impact of incentives on forced turnover among the firms that perform very poorly relative to their industry. These are defined to be firms that are in the lowest quartile of their industry in terms of each of three performance measures, namely, NIS, ROA and stock returns. Columns 1 through 3 of table 9 contain the estimates for the full sample, and columns 4 through 6, for the sample without outliers, using dollar sensitivity as the incentive measure. Table 10 presents the estimates with the return sensitivity as the performance measure. The results are largely identical to the earlier estimates - the coefficient on dollar incentives is positive and significant at the 5% level or better. The coefficient on return sensitivity is always positive, and is significant at the 5% level with NIS as the performance measure. When incentive outliers are dropped, the results are strengthened, with a consistently positive and significant coefficient on incentives for all measures of performance. CEO stock ownership and CEO tenure continue to have significantly negative effects, and BTM, a positive effect, on the likelihood of forced CEO turnover.

[TABLES 9 AND 10 HERE.]

We also repeated the regressions after redefining poor performers to be those that are in the lower half of their industry (rather than the lowest quartile) in terms of each of three performance measures, namely, NIS, ROA and stock returns. The results (not reported here) are positive and significant at the 5% level with dollar sensitivity as the incentive measure, but not significant when return sensitivity is used as the incentive measure.

4.4 Past Performance

One potential problem with the specification of equation 14 is that it assumes that firms decide on whether to fire their CEOs or not based only on the performance in the most recent year. Before addressing this issue more rigorously, we argue at the outset that such misspecification is not likely to be driving the results. Assume first that lagged performance is actually an omitted variable that is driving the results. In order to do so, it must be positively correlated with both incentives and the firing decision. For example, it may be the case that those firms that fire their CEOs for poor performance in a given year do so, not because their incentives were high, but because the performance in the previous year was also poor. Then the positive correlation of firing with incentives must be due to a positive correlation between incentives and the likelihood of two consecutive years (or more) of poor performance. Such a systematic negative correlation between incentives and performance is an unlikely prospect, in theory as well as reality.

In order to be convinced that lagged performance was not a factor driving the results, we repeated the regressions after including the performance in the previous year in the regressions. Table 11 presents the estimates. The results clearly indicate that lagged performance is not an important determinant of the link between incentives and firing. In fact, the positive effect of incentives on the likelihood of forced turnover is reinforced by including lagged performance.

[TABLE 11 HERE.]

4.5 Volatility

Aggarwal and Samwick (1999) show that the pay-performance sensitivity of executives is closely related to the volatility of stock prices of the firm. Executives at firms with higher stock price volatility face greater risks, and given executive risk aversion, this implies that such firms do not link executive pay to performance as readily as less risky firms. However, Core and Guay (forthcoming) argue that controlling for firm size reverses the Aggarwal and Samwick (1999) result, and that, consistent with Demsetz and Lehn's (1985) prediction, that controlling for firm size, there is an increasing relation between risk and the pay-performance sensitivity. These results indicate that the volatility of performance may be an important variable to be included in any estimation of the relationship between incentives, performance and turnover. Accordingly, we repeated the regressions controlling for the volatility of performance. The control variable we used was the Black-Scholes volatility measure of the stock based on 60 month stock returns, a variable that was readily available in the ExecuComp dataset. Table 12 presents these estimates. The results are similar to the baseline results - the coefficient on the dollar sensitivity of CEO pay is positive and significant at over the 5% level for all four measures of performance, while the coefficient on the return sensitivity is positive and significant at the 10% level or higher for the net loss and ROA measures of performance, and insignificant otherwise.

[TABLE 12 HERE.]

5 Conclusion

In this paper, we examine the issue of the firing threat and its relationship to the optimal incentive contract in the context of the principal-agent relationship. We first derive some theoretical results on the relationship between the optimal incentive contract and the likelihood of being fired for poor performance. We then examine the empirical evidence on the incidence of forced turnover among CEOs with different compensation contracts. We find that CEOs with higher incentives are also more likely to be fired for poor performance.

Defining a year of poor performance to be one in which the firm's profitability (NIS) is below the industry average level, we find that a CEO receiving performance based incentives (measured by the dollar sensitivity) at the 60th percentile level is 16.39% more likely to be fired following a year of poor performance as compared to a CEO with incentives at the 40th percentile level. The corresponding figure with a year of poor performance defined to be one in which the ROA is below the industry average level is 15.07%, and with a year of poor performance defined to be one in which the firm's stock return is below the market return is 15.86%. While the results are weaker with return sensitivity as the incentive measure, they are nevertheless significantly positive for most measures of firm performance.

