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*Hamid Mehran, David Yermack*

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Hamid Mehran[a] and David Yermack[b]


[a] *Kellogg Graduate School of Management, Department of Finance, Leverone Hall,*
*Northwestern University, Evanston, IL 60208-2001*

[b] *Stern School of Business, Department of Finance, Management Education Center,*
*44 West Fourth Street, Suite 9-190, New York University, New York, NY 10012-1126*

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## Abstract

An examination of CEO compensation and turnover in 452 large U.S. companies between 1984 and 1991 provides evidence that compensation policies play a significant role in retaining the services of top managers. We find inverse associations between the probability of CEO turnover and the amount by which their compensation is higher than expected. We also find inverse associations between the probability of CEO turnover and the dollar value of stock option compensation in relation to cash pay. The results, which are significant across the entire sample of CEOs, appear stronger for subsamples of CEO departures likely to have been voluntary.

*Key words*: Incentives; Compensation; Ownership; Turnover
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# Compensation and Top Management Turnover

Because superior human resources give a firm a competitive advantage over its rivals, retaining good managers is a high priority for nearly all corporations (Wall Street Journal, 1991). Anecdotal evidence suggests that retaining key employees has become more difficult for large companies in recent years (see e.g., Miller, 1992), partly because of the growing allure of the economy's entrepreneurial high-tech and small-business sectors (Bushnell, 1987).

Our paper explores one element of how firms attempt to retain their top managers, studying how turnover patterns of CEOs are influenced by the structure of their compensation contracts. Theorists have argued that both the level and structure of executives' pay should influence their decisions about whether to remain with their firms. With respect to the level of pay, one compensation strategy to discourage turnover involves paying an "efficiency wage" above what an executive could receive from alternative opportunities (Shapiro and Stiglitz, 1984). Proponents of efficiency wages note that the "excess" pay not only can reduce the costs associated with turnover, but it can also encourage executives to value their jobs and develop firm-specific human capital (Milgrom and Roberts, 1992). An alternative strategy for retaining managers is to change the mix of their pay to include more contingent stock-based incentive compensation (Weber, 1991). Stock-based pay, often in the form of options, usually takes several years to vest and provides rewards linked to the long-term performance. We therefore

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test two hypotheses: that companies experience lower CEO turnover when their top managers receive higher compensation than expected, and that turnover is also lower when CEOs receive more equity-based compensation relative to cash pay.

Using compensation data for CEOs of 452 large U.S. companies between 1984 and 1991, and controlling for corporate performance, age of the CEO, firm size, and other variables, we find inverse associations between the probability of CEO turnover and the amount by which their compensation is higher than predicted by a regression model that includes firm size, industry, performance, and other relevant variables. We also find inverse associations between the probability of CEO turnover and the amount of stock option compensation in relation to cash pay. The results, which are significant across the entire sample of CEOs, appear stronger for a subsample of CEO departures likely to have been voluntary.

In line with other theories and past studies of CEO turnover, we also find that CEOs are less likely to lose their jobs if (1) they own a large fraction of the company's stock; (2) they founded the company or belong to the founding family; or (3) company performance is strong. Also, we find that CEOs are more likely to leave if the company has an unstable operating environment, as indicated by the standard deviation of annual changes in ROA. This last result may reflect a tendency by boards to punish CEOs for delivering inconsistent results, or may reflect CEOs' preferences to work in more stable environments.

Our results about the importance of the level and structure of compensation extend the prior literature on CEO turnover, though the role of the level of pay has been examined in a more parsimonious framework by Coughlan and Schmidt (1985). Previous authors have studied how CEO turnover is affected by such factors as company performance (Coughlan and Schmidt,

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1985, and Warner, Watts and Wruck, 1988), the composition of the board of directors (Weisbach, 1988), the age, stock ownership and organizational "power" of individual CEOs (Mørck, Shleifer and Vishny, 1989), and the operation of the market for corporate control (Martin and McConnell, 1991). We also believe that our paper contributes to the literature by investigating the application of efficiency wage theory to top managers, a contrast to prior studies (e.g. Krueger, 1991) that rely on data for lower-ranked employees .

The remaining sections of the paper are organized as follows: Section I reviews the relevant literature and presents hypotheses. Section II describes the sample selection procedure and variables used. Empirical results and their interpretation are presented in Section III. Section IV summarizes the key findings.

## I. Compensation Policy and Retention of Top Executives

The importance of using compensation contracts to reduce managerial turnover hinges two issues: whether high levels of turnover are costly to a firm, and whether the level and type of compensation help keep managers tied to their firms.

*A. Costs of Managerial Turnover*

The costs of executive turnover have been debated among labor economists for many years (see Osterman, 1988). Some theorists view high rates of labor mobility as important for matching employees' skills with the jobs to which they are best suited, a conjecture that suggests all firms might perform better if employees moved freely among companies. However, each episode of employee turnover results in costs specific to the firm that is losing the employee,

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such as the company's loss of value from previous investments in recruiting and training that individual. Although the employee's firm-specific human capital is not valuable outside the firm or to its competitors, the firm loses rents and quasi-rents with the departure of the employee (Milgrom and Roberts, 1992). High turnover may also affect the morale and productivity of workers who remain with the company or provide a negative signal about the firm and its prospects. Further disruption to the organization could occur because talented managers have ongoing incentives to shop for outside offers or engage in disingenuous bargaining in order to extract greater wages from their current employers (Milgrom and Roberts, 1992, p. 345 or Lazear, 1995, p. 76). Also, a manager could develop a valuable new idea and leave the firm to establish his own company, rather than share the idea with his employer. This problem arises because the manager might not capture the full monopoly rent if he stays with his original firm (Jackson and Lazear, 1991).

