# Pay for Future Returns

Moqi Groen-Xu [*] Yiqing Lü [†]

**Abstract**

Is managerial compensation sensitive to future performance or only to realized returns? We show that salary raises of U.S. American CEOs predict positive stock returns in the year after. The wealth effect of an average raise is $1.6 million, implying a wealth increase of $0.28 million per 1% stock price increase in the next year. This compares to an equity delta of $0.71 million. We verify in 649 hand-collected CEO employment contracts that salary raises are relevant outputs of compensation reviews and link the provisions to actual raises. Our results are consistent with implicit contracting to reward contribution to future performance.

***Keywords:*** pay for performance, executive compensation, long-term compensation, inside information, implicit contracts, stock returns, research and development

***JEL:*** G12, G14, G34, J41, O32

[*]Financial Markets Group, Department of Finance, London School of Economics, m.xu1@lse.ac.uk.

[†]New York University Shanghai, yiqing.lu@nyu.edu.

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Publicly observable performance measures take time to realize and are noisy signals of contribution to performance. Principals can therefore improve incentives for risk-averse agents with compensation based on private information on their contribution to future performance (Baker, Gibbons, and Murphy, 1994; Hayes and Schaefer, 2000; Prendergast, 2002). However, compensation based on private information requires discretion that can be abused. That possibility of abuse casts doubt on the practical relevance of compensation "for future returns". In this paper, we study pay-performance sensitivity to future returns in a setting with disclosure on compensation contracts, compensation outcomes, and performance: U.S. Chief Executive Officers (CEOs).

Measuring the sensitivity of compensation to future performance presents a challenge since the empirical researcher cannot directly observe ex-ante information on future returns. Linking total CEO compensation to future returns (Lewellen et al., 1992; Brick et al., 2006) yields mixed results and is problematic to interpret because of mechanical links between equity compensation and subsequent returns. This is because the reported value of the ending year's equity-based compensation is calculated using the year-end stock price. Additional evidence on retrograde timing of equity compensation grants to times of stock price lows provides another explanation for links between compensation and future returns (Yermack, 1997; Lie, 2005). To avoid these challenges, we focus on standalone raises of base salary, the element of CEO compensation that is not mechanically related to the stock price or subject to timing concerns. Although firms may well increase all components of compensation as a reward for future returns, we can use salaries to calculate a lower bound of pay for future performance.

Specifically, this paper uses CEO base salary changes to estimate a lower bound for the link between compensation and future performance. In other words, we estimate the total CEO wealth effects of next-year stock price increases via raises of the current base salary. Our estimations reveal that CEO compensation is on average sensitive to future performance. A hypothetical long-short portfolio strategy – one that invests in firms that offer standalone salary raises and takes a short position in firms without such raises – could earn an abnormal annual return of 6% one year after the raise. Return predictability ends after 1.5 years, the average time to the disclosure of the signal when proxy statements are released (Figure 1). The implied average forward-delta is 280 thousand USD for 1% increase in stock returns next year, compared to a backward-looking equity compensation delta of 714 thousand USD.

[[ INSERT Figure 1 about Here ]]

Although the average dollar magnitude of a salary increase (0.71 million USD) is much smaller than a typical increase in equity-based compensation (5.86 million USD), the total wealth effects of salary increases are larger because salary mechanically affects pensions (De Angelis and Grinstein, 2015; Bebchuk and Jackson Jr, 2005; Stefanescu, Wang, Xie, and Yang, 2018). A back-of-envelope calculation assuming that the increase is permanent (salary decreases occur only in 5% of all firm-years, compared to 69% firm-years with salary raises) estimates the present value of one standard deviation increase in salary as 64% of the value of total annual compensation.

We verify whether the forward-looking pay-performance-sensitivity we document reflects intentional contracting. To this end, we review actual corporate disclosure on performance reviews, combining ex-ante contracts and ex-post narratives in compensation disclosure. Most contracts explicitly plan performance reviews, and almost all review terms appear in the section of "Base Salary" and are explicitly linked to potential raises in salary. The review clauses are not boilerplate, but more prevalent for CEO-firm pairs when theory predicts that early reviews are most likely to be useful (e.g., firms with higher information asymmetry, higher R&D investment, and firms that hired an outside CEO). Firms seem to honor the contracts: CEOs with performance clauses receive 7.5% more raises of the targeted compensation components, and firms justify such raises in their compensation statements 8.1% more often with "subjective" explanations (or offer no explanations at all).

While we interpret the positive correlation between compensation changes and subsequent stock performance as a result of rewarding early success that later is impounded into the stock price, other explanations are entirely plausible. For example, salary increases may be correlated with other omitted variables that drive long-term firm performance. Moreover, compensation increases themselves can set incentives to work harder (Akerlof, 1982, 1984). These arguments would also predict a positive relationship between compensation changes and the subsequent stock performance. We therefore conduct a battery of cross-sectional and placebo tests to provide additional support for our conclusion.

First, inside information should be more valuable in determining pay for future performance when objective performance measures are noisier, for example in firms with greater information opacity, or for CEOs who are still early in their tenure. Indeed, we find that salary raises offered by firms with more dispersed analyst forecasts, greater idiosyncratic risk, and bid-ask spreads, as well as those offered by firms with early-tenure CEOs, predict higher monthly stock returns.

Second, self-serving, powerful CEOs may pay themselves more when they forecast better returns and thus less scrutiny by shareholders. Inconsistent with this explanation, we find that the return-prediction power of salary increases is significant in firms with more effective boards or compensation committees, as measured by fewer outside engagements (serving on multiple boards) and independence of directors, but not in firms with less effective boards or compensation committees. This finding also lends support to our conclusion, as better governance should improve the quality of compensation reviews, especially in interpreting information on future returns.

Third, one might argue that CEO salary changes simply reflect an general upwards trend in compensation, for example in a growing industry. To test this possibility, we construct a long–short portfolio that invests in firms whose industry peers (defined as having the same first two digits of the SIC code) experienced a stand-alone salary increase on average and takes a short position in firms whose industry peers experienced no increase in salary. This measure does not predict stock returns. This result suggests that the correlation between raises and returns is unlikely to be caused by omitted peer compensation factors.

Fourth, paying a wage higher than the market equilibrium rate increases the cost of dismissal, which itself may cause the CEO to work harder or shirk less (Akerlof, 1982, 1984). As a result, it is possible that the good performance after salary raises stems from the improvement in performance caused by the raise. To test this possibility, we double sort firms on stand-alone salary raises and abnormal compensation, as in Gillan, Hartzell, and Parrino (2009). If return predictability can be fully explained by the incentive effect of efficiency wages, then salary raises of CEOs with negative abnormal compensation should not predict future returns. A long-short portfolio that invests in firms with negative abnormal compensation that offer stand-alone salary increases does predict future returns. Thus, efficiency wages cannot fully explain our results.

In addition, we show that our results are robust to alternative constructions of stand-alone salary raises based on nominal salary increases and various ways to control for changes in equity-based pay. Finally, we construct compensation measures using increases in bonus and equity-based pay. These measures do not predict stock returns as our measure based on salary does. As CEO compensation is a package of many compensation components, the lack of return predictability of raises in bonus and equity compensation casts further doubt on the argument that our results are fully explained by the causal influence of base salary on performance (e.g., via an efficiency wage channel).

Previous literature names R&D as one main example for delays in stock price reactions. We show that, consistent with the literature, salary increases are associated with positive R&D outcomes. One year following CEO salary increases, the number of news articles about new product developments compared to the last year increases by 24%, with average positive abnormal returns of 0.3% per product announcement.[1] These findings suggest that firms offer salary increases to CEOs as a reward for early R&D investment success that has yet to be reflected in objective performance measures.

First, our paper contributes to the managerial compensation literature that primarily focuses on the pay for *past* performance (cf. Jensen and Murphy, 1990; Hall and Liebman, 1998). We show that pay for *future* returns based on inside information is also an integral part of the CEO compensation practice. Thus, our paper lends support to the theoretical literature on subjective performance reviews (Hölmstrom, 1979; Baker, Gibbons, and Murphy, 1994; Fuchs, 2015) that incorporates compensation based on subjective performance measures as part of the contract design. We are part of a small literature that links compensation to *subsequent* returns. Event studies relate stock returns to corporate governance regulation events to CEO pay (Larcker, Ormazabal, and Taylor, 2011; Cai and Walkling, 2011). Core et al. (1999) show that the component of compensation that can be predicted from governance variables has a negative relation with future stock returns, where our focus is on unexplained compensation. The closest to our paper is Cooper and Rau (2016) which shows a negative relationship between equity-based CEO pay and returns for periods up to five years after the end of the compensated year. In contrast to these findings, we document a positive relationship between salary raises and returns one year after the salary raise.

With our focus on cash compensation, we contribute to recent discussions on the downsides of equity compensation. Notable examples include manipulation of the used explicit measures (For example, Hallock and Oyer, 1999; Murphy, 2000; Department for Business, Innovation & Skills, 2011). In addition, restricted stocks and options have major effects on the optimal investment and consumption strategies and therefore are very costly to risk-averse executives (Kahl, Liu, and Longstaff, 2003; Hall and Murphy, 2002; Meulbroek, 2001). The literature also suggests that there are negative long-term effects of equity vesting on firm activities, such as repurchases and M&A (Edmans, Gabaix, and Jenter, 2017), investment (Ladika and Sautner,

[1]The average number of product announcements in our sample is 4, so the total abnormal return due to new product development is approximately 1.2%.

2017), and CEO turnover (Jochem, Ladika, and Sautner, 2018; Gopalan, Huang, and Maharjan, 2016). These concerns call for cash compensation based on inside information to complement traditional equity-based pay in rewarding long-term performance.

Second, we offer an empirical analysis of private information in executive compensation. Our paper shows that firms use inside information to guide long-term performance. This contributes to the growing literature on the role of boards (Adams and Ferreira, 2007; Adams, Hermalin, and Weisbach, 2010; Schwartz-Ziv and Weisbach, 2013; Burkart, Miglietta, and Ostergaard, 2017). Our paper underscores the important role that boards play in monitoring CEOs on behalf of shareholders who are less informed and, hence, unable to monitor CEOs themselves (Burkart, Miglietta, and Ostergaard, 2017). We also complements the growing literature on boards' decision-making (Malenko, 2013). The use of inside and soft information by boards emphasizes the importance of communication among board members before reaching a consensus view on compensation practices.

Within the literature on boards and information, we particularly build on Cornelli, Kominek, and Ljungqvist (2013), which links board information about non-verifiable performance to CEO turnover decisions in private equity-backed firms. CEO turnover provides a convenient setting for researchers to study such information as we can observe CEO turnovers. A structural estimation by Taylor (2010) further indicates that such information has a more than five times larger influence on boards in deciding on CEO turnovers, when compared to information contained in profitability. Our paper focuses on inside board information in a different setting – CEO compensation – and presents positive evidence how widely-held public US firms use private information to reward CEOs. Our findings based on CEO contracts also confirm the intuition of Hayes and Schaefer (2000) who establish a link between cash compensation raises and subsequent changes in return on equity (ROE) and interpret this link as evidence for usage of private information in implicit incentive contracts. Our empirical test focuses on stock returns instead of ROE. Since stock returns incorporate public information, examining them enables us to distinguish private from public information that takes time to materialize into operational performance.

Third, our analysis is closely related to the literature on discretionary bonus compensation. Although Murphy and Oyer (2003) and **?** find that personalized bonuses are less prevalent with CEOs, we nevertheless build heavily on the similar arguments and empirical designs of this literature. Consistent with this literature, we find that compensation changes in firms

with greater information asymmetry have a greater predictive power of returns in the long run. While some papers (Ittner, Larcker, and Rajan, 1997; Baker, Jensen, and Murphy, 1988) point to negative consequences of discretionary compensation such as managerial entrenchment, other research (Bushman, Indjejikian, and Smith, 1996; Gibbs, Merchant, Van der Stede, and Vargus, 2004) finds that the use of discretionary compensation is positively related to long-term investment in tangibles, growth opportunities, and the length of product development. Based on the evidence from actual contracts, we explore in depth the nature of base salary and thus complement the literature on discretionary bonuses.

Finally, this paper contributes to the empirical literature on contracts. Schwab and Thomas (2005) describe a sample of 375 CEO employment contracts from a legal perspective. Cronqvist and Fahlenbrach (2013) study 20 CEO contracts in private equity-sponsored firms. Kaplan and Strömberg (2003) study 213 contracts between venture capitalists and entrepreneurs. Yermack (2006) examines CEO separation agreements and finds that most severance pay is awarded on a discretionary basis by boards of directors. Gillan, Hartzell, and Parrino (2009) report that many CEOs operate without an explicit contract and study the choice between explicit and implicit contracts. We focus on the compensation section of CEO contracts and link contract clauses to ex-post changes in compensation. To the best of our knowledge, ours is the first study to show that CEO contracts explicitly cater for subsequent dynamics in compensation.

# 1 Empirical Strategy

To fix ideas, consider a firm that decides on the compensation of its CEO at time $t$. The firm value $V_{t+1}$ will be realized and become observable at time $t+1$. The CEO chooses an action $a_t$ at time $t$ that will translate into firm value $V_{t+1}$ at $t+1$, with a noise $\epsilon_a$. At time $t$, the board does not observe the CEO's action but $S_t$, a signal of the effect of the action on firm value, with a noise $\epsilon_s$. The signal is not contractible at time $t$, similar to the subjective measure in Baker, Gibbons, and Murphy (1994).

The compensation contract can consist of payment at both times. First, the firm can offer an explicit contract based on performance, to be paid after the realization of $V_{t+1}$ in $t+1$. Denote this compensation $C^E_{t+1}$. In practice, $C^E_{t+1}(V_{t+1})$ can correspond to equity grants, explicit bonus and long-term performance plans.

The focus of this paper, however, is on forward-looking compensation determined at time

$t$. We denote it $C^F$, where $F$ stands for forward-looking pay. This compensation can be based on the subjective signal $S_t$. If $\partial C_t^F / \partial V_{t+1} > 0$, CEO compensation reacts immediately to the CEO's contribution to future performance before the realization. In other words, the CEO receives "pay for future returns". Equation 1 specifies the expected value of compensation awarded at time $t$, denoted as $C_t$, under discount rate $r$.

$$C_t = C_t^F(S_t) + \frac{1}{1+r}\mathbb{E}_t(C_{t+1}^E(V_{t+1})) \tag{1}$$

The aim of this paper is to study $C_t^F$, and specifically whether it is sensitive to future performance (whether $\partial C_t^F / \partial V_{t+1} > 0$). The previous literature (Lewellen et al., 1992; Brick et al., 2006) regresses total compensation $C_t$ on next year's performance $V_{t+1}$ to estimate the forward-looking pay-performance-sensitivity $\partial C_t / \partial V_{t+1}$. But, $C_t$ may be linked to $V_{t+1}$ because the explicit contract $C_{t+1}^E$ sets incentives (Mehran, 1995; Murphy, 1999; Laffont and Martimort, 2002), because $C_{t+1}^E$ is reported using the $t+1$ stock prices, or because firms time the grant of equity compensation just prior to price increases (Yermack, 1997; Lie, 2005). In contrast, our aim is to measure whether compensation at time t, $C_t^F$, reacts to forward-looking information on $V_{t+1}$.

To isolate $C_t^F$, we focus on the components of CEO compensation that are not explicitly linked to observable performance measures. These are first and foremost the base salary and pensions. Even though pensions are usually a function of - among other factors - the final salary, current salary raises are likely to affect them given the observed downward rigidity of CEO salaries. To quantify these effects, we begin our analysis with estimates of the total expected wealth impact of contemporaneous salary raises. In practice, $C_t^F$ may well contain other components such as additional equity grants or perquisites, causing us to underestimate $\partial C_t^F / \partial V_{t+1}$.[2]

To link $C_t^F$ to subsequent performance, we then identify all firm-years in which CEOs received salary raises. To avoid spurious links between $C_t$ and $V_{t+1}$, we focus on those firm-years without contemporaneous changes in equity compensation. We then quantify performance changes after raises in base salary by linking salary raises to stock returns. Specifically, we construct a long–short portfolio that holds a long position in companies that offer stand-alone salary raises and a short position in firms that do not. We then use the abnormal returns on

[2]For example, bonus could also be partly discretionary, although Murphy and Oyer (2003) and Guay, Kepler, and Tsui (2019) show that it is subject to company-wide plans and thus mostly not person-specific.

such portfolio as a measure for $V_{t+1}$ and the total expected wealth effect of the salary raise to compute $\partial C_t^F / \partial V_{t+1}$.