We do not argue that these effects are very important from the manager's point of view. Indeed, as Jensen and Murphy (1990a) point out, dismissals are not an important source of managerial incentives. Firms nevertheless do fire their CEOs following poor performance, and we attempt to understand how this is related to the issue of incentives. We argue that if firms learn sufficiently about the ability of a manager by observing performance, they may fire managers who perform poorly after being incentivized. Our empirical analysis bears this out. Firms do seem to consider the level of incentives offered in deciding on whether to penalize a CEO for poor performance. CEOs with greater incentives also face greater performance pressures and have less secure jobs.

Appendix A

Proof of Result 2

(i) Comparing equations 10 and 12, we note that the right hand side (RHS) of 12 has all the terms in the RHS of 10 plus two additional negative terms. (Condition 9, combined with the condition that $(1 - z_1 e_1) \in [0, 1]$, implies that the last term in the RHS of 12 is negative.) Hence result 2 (i).

(ii) From equation 10, we have

$$\begin{aligned} g''(e_{1F})\frac{de_{1F}}{db_1} &= z_1 \\ \frac{de_{1F}}{db_1} &= \frac{z_1}{r} \end{aligned} \tag{15}$$

Differentiating both sides of 12 w.r.t. b_1 and ignoring the second order effect $\frac{d^2 u_{20}}{de_1^2}$, we have

$$g''(e_{1R})\frac{de_{1R}}{db_1} = z_1 - 2\delta z_1 \left(\frac{du_{20}^*}{de_{1R}}\right)\left(\frac{de_{1R}}{db_1}\right). \tag{16}$$

Simplifying, we have

$$\frac{de_{1R}}{db_1} = \frac{z_1}{\left(r + 2\delta z_1 \frac{du_{20}^*}{de_{1R}}\right)}. \tag{17}$$

From 15 and 17, given that $\frac{du_{20}^*}{de_{1R}} < 0$, we have result 2 (ii).

Proof of Result 3

Combining equations 11 and 13, we get

$$b_{1R} = b_{1F} + \delta F - 2\delta u_{20}^* + 2\delta\left(\frac{1 - z_1 e_{1R}}{z_1}\right)\frac{du_{20}^*}{de_{1R}} - \left(\frac{e_{1R}}{\left(\frac{de_{1R}}{db_1}\right)} - \frac{e_{1F}}{\left(\frac{de_{1F}}{db_1}\right)}\right). \tag{18}$$

Substituting for e_{1F} and e_{1R} from equations 10 and 12, and for $\frac{de_{1F}}{db_{1F}}$ and $\frac{de_{1R}}{db_{1F}}$ from equations 15 and 17, and rearranging terms, we get

$$\begin{aligned} 2(b_{1R} - b_{1F}) &= \delta F + \left(\frac{\delta(1 - z_1 e_{1R})}{z_1} \right) \frac{du_{20}^*}{de_{1R}} \left(1 - \frac{2\delta z_1}{r} \frac{du_{20}^*}{de_{1R}} \right) + \\ & \delta u_{20}^* \left(\frac{2\delta z_1}{r} \frac{du_{20}^*}{de_{1R}} - 1 \right) + (b_{1R} - 2\delta u_{21}^*) \frac{2\delta z_1}{r} \frac{du_{20}^*}{de_{1R}}. \end{aligned}$$

Further manipulation of the above expression leads to

$$\begin{aligned} 2(b_{1R} - b_{1F}) &= \delta(F - u_{20}^*) + \frac{du_{20}^*}{de_{1R}} \left[\frac{\delta(1 - z_1 e_{1R})}{z_1} \left(1 - \frac{2\delta z_1}{r} \frac{du_{20}^*}{de_{1R}} \right) \right] + \\ & \frac{du_{20}^*}{de_{1R}} \left[\frac{2\delta z_1}{r} (-b_{1R} - \delta u_{21}^* + \delta u_{20}^*) \right], \end{aligned}$$

which leads to

$$\begin{aligned} 2(b_{1R} - b_{1F}) &= \delta(F - u_{20}^*) + \frac{du_{20}^*}{de_{1R}} \left[\frac{\delta}{z_1} - \delta e_{1R} - 2\delta e_{1R} \right] \\ &= [\delta(F - u_{20}^*)] + \frac{du_{20}^*}{de_{1R}} \left[\frac{\delta}{z_1} - 3\delta e_{1R} \right]. \end{aligned}$$

The term in the first square brackets is negative in any equilibrium involving rehiring since rehiring implies that $\Pi_{20}^* > 0$. This, combined with condition 9, implies that $(b_{1R} - b_{1F}) < 0$ if the term in the second square brackets is positive. Hence result 3.