Several recent legal disputes between major corporations highlight the seriousness that firms place upon retaining the services of top- and even mid-level executives. In a noted recent case, General Motors alleged that its former purchasing chief, J. Ignacio Lopez de Arriortua, took valuable strategic information and confidential documents and disclosed them to his new employer, Volkswagen, at GM's expense (Simison, 1993). In a similar case, Dow Chemical Co. recently sued General Electric Co. for allegedly stealing trade secrets by hiring 14 employees from its plastics divisions (Ewing, 1997).

## B. *Limiting the Costs of Turnover*

To reduce the incidence of managerial turnover, many firms include certain provisions in

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the contractual bargains they reach with their key executives. These contract terms can be explicit, such as non-compete clauses written into employment contracts (see Kitch, 1980), as well as implicit, such as a compensation structure that gives managers incentives not to leave.

Though noncompete agreements have appeared in employment contracts with growing frequency in recent years (Waldman, 1992), U.S. courts have typically construed these clauses quite narrowly because of the Constitution's ban on involuntary servitude. While some successful court cases have barred lower-ranked employees from working for competitors, particularly in the brokerage industry (Wall Street Journal, 1992), the enforcement of noncompete agreements against top executives is generally rare unless the employee leaves with trade secrets (see Himelstein, Schiller and Zinn, 1993, and Siler and Zellner, 1991, for exceptions).

Compensation incentives represent an alternative to the threat of legal sanctions as a way of mitigating costs associated with managerial turnover. A straightforward method for firms to retain their managers would be to offer premium or "excess" pay with a higher value than the contract offered by any competitor (see the efficiency wage models surveyed by Katz, 1986). In theory, firms should be willing to match any offer received by an executive up to the point where the compensation cost just equals the executive's marginal product, a process that should lead to a value-maximizing solution in the economy (Milgrom and Roberts, 1992).

However, relying on the level of pay as a means of retaining top managers involves certain problems and costs that might be avoided by using more sophisticated compensation schemes such as stock-based compensation. In practice an employer will have difficulty gathering sufficient information to discern the reservation wages of the manager (see Milgrom

and Roberts, 1992, p. 345). Contracts based strictly on cash pay, even if they include a bonus component for outstanding performance, require subjective decisions by the board of directors about the manager's contributions to firm value. This process is likely to be costly and time-consuming for the board, compared to the alternative of using stock-based pay to give the managers a portion of stockholder gains. Cash-based contracts will also require frequent renegotiation for successful managers who receive offers from other firms. These renegotiation costs could also be reduced considerably by awarding stock-based pay, since it has an unlimited payoff tied to the manager's productivity. Finally, not all firms may be able to compete for executive talent solely on the basis of cash compensation. For example, firms that are cash-constrained because of small size or the presence of expensive investment opportunities will have to use other methods of delivering value to executives. For example, in 1997 the software firm Oracle Corp. gave its president an award of 2,500,000 stock options in response to an offer he received to become CEO of competitor Novell Inc. (Clark, 1997).

The benefits of stock-based pay for retaining managers have been suggested by Nitzan and Pakes (1983), Jackson and Lazear (1991) and many others. They argue that stock-based pay helps retain managers because its payoffs are deferred several years into the future, requiring executives to remain with the firm in order to collect. Stock options, the most common type of stock-based pay, usually require employees to remain with the firm for three to five years before the options become fully "vested" so they may be exercised. Similarly, restricted stock plans provide shares of stock to managers but require them to remain with the firm over some specified

period (again, usually three to five years) before the stock may be sold.[1]  Related compensation plans include "performance shares" and "phantom stock," which provide deferred cash payouts tied to long-term changes in a company's share price.  Rivals who want to recruit a firm's managers must pay them the present value of non-vested stock-based awards that they surrender if they change firms.[2]  Some stock option plans impose an even greater penalty on managers who leave to work for competitors, requiring them to refund to the firm all payoffs received as far back as three years prior to the departure date (Jha, 1997).

The structure of stock-based pay, which rewards managers for long-term appreciation in firm value, encourages managers to take risks by making long-term investments that promise large future payoffs but reduce short-term cash flow and earnings.  However, empirical studies of whether managers respond this way to stock option awards have yielded ambiguous results (see DeFusco et al., 1991).  The temporal structure of this risk-reward framework encourages managers to remain with their firms, for three related but somewhat distinct reasons.  First, investors might behave "myopically" and fail to capitalize the value of long-term investments in current stock prices (Stein, 1988).  This would require managers to stay with their firms for a long period in order to realize the fair value of their stock-based pay once long-term projects eventually paid off, if ever.  Second, managers may have indispensable asset-specific knowledge

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[1] Although restricted stock and stock options may be substitute methods for reducing labor turnover, their incentive effects are not the same, since an executive who stays with the firm will always realize value from a restricted stock award but will profit from stock options only if the company's shares rise in price.

[2] In two widely noted recent cases, IBM paid $7.8 million in cash to its Chairman, Louis Gerstner, Jr. to cover the value of stock options at his former employer, RJR Nabisco Holdings (Hays, 1995), while General Dynamics paid $3.3 million to William Anders to replace deferred compensation he would have received had he remained with his former employer, Textron (Dial and Murphy, 1995).

that is required to make long-term investments succeed, which again would motivate them to stay with their current employers in order to realize the full value of their stock-based pay. Finally, the unlimited payoffs the stock-based pay promises in exchange for managerial risk-taking may play a "screening" function in the labor market, leading managers with high risk tolerances to join and remain with employers that offer stock options or restricted stock.