# 2 Data and Salary Raises

## 2.1 Data

We analyze CEO compensation and stock returns for all firms that were part of the S&P 500 in one of the years between 1994 and 2008. We obtain firms' financial information from Compustat, stock returns from the Center for Research in Security Prices (CRSP), realized compensation data from ExecuComp, board and corporate governance information from Institutional Shareholder Services (ISS) and Boardex, financial analyst estimates from the Institutional Brokers' Estimate System (I/B/E/S), and product announcements from S&P Capital IQ. In addition to using standard sources, we obtain and provide information of ex-ante CEO contracts and ex-post narratives on compensation changes.

Our final data set consists of 8,190 firm-year observations, including 3,250 observations of firms that disclose their CEO employment agreements or details thereof. Because CEOs are often compensated for fewer months than one full year in the first and the last fiscal years of their tenure, compensation changes during those years could be due to reasons other than performance. We therefore exclude the first and the last years of a CEO's tenure. After excluding such years, we are left with 5,121 observations.

[[ INSERT Table 1 about Here ]]

Table 1 gives summary statistics of the explanatory variables that we use: firm characteristics, CEO characteristics, and labor market characteristics. For each variable, we report its mean, median, and standard deviation, as well as minimum and maximum values (See Appendix 1 for the definitions of these variables). Our sample firms have an average of $23.9 billion in assets and $10.4 billion in sales; their average return on assets (ROA) is 8% and average leverage ratio is 33%. The idiosyncratic risk (as defined by Wurgler and Zhuravskaya, 2002) of our sample firms averages 30%, and the analyst forecast dispersion is 12%. About 14% of CEOs are either hired from outside the firm or have worked in the firm for less than a year before becoming an CEO. The mean of CEO tenure is seven years, and the mean CEO age is 56. About 67% of a typical board is comprised of independent directors, and 29% of all boards are

"busy" boards (as compared with 21% in Fich and Shivdasani, 2006). The annual industry turnover rate for CEOs averages about 12%, but varies, across industries from a minimum of no turnover during the sample period to a maximum of 75% turnover.

### 2.2 Wealth Effect of Salary Raises

How large are the wealth effects of a raise in base salary? Intuitively, salary raises seem small compared to the magnitudes of equity-based compensation. In this section, we document the total wealth effects of salary changes and show that they are actually rather large. This is because salary increases are rarely reverse (Shue and Townsend, 2017; Taylor, 2013), and pensions are usually calculated in multiples of the salary (Stefanescu, Wang, Xie, and Yang, 2018).

[[ INSERT Table 2 about Here ]]

First, we confirm that base salaries are smaller than equity-compensation in our sample. Table 2 reports summary statistics for compensation and changes, separated for firm-years with increases and decreases. To take a conservative approach in classifying changes in salary as *raises*, we do so only if the "real" (i.e., inflation-adjusted) salary growth is positive. In other words, we do not consider an upward adjustment that does not exceed the inflation rate to be a raise. The average increase in salary is 9.5% of a salary of $0.7 million. This compares to an annual $3.9 million equity-based compensation and $0.6 million bonus in the same firm-years with salary raises. Across the sample, equity-based compensation is about seven to eight times as high as salary. So indeed, salary raises seem small compared to equity compensation.

Second, we document that salary raises are rarely reversed. Panel A of Table 2 presents the frequency of years with salary cuts, no changes, and raises (and their magnitudes) in columns 1, 2, and 3, respectively. Salary cuts are rare, though we include all, including nominal cuts; they occur in only 5.2% of all firm-years and average -13.3%. In only 25.4% of firm-years do CEOs receive the same salary (or a salary increase of less than the inflation rate). Salary raises are frequent in comparison; they occur in 69.4% of all firm-years and average 9.5%.

Cuts in equity compensation, in contrast, are more frequent. Panel B presents frequency of years with equity cuts, no change, and raises and their magnitudes in columns 1, 2, and 3, respectively. Equity cuts occur in 13% of all firm-years. Years with no changes in equity are frequent; they occur in 71% of all firm-years. In 16% of firm-years, CEOs receive equity raises.

Given that salary increases are rarely reversed, we can perform a back-of-envelope calculation of the present value of a permanent salary increase to future salary, severance payments and pension payments. We report the estimates in Panel D of Table 2. For a conservative estimation, we assume that the CEO retires after the current year. Following Rusticus (2006) that finds the median agreement provides for cash severance benefits equivalent to two years of cash compensation, we construct the change in severance payment as two times the salary change. We then compute the change in annual pension as the benefit factor times years in service times the change in salary (Rauh, Stefanescu, and Zeldes, 2013). We use the benefit factor (0.02), discount rate (5.5%), and annuity factor from Stefanescu, Wang, Xie, and Yang (2018) which takes mortality rates into account.

The total effect of salary increases is large. We first report the total effect of one standard increase in salary as a percentage of the current total annual compensation (TDC1) in row 1 of Panel D; our conservative estimate is as high as 47% (min case, row 1). For a CEO who stays for the average tenure of leaving CEOs (base case, row 1), the corresponding number is 64%. For a CEO who stays until age 65, the total effect of salary raises is 84% (max case, row 1). We then report the total effect of an increase in salary equivalent to sample mean as a percentage of the current total annual compensation (TDC1) in row 3 of Panel D. Magnitudes are similar compared to row 1.

We also provide an analysis of the total effect of salary changes over total compensation after taking into consideration the personal income tax in rows 2 and 4 of Panel D. We apply the highest bracket (39.6%) of personal income tax in the US to salary, severance pay and pensions, and 20% of capital gain tax to stock grants. We find that the effect of one standard deviation increase in salary as a percentage of the current total annual compensation ranges from 46% to 84%. Thus, we conclude that the total effect of salary increases is economically meaningful.

### 2.3 Classification of Raises

As noted in the introduction, linking total CEO compensation to future returns (Lewellen et al., 1992; Brick et al., 2006) yields mixed results and is problematic to interpret for various reasons. To avoid these challenges, we focus on standalone base salary raises to study performance sensitivity.

To classify a stand-alone salary increase, our measure of $C^F$, we proceed as follows. First, we take a conservative approach in classifying changes in salary as *raises*: we do so only if the

"real" (i.e., inflation-adjusted) salary growth is positive. In other words, we do not consider an upward adjustment that does not exceed the inflation rate to be a raise. We then exclude firm-years with contemporaneous increases in equity compensation. Here, we use the change in *grant values* of restricted stocks plus options (as opposed to realized values) because our objective is to study compensation decisions rather than realized changes in wealth. When calculating changes in such compensation, we also incorporate two observations documented in the literature. First, equity-based compensation is typically granted in multi-year cycles (Hall, 1999), and recipients are not entirely vested until a pre-specified period of time (typically 3 years) has elapsed (Cadman, Campbell, and Klasa, 2016). We therefore assume that, if a CEO receives no equity in years between two grants, then that is an instance of "no change" in equity-based compensation instead of a massive decrease, followed by a similarly massive increase. We then compare the current grant value to the previous grant's value. Second, to ensure that we include only non-trivial changes in equity compensation, we flag only those changes in equity-based compensation that exceed (in absolute value terms) that year's change in salary. Conditioning our predictor to have no simultaneous raises in equity compensation is likely conservative, since we miss some simultaneous raises of equity pay and salary that may, in fact, be related to compensation reviews. Section 7.1 shows that our results are robust to various modifications that relax these restrictions on the salary increase measure.

Panel C of Table 2 summarizes the incidence of our indicator of positive reviews: increases in CEO salary with no contemporaneous change in equity-based pay. These happen in 46% of all firm-years. For comparison's sake, we observe that CEOs receive more salary *and* equity in 12.6%, compared to more salary but *less* equity-based pay in 10.2% of all firm-years.

# 3 Returns after Salary Raises

In this section, we quantify whether and how much stock returns improve after salary raises.

## 3.1 Portfolio Returns

We examine average returns on portfolios formed using information about compensation changes. We compute excess returns, three- and four-factor alphas (as in Fama and French, 1996; Carhart, 1997) by running time-series regressions of excess portfolio returns on the market (MKT), size (SMB), value (HML), and momentum (UMD) factor returns. Specifically, we form

equal-weighted portfolios for each month; each portfolio includes all companies that made the same type of compensation change (e.g., stand-alone salary raises) in the fiscal year that starts within the prior 12 months. The portfolios so constructed are rebalanced monthly. More precisely, salary is set at the beginning of a fiscal year t rather than at the end of a fiscal year t. Salary changes thus reflect information about CEO performance in the fiscal year t-1. Similarly, in the next section where we conduct return forecasting regressions, all the control variables are measured in the year subject to the review, hence one year prior to the fiscal year in which the CEO earns the increased salary.

[[ INSERT Table 3 about Here ]]

Table 3 reports the average monthly returns to these portfolios and illustrates our main returns result: firms that offer stand-alone salary increases outperform those that do not. This finding holds for excess returns and three- and four-factor alphas. As reported in Panel A, a long–short portfolio spread ("Spread") – that between the portfolio that offers stand-alone salary increases and the one that does not offer increases in either component – is significant and large under all risk adjustment specifications. For example, abnormal returns after three-factor adjustment to the long–short portfolio equals 51 basis points (bps) ($t = 3.75$) half a year after the raises, or 6.12% annually. However, both magnitude and significance decline one year after the raises and disappear 1.5 years after raises.

The disappearance of abnormal returns after 1.5 years indicates that the market takes the disclosed information into account. Figure 2.1 plots the time lag between raises and disclosure in proxy statements. We find that changes are only made public around 1.5 years (mostly 15 and 16 months) after the raise. It implies that replicating this strategy based on official announcements of CEO salary in the following year is not possible without inside information.

[[ INSERT Figure 2 about Here ]]

To confirm that performance evaluations are related to abnormal returns, in Panel B of Table 3, we sort firms with stand-alone salary increases into two subgroups based on the explanations given for raises: one portfolio consists of firms that offer stand-alone salary increases with subjective explanations, and the other consists of firms that offer salary increases with objective explanations. We explain justifications for compensation changes provided in proxy statements in detail in Section 5.1. A long–short portfolio spread ("Spread_subjective explanation") between the portfolio that offers salary raises with subjective explanations and the

portfolio with no increases in either component is significant and large under all risk adjustment specifications. Abnormal returns to the long–short portfolio after three-factor adjustment equal 54 bps ($t = 3.60$), which translates to 6.48% annually. Here, too, the significance disappears in 1.5 years after the raises. In contrast, a long–short portfolio spread ("Spread_objective explanation") between the portfolio that offers salary raises with objective explanations and the portfolio with no increase in either component is not significant. This result suggests that compensation changes with subjective explanations may contain information that is not captured by objective performance measures.

Panel C of Table 3 presents additional characteristics of these portfolios. The portfolio consisting of firms with no change in salary loads positively on value but negatively on momentum, suggesting that stocks in this portfolios are typically value stocks with poor past returns.

In sum, the results from Table 3 demonstrate that salary raises explain a large and significant spread in future abnormal returns.

### 3.2 Cross-Sectional Regressions

To further isolate the marginal predictive power of compensation changes on future stock returns, we perform return forecasting regressions based on the following equation:

$$\%\Delta \mathrm{V_{i,s}} = \alpha + \beta * 1(\Delta C^F_{i,t} > 0) + \gamma * \mathrm{Control} + \varepsilon_{i,s} \tag{2}$$

where the dependent variable $\%\Delta V_{i,s}$ is the monthly stock return for firm $i$ in the month $s$. The independent variable of interest $1(\Delta C^F_{i,t} > 0)$ is the indicator variable for stand-alone salary increase in year $t$, where $t$ is latest fiscal year that starts before $s$.

Additional control variables include past returns (Jegadeesh, 1990) up to lags of five months. We also control for firm size (Banz, 1981) and book-to-market ratio (Rosenberg, Reid, and Lanstein, 1985; Fama and French, 1992), measured in the year of the review (i.e., one year prior to the fiscal year in which the CEO earns the increased salary). Because residuals may be correlated across firms or across time, we run pooled regressions and estimate standard errors clustered by firm and by year-month (Petersen, 2009). We also conduct Fama and MacBeth (1973) return forecasting regressions. We include in the regression observations with either a stand-alone salary increase or no change in salary.

[[ INSERT Table 4 about Here ]]

The regression estimates reported in Table 4 confirm our earlier portfolio results: firms that offer stand-alone salary increases outperform those that do not. More specifically, stand-alone salary increases significantly predict stock returns in the year after raises in both one- and two-way clustering and Fama–Macbeth regressions. The coefficients reported in Table 4 imply that a stand-alone salary increase results in, with half a year, a 50-bps increase in stock returns under one-way clustering and two-way clustering, and a 30-bps increase in Fama–Macbeth regressions. The predictability disappears 1.5 years after raises. Therefore, an average percentage increase of 10.8% for stand-alone salary increases (see Table 2) corresponds to a 30-50 bps increase in future stock returns.

# 4 Pay-performance Sensitivity

In this section, we quantify $\partial C_t^F / \partial V_{t+1}$, the sensitivity of salary raises for future returns. Explicit equity compensation, $C_{t+1}^E$, has been the subject of an extensive literature (e.g., Edmans, Gabaix, and Jenter, 2017; Hall and Liebman, 1998; Jensen and Murphy, 1990) which quantifies the sensitivity of CEO wealth and compensation on a change in firm value (via bonus: Guay, Kepler, and Tsui (2019) and Cho, Ibrahim, and Yan (2019); via LTIP: Li and Wang (2016); via equity grants: Core and Guay (2002) and Bettis et al. (2018)). In contrast, it is hard to obtain an analytical form for the performance-sensitivity of $C_t^F$, since by definition, CEO action $a_t$ is unobservable and its signal $S_t$ is not contractible.

Instead, below we calculate the sample average for $\partial C_t^F / \partial V_{t+1}$, which we denote $\Delta_t^F$, or forward-delta. For this analysis, we compare the total wealth effect of a salary raise to the abnormal returns after salary raises from the previous section as a measure of the percentage change in firm value $\%\Delta V_{t+1}$. For the sample average $\Delta_t^F$, we divide the average wealth increase following salary raise, $C_t^F$, by the abnormal excess return of the long-short portfolio (see Equation 3). We use a dollar sign \$ and a percentage sign % to denote that the delta is calculated in dollar for percentage change.

$$\Delta_t^F = \$\Delta C_t^F / \%\Delta V_{t+1} \tag{3}$$

The average wealth effect following a salary raise is 1,620 thousand USD, and the associated abnormal stock return 6%. Thus, the sample $\Delta_t^F$ is 280, implying an increase of 280 thousand USD to the CEO for each 1% in returns next year. This compares to an average equity delta

$\Delta^E_{i,t+1}$ of 714 following Core and Guay (2002)'s definition.

We complement the sample average analysis with a more detailed numerical interpolation by dividing our sample into deciles based on $\Delta C^F_t$. For each decile $i$, we construct a long-short portfolio that holds a long position in companies in that decile portfolio and a short position in firms that do not offer salary raises. We then obtain the abnormal excess return for each decile $i$ and calculate its forward-looking delta following Equation 4.

$$\Delta^F_{i,t} = \$\Delta C^F_{i,t}/\%\Delta V_{i,t+1} \tag{4}$$

[[ INSERT Table 5 about Here ]]

Table 5 shows that abnormal returns on average increase with the magnitude of changes in salary raises. The bottom decile has an abnormal return of 0.9%, compared to 15.4% of the top decile. In other words, subsequent returns are higher for higher amounts of compensation raises. The implied $\Delta^F_{i,t}$ varies across portfolios; taking the 5th decile portfolio as an example, it has a magnitude about 412 across different portfolios, implying a 412 thousand USD wealth effect for a 1% increase future returns. To put the magnitude into perspective, we compare it to the magnitude of the equity delta $\Delta^E_{i,t+1}$. The equity delta for the 5th decile portfolio is 644, implying a ratio of 2:3 between the forward-looking delta and the equity delta.