Appendix B

Below, we describe briefly the method used to calculate CEO incentive levels (for full details, see Core and Guay, 1999b). CEO wealth consists of a portfolio of stock and options. Return Sensitivity is defined as the dollar change in CEO wealth for a 1% change in stock price, while Dollar Sensitivity is defined as the dollar change in CEO wealth for a dollar change in stock price. If W denotes CEO wealth in options and stocks held, and and V denotes firm value, then,

$$\text{Return Sensitivity} = \text{r} = 0.01 * dW/(\frac{dV}{V}), \text{ and}$$
$$\text{Dollar Sensitivity} = (\frac{dW}{dV}) = \frac{100*r}{V}.$$

The sensitivity of a stock portfolio to a 1% change in stock price is just 1% of the stock portfolio value. As for the option portfolio, we use the Black-Scholes model incorporating dividends to estimate sensitivities (Black and Scholes, 1973; Merton, 1973). This is in line with prior research by Jensen and Murphy (1990), Yermack (1995), Hall and Liebman (1998) and Core and Guay (1999b). The sensitivity of an option's value to a 1% change in the stock price is the option *delta* multiplied by $0.01P$, where P is the stock price. Thus, denoting the number of shares and options held by N_s and N_o,

$$\text{Stock Portfolio Return Sensitivity} = 0.01 * N_s P.$$
$$\text{Option Portfolio Return Sensitivity} = 0.01 * \delta N_o P.$$

To calculate the option delta, we need the stock price, exercise price, time to maturity, expected stock return volatility, expected dividend yield, and the risk-free rate. For each fiscal year, firms are required to disclose the exercise price and time to maturity for options that are granted in that particular year. Therefore, the option delta is readily calculated for these options. However, for options granted in previous years, such details are not available and would have to be collected from past proxy statements. Core and Guay (1999a) present a simplified method for calculating the values of options granted in past years using information from only the latest proxy statement. This involves (i) Approximating the exercise price with the year-end price minus the current realizable value per option and (ii) Setting the time to maturity of unexercisable options to one year less than time to maturity of most recent year's grant (or nine years if no new grant was made), and of exercisable options to three years less than time to maturity of unexercisable options (or six years if no new grant was made). Core and Guay (1999a) show that this method yields estimates of option portfolio sensitivities that are 99% correlated with the measures that would be obtained if the parameters of a CEO's option portfolio were known.

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Table 1: CEO Changes, by reason for the change

CEO changes between 1993-1999 in the ExecuComp database classified by the reason for the change. A CEO change is defined as a change in the identity of the CEO in the ExecuComp database. The reason for the change was identified through a search of the Lexis-Nexis Academic Universe database for news announcements on the change. CEO changes on account of death, illness, corporate control changes and moves to other firms are omitted, as are changes that could not be cross-checked through news reports. Only firms in the non-financial sector and non-regulated industries are included. Data Source: ExecuComp, 1993-1999 & Lexis-Nexis Academic Universe.

Year	No Change	Retirement	Forced	Other	Total
1993	813	35	3	2	853
1994	1076	70	12	14	1172
1995	1137	71	15	20	1243
1996	1176	55	15	30	1276
1997	1190	89	13	20	1312
1998	1247	74	18	23	1362
1999	1277	93	18	15	1403
Total	7916	487	94	124	8621

Table 2: Summary Statistics of Key Variables

Descriptive Statistics of the key variables used in the estimation. Total compensation includes salary, bonus, other annual compensation, restricted stock and stock options exercised during the year and long term incentive payouts. Stock options are valued using the Black-Scholes method. Data Source: ExecuComp, 1993-1999.

Variable	Mean	Median	Std. Dev.
No CEO Change			
Sales ($ mn)	3441.79	891.19	9785.96
Market Value ($ mn)	4791.73	914.57	16661.99
Book to Market	0.60	0.60	0.27
Return on Assets (%)	4.21	5.51	13.25
Stock Return (%)	32.62	12.09	710.76
Age of CEO (Years)	55.52	56.00	7.79
Tenure of CEO (Years)	7.04	5.00	7.02
Total Compensation ($ '000)	2981.98	1141.55	12566.87
Ownership (%)	4.57	1.70	7.74
Forced Change			
Sales ($ mn)	4870.17	1097.55	9062.87
Market Value ($ mn)	6854.70	850.34	21171.79
Book to Market	0.70	0.68	0.29
Return on Assets (%)	-5.08	1.30	22.76
Stock Return (%)	-12.88	-12.11	35.92
Age of CEO (Years)	53.24	54.00	5.94
Tenure of CEO (Years)	5.12	4.00	4.10
Total Compensation ($ '000)	2399.70	978.33	3326.24
Ownership (%)	1.64	0.62	2.49
Full Sample			
Sales ($ mn)	3557.26	923.13	10100.52
Market Value ($ mn)	4915.48	930.56	17352.74
Book to Market	0.61	0.60	0.27
Return on Assets (%)	4.00	5.42	13.51
Stock Return (%)	31.19	11.08	685.16
Age of CEO (Years)	55.97	56.00	7.85
Tenure of CEO (Years)	7.18	5.00	7.08
Total Compensation ($ '000)	2995.66	1152.80	12151.13
Ownership (%)	4.48	1.66	7.62