To summarize, firms can reduce costly managerial turnover by better design of compensation contracts. Firms can offer their top managers a premium "efficiency wage" higher than what they would earn from alternative opportunities. We expect the higher the premium or excess pay, the less likely managers are to leave their jobs. Firms can also reduce turnover by compensating their top managers with deferred compensation contracts such as stock options. After controlling for the level of compensation, we expect the higher the ratio of deferred compensation to current pay, the less likely managers are to leave voluntarily. Of course, these two hypotheses about how compensation policies affect the retention of top managers are not mutually exclusive, and firms are likely to use the two policies jointly.

## II. Sample Selection and Data Description

To estimate the impact of stock-based compensation on managerial turnover, we study CEOs in a panel of 452 large U.S. industrial companies, using the executive compensation data set assembled by Yermack (1995). To qualify for inclusion in the sample, a firm is required to rank among *Forbes* magazine's largest 500 U.S. companies in any of the categories of sales, net income, total assets, or market capitalization. Our sample includes all firms meeting this criterion at least four times during the eight-year period 1984-91 except for financial institutions

and utilities, which were dropped because of Compustat's thin coverage of firms in these industries. Observations are included in the data set for every full fiscal year between 1984 and 1991 for which a company's stock was publicly traded, whether or not the firm qualified for the *Forbes* rankings in every year. This sample selection rule yields 3,438 CEO-year observations. For each observation, we use corporate proxy statements to obtain data about the CEO's compensation and ownership of stock and stock options. When a company has more than one CEO during a fiscal year, we collect data for the executive serving for the majority of the year. Ownership variables are measured as of the date of the proxy statement, usually three to four months after the start of the fiscal year. We match these data with financial statement data obtained from Compustat and stock return data from the Center for Research in Security Prices (CRSP) database.

*A. CEO Turnover Data*

We use our data to estimate binary (0, 1) probit models of CEO turnover, assessing the importance of a range of explanatory variables upon the probability of whether the CEO leaves office in a given year. Our dependent variable is set equal to one if a CEO leaves office during the last six months of the current fiscal year or the first six months of the subsequent period. Summary statistics displayed in Table I indicate that CEO turnover events occur for 10.8% of the observations in our sample, a frequency similar to those in related studies such as Coughlan and Schmidt (1985) (12.7%, 1978-80 data), Weisbach (1988) (7.8%, 1974-83 data), and Martin and McConnell (1991) (between 7.1% and 11.1% in the five years before takeovers occur, 1958-84 data).

Our analysis of the role of compensation in the CEO turnover process would be enhanced considerably if we could identify whether individual CEOs left office voluntarily or were removed by their boards of directors. These data are nearly impossible to obtain from public sources, as news releases by companies rarely mention performance as the reason for an executive's departure.[3] However, we believe that the fate of the CEO at the time of departure is highly correlated with the probability of whether the transition is friendly or unfriendly. In particular, CEO retirements are increasingly likely to have been voluntary if the CEO is older, and if the CEO remains connected to the company in a position such as Chairman of the Board of Directors.

Table I provides further information about the fate of CEOs at the time of departure. By reading proxy statements and, where necessary, news reports, we find that 34.8% of exiting CEOs remain with the company at least temporarily as Chairman of the Board, apparently following the "relay" model of CEO succession described by Vancil (1988). An additional 26.1% of exiting CEOs remain on the board, but not as Chairman. Among the remaining subsample of departing CEOs, 10.0% lose their jobs because their firms are delisted due to acquisition or insolvency, and a small handful either die while serving (2.7%) or are demoted to a lower position in the company (2.2%, usually cases in which an acting CEO returns to his former post). The remaining cohort, 24.3% of exiting CEOs, sever all ties with their former companies and do not retain a place on the board of directors.

We find a sharp dichotomy in the fate of younger and older CEOs at the time of

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[3] Weisbach (1988) read *Wall Street Journal* news announcements for his sample of 286 exiting CEOs and found that poor performance was cited in only nine cases, with scandals mentioned in an additional four.

departure. We divide our sample into two groups: (1) CEOs with ages of 64 or less and (2) CEOs aged 65 or more, choosing this break point because of the widespread practice in most companies of having planned CEO retirements occur at age 65.[4] The younger cohort of exiting CEOs aged 64 or less are far more likely to sever all ties with their employers by not remaining on the board of directors (32% vs. 14%). Younger exiting CEOs are also far more likely to be replaced by a successor from outside the company (18% vs. 5%). Each of these patterns offers further indications that a disproportionate number of departing CEOs aged 64 and under might not have left voluntarily.

We use these data to define two proxy variables for cases of CEO turnover that are likely to be involuntary. Our first variable is set equal to one if the CEO is aged 64 or less and severs all ties with his former employer. This group includes 68 CEOs. However, it is possible that some of these CEOs leave their companies for more attractive positions with other companies, and we research this possibility by reading the biography of each exiting CEO in *Who's Who in Finance and Industry*. The vast majority of outgoing CEOs are no longer covered by *Who's Who* after leaving their posts, suggesting that they did not receive better offers, but we do identify two of the 68 exiting CEOs who appear to have taken similar positions with other firms. We drop these two CEOs from the subsample of departures classified as involuntary and instead treat them as voluntary. Our second proxy for involuntary turnover is based upon whether the successor CEO comes from outside the company, since the board is more likely to hire an external CEO if recent performance has been poor, or if it wants to prevent the outgoing CEO

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[4] Our data indicate that the unconditional probability of a CEO departure fluctuates in a range between 3% and 7% for CEO ages below 62 before rising to 11% at age 62, 13% at age 63, 21% at age 64, and spiking at 56% at age 65.

from appointing a successor from inside the firm. Forty cases fall into this group, while the intersection of these two subsamples has 30 observations.