We obtain similar results when we divide our sample into 10 deciles based on the magnitude of salary raises instead (Panel B). We also find that abnormal returns increase with the magnitude of salary raises. For example, the bottom decile has an abnormal return of 6.6% compared to 14.9% of the top decile. Forward-delta $\Delta^F_{i,t}$ has a magnitude about 200 across different portfolios, compared to a mean equity-delta $\Delta^E_{i,t+1}$ of 800. In other words, the ratio between forward-looking and equity delta is about 1:4.

## 5 Pay for Future Returns as an Implicit Contract

Our results imply that CEO compensation is sensitive to future returns at a magnitude that is not much smaller than through explicit equity-based compensation. This section provides suggestive evidence for an interpretation of such forward-looking compensation as part of implicit contracts to set long-term incentives. We first document how firms view performance reviews and their outcomes in ex-ante contracts and ex-post disclosure on CEO compensation. We then link both the ex-ante contract clauses and the ex-post return predictability to firm and

CEO characteristics where such contracts are more useful. We then zoom in on innovation as one activity for which information is often incorporated into stock returns with a delay.

### 5.1 Evidence from CEO Compensation Disclosure

To document actual compensation contractual practices, we construct a sample of compensation contracts by screening proxy statements and forms 10K, 10Q, and 8K (and their corresponding exhibits) for explicit employment agreements. US Securities and Exchange Commission Regulation S-K (§229.601) requires the disclosure of any contracts or any compensatory plan of named executive officers as defined by item 402(a)(3) (§229.402(a)(3)). When agreements are not available, we screen the same filings for indications of whether CEOs are subject to any agreements containing compensation related clauses. In total, 649 employment agreements are publicly available. The portion (40%) of our sample firms whose CEOs have explicit contracts is in line with findings in the literature (Gillan, Hartzell, and Parrino (2009): 46%, and Schwab and Thomas (2005): 42% ).

Most compensation contracts account for reviews. In Panel A of Table 6, we provide an overview of the frequency of review clauses and their content. More than half (54.7%) of the contracts require future reviews, and most contracts specify the review frequency (usually each year). Some contracts (less than 15%, see Panel B of Table 6) explicitly list factors considered for reviews, such as CEO performance and peer firm compensation, and among others. The most frequently mentioned review component is performance (8.6% of contracts).

[[ INSERT Table 6 about Here ]]

Most of the review provisions link positive reviews to increases in base salary. More than 75.5% of contracts explicitly prescribe salary adjustments as a consequence of positive reviews, as compared with 4.93% and 13.41% for bonus and equity adjustments (see Panel C of Table 6), respectively. Mr. Freeman's contract in Appendix 2 is a typical example. It calls for reviews only when discussing salary; in contrast, any adjustments to bonus or equity are subject to company-wide compensation policies that leave little discretion to the board.

Firms must justify compensation raises in proxy statements. We summarize these ex-post explanations in Panel A of Table 7 and lists the keywords we use to signify different types. For example, 7.4% of salary increases are explained using explicit measures of financial performance (i.e., objective performance reflected by net income, ROA, and so forth), and 39.9% of salary

increases are justified using general financial performance. In contrast, 16.8% of salary increases are described as a reward for subjectively evaluated performance – leadership, strategic planning, accomplishing an expansion or restructuring, and so forth. No justification is given (in proxy statements) for nearly a third of salary increases.[3]

[[ INSERT Table 7 about Here ]]

In Panel B of Table 7, we link these justifications to ex-ante contracts. Salary increases of CEOs with explicit review clauses are more likely to be justified subjectively (45.3% when no justification is given, and in 61.1% of firm-years when either no justification is given or their performance is evaluated subjectively). The corresponding numbers for CEOs with no contractual reviews are significantly lower: 31.5% and 51.9%, respectively. In contrast, CEOs with review clauses receive salary increases with justifications that use specific, objective measures in only 5% of all firm-years and use general financial performance in 30.5% of firm-years. The corresponding numbers for CEOs with no contractual reviews are significantly higher: 7.7% and 41.2%, respectively. In Panel C, we report results for CEOs who must undergo annual reviews; these results are similar to those in Panel B.

We link review requirement clauses to stand-alone salary raises and their disclosed justifications for firm-years under contract. Since not all CEOs sign contracts and not all firms that sign contracts disclose their particulars, we control for selection into our contract sample (see Appendix 3). We choose a state law characteristic for the identifying restriction: the at-will exception rule of good faith and fair dealing. This rule protects employees with shorter contracts or without contracts. The ensuing popularity of these contracts makes longer explicit contracts less attractive.

In the second stage (Table A.3, columns 1 and 2), we link subsequent compensation changes to contractual clauses requiring periodic review. To ease the comparison, we include only years when there is either a stand-alone salary increase or no change in salary. The presence of review clauses corresponds to 7.5% more salary raises when the only control is year fixed effects. This positive link is robust to controlling for CEO tenure, age, selection into contracting, year and industry fixed effects, as well as for an indicator variable for review factors explicitly written into the contract. In columns 3-5 we link contractual review clauses to the compensation

[3]There are also explanations for compensation changes that are not based on performance. In the sample, 29% of changes result from the benchmarking of CEO compensation to other executives who work in the same industry. Further increases followed contract renewals or adjustments for inflation.

narratives from proxy statements. Firms are less likely to cite objective performance measures for standalone salary raises under such contracts. Column 3 shows that CEOs with review clauses are 5.1% more likely to receive stand-alone salary increases without a stated justification. Column 4 shows that CEOs with review clauses are 8.1% more likely to receive stand-alone salary increases with subjective explanations. Column 5 indicates that contracts with review clauses are *not* more predictive of stand-alone salary increases justified with objective performance measures. These results are consistent with stand-alone salary raises as rewards for contribution to long-term performance.

### 5.2 Determinants of Review Clauses

One might argue that salary review clauses may be written into contracts for other reasons than reviewing the CEO for their contribution to future returns. For instance, competitive labor market conditions may require that the board frequently review executive performance and adjust CEO compensation accordingly. Moreover, a powerful CEO could demand more favorable clauses. Therefore, review clauses do not necessarily imply the need for performance evaluations. To explore the possible alternative explanations, we directly investigate the determinants of review clauses. Are firm–CEO pairs for which performance evaluations are more useful also more likely to sign contracts that contain review clauses?

According to Baker, Gibbons, and Murphy (1994), performance evaluations of contributions to long-term performance should be more prevalent in firms with noisier objective performance measures. For example, firms typically face a long delay before early R&D success comes to fruition in accounting terms; hence, compensation reviews based on inside information can be especially useful for firms with substantial R&D investment. Similarly, reviews are also especially useful for firms characterized by greater information asymmetry with respect to investors and/or by more volatile returns, as objective performance measures in these firms are noisy measures of CEOs' contribution to firm performance.

Compensation reviews for future performance are only one of several possible reasons for preferring contractual flexibility with respect to compensation. An extensive literature studies the various factors affecting compensation, including outside options, the extent of managerial power, and firm's financial constraints. First, compensation may change after renegotiations in response to changes in CEOs' outside options. For example, we find that firms explain in the proxy statement 29% of salary increases as benchmarked to peer CEO compensation in

the same industry. We use industry CEO turnover and homogeneity to measure labor market depth (Gillan, Hartzell, and Parrino, 2009). We also use total assets to proxy for firm size, as matching theories (Gabaix and Landier, 2008) predict that larger firms need more able CEOs, and accordingly, must offer higher compensation to attract them. Second, CEOs can influence reviews based on inside information far more easily than they can affect objective performance measures (for example, see Bebchuk and Fried (2006)). We use indicators for busy boards and board independence to assess managerial power. Third, more financially constrained firms have less to spend on salary and so may prefer to offer more equity-based pay. Babenko, Lemmon, and Tserlukevich (2011) posit that financially constrained firms may finance investments using cash inflows from employees exercising their stock options. Similarly, Core and Guay (2001) document that firms with financial constraints use more options for compensation. We use a dummy variable "distress" (Altman, 1968) as a measure for financial constraints. In Table A.4, we link these potential determinants to an indicator variable for review clauses as our dependent variable using a Probit specification for years in which we find a disclosed CEO contract. Columns 3 and 4 in Table A.4 include industry characteristics; columns 2 and 4 industry fixed effects.

Columns 1 and 4 in Table A.4 show that a firm with more R&D investment is more likely to have review clauses in its CEO's contract. This finding is consistent with our hypothesis because such firms are the most likely to realize their performance gains (or losses) after some delay. We also find that outside CEOs, about whom boards have less information, are more likely (by 12%) subject to review requirements; this result is significant across all specifications. In line with these results, columns 1 and 3 in Table A.4 reveal that firms with higher levels of idiosyncratic risk are also more likely to offer CEO contracts that include a review requirement. However, review clauses are less likely to be required by distressed firms. This finding could be explained by the asymmetry of adjustments that result from compensation review (i.e., upward adjustments are far more common than downward ones).

Industry characteristics are also significantly related to contract characteristics, although not in all specifications and sometimes not in the expected direction. We find that firms operating in a more homogeneous industry (where outside options are more likely to emerge) are *less* likely to write review requirement clauses into their CEO contracts. In contrast, industries with more outside CEOs in which better outside options are more likely to emerge are *more* likely to incorporate review clauses, although not in all specifications. Finally, we find weak evidence

of a negative association between good governance and review clauses.

Collectively, these findings suggest that, when information asymmetry between a firm and investors is higher, firms are more inclined to offer flexible CEO contracts that incorporates compensation reviews for future performance. We also find evidence that review clauses are predicted (albeit much more weakly) by potential outside options.

### 5.3 Heterogeneity of Return Predictability

The results in previous sections suggest that review contract clauses are more prevalent in firms with greater information asymmetry. To provide additional evidence for the implicit contracting based on future performance, we explore here whether the heterogeneity in firms' informational environment also affects the return predictability of salary raises.

Following Dierkens (1991), Thomas (2002), and Moeller, Schlingemann, and Stulz (2007), we use quarterly analyst forecast dispersion, idiosyncratic risk based on a four factor-model, bid-ask spread of stock prices, and the length of years since a CEO assumed that role as measures of information asymmetry (see Appendix 1 for definitions). Specifically, in Panel A of Table 8, columns from 1 to 6, we rank firms based on analyst forecast dispersion, idiosyncratic risk, and annual average stock bid-ask spread above or below the industry median for each year. In columns 7 and 8, we rank firms based on their CEO tenure each year: whether a CEO has served for fewer or more years than his or her median industry peer in that year; we make this adjustment to accommodate industry differences. We then conduct return forecasting regressions, as in Table 7, for each subsample.

[[ INSERT Table 8 about Here ]]

We find that stand-alone salary increases predict 50-bps monthly stock returns one year after raises in the subsample of firms with more divergent analyst forecasts. In the other subsample of firms with less convergent analyst forecasts, stand-alone salary increases, however, do not predict stock returns. Similarly, salary raises offered by firms with greater idiosyncratic risk and higher bid-ask spreads predict stock return increases one year after raises, but not in other subsamples. Stand-alone salary raises offered to CEOs who have served fewer years than their industry peers predict an 80-bps increase in monthly stock returns one year after raises, but not in the other subsample. These findings confirm our hypothesis that the return predictability of inside information should be more pronounced in firms that operate in more

opaque environments or if objective performance measures cannot adequately account for CEO performance.

### 5.4 R&D Activities and Accounting Performance

Innovation is one main area in which the literature suggests that objective performance measures incorporate inside information with a delay. Extensive evidence documents that individuals pay less attention to, and place less weight on, information that is harder to process (Song and Schwarz, 2010; Cohen, Malloy, and Ngyuen, 2018). This inattention may be one reason for the market under-reaction to information contained in R&D investment (Chan, Lakonishok, and Sougiannis, 2001; Eberhart, Maxwell, and Siddique, 2004; Cohen, Diether, and Malloy, 2013; Hirshleifer, Hsu, and Li, 2013). If financial measures have not yet absorbed the effect of novel research and product development, then such firm activities should come to fruition after rewards based on evaluation of those activities. In contrast, there is little reason why reaction to omitted factors outside the firm should predict success in innovation.

Panel A of Table 9 summarizes two outcomes of R&D activities: the number of future product announcements and the abnormal returns to those announcements. Because product announcement data from S&P Capital IQ does not start until year 2002, we use only a subsample of our data. We control for the R&D investment and past returns that may lead to better innovation and return outcomes: the logarithm of total assets, market-to-book ratio, R&D/sales, and annual stock returns, all with a one-year lag. We include firm-year observations with either a stand-alone salary increase or no change in salary.

[[ INSERT Table 9 about Here ]]

In columns 1 and 2 of Panel A, we regress product announcements, one year and two years after the raises, on compensation changes. We scale the number of product announcements as a fraction of the number of announcements one year before the raises. After we control for both year and firm fixed effects, the number of product announcements compared to the last year increases by 24% one year after an increase in stand-alone salary.

In the event of a positive performance evaluation, we expect that compensation changes predict an improvement in returns to new product announcements. Hence, we calculate, in columns 3 and 4 of Panel A, the average abnormal return changes before and after each product announcement date. Here we use the standard market model approach to estimate abnormal

stock returns and define the product announcement date as the event day ($t = 0$). We estimate parameters for the market model over a 90-day period – ending 46 days before the event day – using the equal-weighted CRSP index. We calculate cumulative abnormal returns (CARs) for an event window that ranges from $t = 5$ to $t = +5$. We then calculate the mean CARs for all product announcement events in each year. Stand-alone salary increases predict returns that increase significantly (by 30-bps) over the +/-5-day window.

These results indicate that stand-alone salary raises are a good predictor of the future success of a firm's research activities. Moreover, firm activities improve in the year after such raises, but we do not find any improvement 2 years after the salary changes, which is consistent with our results with respect to portfolio analysis and return forecasting regressions.

In Figure 2.2, we plot the number of product announcements as a fraction of the total number of announcements in the past year. The x-axis is the number of months between the fiscal year start and the month when the product announcement is made. The number of product announcements one year after the compensation change is higher for firms that offer stand-alone salary raises than that of firms that do not offer such raises, especially around 13 and 15 months after the raises. Consistent with Figure 2.1, such a pattern further confirms that replicating long-short strategy based on official announcements of CEO salary in the following year is not possible, as most of the information is already public when compensation change is finally announced in the proxy statement.

In Panel B of Table 9, we examine if accounting performance also improves following the salary raises. The dependent variables in columns 1 and 2 of Panel B are sales 1 year and 2 years after compensation changes, divided by sales one year before compensation changes. The dependent variables in columns 3 and 4 of Panel B are ROE 1 year and 2 years after compensation changes. We find that sales picks up by 16% one year after the salary raise and ROE by 3% two years after the salary raise.

Overall, our results show that positive reviews are followed by positive R&D outcomes and accounting performance. Our findings suggest that firms are aware of delays in information being incorporated into objective measures and reward CEOs based on such information.

# 6 Alternative Explanations

While the previous section provides evidence suggesting that firms indeed use inside information to reward CEOs for future returns, there are several plausible explanations for such return predictability of stand-alone salary raises. First, both the salary raises and the subsequent positive returns may be driven an industry-wide trend to increase compensation in ways that improve outside options for CEOs. Second, entrenched CEOs in badly governed firms, forecasting good performance and therefore less shareholder scrutiny, may demand a raise in salary even if they do not deserve it. Third, salary raises themselves may actually cause, rather than reward, positive future performance by giving CEOs incentives to improve future performance (e.g., via the efficiency wages channel, Akerlof (1982, 1984)). In this section, we test these alternative explanations.

## 6.1 Industry-wide Compensation Trends

One might argue that CEO salary changes may simply reflect an industry-wide compensation trend; thus, the subsequent positive returns can be explained by omitted industry factors that positively impact firm returns. We conduct a placebo test to examine this possibility.

In Panel A of Table A.5, we construct a long–short portfolio that invests in firms whose industry peers experienced a stand-alone salary increase on average and takes a short position in firms whose industry peers experienced no increase in salary. We take the mean of changes in each component of compensation for a firm's industry peers (excluding the firm) and categorize stand-alone salary raises for the mean change in industry peers. Salary increases constructed by using a firm's industry peers are not predictive of its future stock returns under any risk adjustments. For example, the spread return after three-factor adjustment are insignificant 6 bps ($t = 0.37$) one year after the raises. Thus, the return predictability of stand-alone salary increases is unlikely to be entirely caused by unobservable industry factors.