Table 3: Firm Performance Around Turnovers

Measures of firm performance in the previous fiscal year. NIS is the ratio of Net Income (before adjustments for extraordinary items) to Sales, ROA is the return on assets, and $RET1$, the stock return over the previous fiscal year. $NISAVG$ and $ROAAVG$ are the average NIS and ROA of the 2-digit SIC industry to which the firm belongs. $MRET1$ is the return, over the firm's fiscal year, on the NASDAQ Composite Index if the firm is traded on the NASDAQ market, and on the S&P 500 Composite Index otherwise. Data Source: ExecuComp, 1993-1999.

Change	$NIS - NISAVG$		$ROA - ROAAVG$		$RET1 - MRET1$	
	Mean	Median	Mean	Median	Mean	Median
No Change	-0.30	2.44	0.25	1.34	7.95	-8.33
Forced	-0.42	-1.93	-8.96	-2.83	-38.59	-34.64
Full Sample	-0.29	2.35	0.05	1.24	6.56	-9.44

Table 4: Components of CEO Incentives

Total Sensitivity is the change in CEO wealth for a 1% change in firm wealth. It is calculated as the sum of the sensitivities of the 3 components of the CEO's portfolio - shares, options granted this year (current options) and the portfolio of unexercised options carried over from past years. The sensitivity of the portfolio of unexercised past options is calculated using the Core and Guay (1999a) method. Dollar sensitivity is the dollar change in CEO wealth for a dollar change in firm value. The full sample includes CEO changes for retirement and other reasons.

Variable	Mean	Median	Std. Dev.
No CEO Change			
Share Sensitivity ($'000)	913.45	62.68	10369.34
Curr. Option Sensitivity ($'000)	47.34	9.85	238.50
Old Option Sensitivity ($'000)	176.56	50.42	620.46
Total Sensitivity ($'000)	1067.87	193.18	9168.87
Dollar Sensitivity ($ per $1000)	58.68	29.47	82.46
Forced Turnover			
Share Sensitivity ($'000)	87.81	22.41	175.14
Curr. Option Sensitivity ($'000)	44.58	3.78	194.50
Old Option Sensitivity ($'000)	186.27	54.38	584.95
Total Sensitivity ($'000)	328.31	130.39	754.22
Dollar Sensitivity ($ per $1000)	32.72	21.45	50.31
Full Sample			
Share Sensitivity ($'000)	970.38	62.22	12626.30
Curr. Option Sensitivity ($'000)	45.92	9.29	230.30
Old Option Sensitivity ($'000)	174.89	50.48	603.70
Total Sensitivity ($'000)	1134.25	191.46	11887.59
Dollar Sensitivity ($ per $1000)	57.57	28.92	81.15

Table 5: Incentive Levels, by Performance and Turnover

Median incentive levels of CEOs, by CEO change category and firm performance. Return Sensitivity is the dollar change in CEO wealth for a 1% change in firm wealth. Dollar Sensitivity is the dollar change in CEO wealth for a dollar change in firm value. NIS is the ratio of Net Income (before adjustments for extraordinary items) to Sales, ROA is the return on assets, and $RET1$, the stock return over the previous fiscal year. $NISAVG$ and $ROAAVG$ are the average NIS and ROA of the 2-digit SIC industry to which the firm belongs. $MRET1$ is the return, over the firm's fiscal year, on the NASDAQ Composite Index if the firm is traded on the NASDAQ market, and on the S&P 500 Composite Index otherwise.

	Dollar Sensitivity		Return Sensitivity	
	No Change	Forced	No Change	Forced
Net Profit	218.60	121.64	29.25	19.55
Net Loss	93.55	81.60	31.36	23.79
Ratio	2.34	1.49	0.93	0.82
$NIS \geq NISAVG$	246.58	152.72	29.04	17.76
$NIS < NISAVG$	121.53	74.31	30.44	23.09
Ratio	2.03	2.06	0.95	0.77
$ROA \geq ROAAVG$	252.58	196.39	28.91	13.72
$ROA < ROAAVG$	129.44	97.88	30.37	24.16
Ratio	1.95	2.01	0.95	0.57
$RET1 \geq MRET1$	262.46	59.38	29.22	16.42
$RET1 < MRET1$	157.09	134.08	29.54	21.51
Ratio	1.67	0.44	0.99	0.76