## B. *Explanatory Variables*

Descriptive statistics for our turnover variables are listed in the top section of Table II. Table II also provides information about the explanatory variables in our probit models of CEO turnover.

To test our hypotheses about the link between CEO turnover and stock-based compensation, we use as key explanatory variables the stock options received and held by each CEO. While CEOs receive stock-based compensation in other forms, such as restricted stock and phantom stock, options account for the lion's share of this type of pay (Yermack, 1995).[5] Moreover, complete data about other stock-based compensation instruments is far more difficult, and sometimes impossible, to obtain from corporate proxy statements, especially those filed before expansion of the SEC's disclosure requirements in 1992.

Our measure of stock-based compensation is the ratio of the dollar value of each CEO's annual stock option award, divided by the cash salary and bonus payments received during the fiscal year. Approximately 60% of the CEOs in our sample receive nonzero stock option awards during the sample period, and we value these awards as of the date of grant using Black-Scholes (1973) methodology, assumptions for which are detailed in Yermack (1995). Salary and bonus payments are normalized to annual equivalents for the small group of CEOs not employed by

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[5] CEOs in our sample received approximately 55% of their compensation from salary and bonus, 33% from stock option awards, and 12% from other long-term pay and fringe benefits.

their firms for twelve-month fiscal years.

We measure a CEO's inventory of stock options awarded in prior years by collecting data on the exercisable options held near the start of the fiscal year, expressing this value as a percentage of the firm's common shares. Unfortunately, until recently the SEC did not require firms to report information about whether these exercisable options' strike prices were above or below the company's stock price, and no disclosure at all was required about options that had not yet vested and become exercisable. These data limitations may dampen our ability to detect significant associations between option holdings and CEO turnover, since an executive's greatest incentives to remain with the firm will arguably come from those options that will not become exercisable unless he remains on the job.

Data in Table II indicate that stock option compensation has a significant role in the overall remuneration of CEOs. Over time, vested option awards accumulate so that the typical CEO holds a mean of 0.18% of his firm's common shares in exercisable options (median 0.06%). The mean ratio of stock option pay over cash salaries and bonuses is 0.535; if one ignores other types of compensation, this statistic implies that the typical CEO in our sample receives more than one-third of his pay from stock options, although the median value is far smaller at 0.191. However, stock options account for an overwhelming portion of the sensitivity of our CEOs' compensation to firm performance. For cash pay, regression estimates by Yermack (1996) using our data indicate that the typical CEO receives an increase of 1.5 cents in pay per $1,000 in shareholder wealth created. In contrast, the mean pay-performance sensitivity of CEOs' annual stock option awards (*including* the 40% zero values) is about 50.2 cents per $1,000 created in

shareholder wealth.[6]

Our other major hypothesis in this paper concerns the effect of the level of pay on CEO

turnover.  To measure the level of pay, we analyze the sum of salary, bonus, and the Black-

Scholes value of stock options received each year by the CEO.  Data unavailability and

measurement difficulties make the inclusion of other types of compensation infeasible.  We

develop a measure of "excess" compensation beyond that which a CEO should expect to receive

given the company's size, industry, performance, and his own age, stock ownership, and tenure in

office.  Our approach is similar to that of Coughlan and Schmidt (1985), who estimate a much

more parsimonious set of regressions studying the linkages between compensation, CEO

turnover, and firm performance.  We define excess fixed compensation as the residual in an

ordinary least squares (OLS) regression that we fit over our sample:

$$
\begin{aligned}
\log(Salary_{it} &+ Bonus_{it} + Option\ Award_{it}) = \\
&\beta_1\ \log(Sales_{it}) + \beta_2\ (CEO\ Stock + Option\ Ownership\ (\%)_{it}) + \beta_3\ (Age_{it}) + \\
&\beta_4\ (Years\ as\ CEO_{it}) + \beta_5\ (Return\ on\ Assets_{it}) + \beta_6(Return\ on\ Assets_{it-1}) + \\
&\beta_7\ (\log(1+Stock\ Return_{it})-\log(1+Market\ Return_{it})) + \\
&\beta_8\ (\log(1+Stock\ Return_{it-1})-\log(1+Market\ Return_{it-1})) + \\
&\gamma'\ (Industry\ dummies) + \theta'\ (Year\ Dummies) + \epsilon_{it}
\end{aligned}
\tag{1}
$$

The subscripts i and t represent firms and years, respectively, and all dollar values are adjusted

for inflation.  By construction the dependent variable has a distribution centered around a mean

of zero, so it is excluded from the descriptive statistics presented in Table II.

The other explanatory variables in our analysis include CEO and company characteristics

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[6] The pay-performance sensitivity of a stock option award is estimated as the Black-Scholes (1973) partial
derivative with respect to stock price, times the fraction of the firm's equity represented by the award.  See Yermack
(1995).

that should influence the likelihood of turnover. Among CEO characteristics, age is widely recognized as a critical factor in the turnover process, with marked clustering of CEO retirements around age 65. To capture this effect, we include in our models (0, 1) indicator variables for each CEO age between 55 and 70, and an additional indicator variable for CEOs aged 71 and higher. CEOs should be less likely to leave their jobs if they have direct or indirect control over the firm's board of directors. We include the CEO's direct stock ownership in our models as one measure of CEO power, and we also include the CEO's number of years in office. In addition, we add to the model a (0, 1) indicator variable for whether the CEO is the company's founder or belongs to the founding family, since Mørck, Shleifer and Vishny (1989) present evidence indicating that membership in the founding family reduces the likelihood of top management turnover.