## 6.2 Corporate Governance

The pay-performance-sensitivity may reward luck instead of an actual contribution by the CEO. Especially in firms with bad corporate governance, entrenched CEOs may raise their salary ahead of good future performance because they fear less shareholder scrutiny. If such raises are more prevalent, salary raises should predict higher stock returns in firms with worse

governance. To test this alternative explanation, we conduct cross-sectional tests with respect to firms' governance quality.

Measurement of governance is always somewhat arbitrary, and empirical evidence on the effects of governance measures is often contradictory, lacks significance, or inadequately accounts for governance quality (e.g., Knyazeva, Knyazeva, and Masulis, 2013; Kang, Kim, and Low, 2016; Houston, Lee, and Shan, 2016). With this note of caution, we follow the literature and examine two board-related characteristics: whether a board has a high number of directors with other engagements ("busy directors" in Fich and Shivdasani, 2006, or "overboarding directors" for practitioners[4]) and whether the board is dominated by independent directors (Nguyen and Nielsen, 2010). In columns 1-4 in Table A.6, we rank firms based on their percentage of busy directors and their percentage of independent directors on their respective boards above or below industry median for each year. In columns 5-8 of Table A.6, using Boardex data, we compute the same measures of the fractions of independent directors and busy directors, but only for compensation committees (Anderson and Bizjak, 2003; Bebchuk and Fried, 2003). We rank firms based on their respective percentage of busy directors and percentage of independent directors on the compensation committee above or below industry median for each year. We then conduct return forecasting regressions for each subsample.

Columns 1-4 of Table A.6 shows that stand-alone salary increases are predictive of future returns, but only in firms with fewer outside engagements and more independent directors. Stand-alone salary raises offered by a more independent board predict a 40-bps increase in monthly stock returns one year after raises. Similarly, stand-alone salary raises offered by a less busy board predict a 50-bps increase in monthly stock returns one year after raises. In addition to the higher return predictability in better governed firms, our results also suggest that board independence does not hamper information flows for compensation reviews based on future returns.

The compensation committee is the vehicle directly responsible for CEO compensation. Consistent with the advisory role that compensation committees serve, the results we find in columns 1-4 of Table A.6 also hold for directors on compensation committees, as shown in columns 5-8 of Table A.6. Stand-alone salary increases are also predictive of future returns, but only in firms with better-governed compensation committees. For example, stand-alone salary raises offered by a more independent compensation committee predict an 80-bps increase in

[4]More details available at https://www.issgovernance.com/file/policy/uk-ire-overboarding.pdf.

monthly stock returns one year after raises. Similarly, stand-alone salary raises offered by a less busy compensation committee predict a 90-bps increase in monthly stock returns one year after raises.

These findings also lend further support to our interpretation of implicit contracting that rewards CEOs for their contribution that takes time to be impounded into stock returns. The quality of reviews based on inside information depends on the quality of firm governance and the directors who make the judgments. However, a large literature raises questions on the adequacy of governance by boards (Mace, 1971; Fich and Shivdasani, 2006; Nguyen and Nielsen, 2010). Thus, inside information should be more valuable in predicting long-run returns in firms with better governance, where boards are better in obtaining such information, monitoring and rewarding CEOs, and less subject to performance measure manipulation.

### 6.3 Efficiency Wage

A wage above the market equilibrium rate can itself cause employees to work harder, as it increases the cost of dismissal (Akerlof, 1982, 1984). Thus, increases in base salary could have a causal influence on performance via this efficiency wages channel. To find whether the CEO is paid above or below the market equilibrium rate, we follow Gillan, Hartzell, and Parrino (2009) and regress total compensation on firm and CEO characteristics and control for industry and year fixed effects. A negative residual indicates that the CEO is paid below the market wages suggested by the model in Gillan, Hartzell, and Parrino (2009). If return predictability can be fully explained by the incentive effect of efficiency wage, then salary raises offered to a CEO with negative abnormal compensation should not predict future returns.

In Panel B of Table A.5 tests this idea. We double sort stocks based on salary increase and negative abnormal compensation. We first sort them into two groups based on whether the abnormal compensation is negative or positive, and then sort each group based on stand-alone salary increases. A long–short portfolio spread between the portfolio with stand-alone salary increases in firms that offer negative abnormal compensation and the portfolio with no change in salary in firms that offer negative abnormal compensation has positive abnormal returns after three-factor adjustment of 45 bps ($t = 2.55$) half a year after the raises. Thus, the return predictability of stand-alone salary increase is unlikely to be fully driven by the efficiency wage channel.

A long–short portfolio spread between the portfolio with stand-alone salary increases in firms

that offer positive abnormal compensation and the portfolio with no change in salary in firms that offer positive abnormal compensation also predicts stock returns of 93 bps ($t = 2.24$) half a year after the raises. The difference between two spread portfolios could be ascribed to pay for future returns and efficiency wages. Alternative sample splits, comparing total compensation or base salary to the industry average, yield qualitatively similar results.

### 6.4 Compensation Based on Explicit Performance Measures

Extant research (Bushman, Indjejikian, and Smith, 1996; Gibbs, Merchant, Van der Stede, and Vargus, 2004) suggests that the board could also use bonus as discretionary pay. Thus, it is possible that the return prediction power of salary raises could be driven by contemporaneous change in bonus. We test this possibility in Panel C of Table A.5.

We double sort stocks based on salary increase and bonus increase. We construct two long–short portfolios, one that invests in firms that reduce bonus and stand-alone salary increase and takes a short position in firms that reduce bonus but no change in salary, and the other one that invests in firms that increase bonus and stand-alone salary increase and takes a short position in firms that increase bonus but no change in salary. The spread portfolio has insignificant returns after the raises. For example, the spread portfolio with bonus decreases has significant returns after three-factor adjustment of 1.72 bps ($t = 2.45$) half a year after the raises. We also do not find significant spread returns one year or 1.5 years after the raises. The spread portfolio with bonus increases however does not predict future stock returns. These results indicate that the incentive effect caused by bonus increases is unlikely to be the primary factor that drives the predictability of stand-alone salary increases. In addition, the sizable magnitude of salary predictability when bonus goes down further suggests that the importance of salary as pay for long-term performance when short-term performance measures suggest the opposite.

In unreported results, we find that CEO salary and bonus both increase in 36% of all firm-years. In 30% of all firm-years, salary increases but bonus declines, suggesting that these payment forms are not perfect substitutes. One reason why we are unable to uncover inside information from measures based on bonus and equity-based pay is that adjustments of bonus or equity are subject to either company-wide compensation plans or to rules protecting shareholders from dilution. Therefore, boards are left with little discretion in these matters. In fact, as we documented in Section 2.1, fewer than 5% of CEO contracts discussed explicit discretionary adjustments of bonuses. Consistent with our finding, Guay, Kepler, and Tsui (2016) show that

more than 90% of CEO bonus plans include at least one earning-based metric.

# 7 Robustness Tests

In this section, we provide several tests to show that our construction of stand-alone salary raises is robust.

## 7.1 Alternative Construction for Stand-alone Salary Increases

Salary increases can be identified in many ways. In this section, we show that our results are robust to alternative ways of constructing stand-alone salary increases. In Table 11, we report abnormal returns and t-statistics for the long-short spread portfolio of each test in the first and second row respectively (see the Internet Appendix for the abnormal returns of the underlying portfolios).

In Panel A of Table A.7, we exclude from the sample the years 2001–2003 during which the stock market crashed. A crash may render equity grants less attractive (Frydman and Jenter, 2010) and could thus result in such grants being replaced with cash-based pay. Excluding those years renders the returns more statistically significant and economically substantial than when we use the full sample. For instance, abnormal returns to the long–short portfolio after three-factor adjustment are 56 bps ($t = 4.17$) half a year after raises, or 5 bps higher than in the full sample.

In Panel B of Table A.7, we define stand-alone salary increases using nominal salary increases instead of real salary increases, as not every firm adjusts salary to incorporate inflation. A long–short portfolio that invests in firms that offer nominal stand-alone salary increases and takes a short position in firms that do not has significant and large spreads under all risk adjustment specifications. Abnormal returns to the long–short portfolio after three-factor adjustment amount to 50 bps ($t = 3.65$) half a year after the raises, or 6% annually.

In Panel C of Table A.7, when defining stand-alone salary increases, we exclude all changes in equity compensation rather than only changes that exceed the contemporaneous changes in salary. Thus, the set of stand-alone salary increases is reduced based on this stricter definition of "no change in equity pay". A long–short portfolio that invests in firms that offer stand-alone salary increases without any changes in equity value and takes a short position in firms that do not has a significant and large spread under all risk adjustment specifications.

Equity-based compensation is typically granted in multi-year cycles (Hall, 1999), and vests according to a pre-specified schedule (Cadman, Campbell, and Klasa, 2016). Thus, comparing equity values between two consecutive years is less likely to capture the actual decision making of boards in granting equities. In Panel D of Table A.7, we compare equity grant value to the previous year's grant values, rather than the previous grant's value, and define stand-alone salary increases if there is no change in equity value from the previous year. The spread is only significant under three-factor and four-factor adjustment specifications, and the predictability does not persist after a year. While this result suggests that our measure of stand-alone salary increases is robust to more flexible ways of controlling for equity-based pay, it also indicates that comparing equity values between two grants is more likely to capture the actual decision making of boards in granting equities. In unreported tests, we also compare the number of options granted rather than their value to that of the previous grant. The spread of a long–short portfolio that invests in firms that offer stand-alone salary increases without any changes in the number of equity grants and takes a short position in firms that do not offer such raises is not significant under any of the risk adjustment specifications. This result suggests that boards' decisions in making equity grants are likely to be based on value, although they may be offered in the form of fixed numbers (Shue and Townsend, 2017).

### 7.2 Total Compensation Changes

As noted earlier, linking total CEO compensation to future returns (Lewellen et al., 1992; Brick et al., 2006) yields mixed results and is problematic to interpret because of mechanical links between equity compensation and subsequent returns. Also, it may reflect unobservable changes in negotiation power of the CEO and the firm. In this section, we construct long-short portfolios based on compensation changes used in the literature to compare our results to the literature.

In Panel A of Table A.8, we sort stocks into two portfolios, one consisting of firms with top decile of total compensation (tdc1) changes and the other consisting of firms with bottom decile of total compensation changes. To ease the comparison, in Panel B, we sort stocks into two portfolios, one consisting of firms with top decile of salary changes and the other consisting of firms with bottom decile of salary changes. We find that long-short portfolios based on salary raises predict stock returns, largely consistent with results in Table 3. Long-short portfolios based on total compensation changes, however, do not predict stock returns.

In Panel C of Table A.8, we also provide tests to see if compensation measures based on equity raises can also predict firm performance and activities. We construct a long–short portfolio that invests in firms that increase both salary and equity and takes a short position in firms that do not offer a raise in either component.[5] The spread portfolio has insignificant returns after three-factor adjustment of 24 bps ($t = 1.31$) in half a year after the raises. We also do not find significant spread returns 1 year or 1.5 years after the raises.

# 8 Conclusion

Monitoring and compensating managerial contribution to long-term performance is the central task of boards (Adams, Hermalin, and Weisbach, 2010; Burkart, Miglietta, and Ostergaard, 2017). In practice, many investors question the feasibility of "pay for future returns". Instead, growing concerns about self-serving behavior, board governance quality and information manipulation (Prendergast and Topel, 1996; Murphy and Oyer, 2003; Hallock and Oyer, 1999) have led to calls for limits to discretion in executive compensation. Indeed, the most popular regulatory response to such concerns, the non-binding shareholder vote on executive pay ("Say-on-Pay", mandated in the UK in 2002 and 2011 in the US), dramatically reduces the ability of boards to reward executives based on inside information (Ferri and Maber 2013, Kaplan 2007). This debate whether boards can, and should have the power to use inside information to monitor and reward long-term performance is not only important for executive compensation. If boards cannot bridge the information gap between the firm and outside investors (Cornelli, Kominek, and Ljungqvist, 2013), do we need them at all?

This paper demonstrates how firms pay CEOs not only to reward past performance, but also future performance. The recent discussion of potential downsides of explicit performance-based compensation has triggered calls to use cash compensation to reward long-term returns (e.g., Bizjak et al., 1993; Shilon, 2018). These arguments reflect a long-standing theoretical literature on the benefits of subjective performance reviews when stock prices incorporate performance with a delay. We document for the first time that executive contracts indeed schedule reviews for long-term performance, and that positive reviews are rewarded with increases in base salary. Executives with explicit review provisions are more likely to receive subjectively justified stand-

[5]We tried to construct a portfolio that takes the same long position and a short position in firms that offer an increase in equity but not in salary. However, because fewer than 5% of firms employ that scheme, we are unable to make any statistically meaningful statements about it.

alone salary increases, which implies that compensation changes following reviews are part of the incentive scheme.

Our paper complements the literature on long-term compensation, a growing literature that focuses on the inside information in the context of corporate governance, as well as the theoretical literature that explores the evaluation of long-term performance. Instead of studying compensation based on explicit performance measures, we provide evidence gathered from CEO contracts whose terms do not exclusively rely on such measures. We show how they play a key role in encouraging long-term innovation decisions. Due to the fast development in information and communication technology in recent years, the cost of acquiring information has greatly declined for shareholders. Our evidence on the existence of inside information suggests that the increased accessibility of such information could encourage more active shareholder engagement, especially in situations in which objective performance measures are not sufficient to align incentives between management and shareholders.

While our methodology of identifying inside information applies to rewards using salary raises, future studies can uncover such information embedded in other components of CEO compensation, such as equity-based pay. It would be worthwhile also to study how boards weigh observable and inside information to determine CEO compensation. Doing so would help us better understand both the pay-performance sensitivity and effectiveness of CEO compensation designs based on inside information.

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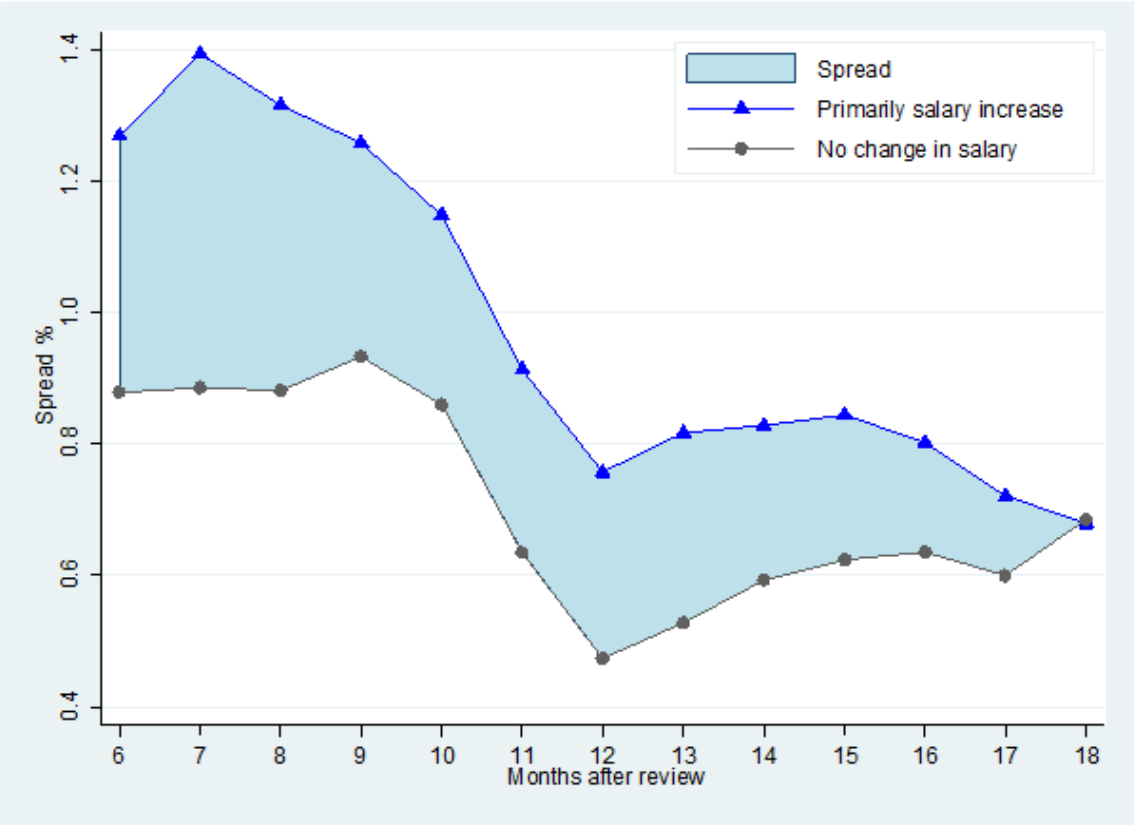
Figure 1: Long-short spread portfolio




| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Spread | 0.39% | 0.51% | 0.43% | 0.33% | 0.29% | 0.28% | 0.28% | 0.29% | 0.24% | 0.22% | 0.17% | 0.12% | -0.01% |
| t-stat | 2.53 | 3.83 | 3.16 | 2.3 | 2.06 | 1.97 | 1.75 | 2 | 1.64 | 1.55 | 1.14 | 0.8 | -0.05 |

Note: This figure plots monthly long-short portfolio returns from 6 months to 18 months following compensation changes. Each month, we construct a long–short portfolio that invests in firms that offer stand-alone salary increases without contemporaneous changes in equity-based pay and takes a short position in firms that do not offer such raises using CEO compensation changes at the beginning of the each fiscal year. We compute excess returns for these long and short portfolios. More details of portfolio construction are provided in Section 4. The panel below the figure presents spreads of long-short portfolios and t-statistics. Standard errors are computed after Newey-West adjustment with three lags.