Table 6: Dollar Sensitivity and Forced Turnover - I

Logit estimation of the factors affecting the probability of CEO turnover among firms that perform poorly. Incentives are measured by the dollar change in CEO wealth (including stock and options) for a dollar change in firm value, measured at prior fiscal year-end. Columns 1 and 5 present estimates for firms whose net income before extraordinary items was negative over the previous year, columns 2 and 6 for firms whose ratio of net income to sales (NIS) was below the 2-digit SIC industry average over the previous year, columns 3 and 7 for firms whose ROA over the previous year was less than industry average, and columns 4 and 8 for firms whose previous year stock returns (RET1) were below the relevant index returns. Columns 1 through 4 are for the full sample and columns 5 through 8 are for the sample without outliers. The dependent variable is zero if there is no turnover and 1 if the CEO is forced out for performance related reasons. BTM is the ratio of book to market values of the assets of the firm. Age and tenure pertain to the CEO. Industry and year dummies not reported. *p*-values in parentheses. * indicates significant at 10%, * significant at 5%; *** significant at 1%. Data Source: ExecuComp, 1993-1999.

	Full Sample				Without Outliers			
	Net Loss	Low NIS	Low ROA	Low RET1	Net Loss	Low NIS	Low ROA	Low RET1
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Log Sales	0.278	-0.034	-0.057	0.072	0.281	0.028	-0.012	0.089
	(0.312)	(0.865)	(0.730)	(0.560)	(0.317)	(0.895)	(0.941)	(0.445)
BTM	0.576	2.271**	1.917**	1.356*	0.525	2.432**	2.078**	1.523**
	(0.723)	(0.022)	(0.038)	(0.072)	(0.746)	(0.020)	(0.029)	(0.049)
Age	0.074*	0.02	0.038	0.024	0.074**	0.032	0.044*	0.038
	(0.054)	(0.476)	(0.147)	(0.366)	(0.046)	(0.263)	(0.080)	(0.138)
Ownership	-0.412***	-0.234***	-0.260***	-0.222***	-0.419***	-0.287***	-0.304***	-0.289***
	(0.000)	(0.004)	(0.001)	(0.010)	(0.001)	(0.001)	(0.000)	(0.000)
Tenure	-0.07	-0.083**	-0.091**	-0.069**	-0.051	-0.090**	-0.095**	-0.085***
	(0.191)	(0.046)	(0.030)	(0.033)	(0.448)	(0.035)	(0.028)	(0.010)
Incentives	25.570***	9.012**	10.158***	8.132***	26.235***	16.146***	15.672***	17.114***
	(0.000)	(0.017)	(0.009)	(0.008)	(0.000)	(0.001)	(0.001)	(0.000)
Constant	-7.050**	-16.973***	-17.254	-18.635***	-5.581**	-20.351***	-18.105***	-20.012
	(0.022)	(0.000)	(.)	(0.000)	(0.037)	(0.000)	(0.000)	(.)
No. of Obs.	141	539	629	1463	139	530	618	1431

Table 7: Return Sensitivity and Forced Turnover - I

Logit estimation of the factors affecting the probability of CEO turnover among firms that perform poorly. Incentives are measured by the dollar change in CEO wealth (including stock and options) for a 1% change in firm value, measured at prior fiscal year-end. Columns 1 and 5 present estimates for firms whose net income before extraordinary items was negative over the previous year, columns 2 and 6 for firms whose ratio of net income to sales (NIS) was below the 2-digit SIC industry average over the previous year, columns 3 and 7 for firms whose ROA over the previous year was less than industry average, and columns 4 and 8 for firms whose previous year stock returns (RET1) were below the relevant index returns. Columns 1 through 4 are for the full sample and columns 5 through 8 are for the sample without outliers. The dependent variable is zero if there is no turnover and 1 if the CEO is forced out for performance related reasons. BTM is the ratio of book to market values of the assets of the firm. Age and tenure pertain to the CEO. Industry and year dummies not reported. *p*-values in parentheses. * indicates significant at 10%, ** significant at 5%; *** significant at 1%. Data Source: ExecuComp, 1993-1999.