Numerous studies, such as Weisbach (1988) and Warner, Watts, and Wruck (1988), find inverse connections between company performance and the probability of CEO turnover. We include the firm's current year, net-of-market stock return in the model as the performance variable, and we also include one year's lag of this variable. For the market return we use CRSP's value-weighted, dividend inclusive index for either the NYSE/AMEX or NASDAQ file, as appropriate. In addition, we include return on assets (based on pre-tax operating income before interest and taxes) for the current and prior year.

Further control variables include proxies for growth opportunities, leverage, firm size, and the riskiness of a firm's operating environment. These characteristics are expected to influence both the mechanisms by which boards of directors evaluate CEO performance, and the incidence of stock-based compensation awarded to CEOs. We measure growth opportunities

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with two variables, research and development expenditures over sales, and an estimate of Tobin's Q. The Q-ratio is measured at the start of the year and calculated from recursive methods described in Yermack (1996), based upon the $q_{PW}$ estimator of Perfect and Wiles (1994). Leverage is defined as the ratio of long-term debt over total assets. Firm size is the natural log of total assets in constant 1991 dollars. The volatility of the operating environment is calculated as the standard deviation of annual changes in return on assets over the 1984-91 period.

## III. Results

Table III presents coefficient estimates for our basic model of CEO turnover. To control for industry and time effects, we estimate our models with full sets of (0, 1) indicator variables for individual years and two-digit SIC industries. Though we find that these dummy variables do not affect the estimates for other explanatory variables, for completeness we use them in all of the models presented in the paper. We drop from our analysis 55 observations involving cases of CEO turnover due to death in office, demotions of acting CEOs to lower positions in their firms, and departures of CEOs due to delisting of their companies, because these cases appear to result from extraordinary events that are either outside the control of the CEO and board or beyond the subject matter of our study.

### A. Compensation and CEO Turnover

Consistent with our main hypothesis, both the level and mix of compensation appear to influence patterns of CEO turnover. The first column of Table III shows estimates for a model that includes our variable measuring excess compensation. This variable has a negative estimate

as predicted with a p-value below 0.01, implying that CEOs are less likely to leave their positions if they receive higher pay than expected. In the second column of Table III, estimates appear for a model with the variable measuring the ratio of stock option to cash pay appears in the second column. Again the estimate is negative as expected with significance below 0.01, implying lower frequencies of CEO turnover when the mix of pay is weighted toward stock options. Finally, the right column of Table III shows a specification including both variables. Each coefficient moves toward zero and loses some significance when both variables are included, but each nevertheless remains significant at levels between 0.05 and 0.10. We believe the results in the right column are largely due to multicollinearity; our measures of excess correlation and the ratio of stock pay to cash pay have a sample correlation of +0.52, suggesting that "excessive" compensation packages tend to include large stock option awards.

We find weak evidence that the inventory of previously awarded options is inversely associated with CEO turnover as expected, with the negative estimates for this variable in Table III significant only at levels ranging from 0.17 to 0.13. Other variables appear to influence CEO turnover in expected patterns. CEOs are less likely to lose their jobs if they own large amounts of stock (Denis, Denis and Sarin, 1997) or if they founded the company or belong to the founding family. Company performance, measured by both the current year's stock return (net-of-market) and ROA, has a marked negative association with CEO turnover. The lagged values of these variables, however do not have statistically significant coefficient estimates. CEOs are more likely to leave their firms if the company has an unstable operating environment, as indicated by the standard deviation of annual changes in ROA. This may reflect a tendency by boards to punish CEOs for delivering inconsistent results, and may also reflect CEOs' disutilities

for working in unpredictable environments.

*B.  Voluntary and Involuntary Turnover*

We analyze our findings more closely by disaggregating CEO turnover events into two classes: voluntary and involuntary.  If a connection exists between stock-based compensation and CEO turnover, by definition we expect it to influence only voluntary CEO departures.  As discussed earlier, we use two indicator variables as proxies for involuntary turnover.  The first variable equals one if the exiting CEO is 64 years old or younger and does not remain on the board of directors.  The second variable equals one if the successor CEO is chosen from outside the firm.

Table IV presents estimates using our first proxy for involuntary CEO turnover.  To save space, the table shows only estimates for the key explanatory variables related to excess compensation, stock option compensation and stock option holdings.  For comparison purposes, the first section of the table reproduces results from Table III, showing estimates for a probit model where the dependent variable equals one for all episodes of CEO turnover.  Estimates in the middle section are produced by setting the dependent variable to one only for involuntary CEO turnover.  The lowest section shows estimates with the dependent variable equal to one only for all other CEO departures, e.g., voluntary resignations and retirements.  All models include the same specification as Table III.

Results in Table IV generally support our hypothesis related to the mix of pay.  The link between stock-based compensation and CEO turnover holds with especially strong significance for voluntary turnover episodes and is close zero with no statistical significance when turnover is

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involuntary. Coefficient estimates for the variable measuring option holdings are negative with borderline statistical significance in the voluntary turnover models, while these estimates have a positive (though not significant) estimate in the involuntary turnover analysis. With respect to our hypothesis related to the level of compensation, results in Table IV are inconclusive, as the estimated coefficients for this variable negative but nearly identical in all three panels of Table IV.