Figure 2: Timing of proxy filings and product announcements

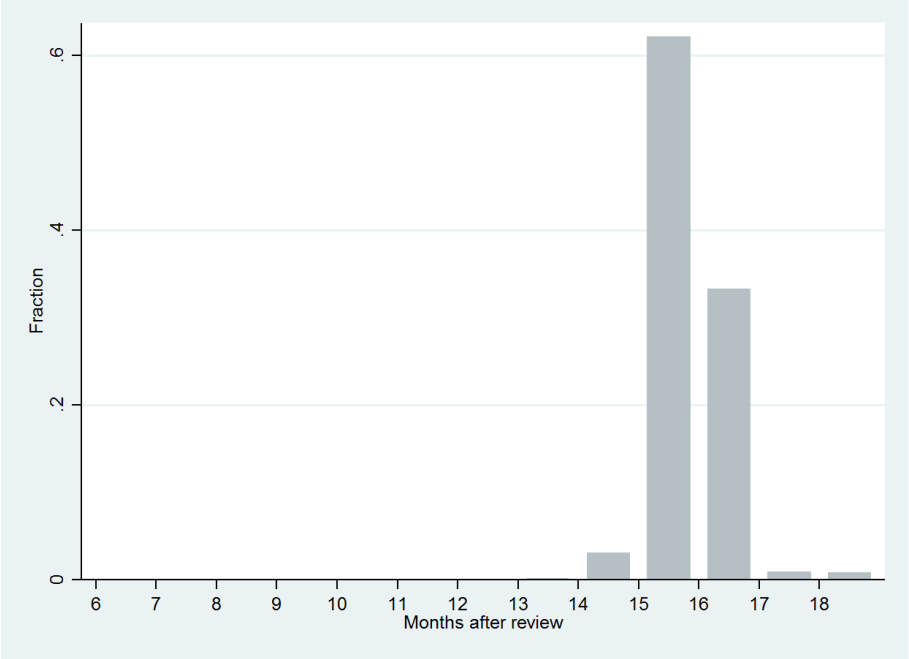



Figure 2.1: Proxy filings

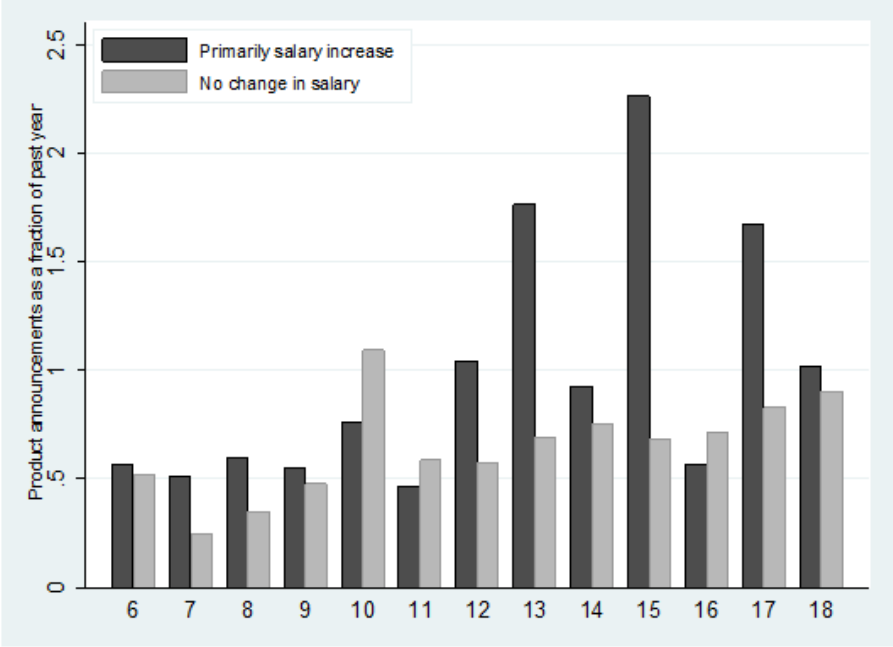



Figure 2.2: Product announcements

Note: The first figure plots the distribution of time lags between compensation change (salary) and disclosure in the proxy statements. Time lags are calculated as the number of months between the fiscal year start and the month when the proxy statement of that fiscal year is disclosed. The second figure plots the number of product announcements as a fraction of past year total announcements for firms that offer stand-alone salary raises and for firms that do not. Time lags are calculated as the number of months between the fiscal year start and the month when the product announcement of that fiscal year is made.

Table 1: **Summary statistics**

| Variable | N | Mean | Median | STD | Min | Max |
|---|---|---|---|---|---|---|
| **Firm characteristics** | | | | | | |
| Total assets (in $ millions) | 5,121 | 23,901.01 | 7,059.60 | 39,722.50 | 57.33 | 153,412.60 |
| Total sales (in $ millions) | 5,121 | 10,353.05 | 5,081.50 | 12,577.00 | 15.66 | 46,089.78 |
| ROA | 5,097 | 0.08 | 0.07 | 0.06 | -0.62 | 0.17 |
| Idiosyncratic risk | 5,117 | 0.30 | 0.26 | 0.15 | 0.06 | 1.27 |
| Analyst forecast dispersion | 5,121 | 0.12 | 0.05 | 0.27 | 0.00 | 3.32 |
| R&D/sales | 5,121 | 0.04 | 0.00 | 0.26 | 0.00 | 16.44 |
| Leverage (net) | 5,121 | 0.33 | 0.36 | 0.24 | -0.37 | 0.88 |
| Distress | 5,096 | 0.30 | 0.00 | 0.46 | 0.00 | 1.00 |
| Depre.&Amort.% | 5,032 | 0.04 | 0.03 | 0.03 | 0.00 | 0.78 |
| Gindex | 5,121 | 9.51 | 9.44 | 1.59 | 3.00 | 15.00 |
| Stock return monthly | 58,849 | 0.01 | 0.01 | 0.11 | -0.45 | 0.35 |
| Product announcements | 2,989 | 3.42 | 0.00 | 15.67 | 0.00 | 295.00 |
| **CEO characteristics** | | | | | | |
| Outside CEO | 5,121 | 0.14 | 0.00 | 0.34 | 0.00 | 1.00 |
| Tenure CEO | 5,121 | 7.84 | 6.00 | 6.46 | 2.00 | 45.00 |
| Age CEO | 5,121 | 55.80 | 56.00 | 6.84 | 36.00 | 74.00 |
| Chairman CEO | 5,121 | 0.74 | 1.00 | 0.44 | 0.00 | 1.00 |
| Independent directors (% of board) | 5,121 | 0.67 | 0.66 | 0.16 | 0.00 | 1.00 |
| Busy board | 5,121 | 0.29 | 0.00 | 0.39 | 0.00 | 1.00 |
| Independent directors | | | | | | |
| (% of compensation committee) | 3,723 | 0.67 | 0.70 | 0.19 | 0.00 | 1.00 |
| Busy compensation committee | 3,725 | 0.29 | 0.00 | 0.45 | 0.00 | 1.00 |
| **Labor market characteristics** | | | | | | |
| Industry homogeneity | 5,117 | 0.06 | 0.05 | 0.02 | 0.04 | 0.14 |
| Industry CEO turnover | 5,121 | 0.12 | 0.11 | 0.07 | 0 | 0.75 |
| Industry outside CEOs% | 5,121 | 0.58 | 0.58 | 0.07 | 0.17 | 0.86 |

Note: This table presents summary statistics for our sample, excluding the first and last years of each CEO's tenure, for S&P 500 companies between 1994 and 2008. Columns 1, 2, 3, 4, 5, and 6 show the number of observations, mean, median, standard deviation (STD), and minimum and maximum values in the sample, respectively, for each variable. Industry classifications are based on the first two digits of the SIC code.

Table 2: **Salary changes**

| *Panel A: Changes in salary* | | | |
|---|---|---|---|
| | (1) | (2) | (3) |
| Change in salary | **-** | **0** | + |
| Salary (thousands) | 646.04 | 721.14 | 712.96 |
| Bonus (thousands) | 553.06 | 793.24 | 648.94 |
| Equity-based compensation (thousands) | 4,082.80 | 4,677.45 | 3,850.01 |
| Change in salary | -13.3% | -2.6% | 9.5% |
| Frequency in % of all years | 5.2% | 25.4% | 69.4% |
| *Panel B: Change in equity* | | | |
| Change in equity-based pay | **-** | **0** | + |
| Salary (thousands) | 731.54 | 691.71 | 774.85 |
| Bonus (thousands) | 653.45 | 669.67 | 747.17 |
| Equity-based compensation (thousands) | 3593.15 | 3708.68 | 5862.58 |
| Change in salary | 3.4% | 5.7% | 3.5% |
| Frequency % of all years | 13% | 71% | 16% |
| *Panel C: Changes in salary and equity* | | | |
| Change in salary | | + | |
| Change in equity-based pay | **-** | **0** | + |
| Salary (thousands) | 713.68 | 699.61 | 766.99 |
| Bonus (thousands) | 677.39 | 665.56 | 655.67 |
| Equity-based compensation (thousands) | 3,170.69 | 4,009.93 | 5,405.40 |
| Change in salary | 6.7% | 10.8% | 6.5% |
| % of all years | 10.2% | 46.0% | 71240.1% |
| *Panel D: Total effect of salary changes* | | | |
| | Min | Base | Max |
| Wealth effect via salary raise as fraction of total compensation STD | | | |
| Before tax | 46.59% | 64.15% | 84.46% |
| After Tax | 46.20% | 55.83% | 83.77% |
| Wealth effect via salary raise as fraction of total compensation Mean | | | |
| Before tax | 49.27% | 59.56% | 89.32% |
| After Tax | 48.86% | 59.03% | 88.59% |

Note: This table presents summary statistics of CEO compensation. The sample consists of S&P 500 companies between 1994 and 2008. Panel A (B) presents the frequency of increases and decreases in CEO salary (equity compensation), the magnitude of compensation components in firm-years of these changes, and the percentage change. Panel C presents the frequency of increases and decreases in equity compensation for firm-years with real increases in salary, the magnitude of compensation components, and the percentage change. We classify a raise if real (i.e., inflation adjusted) salary growth is positive; the salary cut classification is based on nominal growth. If a CEO receives no equity in the years between two grants, we classify these years as no change in equity-based compensation. We then compare the current grant value to the previous grant's value. We classify equity-based compensation only as change if it exceeds (in absolute value terms) that year's change in salary. Rows 1 and 2 in Panel D reports the present value of implied effects of one standard deviation increase in salary on salary, severance pay and pensions as a fraction of the current total compensation (TDC1). Rows 3 and 4 in Panel D reports the present value of implied effects of sample mean increase in salary on salary, severance pay and pensions as a fraction of the current total compensation (TDC1). The min case assumes retirement next year, the base case assumes at the average tenure of all CEOs that leave office in the focal year (or next year, if the current tenure is larger), the max case assumes at an age of 65 (or next year, if the CEO is over 65). The impact on severance pay is calculated as two times the salary change for a given CEO-firm pair (Rusticus, 2006). The impact on pensions is the sum of salary change times benefit factor times years in service. The discount rate of 5.5%, benefit factor of 0.02, and the annuity factor are from Stefanescu, Wang, Xie, and Yang (2018) which takes mortality rates into account. Rows 2 and 4 in Panel D take into consideration the personal income tax. We apply the highest bracket (39.6%) of personal income tax in the US to salary, severance pay and pensions, and 20% of capital gain tax to stock grants.

Table 3: **Calendar-time portfolio returns**

| Returns | Excess returns | 3-factor alpha | 4-factor alpha | Excess returns | 3-factor alpha | 4-factor alpha | Excess returns | 3-factor alpha | 4-factor alpha |
|---|---|---|---|---|---|---|---|---|---|
| | Year 0.5 after salary change | | | Year 1 after salary change | | | Year 1.5 after salary change | | |
| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) | (9) |
| *Panel A: Stand-alone salary increases* | | | | | | | | | |
| Stand-alone salary increase | 1.27% | 0.73% | 0.81% | 0.76% | 0.48% | 0.55% | 0.68% | 0.57% | 0.59% |
| No change in salary | 0.88% | 0.22% | 0.39% | 0.47% | 0.11% | 0.28% | 0.69% | 0.57% | 0.60% |
| Spread | **0.39%** | **0.51%** | **0.42%** | **0.28%** | **0.36%** | **0.27%** | -0.01% | 0.00% | -0.01% |
| T-stat | 2.53 | 3.75 | 3.10 | 1.75 | 2.46 | 1.91 | -0.05 | 0.00 | -0.07 |
| *Panel B: Stand-alone salary increases: justifications* | | | | | | | | | |
| Spread_subjective explanation | **0.41%** | **0.54%** | **0.43%** | 0.24% | **0.32%** | 0.27% | -0.10% | -0.11% | -0.11% |
| T-stat | 2.45 | 3.60 | 2.95 | 1.29 | 1.86 | 1.59 | -0.66 | -0.75 | -0.73 |
| Spread_objective explanation | 0.20% | 0.42% | 0.33% | 0.28% | **0.57%** | 0.46% | -0.46% | -0.50% | -0.53% |
| T-stat | 0.54 | 1.20 | 0.95 | 0.76 | 1.69 | 1.35 | -1.03 | -1.12 | -1.20 |
| *Panel C: Four factor loadings, Year 1 after salary change* | | | | | | | | | |
| | MKT | T-stat | SMB | T-stat | HML | T-stat | UMD | T-stat | |
| Stand-alone salary increase | 0.71 | 14.95 | -0.03 | -0.51 | 0.04 | 0.60 | -0.04 | -1.14 | |
| No change in salary | 0.76 | 12.96 | -0.10 | -1.42 | 0.19 | 2.49 | -0.08 | -1.74 | |
| Spread | -0.07 | -1.96 | 0.12 | 2.83 | -0.14 | -2.84 | 0.03 | 1.02 | |

Note: This table shows calendar-time equally weighted monthly returns and t-statistics for portfolios sorted by changes in compensation. We form portfolios for each month; each portfolio includes all companies that made the same type of compensation change and of which the fiscal year starts within the prior 12 months. These portfolios so constructed are rebalanced monthly. In Panel A, we sort stocks into two portfolios, one consisting of firms with stand-alone salary increases and the other consisting of firms with no such increases. In Panel B, we further sort firms with stand-alone salary increases based on the justifications for salary changes listed, namely, subjective and objective reasons. Industry classifications are based on the first two digits of the SIC code. We compute excess returns, three- and four-factor alphas (as in Fama and French, 1996; Carhart, 1997) by running time-series regressions of excess portfolio returns on the market (MKT), size (SMB), value (HML), and momentum (UMD) factor returns. Panel C reports the factor loadings based on the four-factor model for portfolios in Panel A and their t-statistics. Standard errors are computed after Newey-West adjustment with three lags. The spreads of long-short portfolio returns are indicated in bold if they are positive and significant at the 10% level.