	Full Sample				Without Outliers			
	Net Loss	Low NIS	Low ROA	Low RET1	Net Loss	Low NIS	Low ROA	Low RET1
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Log Sales	-0.0248	-0.101	-0.1226	0.0337	-0.0782	-0.1311	-0.1441	0.0214
	(0.921)	(0.614)	(0.458)	(0.797)	(0.782)	(0.527)	(0.385)	(0.883)
BTM	0.2141	2.1102**	1.7818*	1.3052*	0.691	2.3292**	1.9847**	1.3754*
	(0.891)	(0.040)	(0.067)	(0.094)	(0.646)	(0.021)	(0.033)	(0.087)
Age	0.0385	0.0082	0.025	0.0173	0.0464	0.0116	0.0253	0.0181
	(0.449)	(0.810)	(0.441)	(0.568)	(0.326)	(0.719)	(0.443)	(0.539)
Ownership	-0.2784*	-0.1552**	-0.1828**	-0.1386*	-0.1803*	-0.1712**	-0.2078**	-0.1448*
	(0.085)	(0.027)	(0.013)	(0.059)	(0.060)	(0.016)	(0.010)	(0.061)
Tenure	-0.0537	-0.0909**	-0.0921**	-0.0632*	-0.0666	-0.1170**	-0.0992**	-0.0640*
	(0.311)	(0.041)	(0.037)	(0.061)	(0.275)	(0.041)	(0.024)	(0.067)
Incentives	0.3652*	0.1737	0.0901*	-0.0051	0.0010**	0.4691**	0.3120**	0.0619
(x 10^{-3})	(0.054)	(0.199)	(0.090)	(0.915)	(0.017)	(0.036)	(0.034)	(0.774)
Constant	-1.1505	-17.9903	-15.1047	-16.9214	-1.6334	-18.8869	-15.676	-17.9620***
	(0.728)	(.)	(.)	(.)	(0.591)	(.)	(.)	(0.000)
No. of Obs.	143	538	632	1464	142	534	624	1445

Table 8: Marginal Effect of Incentives on Forced Turnover

The table gives the percentage increase in the probability of being fired following poor firm performance, for the median CEO, as the incentive levels increase from the 40th percentile level or the median level to the 60th percentile level. Dollar sensitivity is the dollar change in CEO wealth for a dollar change in firm value. Return Sensitivity is the change in CEO wealth for a 1% change in firm wealth. NIS is the ratio of net income to sales and RET1 is the return on the firm's stock over its fiscal year.

	Dollar Sensitivity		Return Sensitivity	
	40th to 60th	Median to 60th	40th to 60th	Median to 60th
Net Loss	26.55	19.55	3.51	1.62
Low NIS	16.39	10.71	2.07	1.22
Low ROA	15.07	9.60	1.11	0.66
Low RET1	15.86	10.28	-	-

Table 9: Dollar Sensitivity and Forced Turnover - II

Logit estimation of the factors affecting the probability of CEO turnover among firms that perform poorly. Incentives are measured by the dollar change in CEO wealth (including stock and options) for a dollar change in firm value, measured at prior fiscal year-end. Poor performance is defined as being in the lowest quartile of the industry in terms of ratio of net income to sales (NIS) for the estimations in columns 1 and 2, ROA for columns 3 and 4, and stock returns (RET1) for columns 5 and 6. Columns 1, 3 and 5 are for the full sample and columns 2, 4 and 6 are for the sample without outliers. The dependent variable is zero if there is no turnover and 1 if the CEO is forced out for performance related reasons. BTM is the ratio of book to market values of the assets of the firm. Age and tenure pertain to the CEO. Industry and year dummies not reported. *p*-values in parentheses. * indicates significant at 10%, ** significant at 5%; *** significant at 1%. Data Source: ExecuComp, 1993-1999.

	Full Sample			Without Outliers		
	Low NIS	Low ROA	Low RET1	Low NIS	Low ROA	Low RET1
	(1)	(2)	(3)	(4)	(5)	(6)
Log Sales	0.0139	-0.0069	0.0387	0.014	0.0042	0.0972
	(0.944)	(0.970)	(0.803)	(0.944)	(0.981)	(0.544)
BTM	0.7314	-0.0364	1.0592	0.7299	-0.0823	1.1963
	(0.423)	(0.973)	(0.188)	(0.424)	(0.939)	(0.154)
Age	0.0486*	0.0616**	0.0476	0.0486*	0.0625**	0.0524
	(0.069)	(0.035)	(0.158)	(0.069)	(0.033)	(0.131)
Ownership	-0.3259***	-0.3641***	-0.2294***	-0.3263***	-0.3710***	-0.2781***
	(0.002)	(0.001)	(0.004)	(0.002)	(0.001)	(0.002)
Tenure	-0.1111***	-0.1023***	-0.1354***	-0.1100***	-0.1050***	-0.1369**
	(0.008)	(0.006)	(0.009)	(0.010)	(0.009)	(0.013)
Incentives	13.9814**	16.3016***	9.4660**	13.9906**	16.0846***	15.3021***
	(0.012)	(0.004)	(0.033)	(0.012)	(0.005)	(0.005)
Constant	-4.9330**	-4.1820*	-20.5131***	-5.7756**	-3.7149	-19.6822
	(0.043)	(0.059)	(0.000)	(0.013)	(0.120)	(.)
No. of Obs.	328	328	526	322	322	519