Our findings in Table IV suggest that altering the mix of a CEOs pay to deliver more stock-based compensation relative to cash pay can succeed in curbing voluntary CEO departures. One possible explanation for this result is that outgoing CEOs could receive less stock-based pay for "life cycle" reasons, since boards of directors may not perceive a need for long-term incentives when the CEO is expected to leave. We do not believe that either compensation theory or our data supports this conjecture. First, we point to the theoretical work of authors who have studied the "horizon problem" of CEOs nearing retirement, such as Dechow and Sloan (1991). They argue that CEOs should receive *more* stock-based pay at the end of their careers, rather than less, so that they have incentives to continue pursuing long-term investment projects. Second, we highlight the result in Table IV indicating that the negative association between stock-based pay and turnover weakens, rather than strengthens, when the analysis is confined to involuntary turnover. Involuntary CEO departures are those over which the board has the most control, and therefore should be the ones in which CEOs are most likely to be denied stock option awards for "life cycle" reasons, if this in fact occurs. However, such a pattern would imply especially negative estimates for the compensation variable for cases of involuntary departures compared to voluntary departures, exactly the opposite of what we estimate.

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We further analyze voluntary and involuntary CEO turnover using a second proxy, an indicator variable for forced turnover that equals one if the successor CEO is selected from outside the firm. Table V presents probit estimations based upon this variable, in a format identical to Table IV. In this model we also find a dichotomy of results between voluntary and involuntary turnover. Our results indicate that the level of pay has a strong, significantly negative association with voluntary turnover compared to a positive, insignificant estimate for involuntary departures. The mix of pay has a negative and significant association with voluntary turnover, compared to a negative and insignificant (though not significantly different) estimate for involuntary cases. The variable measuring option holdings has a strong negative association with voluntary turnover and a near-zero relation to involuntary turnover.

## C. Relevance of Results to Other Levels of Management

Our results about the effects of compensation on voluntary turnover are based on a sample of chief executive officers, those managers who have already reached the top position in their respective firms. Although we do not have data about the turnover patterns of lower-ranked managers, we believe the results in our models would be at least as strong or even stronger among this group.

Companies may face a greater probability of turnover for managers just below the CEO level than for the CEO himself, for several reasons. A large number of incumbent CEOs will always be unattractive to other firms, either because of advancing age, high compensation, or because their position is derived from membership in the company's founding family. Our data discussed in section III.A above seems to support this conjecture, as nearly one-fourth of our

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CEOs are members of the founding family, and very few CEOs (only two in our entire sample) leave their firms during our eight-year sample period to take CEO posts elsewhere. In firms with successful or entrenched CEOs, other managers may feel they have no realistic or timely chance for further promotion and therefore look outside for other opportunities.[7] Also, managers below the CEO level may have more specific knowledge about the firm's products or technology than the CEO, making them potentially more valuable for competitors to hire. For these reasons, firms may use stock-based compensation more extensively for lower-ranked managers than for CEOs in order to reduce turnover.

Prior research gives some evidence that stock options are used intensively to retain lower-ranked managers. Mehran (1992) shows a higher ratio of value of new stock options over total compensation for officers below the CEO level compared to their CEO counterparts. He also documents a positive correlation between the ratio of the firm's R&D to sales (as a proxy for degree of inside information) and the ratio of officers' value of new stock options to their total compensation. One interpretation of these findings is that boards adopt stock-based compensation for lower-ranked managers in order to discourage their turnover.

## IV. Conclusions

Retention of employees is an important issue in human resource management, and many firms use compensation policy to provide incentives for key managers to remain with their firms.

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[7] For example, General Electric has seen many of its high-ranked executives leave to become CEOs of other firms during the successful tenure of John Welch, and in a highly publicized recent case, Alex Mandl gave up the number two job at AT&T in part because he expected a wait of at least several years before the CEO ahead of him retired.

We test the hypotheses that CEOs leave their jobs less often when they receive high compensation and more stock-based pay relative to cash salary and bonus. We find the probability of CEO turnover is smaller for firms whose CEOs compensation packages contain large "excess" compensation, based on the predictions of a regression model, and also when CEOs receive a higher ratio of value of stock option compensation to cash pay. The results appear stronger for subsamples of CEO departures likely to have been voluntary. Our findings suggest that compensation policy plays a significant role in helping firms retain the services of top managers.

Further results indicate that CEOs are less likely to lose their jobs if they own large amounts of stock, or if they founded the company or belong to the founding family. Company performance has a marked negative association with CEO turnover. CEOs are more likely to leave if the company has an unstable operating environment, as indicated by the standard deviation of annual changes in ROA. This may reflect a tendency by boards to punish CEOs for delivering inconsistent results, and may also reflect CEOs' preference for working in predictable environments.

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# Table I
## CEO turnover statistics

Descriptive statistics about the frequency of turnover for CEOs of 452 large U.S. industrial companies between 1984 and 1991. A CEO turnover event occurs if the CEO leaves his position during the last half of the current fiscal year or the first half of the subsequent fiscal year.

The sample includes all firms qualifying at least four times between 1984 and 1991 for Forbes magazine's annual list of the 500 largest U.S. public corporations in any of the categories of sales, assets, net income, or market capitalization. Data about CEO turnover events and the fate of the departing CEO was gathered mainly from annual corporate proxy statements, supplemented when necessary by news reports.

| Summary statistics | All CEOs | CEOs aged 64 or less | CEOs aged 65 or more |
|---|---|---|---|
| CEO-year observations in sample | 3,438 | 2,968 | 470 |
| | | | |
| Turnover events | 371 | 213 | 158 |
| (Frequency among all CEOs) | 10.8% | 7.2% | 33.6% |
| | | | |
| **Nature of CEO turnover events** | | | |
| CEO remains as Chairman of the Board | 129 | 69 | 60 |
| (Frequency among exiting CEOs) | 34.8% | 32.4% | 38.0% |
| | | | |
| CEO remains on board of directors, | 97 | 28 | 69 |
| but not as Chairman | 26.1% | 13.1% | 43.7% |
| | | | |
| CEO demoted to lower position in firm | 8 | 5 | 3 |
| | 2.2% | 2.3% | 1.9% |
| | | | |
| CEO severs all ties with company | 90 | 68 | 22 |
| | 24.3% | 31.9% | 13.9% |
| | | | |
| CEO dies in office | 10 | 9 | 1 |
| | 2.7% | 4.2% | 0.6% |
| | | | |
| Company delisted due to acquisition | 37 | 34 | 3 |
| or insolvency | 10.0% | 16.0% | 1.9% |
| | | | |
| **Successor CEO** | | | |
| Chosen from outside the company | 40 | 33 | 7 |
| (Frequency among non-delisted firms) | 12.0% | 18.4% | 4.5% |