Table 4: **Stock return regressions**

| Dependent variable | Monthly stock return 0.5 year after salary change | | | Monthly stock return 1 year after salary change | | | Monthly stock return 1.5 years after salary change | | |
|---|---|---|---|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) | (9) |
| Stand-alone salary increase | 0.005*** | 0.005*** | 0.003** | 0.005*** | 0.005*** | 0.003** | 0.003 | 0.003 | 0.001 |
| | (0.002) | (0.001) | (0.019) | (0.002) | (0.002) | (0.019) | (0.002) | (0.002) | (0.018) |
| Other controls | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Firm cluster | Yes | No | No | Yes | No | No | Yes | No | No |
| Two way cluster | No | Yes | No | No | Yes | No | No | Yes | No |
| Fama-Macbeth | No | No | Yes | No | No | Yes | No | No | Yes |
| R-squared | 0.002 | 0.002 | 180 | 0.001 | 0.001 | 180 | 0.001 | 0.001 | 180 |
| N | 34,648 | 34,648 | 34,648 | 34,652 | 34,652 | 34,652 | 34,639 | 34,639 | 34,639 |

Note: This table reports the coefficients and standard errors (in parentheses) of forecasting regressions of monthly stock returns on compensation changes. We include observations with either a stand-alone salary increase or no change in salary. The dependent variables in columns 1, 2, and 3 are the monthly stock returns 0.5 year after compensation changes; in columns 4, 5, and 6, they are the monthly stock returns 1 year after compensation changes; in columns 7, 8 and 9, they are the monthly stock return 1.5 years after compensation changes. The independent variable is the dummy variable indicating stand-alone salary increases. Control variables include one-, two-, three-, four- ,and five-month lagged returns, the logarithm of asset size and market-to-book ratio, both with one-year lag. We estimate pooled regression in columns 1, 2, 4, 5, 7, and 8. Standard errors are clustered by firm in columns 1, 4, and 7 and by firm and year-month in columns 2, 5, and 8. Fama and MacBeth (1973) regressions are estimated in columns 3, 6, and 9. *** Significant at the 1% level. ** Significant at the 5% level. * Significant at the 10% level.

Table 5: **Estimating pay for future performance sensitivity**

| Decile | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
|---|---|---|---|---|---|---|---|---|---|---|
| *Panel A:Deciles based on wealth effect of salary raises* | | | | | | | | | | |
| Change in wealth effect | 0.017 | 0.022 | 0.026 | 0.031 | 0.035 | 0.041 | 0.046 | 0.055 | 0.065 | 0.101 |
| Annual abnormal return (%) | 0.887 | -1.511 | 0.605 | 4.280 | 4.154 | 2.808 | 6.737 | 5.504 | 6.597 | 15.357 |
| Wealth effect via salary raise (thousands) | 2,111 | 1,919 | 1,872 | 1,787 | 1,712 | 1,620 | 1,499 | 1,448 | 1,258 | 1,044 |
| Wealth effect via equity delta (thousands) | 651 | -1,095 | 445 | 3,308 | 2,676 | 2,346 | 6,344 | 4,420 | 5,552 | 11,314 |
| DeltaF | 2,381 | -1,270 | 3,094 | 418 | 412 | 577 | 222 | 263 | 191 | 68 |
| DeltaE | 734 | 725 | 735 | 773 | 644 | 835 | 942 | 803 | 842 | 737 |
| DeltaF : DeltaE | 13/4 | -7/4 | 21/5 | 1/2 | 2/3 | 2/3 | 1/4 | 1/3 | 2/9 | 6/65 |
| *Panel B:Deciles based on salary raises* | | | | | | | | | | |
| Change in salary | 0.014 | 0.025 | 0.019 | 0.031 | 0.047 | 0.062 | 0.079 | 0.106 | 0.152 | 0.409 |
| Annual abnormal return (%) | 6.594 | -8.359 | 5.618 | 4.920 | 8.029 | 5.187 | 6.621 | 9.514 | 10.070 | 14.930 |
| Wealth effect via salary raise (thousands) | 1,346 | 321 | 991 | 1,620 | 1,659 | 1,652 | 1,584 | 1,909 | 2,013 | 2,534 |
| Wealth effect via equity delta (thousands) | 6,305 | -2,399 | 3,969 | 3,502 | 5,108 | 3,471 | 3,939 | 5,840 | 6,474 | 13,046 |
| DeltaF | 204 | -38 | 176 | 329 | 207 | 318 | 239 | 201 | 200 | 170 |
| DeltaE | 956 | 287 | 706 | 712 | 636 | 669 | 595 | 614 | 643 | 874 |
| DeltaF : DeltaE | 1/5 | - 1/7 | 1/4 | 1/2 | 1/3 | 1/2 | 2/5 | 1/3 | 1/3 | 1/5 |

Note: In Panel A, we divide our sample into 10 deciles based on the change in the wealth effect brought by salary raises. In Panel B, we divide our sample into 10 deciles based on changes in salary. For each decile portfolio $i$, we construct a long-short portfolio that takes a long position in the stocks in the decile portfolio and a short position in firms that do not offer salary raises.We then obtain the abnormal returns for each long-short portfolio based on their excess returns. We calculate the wealth effect via salary raise for the decile portfolio $i$ based on the mean of salary raises, and the wealth effect via equity delta based on the abnormal returns of the long-short portfolio $i$. Finally, we calculate the two delta measures based on the discussion in Section 4.

Table 6: **Contract clauses**

| Clauses | Number | % of Total |
|---|---|---|
| (1) | (2) | (3) |
| *Panel A: Review clauses* | | |
| Review requirement | 355 | 54.70% |
| Review frequency: | 327 | 50.39% |
| Regular (Annually,15 Months and 18 Months) | 256 | 39.45% |
| Irregular | 64 | 9.86% |
| As often as other officers | 7 | 1.08% |
| Not specified | 28 | 4.31% |
| *Panel B: Review factors explicitly expressed in contracts* | | |
| Performance of the company and the CEO | 56 | 8.63% |
| Comparable executives in the firm and industry | 23 | 3.54% |
| Market conditions | 3 | 0.46% |
| Financial condition of the firm | 3 | 0.46% |
| Cost of living | 7 | 1.08% |
| *Panel C: Compensation components with explicit discretion* | | |
| Salary | 490 | 75.50% |
| Bonus | 32 | 4.93% |
| Equity grants | 87 | 13.41% |

Note: This table presents the summary statistics for contract clauses. The sample contains S&P 500 companies between 1994 and 2008. Specific contract clauses are listed in column 1, the number of contracts containing such clauses are shown in column 2, and column 3 presents the incidence of such clauses. Panels A and B list clauses regarding review requirement, review frequency and contract-mandated factors that should be considered in reviews. Panel C presents compensation components that boards have the discretion to adjust based on CEO performance.

Table 7: **Performance-related justifications for compensation changes**

| *Panel A: Justifications for compensation changes* | | |
|---|---|---|
| Justifications for changes | N | % of Total |
| | (1) | (2) |
| Objective performance | 322 | 7.41% |
| General performance | 1,735 | 39.90% |
| Soft measures of performance | 731 | 16.81% |
| Leadership | 421 | 9.68% |
| Strategy | 298 | 6.85% |
| Organizational development | 40 | 0.92% |
| Expansion | 37 | 0.85% |
| Restructure | 3 | 0.07% |
| Subjective | 130 | 2.99% |
| No justifications given | 1,446 | 33.26% |

| *Panel B: Review clauses of review requirement* | | | | |
|---|---|---|---|---|
| | Mean No | Mean Yes | t-stat of difference | |
| | (1) | (2) | (3) | |
| No justifications given | 0.315 | 0.453 | -6.375 | *** |
| Soft measures or no justifications given | 0.519 | 0.616 | -4.227 | *** |
| Objective performance | 0.077 | 0.050 | 2.293 | ** |
| General performance | 0.412 | 0.305 | 4.785 | *** |
| *Panel C: Annual review clauses* | | | | |
| No justifications given | 0.318 | 0.464 | -6.081 | *** |
| Soft measures or no justifications given | 0.520 | 0.628 | -4.229 | *** |
| Objective performance | 0.077 | 0.047 | 2.263 | ** |
| General performance | 0.409 | 0.309 | 4.001 | *** |

Note: Panel A presents the summary statistics for the justifications for compensation changes stated in the proxy statement. The sample contains S&P 500 companies between 1994 and 2008. The number of observations that contain those keywords is shown in column 1, and the percentage of such changes is provided in column 2. We present the frequency of salary increases based on justifications with and without review requirement clauses in columns 1 and 2 of Panel B and with and without annual review clauses in columns 1 and 2 of Panel C. We then compare the differences in the frequencies and present t-statistics in column 3 of Panels B and C. *** Significant at the 1% level. ** Significant at the 5% level. * Significant at the 10% level.

Table 8: **Stock return regressions: information heterogeneity**

| Dependent variable | Monthly stock return 1 year after salary change | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) |
| Sample | Low analyst forecast dispersion | High analyst forecast dispersion | Low idiosyncratic risk | High idiosyncratic risk | Low bid-ask spread | High bid-ask spread | Early CEO tenure | Late CEO tenure |
| Stand-alone salary increase | 0.001 | 0.005** | 0.002 | 0.005** | 0.001 | 0.006** | 0.008** | 0.002 |
| | (0.002) | (0.002) | (0.002) | (0.003) | (0.002) | (0.003) | (0.003) | (0.002) |
| Controls | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Two way cluster | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Adjusted R-squared | 0.0069 | 0.0073 | 0.0047 | 0.0077 | 0.0049 | 0.0080 | 0.0065 | 0.0059 |
| N | 18,546 | 16,119 | 17,747 | 16,918 | 17,465 | 17,200 | 12,055 | 22,610 |

Note: This table reports the coefficients and standard errors (in parentheses) of forecasting regressions of monthly stock returns on compensation changes. We include observations with either a stand-alone salary increase or no change in salary. The dependent variable is monthly stock returns 1 year after compensation changes. In columns 1-6, we rank firms based on analyst forecast dispersion, idiosyncratic risk, and stock bid-ask spread above or below industry median for each year. In columns 7 and 8, we rank firms based on their CEO tenure each year: whether the CEO serves for fewer or more years than his or her median industry peer in that year. Industry classifications are based on the first two digits of the SIC code. In all regressions, we include control variables of one-, two-, three-, four-, and five-month lagged returns, the logarithm of asset size and market-to-book ratio, both with one-year lag. Standard errors are clustered by firm and year-month. *** Significant at the 1% level. ** Significant at the 5% level. * Significant at the 10% level.

Table 9: **Firm activity**

| | After 1 year | After 2 years | After 1 year | After 2 years |
|---|---|---|---|---|
| | (1) | (2) | (3) | (4) |
| *Panel A: Product announcement* | | | | |
| Dependent variable | Product announcement | | CARs (-5, +5) | |
| Stand-alone salary increase | 0.240* | 0.077 | 0.003** | -0.001 |
| | (0.143) | (0.223) | (0.001) | (0.002) |
| Control | Yes | Yes | Yes | Yes |
| Year fixed effects | Yes | Yes | Yes | Yes |
| Firm fixed effects | Yes | Yes | Yes | Yes |
| Adjusted R-squared | 0.433 | 0.430 | 0.114 | 0.177 |
| N | 1,448 | 855 | 1,175 | 685 |
| *Panel B: Accounting performance* | | | | |
| Dependent variable | Sales | | ROE | |
| Stand-alone salary increase | 0.158*** | 0.204** | -0.022 | 0.0339* |
| | (0.053) | (0.085) | (0.024) | (0.019) |
| Control | Yes | Yes | Yes | Yes |
| Firm fixed effect | Yes | Yes | Yes | Yes |
| Year fixed effect | Yes | Yes | Yes | Yes |
| R-squared | 0.271 | 0.355 | 0.318 | 0.311 |
| N | 3,067 | 2,826 | 3,067 | 2,826 |

Note: This table reports the coefficients of OLS regressions of firm performance on compensation changes. We include firm-year observations with either a stand-alone salary increase or no change in salary. Standard errors (in parentheses) are heteroskedasticity robust.The dependent variables in columns 1 and 2 of Panel A are numbers of product announcements 1 year and 2 years after compensation changes, divided by the number of product announcements one year before compensation changes. The dependent variable in columns 3 and 4 of Panel A is the average 11-day abnormal returns around the product announcement date 1 and 2 years after compensation changes. We use a standard market model approach to estimate abnormal stock returns and then take the mean of all product announcement events each year. The market model parameters are estimated over a 90-day period ending 46 days before the event day using the equal-weighted CRSP index. The sample contains S&P 500 companies between 2002 and 2008. In Panel B, the dependent variables in columns 1 and 2 are sales 1 year and 2 years after compensation changes, divided by sales one year before compensation changes. The dependent variables in columns 3 and 4 are ROE 1 year and 2 years after compensation changes. Control variables include the logarithm of asset size, market-to-book ratio, R&D/sales, and annual stock returns, all with one-year lag. *** Significant at the 1% level. ** Significant at the 5% level. * Significant at the 10% level.

# Appendix 1. Variable Definitions

| Variables | Definitions |
|---|---|
| Age group | Dummy variables for CEO age groups of $< 45$, $\geq 45$ and $< 50$, $\geq 50$ and $< 55$, $\geq 55$ and $< 60$, and $\geq 60$ |
| Analyst forecast dispersion | We first compute the standard deviation of quarterly EPS estimates scaled by the actual value per analyst and firm and compute the average across analysts for each firm |
| At-will exception | Dummy variable equal to 1 if the contract is governed by the law of a state with a good faith and fair dealing at-will exception, and 0 otherwise |
| Bid-ask spread | The absolute value of ask price minus bid price |
| Busyboard | Dummy variable equal to 1 if the fraction of busy directors who are in more than 2 outside public boards over the number of independent directors is greater than 0.5, and 0 otherwise |
| CEO age | CEO age in years |
| CEO tenure | Number of years the CEO has been in office |
| Chairman CEO | Dummy variable equal to 1 if a CEO also serves as a chairman of the board, and 0 otherwise |
| Contract | Dummy variable equal to 1 if we observe an employment agreement between the firm and the CEO, and 0 otherwise |
| Depr.&Amort.% | Depreciation and amortization as percentage of assets |
| Distress | Distress indicator based on Altman (1968) |
| Garmaise | Index of Garmaise (2009) |
| G-Index | Index of Gompers, Ishii, and Metrick (2003) |
| Idiosyncratic risk | Based on Wurgler and Zhuravskaya (2002): we regress daily firm excess return on a four factor-model and measure the volatility of residuals |
| Independent directors (% of board) | Percentage of independent directors on the board based on Fich and Shivdasani (2006) |
| Independent directors%_high | Dummy variable equal to 1 if the percentage of independent directors exceeds the industry median based on the two-digit SIC classification, and 0 otherwise |

| | |
|---|---|
| Industry CEO turnover | Industry turnover ratio of CEOs based on the first two digits of SIC |
| Industry homogeneity | Correlation between common monthly stock returns within two-digit SIC industries as in Parrino (1997) |
| Industry outside CEOs% | Industry ratio of outside CEOs based on the first two digits of SIC (see definition of outside CEO below) |
| Leverage (net) | Debt minus cash, divided by total assets |
| Total assets | Book assets (in $ millions) |
| Outside CEO | Dummy variable equal to 1 if the CEO is hired from outside firms or works in the firm for less than a year before becoming a CEO, and 0 otherwise |
| Product announcement | Number of product announcements per year |
| R&D /sales | R&D expenditure over total sales |
| Renewal | Dummy variable equal to 1 if a CEO was in office at the time of the contract start, and 0 otherwise |
| ROA | Earnings before interest & tax (EBIT) over total assets |
| Tenure group | Three dummies for a CEO who has worked in the same firm for at most 2 years, 3-5 years, and more than 5 years |
| Stock return (monthly) | One month holding period return |

## Appendix 2. Excerpt of a CEO Employment Contract

EMPLOYMENT AGREEMENT BETWEEN KENNETH W. FREEMAN & QUEST DIAGNOSTICS INCORPORATED

This EMPLOYMENT AGREEMENT (the "Agreement") is entered into as of the date of execution (the "Effective Date"), between QUEST DIAGNOSTICS INCORPORATED (the "Company"), a Delaware corporation having its principal place of business at One Malcolm Avenue, Teterboro, NJ 07608, and KENNETH W. FREEMAN (the "Executive"). [. . . ]

1. EMPLOYMENT. The Company shall continue to employ the Executive in a full-time capacity in the position set forth in this paragraph, and the Executive shall continue to accept such employment upon the terms and conditions set forth herein. Such employment shall be in the capacity of Chief Executive Officer of the Company, and as a Director and Chairman of the Board of Directors of the Company (the "Board") reporting directly to the Board. The Company shall nominate the Executive as a Director of the Company and shall use its best efforts to have the Executive elected and re-elected to the Board for the duration of the "Employment Term" (as hereinafter defined). [. . . ]

5. CASH COMPENSATION. Executive shall be compensated for services rendered during the Employment Term as follows:

   (a) BASE SALARY. Executive shall be compensated at an annual base salary of no less than $750,000 (the base salary, at the rate in effect from time to time, is hereinafter referred to as the "Base Salary"). The Company's Board of Directors shall review and may, if appropriate, at its discretion, increase this annual Base Salary during the Employment Term. Base Salary shall be reviewed annually and be adjusted to reflect (among other factors) increases generally granted to other senior executives of the Company and CEO performance consistent with Company pay practices. The Base Salary shall be payable in equal bi-weekly installments.