Table 10: Return Sensitivity and Forced Turnover - II

Logit estimation of the factors affecting the probability of CEO turnover among firms that perform poorly. Incentives are measured by the dollar change in CEO wealth (including stock and options) for a 1% change in firm value, measured at prior fiscal year-end. Poor performance is defined as being in the lowest quartile of the industry in terms of ratio of net income to sales (NIS) for the estimations in columns 1 and 2, ROA for columns 3 and 4, and stock returns (RET1) for columns 5 and 6. Columns 1, 3 and 5 are for the full sample and columns 2, 4 and 6 are for the sample without outliers. The dependent variable is zero if there is no turnover and 1 if the CEO is forced out for performance related reasons. BTM is the ratio of book to market values of the assets of the firm. Age and tenure pertain to the CEO. Industry and year dummies not reported. *p*-values in parentheses. * indicates significant at 10%, ** significant at 5%; *** significant at 1%. Data Source: ExecuComp, 1993-1999.

	Full Sample			Without Outliers		
	Low NIS	Low ROA	Low RET1	Low NIS	Low ROA	Low RET1
	(1)	(2)	(3)	(4)	(5)	(6)
Log Sales	-0.1778	-0.1202	-0.0312	-0.1778	-0.169	-0.0934
	(0.332)	(0.477)	(0.838)	(0.332)	(0.342)	(0.555)
BTM	0.649	-0.1635	0.9176	0.649	0.0482	1.2559
	(0.441)	(0.876)	(0.313)	(0.441)	(0.960)	(0.130)
Age	0.0385	0.04	0.0371	0.0385	0.044	0.0406
	(0.233)	(0.246)	(0.332)	(0.233)	(0.177)	(0.262)
Ownership	-0.2367***	-0.2239**	-0.1354**	-0.2367***	-0.2355***	-0.1707***
	(0.006)	(0.018)	(0.040)	(0.006)	(0.007)	(0.007)
Tenure	-0.1332***	-0.1047***	-0.1315**	-0.1332***	-0.1253***	-0.1538**
	(0.007)	(0.005)	(0.010)	(0.007)	(0.007)	(0.014)
Incentives (x 10^{-3})	0.6552**	0.0768	0.0056	0.6552**	0.5475**	0.3954*
	(0.011)	(0.233)	(0.684)	(0.011)	(0.035)	(0.061)
Constant	-1.5249	-1.8591	-17.1974***	-1.5249	-2.0572	-19.2927
	(0.556)	(0.470)	(0.000)	(0.556)	(0.403)	(.)
No. of Obs.	326	327	522	326	325	515

Table 11: Results with Lagged Performance

Logit estimation of the factors affecting the probability of CEO turnover among firms that perform poorly. Dollar Sensitivity is the dollar change in CEO wealth (including stock and options) for a dollar change in firm value, and Return Sensitivity is the dollar change in CEO wealth for a 1% change in firm value. Columns 1 and 5 present estimates for firms whose net income before extraordinary items was negative over the previous year, columns 2 and 6 for firms whose ratio of net income to sales (NIS) was below the 2-digit SIC industry average over the previous year, columns 3 and 7 for firms whose ROA over the previous year was less than industry average, and columns 4 and 8 for firms whose previous year stock returns (RET1) were below the relevant index returns. The dependent variable is zero if there is no turnover and 1 if the CEO is forced out for performance related reasons. BTM is the ratio of book to market values of the assets of the firm. Age and tenure pertain to the CEO. Lag Perf is the one year lagged performance of the firm by the relevant measure. Industry and year dummies not reported. *p*-values in parentheses. * indicates significant at 10%, ** significant at 5%; *** significant at 1%. Data Source: ExecuComp, 1993-1999.