**Table II**
# Descriptive statistics for key variables

Dependent and explanatory variables used in probit models of CEO turnover. The sample consists of 3,438 observations from a panel of 452 industrial companies during the 1984-91 period, but 55 observations are dropped for years in which CEOs left office due to death, delisting of the company, or demotion to a lower position in the firm (usually an acting CEO returning to his prior job). Data for CEO turnover, stock ownership, and compensation were obtained mainly from corporate proxy statements. Compustat served as the source for financial statement data, while the CRSP database provided stock return data.

| Dependent variables | Functional form | Missing values | Mean | Median | Std. dev. |
|---|---|---|---|---|---|
| CEO turnover indicator (0, 1) | =1 if CEO leaves position during last half of current fiscal year or first half of subsequent fiscal year. | 0 | 0.093 | 0 | 0.291 |
| Involuntary CEO turnover indicator (0, 1) | =1 if CEO turnover occurs at age 64 or less, and CEO does not remain as member of board of directors. | 0 | 0.016 | 0 | 0.128 |
| Involuntary CEO turnover indicator (0, 1) | =1 if successor CEO is chosen from outside the company. | 0 | 0.012 | 0 | 0.108 |

| Independent variables | Functional form | Missing values | Mean | Median | Std. dev. |
|---|---|---|---|---|---|
| Option compensation / (salary + bonus). | Black-Scholes value of options awarded during year / (salary + bonus). | 39 | 0.535 | 0.191 | 1.658 |
| CEO vested option ownership | Exercisable options held / (exercisable options + shares outstanding). | 122 | 0.18% | 0.06% | 0.54% |
| CEO stock ownership | Fraction of equity held by CEO through direct stock ownership. Excludes shares held contingently and those from which CEO derives no economic benefit (e.g., charitable trusteeships). | 90 | 2.93% | 0.16% | 8.49% |
| CEO age | Years. | 0 | 57.8 | 58 | 7.2 |
| CEO tenure as CEO | Years. | 0 | 9.6 | 7 | 8.8 |
| CEO in founding family indicator (0, 1) | =1 if CEO belongs to family that founded company or acquired controlling interest. | 0 | 0.239 | 0 | 0.427 |
| Growth opportunities | Research and development expense / sales. | 0 | 0.019 | 0 | 0.037 |
| Leverage | Long-term debt / total assets. | 0 | 0.199 | 0.178 | 0.156 |
| Riskiness of operating environment | Standard deviation of annual changes in (operating income / total assets) between 1984-91. | 0 | 0.041 | 0.033 | 0.033 |
| Tobin's Q | Market value of equity and debt / book value of assets. See Yermack (1996). | 0 | 1.229 | 1.025 | 0.770 |
| Stock return, net of market | log (1 + stock return) - log (1 + CRSP value-weighted index return). | 0 | -1.76% | -0.42% | 28.40% |
| Return on assets | log (1 + (EBIT / total assets)). | 1 | 12.27% | 11.46% | 8.30% |
| Company size | log (total assets) (1991 dollars). | 0 | 7.827 | 7.738 | 1.185 |

## Table III

## Probit coefficient estimates: Determinants of CEO turnover

Coefficient estimates for (0, 1) probit models of CEO turnover. The dependent variable equals 1 if the CEO leaves his position during the last six months of the fiscal year or the first six months of the subsequent fiscal year. After deletion of observations with missing values, the sample includes 3,182 observations for 452 firms in the 1984-91 period.

The model includes control variables for growth opportunities (r&d expense over sales and Tobin's Q), leverage (long-term debt over total assets), the volatility of the operating environment (the standard deviation of annual changes in ROA between 1982 and 1991), and performance (both stock returns net-of-market and ROA, for the current and prior years). All models include indicator variables for each CEO age from 55 to 69 and CEO age 70 and over, as well as industries and years. Standard errors appear below each estimate.

| Variable | Estimate | | Estimate | | Estimate | |
|---|---|---|---|---|---|---|
| Excess compensation | -0.28 | *** | | | -0.17 | * |
| | 0.08 | | | | 0.10 | |
| Option compensation / (salary + bonus) | | | -0.20 | *** | -0.12 | * |
| | | | 0.06 | | 0.07 | |
| Vested options / shares outstanding | -9.95 | | -17.19 | | -12.01 | |
| | 11.77 | | 11.66 | | 11.86 | |
| Stock owned / shares outstanding | -2.77 | *** | -2.89 | *** | -2.83 | *** |
| | 0.96 | | 0.98 | | 0.97 | |
| CEO is member of founding family | -0.45 | *** | -0.44 | *** | -0.46 | *** |
| | 0.14 | | 0.14 | | 0.14 | |
| Tenure as CEO (years) | -0.002 | | -0.001 | | -0.002 | |
| | 0.006 | | 0.006 | | 0.006 | |
| Stock return net-of-market | -0.38 | *** | -0.33 | ** | -0.36 | *** |
| | 0.14 | | 0.14 | | 0.14 | |
| Stock return net-of-market (lagged one year) | -0.04 | | -0.03 | | -0.03 | |
| | 0.15 | | 0.15 | | 0.15 | |
| Return on assets | -3.08 | *** | -3.24 | *** | -3.18 | *** |
| | 0.97 | | 0.97 | | 0.97 | |
| Return on assets (lagged one year) | 0.61 | | 0.68 | | 0.63 | |
| | 0.86 | | 0.85 | | 0.86 | |
| Tobin's Q | 0.04 | | 0.04 | | 0.04 | |
| | 0.09 | | 0.09 | | 0.09 | |
| Std. Dev. of changes in ROA | 4.62 | *** | 4.75 | *** | 4.77 | *** |
| | 1.32 | | 1.30 | | 1.31 | |
| Log (total assets) | -0.0004 | | -0.01 | | -0.0001 | |
| | 0.04 | | 0.04 | | 0.04 | |
| R&D expense / sales | 2.61 | ** | 2.69 | ** | 2.66 | ** |
| | 1.14 | | 1.13 | | 1.14 | |
| Leverage | 0.14 | | 0.13 | | 0.15 | |
| | 0.28 | | 0.28 | | 0.28 | |