   (b) ANNUAL BONUS. In addition to the Base Salary provided for in Section 5 (a) above, the Company will provide annual bonus awards to Executive under its Management Incentive Plan (MIP) in accordance with the plan and any financial performance targets thereunder. During the Employment Term, Executive's target incentive op-

portunity under the Company's MIP will be no less than 140% of Base Salary as in effect at the time such target incentive opportunity is established. [. . . ]

6. EQUITY AWARD. Executive may be awarded additional compensation (such as stock options, shares of incentive stock, or shares of restricted stock) pursuant to the present or any future incentive compensation or long-term compensation program established for the senior officers of the Company (collectively the "Incentive Compensation Programs"), in an appropriate manner for the position occupied by Executive and his performance therein relative to other Company senior executives and consistent with Company pay practices. [. . . ]

IN WITNESS WHEREOF, the Company has caused this Agreement to be executed on its own behalf and has caused its corporate seal to be affixed, and the Executive has executed this Agreement on his own behalf intending to be legally bound, as of the date first written above.

## Appendix 3. Selection

To control for the selection bias arising from this non-random exclusion, we follow the approach of Heckman (1979) and use the choice regression described below to compute the Mills ratio. We choose a state law characteristic for the identifying restriction: the at-will exception rule of good faith and fair dealing (henceforth the "exception rule"). This state-wide rule prohibits terminations made in bad faith or motivated by malice.[6] This rule protects employees with shorter contracts or without contracts, which makes such forms of employment more attractive. The ensuing popularity of these contracts could potentially make longer explict contracts less attractive.

The direct judicial consequences of the rule to CEOs are likely to be limited, however, since they are protected by individual contracts. We obtain the listing of these so-called at-will exceptions from Walsh and Schwarz (1996) and Muhl (2001). In most states, the rules were adopted between 1960 and 1980, following debates that were driven by political sentiments of that time as well as the particularities of isolated precedent cases.

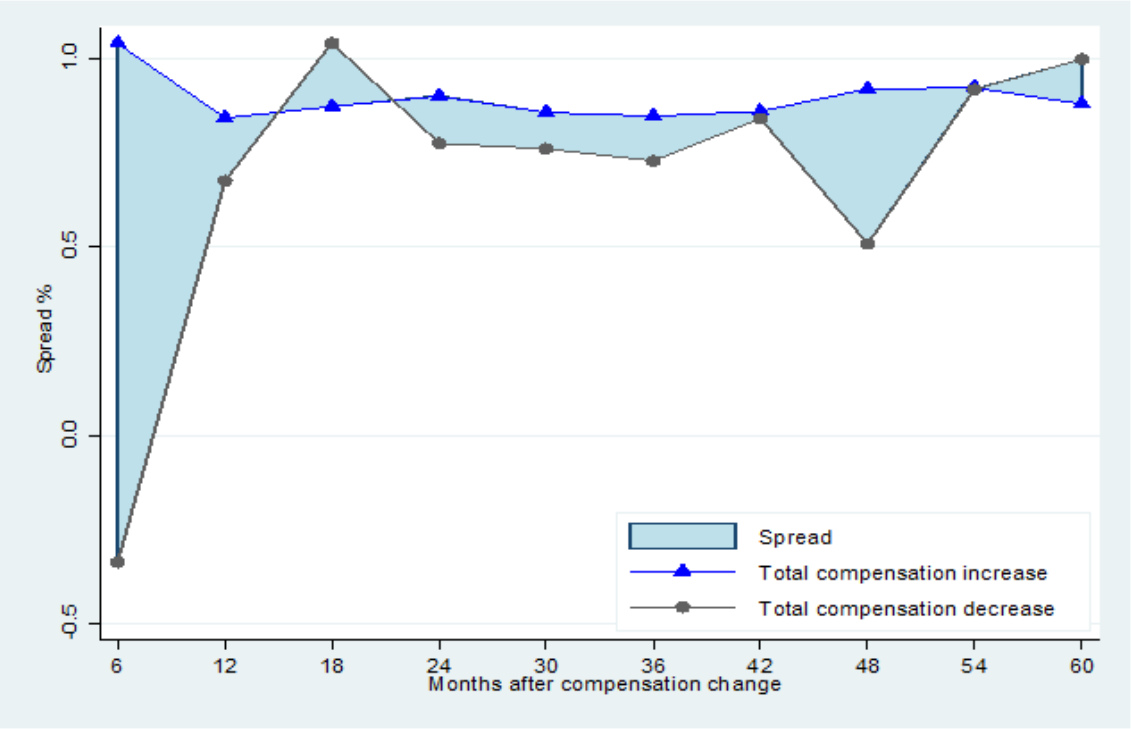
To ensure that geographical effects are due to at-will exceptions and not to other legal differences across states, we control for other geographical indexes, such as the anti-takeover index of Bertrand and Mullainathan (1999) and the anti-competition enforceability index of Garmaise (2009). All regressions contain industry and year fixed effects to control for exogenous shocks to the labor market.

We run Probit regressions of contract disclosure and results are reported in Table A.1. Because we study contract disclosure, not compensation changes, in this regression, we include all firm-year observations, i.e., including the first and last years of a CEO's tenure. We use the Mills ratio to control for the possibility of selection into our contract sample in Table 5, because not all CEOs sign contracts, and not all firms that sign contracts disclose their particulars.

[6]There are two other exceptions that are less relevant for us. Under the public policy exception, dismissal is not allowed if it violates the state's public policy or a statute. Under the implied contract exception, an employee can dispute his/her dismissal if he/she can prove the existence of an implicit contract.

# Appendix 4. Figures and Tables

Figure A 1: Long-short spread portfolio based on total compensation changes




| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Spread | 1.38% | 0.17% | -0.17% | 0.13% | 0.10% | 0.12% | 0.02% | 0.41% | 0.00% | -0.12% |
| t-stat | 4.63 | 0.67 | -0.84 | 0.63 | 0.50 | 0.43 | 0.07 | 1.73 | 0.03 | -0.63 |

Note: This figure plots monthly long-short portfolio returns from 6 months to 60 months following total compensation (tdc1) changes. Each month, we construct a long–short portfolio that invests in firms that offer total compensation increases and takes a short position in firms that cut total compensation, using CEO compensation changes at the beginning of the each fiscal year. We compute excess returns for these long and short portfolios. The panel below the figure presents spreads of long-short portfolios and t-statistics. Standard errors are computed after Newey-West adjustment with three lags.

Table A 1: **At-will exceptions**

| Code | State | At-will exceptions | | | Garmaise | Anti-takeover |
|---|---|---|---|---|---|---|
| | | Public policy | Implied contract | Good faith and fair dealing | | |
| AL | Alabama | 0 | 1 | 1 | 5 | 0 |
| AK | Alaska | 1 | 1 | 1 | 3 | 0 |
| AZ | Arizona | 1 | 1 | 1 | 3 | 1 |
| AR | Arkansas | 1 | 1 | 0 | 5 | 0 |
| CA | California | 1 | 1 | 1 | 0 | 0 |
| CO | Colorado | 1 | 1 | 0 | 2 | 0 |
| CT | Connecticut | 1 | 1 | 0 | 3 | 1 |
| DC | District of Columbia | 1 | 1 | 0 | 6 | 0 |
| DE | Delaware | 1 | 0 | 1 | 7 | 1 |
| FL | Florida | 0 | 0 | 0 | 9 | 0 |
| GA | Georgia | 0 | 0 | 0 | 5 | 1 |
| HI | Hawaii | 1 | 1 | 0 | 3 | 0 |
| ID | Idaho | 1 | 1 | 1 | 6 | 1 |
| IL | Illinois | 1 | 1 | 0 | 5 | 1 |
| IN | Indiana | 1 | 0 | 0 | 5 | 1 |
| IA | Iowa | 1 | 1 | 0 | 6 | 0 |
| KS | Kansas | 1 | 1 | 0 | 6 | 1 |
| KY | Kentucky | 0 | 1 | 0 | 6 | 1 |
| LA | Louisiana | 0 | 0 | 0 | 4 | 0 |
| ME | Maine | 0 | 1 | 0 | 4 | 1 |
| MD | Maryland | 1 | 1 | 0 | 5 | 1 |
| MA | Massachusetts | 1 | 0 | 1 | 6 | 1 |
| MI | Michigan | 1 | 1 | 0 | 5 | 1 |
| MN | Minnesota | 1 | 1 | 0 | 5 | 1 |
| MS | Mississippi | 1 | 1 | 0 | 4 | 0 |
| MO | Missouri | 1 | 0 | 0 | 7 | 1 |
| MT | Montana | 1 | 0 | 1 | 2 | 0 |
| NE | Nebraska | 0 | 1 | 0 | 4 | 1 |
| NV | Nevada | 1 | 1 | 1 | 5 | 0 |
| NH | New Hampshire | 1 | 1 | 0 | 2 | 0 |
| NJ | New Jersey | 1 | 1 | 0 | 4 | 1 |
| NM | New Mexico | 1 | 1 | 0 | 2 | 0 |
| NY | New York | 0 | 1 | 0 | 3 | 1 |
| NC | North Carolina | 1 | 0 | 0 | 4 | 0 |
| ND | North Dakota | 1 | 1 | 0 | 0 | 0 |
| OH | Ohio | 1 | 1 | 0 | 5 | 1 |
| OK | Oklahoma | 1 | 1 | 0 | 1 | 0 |
| OR | Oregon | 1 | 1 | 0 | 6 | 0 |
| PA | Pennsylvania | 1 | 0 | 0 | 6 | 1 |
| RI | Rhode Island | 0 | 0 | 0 | 3 | 1 |
| SC | South Carolina | 1 | 1 | 0 | 5 | 1 |
| SD | South Dakota | 1 | 1 | 0 | 5 | 1 |
| TN | Tennessee | 1 | 1 | 0 | 7 | 1 |
| TX | Texas | 0 | 0 | 0 | 3 | 0 |
| UT | Utah | 1 | 1 | 1 | 6 | 0 |
| VT | Vermont | 1 | 1 | 0 | 5 | 0 |
| VA | Virginia | 1 | 0 | 0 | 3 | 1 |
| WA | Washington | 1 | 1 | 0 | 5 | 1 |
| WV | West Virginia | 1 | 1 | 0 | 2 | 0 |
| WI | Wisconsin | 1 | 1 | 0 | 3 | 1 |
| WY | Wyoming | 1 | 1 | 1 | 4 | 1 |

Note: This table presents at-will exceptions, anti-takeover regulations, the Garmaise (2009) index, and the number of patents issued between 1977 and 2004 by each state.

Table A 2: **First stage**

| | Dependent variable | Contract |
|---|---|---|
| Geography | At-will exceptions | 0.035 |
| | | (0.0545) |
| | Garmaise | -0.018* |
| | | (0.0102) |
| Disclosure quality | Restatements | 0.056 |
| | | (0.0937) |
| | Assets | -0.008 |
| | | (0.0155) |
| Governance | Renewal | -1.430*** |
| | | (0.0467) |
| | Gindex | 0.033*** |
| | | (0.0121) |
| Risk | Analyst forecast dispersion | 0.03 |
| | | (0.058) |
| | Industry homogeneity | -0.73 |
| | | (1.99) |
| Control variables | Tenure group | Yes |
| | Age group | Yes |
| | Year fixed effects | Yes |
| | Industry fixed effects | Yes |
| | N | 7,804 |

Note: This table presents the marginal effects from a probit regression. The dependent variable is a dummy that equals 1 if the CEO has a disclosed contract. We include all firm-year observations. Standard errors (in parentheses) are heteroskedasticity robust. Data for the sample of S&P 500 companies are from 1994 to 2008. The dependent variable is an indicator equal to 1 if the CEO has a disclosed contract and zero otherwise.

*** Significant at the 1% level.
** Significant at the 5% level.
* Significant at the 10% level.

Table A 3: **Stand-alone salary increases**

| Dependent variable | Stand-alone salary increase | | Stand-alone salary increase with | | |
|---|---|---|---|---|---|
| | | | No explanation | Subjective explanation | Objective explanation |
| | (1) | (2) | (3) | (4) | (5) |
| Review requirement | 0.075** | 0.067* | 0.051** | 0.081*** | 0.001 |
| | (0.038) | (0.039) | (0.021) | (0.027) | (0.022) |
| Review factor | | 0.021 | 0.039 | 0.037 | 0.033 |
| | | (0.045) | (0.081) | (0.055) | (0.202) |
| Mills | | 0.062 | 0.021 | 0.009 | -0.037 |
| | | (0.057) | (0.041) | (0.053) | (0.040) |
| Year fixed effects | Yes | Yes | Yes | Yes | Yes |
| Tenure group, age group, and Industry fixed effects | No | Yes | Yes | Yes | Yes |
| N | 954 | 954 | 937 | 937 | 937 |

Note: This table presents the marginal effects from probit regressions, with heteroskedasticity robust standard errors (in parentheses). The dependent variable is an indicator of stand-alone salary raises, which is interacted with "no explanation" in column 3, either no justifications provided or based on subjective explanation in column 4, and objective explanation only in column 5. CEO age groups are: under 45, 46-50, 51-55, 56 -60, and above 60. Tenure groups are: 2 years or less, 3-5 years, and more than 5 years. Industry fixed effects are based on the first two digits of the SIC code. *** Significant at the 1% level. ** Significant at the 5% level. * Significant at the 10% level.

Table A 4: **Determinants of contract clauses**

| Dependent variable | | Review requirement | | | |
|---|---|---|---|---|---|
| | | (1) | (2) | (3) | (4) |
| Information asymmetry | R&D/sales | 1.095*** | 0.456** | 1.068*** | 0.438** |
| | | (0.253) | (0.200) | (0.253) | (0.196) |
| | Outside CEO | 0.121*** | 0.118*** | 0.120*** | 0.115*** |
| | | (0.029) | (0.033) | (0.029) | (0.033) |
| | Idiosyncratic risk | 0.169* | 0.109 | 0.237** | 0.081 |
| | | (0.093) | (0.113) | (0.095) | (0.114) |
| | Depr. &amort.% | -0.162 | 0.947* | 0.037 | 0.945* |
| | | (0.368) | (0.496) | (0.372) | (0.495) |
| | Distress | -0.097*** | -0.099** | -0.119*** | -0.105** |
| | | (0.033) | (0.040) | (0.034) | (0.041) |
| Industry | Industry homogeneity | | | -1.015** | 2.878 |
| | | | | (0.487) | (2.103) |
| | Industry outside CEO | | | 0.890*** | 0.216 |
| | | | | (0.187) | (0.449) |
| Governance | Busy board | 0.027 | 0.071* | 0.022 | 0.075* |
| | | (0.034) | (0.039) | (0.034) | (0.039) |
| | Independent directors% | 0.131 | 0.146 | 0.082 | 0.143 |
| | | (0.084) | (0.099) | (0.084) | (0.099) |
| Controls | Net leverage | 0.192* | 0.055 | 0.180* | 0.066 |
| | | (0.109) | (0.099) | (0.105) | (0.102) |
| | Log assets | 0.009 | -0.000 | 0.005 | 0.000 |
| | | (0.011) | (0.014) | (0.011) | (0.014) |
| | Tenure group | Yes | Yes | Yes | Yes |
| | Age group | Yes | Yes | Yes | Yes |
| | Year fixed effects | Yes | Yes | Yes | Yes |
| | Industry fixed effects | No | Yes | No | Yes |
| | N | 1,876 | 1,693 | 1,875 | 1,693 |

Note: This table presents the marginal effects of firm and industry characteristics from probit regressions. Standard errors (in parentheses) are heteroskedasticity robust. The sample consists of S&P 500 companies with CEO contracts between 1994 and 2008. The dependent variable is review requirement, which is equal to 1 if the contract contains a review requirement clause and zero otherwise. Columns 3 and 4 include industry characteristics as control variables. CEO age groups are: under 45, 46-50, 51-55, 56 -60, and above 60. Tenure groups are: 2 years or less, 3-5 years, and more than 5 years. Industry fixed effects are based on the first two digits of the SIC code. *** Significant at the 1% level. ** Significant at the 5% level. * Significant at the 10% level.