	Dollar Sensitivity				Return Sensitivity			
	Net Loss	Low NIS	Low ROA	Low RET1	Net Loss	Low NIS	Low ROA	Low RET1
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Log Sales	-0.302	-0.073	-0.090	0.069	-0.458*	-0.276	-0.172	0.023
	(0.316)	(0.722)	(0.589)	(0.578)	(0.064)	(0.223)	(0.301)	(0.855)
BTM	1.899	2.182**	1.870**	0.964	1.039	2.501**	1.761*	0.921
	(0.265)	(0.027)	(0.034)	(0.258)	(0.483)	(0.012)	(0.070)	(0.286)
Age	0.106***	0.026	0.039	0.024	0.051	0.026	0.026	0.017
	(0.002)	(0.370)	(0.142)	(0.375)	(0.312)	(0.381)	(0.432)	(0.577)
Ownership	-0.589***	-0.238***	-0.263***	-0.213**	-0.426**	-0.237***	-0.208***	-0.135*
	(0.000)	(0.004)	(0.001)	(0.012)	(0.033)	(0.007)	(0.010)	(0.061)
Tenure	-0.066	-0.081**	-0.088**	-0.068**	-0.042	-0.102*	-0.085**	-0.063*
	(0.250)	(0.046)	(0.030)	(0.040)	(0.454)	(0.053)	(0.042)	(0.063)
Incentives	34.303***	8.127**	9.611**	7.909***	0.531**	0.742***	0.115**	0.008
	(0.000)	(0.032)	(0.015)	(0.009)	(0.033)	(0.005)	(0.040)	(0.719)
Lag Perf	0.006*	3.303	0.023	-0.005	0.004	2.971	0.022	-0.005
	(0.051)	(0.311)	(0.619)	(0.271)	(0.119)	(0.387)	(0.639)	(0.291)
Constant	-7.792**	-18.484	-17.977	-17.544***	-2.682	-17.945	-16.095	-17.305***
	(0.028)	(.)	(.)	(0.000)	(0.506)	(.)	(.)	(0.000)
No. of Obs.	135	495	577	1364	135	495	577	1364

Table 12: Results with Volatility

Logit estimation of the factors affecting the probability of CEO turnover among firms that perform poorly. Dollar Sensitivity is the dollar change in CEO wealth (including stock and options) for a dollar change in firm value, and Return Sensitivity is the dollar change in CEO wealth for a 1% change in firm value. Columns 1 and 5 present estimates for firms whose net income before extraordinary items was negative over the previous year, columns 2 and 6 for firms whose ratio of net income to sales (NIS) was below the 2-digit SIC industry average over the previous year, columns 3 and 7 for firms whose ROA over the previous year was less than industry average, and columns 4 and 8 for firms whose previous year stock returns (RET1) were below the relevant index returns. The dependent variable is zero if there is no turnover and 1 if the CEO is forced out for performance related reasons. BTM is the ratio of book to market values of the assets of the firm. Age and tenure pertain to the CEO. Volatility is the standard deviation of stock returns measured over 60 months. Industry and year dummies not reported. *p*-values in parentheses. * indicates significant at 10%, ** significant at 5%; *** significant at 1%. Data Source: ExecuComp, 1993-1999.

	Dollar Sensitivity				Return Sensitivity			
	Net Loss	Low NIS	Low ROA	Low RET1	Net Loss	Low NIS	Low ROA	Low RET1
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Log Sales	-0.002	-0.043	-0.065	0.111	-0.365	-0.114	-0.13	0.062
	(0.995)	(0.837)	(0.699)	(0.380)	(0.227)	(0.579)	(0.440)	(0.645)
BTM	0.917	2.316**	1.954**	1.280*	0.267	2.173**	1.822*	1.24
	(0.686)	(0.021)	(0.034)	(0.090)	(0.876)	(0.032)	(0.059)	(0.114)
Age	0.088*	0.026	0.044	0.03	0.062	0.014	0.031	0.024
	(0.083)	(0.399)	(0.109)	(0.282)	(0.304)	(0.689)	(0.360)	(0.434)
Ownership	-0.465***	-0.233***	-0.260***	-0.229***	-0.358*	-0.157**	-0.185**	-0.136*
	(0.000)	(0.003)	(0.001)	(0.007)	(0.074)	(0.022)	(0.011)	(0.065)
Tenure	-0.078	-0.086**	-0.094**	-0.071**	-0.067	-0.092**	-0.094**	-0.064*
	(0.219)	(0.039)	(0.023)	(0.027)	(0.278)	(0.033)	(0.030)	(0.057)
Incentives	29.621***	9.054**	10.178***	9.389**	0.480**	0.194	0.092*	-0.007
	(0.000)	(0.017)	(0.008)	(0.011)	(0.041)	(0.201)	(0.092)	(0.908)
Volatility	-5.384	0.169	0.259	0.796	-3.894	0.228	0.305	0.82
	(0.191)	(0.846)	(0.685)	(0.129)	(0.279)	(0.783)	(0.624)	(0.120)
Constant	-1.5	-19.139***	-17.659***	-19.669***	1.463	-18.448	-16.266	-18.786***
	(0.740)	(0.000)	(0.000)	(0.000)	(0.729)	(.)	(.)	(0.000)
No. of Obs.	137	526	614	1403	137	523	615	1406