Significant at 1% (***), 5% (**), and 10% (*) levels.

# Table IV
# Probit coefficient estimates: Voluntary vs. involuntary turnover

Coefficient estimates for (0, 1) probit models of CEO turnover. The top section of the table presents estimates for the entire sample of 3,182 CEO-year observations drawn from 452 firms in the 1984-91 period. The second section of the table presents estimates for a model of involuntary turnover, with the dependent variable equal to one only for CEO turnover events in which the exiting CEO is aged 64 or less and does not remain a member of the board of directors (for other CEO turnover events the dependent variable equals zero). The third section presents estimates with the dependent variable equal to one for all other cases of CEO turnover. Estimates are displayed only for selected explanatory variables; the entire specification is identical to that in Table III. Standard errors appear below each coefficient estimate.

## All CEO turnover     Entire sample

| | Estimate | Estimate | Estimate |
|---|---|---|---|
| Excess compensation | -0.28 *** | | -0.17 * |
| | 0.08 | ' | 0.10 |
| Option compensation / (salary + bonus) | | -0.20 *** | -0.12 * |
| | | 0.06 | 0.07 |
| Vested options / shares outstanding | -9.95 | -17.19 | -12.01 |
| | 11.77 | 11.66 | 11.86 |

## Involuntary turnover     CEO aged 64 or less, and does not remain on board of directors

| | Estimate | Estimate | Estimate |
|---|---|---|---|
| Excess compensation | -0.21 * | | -0.20 |
| | 0.12 | | 0.15 |
| Option compensation / (salary + bonus) | | -0.08 | -0.01 |
| | | 0.08 | 0.08 |
| Vested options / shares outstanding | 12.10 | 7.67 | 11.98 |
| | 13.32 | 13.90 | 13.35 |

## Voluntary turnover     All other cases

| | Estimate | Estimate | Estimate |
|---|---|---|---|
| Excess compensation | -0.26 *** | | -0.08 |
| | 0.08 | | 0.11 |
| Option compensation / (salary + bonus) | | -0.28 *** | -0.24 ** |
| | | 0.09 | 0.10 |
| Vested options / shares outstanding | -17.82 | -26.37 * | -23.55 |
| | 14.12 | 14.07 | 14.50 |

Significant at 1% (***), 5% (**) , and 10% (*) levels.

## Table V
## Probit coefficient estimates: Voluntary vs. involuntary turnover

Coefficient estimates for (0, 1) probit models of CEO turnover. The top section of the table presents estimates for the entire sample of 3,182 CEO-year observations drawn from 452 firms in the 1984-91 period. The second section of the table presents estimates for a model of involuntary turnover, with the dependent variable equal to one only for CEO turnover events in which the exiting CEO is replaced by an executive from outside the company (for other CEO turnover events the dependent variable equals zero). The third section presents estimates with the dependent variable equal to one for all other cases of CEO turnover. Estimates are displayed only for selected explanatory variables; the entire specification is identical to that in Table III. Standard errors appear below each coefficient estimate.

### All CEO turnover        Entire sample

|  | Estimate | Estimate | Estimate |
|---|---|---|---|
| Excess compensation | -0.28 *** <br> 0.08 |  | -0.17 * <br> 0.10 |
| Option compensation / (salary + bonus) |  | -0.20 *** <br> 0.06 | -0.12 * <br> 0.07 |
| Vested options / shares outstanding | -9.95 <br> 11.77 | -17.19 <br> 11.66 | -12.01 <br> 11.86 |

### Involuntary turnover     CEO aged 64 or less, and does not remain on board of directors

|  | Estimate | Estimate | Estimate |
|---|---|---|---|
| Excess compensation | -0.07 <br> 0.13 |  | 0.13 <br> 0.18 |
| Option compensation / (salary + bonus) |  | -0.13 <br> 0.10 | -0.18 <br> 0.13 |
| Vested options / shares outstanding | 1.61 <br> 16.08 | -0.11 <br> 15.66 | -3.43 <br> 16.75 |

### Voluntary turnover        All other cases

|  | Estimate | Estimate | Estimate |
|---|---|---|---|
| Excess compensation | -0.31 *** <br> 0.08 |  | -0.20 * <br> 0.11 |
| Option compensation / (salary + bonus) |  | -0.24 *** <br> 0.08 | -0.14 <br> 0.09 |
| Vested options / shares outstanding | -26.91 * <br> 14.93 | 35.57 ** <br> 14.76 | -29.80 ** <br> 15.03 |

Significant at 1% (***), 5% (**) , and 10% (*) levels.