Table A 5: **Alternative mechanisms**

| Compensation changes | Excess returns | 4-factor alpha | 4-factor alpha | Excess returns | 3-factor alpha | 4-factor alpha | Excess returns | 3-factor alpha | 4-factor alpha |
|---|---|---|---|---|---|---|---|---|---|
| | Year 0.5 after salary change | | | Year 1 after salary change | | | Year 1.5 after salary change | | |
| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) | (9) |
| *Panel A: Industry stand-alone salary increase* | | | | | | | | | |
| Industry stand-alone sal. increase | 1.07% | 0.45% | 0.57% | 0.55% | 0.21% | 0.38% | 0.75% | 0.59% | 0.62% |
| No change in industry sal. | 0.94% | 0.24% | 0.43% | 0.52% | 0.15% | 0.33% | 0.66% | 0.54% | 0.58% |
| Spread | 0.13% | 0.21% | 0.15% | 0.03% | 0.06% | 0.04% | 0.09% | 0.05% | 0.04% |
| T-stat | 0.80 | 1.31 | 0.91 | 0.80 | 0.37 | 0.25 | 0.54 | 0.30 | 0.27 |
| *Panel B: Efficiency wage: abnormal compensation* | | | | | | | | | |
| Stand-alone sal. increase*neg_abn_comp | 1.20% | 0.54% | 0.66% | 0.71% | 0.37% | 0.46% | 0.60% | 0.45% | 0.48% |
| No change in sal.*neg_abn_comp | 0.81% | 0.09% | 0.35% | 0.39% | -0.06% | 0.22% | 0.90% | 0.75% | 0.81% |
| Spread_neg_abn_comp | **0.39%** | **0.45%** | **0.32%** | 0.33% | **0.43%** | 0.24% | -0.30% | -0.30% | -0.33% |
| T-stat | 2.17 | 2.55 | 1.86 | 1.48 | 2.11 | 1.26 | -1.33 | -1.34 | -1.54 |
| Stand-alone sal. increase*pos_abn_comp | 1.94% | 1.32% | 1.35% | 1.26% | 0.99% | 1.11% | 0.64% | 0.52% | 0.47% |
| No change in sal.*pos_abn_comp | 1.17% | 0.39% | 0.52% | 0.48% | 0.25% | 0.39% | 0.56% | 0.38% | 0.39% |
| Spread_pos_abn_comp | **0.76%** | **0.93%** | **0.84%** | 0.78% | 0.74% | 0.73% | 0.08% | 0.14% | 0.08% |
| T-stat | 1.79 | 2.24 | 2.02 | 1.28 | 1.23 | 1.21 | | | |

| Compensation changes | Excess returns | 4-factor alpha | 4-factor alpha | Excess returns | 3-factor alpha | 4-factor alpha | Excess returns | 3-factor alpha | 4-factor alpha |
|---|---|---|---|---|---|---|---|---|---|
| | Year 0.5 after salary change | | | Year 1 after salary change | | | Year 1.5 after salary change | | |
| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) | (9) |
| *Panel C: Bonus as an explict incentive* | | | | | | | | | |
| Stand-alone sal. increase*pos_bonus | 1.59% | 1.09% | 1.09% | 0.62% | 0.47% | 0.56% | 0.26% | 0.16% | 0.17% |
| No change in sal.*pos_bonus | 1.41% | 0.72% | 0.72% | 0.84% | 0.58% | 0.49% | 1.25% | 1.24% | 1.25% |
| Spread | 0.18% | 0.37% | 0.37% | -0.22% | -0.11% | 0.06% | -0.99% | -1.08% | -1.08% |
| T-stat | 0.32 | 0.65 | 0.65 | -0.44 | -0.21 | 0.13 | -1.74 | -1.94 | -1.94 |
| Stand-alone sal. increase*neg_bonus | 1.11% | 0.97% | 1.08% | -0.39% | 0.14% | 0.08% | 0.72% | 1.51% | 1.43% |
| No change in sal.*neg_bonus | -0.53% | -0.75% | -0.45% | -0.93% | -0.55% | -0.31% | -0.10% | 0.24% | 0.18% |
| Spread | **1.63%** | **1.72%** | **1.53%** | 0.54% | 0.69% | 0.39% | 0.81% | 1.27% | 1.25% |
| T-stat | 2.20 | 2.45 | 2.22 | 0.58 | 0.78 | 0.46 | 0.61 | 1.04 | 1.01 |



Note: This table shows calendar-time equally weighted monthly returns and t-statistics for portfolios sorted by changes in compensation. We form portfolios for each month; each portfolio includes all companies that made the same type of compensation change and of which the fiscal year starts within the prior 12 months. These portfolios so constructed are rebalanced monthly. In Panel A, we sort stocks into two portfolios, one consisting of firms whose industry peers experienced a stand-alone salary increase on average and the other consisting of firms whose industry peers experienced no changes in salary on average. In Panel B, we first calculate abnormal compensation, as in Gillan, Hartzell, and Parrino (2009), by regressing total compensation on firm and CEO characteristics and controlling for industry and year fixed effects. We then double sort stocks based on salary increase and negative abnormal compensation. In Panel C, we double sort stocks based on salary increase and bonus changes. Industry classifications are based on the first two digits of the SIC code. We compute excess returns, three- and four-factor alphas (as in Fama and French, 1996; Carhart, 1997) by running time-series regressions of excess portfolio returns on the market (MKT), size (SMB), value (HML), and momentum (UMD) factor returns. Standard errors are computed after Newey-West adjustment with three lags. The spreads of long-short portfolio returns are indicated in bold if they are positive and significant at the 10% level.

Table A 6: **Stock return regressions: Board and compensation committee characteristics**

| Dependent variable | Monthly stock return 1 year after salary change | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) |
| Sample | Low board independent directors% | High board independent directors% | Low board busy directors% | High board busy directors% | Low CC independent directors% | High CC independent directors% | Low CC busy directors% | High CC busy directors% |
| Stand-alone salary increase | 0.003 | 0.004* | 0.005** | 0.002 | 0.003 | 0.008*** | 0.009*** | 0.001 |
| | (0.002) | (0.002) | (0.002) | (0.002) | (0.006) | (0.003) | (0.003) | (0.005) |
| Adjusted R-squared | 0.0064 | 0.0092 | 0.0065 | 0.0068 | 0.0093 | 0.0040 | 0.0050 | 0.0106 |
| N | 13,761 | 20,904 | 21,921 | 12,744 | 2,249 | 9,634 | 7,678 | 4,205 |

Note: This table reports the coefficients and standard errors (in parentheses) of forecasting regressions of monthly stock returns on compensation changes. We include observations with either a stand-alone salary increase or no change in salary. The dependent variable is monthly stock returns 1 year after compensation changes. We rank firms based on the percentage of busy directors, and the percentage of independent directors in the board above or below industry median each year in columns 1-4, and rank firms based on percentage of busy directors, and percentage of independent directors in the compensation committee above or below industry median each year in columns 5-8. We have fewer observations for compensation committees, because Boardex data that we use to construct compensation committee measures starts from 2000. Industry classifications are based on the first two digits of the SIC code. In all regressions, we include control variables of one-, two-, three-, four-, and five-month lagged returns, the logarithm of asset size and market-to-book ratio, both with one-year lag. Standard errors are clustered by firm and year-month. *** Significant at the 1% level. ** Significant at the 5% level. * Significant at the 10% level.

Table A 7: **Robustness tests**

| Returns | Excess returns | 3-factor alpha | 4-factor alpha | Excess returns | 3-factor alpha | 4-factor alpha | Excess returns | 3-factor alpha | 4-factor alpha |
|---|---|---|---|---|---|---|---|---|---|
| | Year 0.5 after salary change | | | Year 1 after salary change | | | Year 1.5 after salary change | | |
| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) | (9) |
| *Panel A: Stand-alone salary increases – excluding 2001-2003* | | | | | | | | | |
| Stand-alone salary increase | 1.44% | 0.60% | 0.70% | 0.72% | 0.37% | 0.48% | 0.60% | 0.51% | 0.51% |
| No change in salary | 1.02% | 0.04% | 0.16% | 0.38% | -0.06% | 0.10% | 0.50% | 0.40% | 0.41% |
| Spread | **0.42%** | **0.56%** | **0.54%** | **0.33%** | **0.43%** | **0.37%** | 0.10% | 0.11% | 0.10% |
| T-stat | 2.77 | 4.17 | 4.01 | 1.81 | 2.64 | 2.25 | 0.58 | 0.69 | 0.60 |
| *Panel B: Stand-alone salary increases: without inflation adjustment* | | | | | | | | | |
| Stand-alone salary increase | 1.19% | 0.69% | 0.79% | 0.77% | 0.47% | 0.56% | 0.69% | 0.59% | 0.61% |
| No change in salary | 0.80% | 0.20% | 0.39% | 0.49% | 0.11% | 0.27% | 0.65% | 0.54% | 0.58% |
| Spread | **0.39%** | **0.50%** | **0.40%** | **0.28%** | **0.36%** | **0.29%** | 0.04% | 0.05% | 0.03% |
| T-stat | 2.49 | 3.65 | 3.01 | 1.75 | 2.40 | 1.99 | 0.28 | 0.34 | 0.24 |
| *Panel C: Stand-alone salary increases: excluding all changes in equity compensation* | | | | | | | | | |
| Stand-alone salary increase | 1.18% | 0.70% | 0.80% | 0.83% | 0.54% | 0.62% | 0.72% | 0.62% | 0.65% |
| No change in salary | 0.80% | 0.20% | 0.39% | 0.49% | 0.11% | 0.27% | 0.65% | 0.54% | 0.58% |
| Spread | **0.39%** | **0.50%** | **0.41%** | **0.33%** | **0.42%** | **0.36%** | 0.08% | 0.08% | 0.07% |
| T-stat | 2.46 | 3.65 | 3.02 | 2.07 | 2.89 | 2.50 | 0.54 | 0.56 | 0.47 |
| *Panel D: Stand-alone salary increases: change in equity compared to previous year's value* | | | | | | | | | |
| Stand-alone salary increase | 1.04% | 0.65% | 0.71% | 0.56% | 0.38% | 0.46% | 0.52% | 0.44% | 0.47% |
| No change in salary | 0.80% | 0.20% | 0.39% | 0.49% | 0.11% | 0.27% | 0.65% | 0.54% | 0.58% |
| Spread | 0.25% | **0.45%** | **0.32%** | 0.07% | 0.26% | 0.19% | -0.13% | -0.11% | -0.11% |
| T-stat | 1.29 | 2.48 | 1.70 | 0.34 | 1.46 | 1.06 | -0.59 | -0.50 | -0.55 |

Note: This table shows calendar-time equally weighted monthly returns and t-statistics for portfolios sorted by changes in compensation. We form portfolios for each month; each portfolio includes all companies that made the same type of compensation change and of which the fiscal year starts within the prior 12 months. These portfolios so constructed are rebalanced monthly. In Panel A, we sort stocks into two portfolios, one consisting of firms with stand-alone salary increases and the other consisting of firms with no such increases, and we exclude years 2001 to 2003. In Panel B, we define stand-alone salary increases using nominal salary increases instead of real salary increases. In Panel C, we define stand-alone salary increases excluding all changes in equity compensation instead of excluding only changes in equity value that exceed the contemporaneous change in salary. In Panel D, we define stand-alone salary increases by comparing equity grant value to the previous year's grant value, rather than the previous grant's value. We compute excess returns, three- and four-factor alphas (as in Fama and French, 1996; Carhart, 1997) by running time-series regressions of excess portfolio returns on the market (MKT), size (SMB), value (HML), and momentum (UMD) factor returns. Standard errors are computed after Newey-West adjustment with three lags. The spreads of long-short portfolio returns are indicated in bold if they are positive and significant at the 10% level.

Table A 8: **Total compensation changes**

| Returns | Excess returns | 3-factor alpha | 4-factor alpha | Excess returns | 3-factor alpha | 4-factor alpha | Excess returns | 3-factor alpha | 4-factor alpha |
|---|---|---|---|---|---|---|---|---|---|
| | Year 0.5 after salary change | | | Year 1 after salary change | | | Year 1.5 after salary change | | |
| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) | (9) |
| *Panel A: Total compensation changes* | | | | | | | | | |
| Top decile | 1.33% | 1.17% | 1.20% | 0.82% | 1.27% | 1.33% | 0.82% | 0.95% | 0.95% |
| Bottom decile | -0.27% | -0.67% | -0.17% | 0.93% | 1.05% | 1.31% | 1.64% | 1.29% | 1.26% |
| Spread | 1.60% | 1.84% | 1.36% | -0.11% | 0.22% | 0.02% | -0.82% | -0.34% | -0.31% |
| T-stat | 1.28 | 1.57 | 1.21 | -0.07 | 0.17 | 0.02 | -0.56 | -0.27 | -0.25 |
| *Panel B: Salary changes* | | | | | | | | | |
| Top decile | 1.48% | 0.83% | 0.79% | 1.10% | 0.63% | 0.72% | 1.12% | 0.72% | 0.80% |
| Bottom decile | 0.24% | -0.56% | -0.38% | 0.84% | 0.28% | 0.45% | 1.14% | 0.75% | 0.79% |
| Spread | 1.24% | 1.39% | 1.17% | 0.27% | 0.35% | 0.27% | -0.02% | -0.03% | 0.00% |
| T-stat | 2.75 | 3.29 | 2.79 | 1.22 | 1.73 | 1.38 | -0.07 | -0.12 | 0.01 |
| *Panel C: Overall compensation increase in both salary and equity* | | | | | | | | | |
| Overall compensation increase | 1.08% | 0.46% | 0.48% | 0.44% | 0.18% | 0.20% | 0.46% | 0.43% | 0.44% |
| No change in salary | 0.88% | 0.22% | 0.39% | 0.47% | 0.11% | 0.28% | 0.69% | 0.57% | 0.60% |
| Spread | 0.20% | 0.24% | 0.09% | -0.03% | 0.06% | -0.08% | -0.22% | -0.14% | -0.16% |
| T-stat | 0.93 | 1.31 | 0.48 | -0.12 | 0.28 | -0.35 | -1.04 | -0.7 | -0.83 |

Note: This table shows calendar-time equally weighted monthly returns and t-statistics for portfolios sorted by changes in compensation. We form portfolios for each month; each portfolio includes all companies that made the same type of compensation change and of which the fiscal year starts within the prior 12 months. These portfolios so constructed are rebalanced monthly. In Panel A, we sort stocks into two portfolios, one consisting of firms with top decile of total compensation (tdc1) changes and the other consisting of firms with bottom decile of total compensation changes. In Panel B, we sort stocks into two portfolios, one consisting of firms with top decile of salary changes and the other consisting of firms with bottom decile of salary changes. In Panel C, we sort stocks into two portfolios, one consisting of firms with compensation increases in salary and equity and the other consisting of firms with no changes in salary. We compute excess returns, three- and four-factor alphas (as in Fama and French, 1996; Carhart, 1997) by running time-series regressions of excess portfolio returns on the market (MKT), size (SMB), value (HML), and momentum (UMD) factor returns. Standard errors are computed after Newey-West adjustment with three lags. The spreads of long-short portfolio returns are indicated in bold if they are positive and significant at the 10% level.