Subjective Performance Reviews and Stock Returns

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Abstract

This paper studies whether firms set long-term incentives by rewarding CEO performance based on soft inside information (subjective performance reviews). Theory suggests that firms should reward successful performance before it manifests in standard objective performance measures. We document that many executive contracts explicitly schedule reviews to do so. Review-related compensation outcomes predict long-term performance. A long–short portfolio strategy that invests in firms with CEO salary increases following scheduled early performance reviews earns abnormal returns of 2%–4% annually. Positive subjective reviews also predict future R&D successes, suggesting that they indeed indicate successful long-term investment.

Keywords: subjective performance reviews, research and development, innovation, stock returns, soft information

JEL: G12, G14, G34, J41, O32

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Modern corporations are often characterized by separation of ownership and control. Agency problems can arise when manager and owners diverge in their interests: even when managers own shares at a given time, the stock price only incorporates information after managerial decisions and actions. Such a delay is especially problematic for long-term decisions such as investment in research and development (R&D), where performance outcomes take particularly long to be reflected in stock prices (Chan, Lakonishok, and Sougiannis, 2001; Eberhart, Maxwell, and Siddique, 2004; Cohen, Diether, and Malloy, 2013; Hirshleifer, Hsu, and Li, 2013). To solve this problem, theory suggests that firms should reward executives based on "soft" inside information, thereby smoothing out their income and aligning long-term interests (Baker, Gibbons, and Murphy, 1994; Hayes and Schaefer, 2000; Prendergast, 2002). However, such information is easy to rig to the favour of executives, potentially resulting in undeserved managerial compensation rather than effective incentives. Therefore, it is not clear ex ante whether firms use subjective information for performance reviews.

We document that chief executive officer (CEO) contracts explicitly schedule such reviews, that their rewards are distinctly recognizable (as increases in salary only), and that such rewards predict long-run returns as well as observable R&D success. Using solely publicly available information on compensation changes, we construct a portfolio of firms that give compensation rewards and subsequently strongly outperforms the market. A long–short portfolio strategy—which invests in firms with stand-alone salary increases and takes a short position in firms with no salary changes—earns abnormal returns of 2%–4% per year.

To verify that compensation contracts do include subjective performance reviews, we hand-collect 649 CEO employment contracts of S&P 500 firms along with the reasons for compensation changes stated in their proxy statements. We find that 55% of all contracts schedule future subjective performance reviews. Such reviews are explicitly linked to potential raises in compensation, notably in base salaries. Clauses that require subjective performance reviews are more prevalent for CEO–firm pairs with higher information asymmetry between the firm and investors, a situation that arguably has

a greater need for them; examples include firms that invest heavily in R&D or that have more dispersed analyst forecasts. Our findings not only show that firms use subjective performance reviews, but also, for the first time, that executive compensation contracts are dynamic and explicitly cater for later changes.

If firms use subjective performance reviews as intended and reward CEOs with compensation raises before their performance affects stock prices and accounting numbers, then such raises should predict better future performance. However, raises—especially in equity compensation—may be related to future performance in a number of other ways. First, the value of equity grants is automatically linked to stock performance and thus could incentivize CEOs to work harder, leading to better subsequent performance (Mehran, 1995; Murphy, 1999; Laffont and Martimort, 2002). Second, powerful CEOs may pressure the board to time the award of equity grants *before* the increases in stock price that they engineered or anticipate (Yermack, 1997; Lie, 2005).

We wish to isolate the soft information contained in subjective performance reviews and its return predictability from incentive provision, market timing, and price manipulation; we therefore focus on increases in base salary only. More specifically, we test for the return predictability of salary increases if the CEO's real (i.e., inflation-adjusted) salary growth is positive in the absence of contemporaneous changes in equity-based compensation. This approach is more appropriate also in light of how contracts are actually structured. In our sample of CEO employment contracts, almost all review clauses link only to salary changes. The preference for using salary may reflect institutional constraints: bonus and equity compensation is commonly linked to company-wide policies and—in the case of equity-based compensation—subject to shareholder approval to protect against dilution.

To verify that subjective performance reviews are indeed associated with subsequent compensation changes, we show that CEOs who must undergo such reviews are more likely to receive stand-alone salary raises and also that their firms are more likely to justify those raises in the compensation statement with subjective reasons (or to offer no reasons at all).

We then link our measure of positive subjective performance reviews (stand-alone salary increases) to long-run returns. Subjective performance reviews may not be effective if the underlying soft information is rigged by the CEO and result in unjustified raises. If compensation changes due to subjective performance reviews do contain information about future success, then we should see improvement in long-run returns following such changes. Indeed, we find that a long–short portfolio strategy—which invests in firms with stand-alone salary increases and takes a short position in firms with no salary changes—earns abnormal returns of 2%–4% per year. Furthermore, only those salary increases offered by firms with contracts that schedule subjective performance reviews or investing heavily in R&D predict favorable long-run performance. This pattern of results is practically unaffected when we adjust portfolio returns by size, value, and momentum factors or by the characteristics-based benchmarks of Daniel, Grinblatt, Titman, and Wermers (1997; hereafter DGTW).

Next we explore how salary increases are associated with R&D outcomes as an example of long-term investment; previous literature has documented that stock prices incorporate information about R&D with a delay. One year following CEO salary increases, the number of news articles about new product developments increases by 17%, with average abnormal returns of 0.6% per product announcement.[1] These findings suggest that firms use subjective performance reviews—and offer salary increases to their respective CEOs—for early R&D investment success that have yet to be reflected in objective performance measures.

In addition, we investigate the link between subjective performance evaluation and board governance. Soft information regarding early R&D success is, by its very nature, hard to quantify. An ineffective board may interpret information too much in the CEO's favor and thus reward inferior performance. We find that for firms with more effective boards—as measured by outside engagement

[1] The average number of product announcements in our sample is 3.85, so the total abnormal return due to new product development is approximately 2.31%.

(serving on multiple boards) and independence of board directors—stand-alone salary increases do predict higher future returns than for firms with less effective boards.

Finally, we explore heterogeneity in the market reaction to salary increases in terms of the information environment. There is extensive evidence that individuals pay less attention to, and place less weight on, information that is harder to process (Song and Schwarz, 2010; Cohen, Malloy, and Nguyen, 2015). Findings in Cohen, Diether, and Malloy (2013) and Hirshleifer, Hsu, and Li (2013) further suggest that cross-sectional variation in information opacity may help explain why the market undervalues information embedded in firms' past track records. In an event study around the filing dates when compensation numbers are revealed, we find that—in firms with more idiosyncratic risk and analyst forecast dispersion—investors underreact more to compensation information in the short run. Compensation changes in such firms also have greater predictive power of returns in the long run. Our results are in line with the market's undervaluation of soft information in compensation changes and show that returns do not simply result from an omitted risk factor, since the latter would predict consistent abnormal returns in both event studies and long-run return regressions across subsamples.

Our paper contributes to the theoretical literature on subjective performance evaluation. A delay in the absorption of performance information in hard measures makes it costly to encourage risk-averse CEOs—especially when they face high discount factors or need more liquidity—to undertake promising investment projects. Subjective performance reviews can solve this problem and, perhaps, avoid negative long-term effects on the firm and the economy both (Holmstrom, 1979; Baker, Gibbons, and Murphy, 1994; Fuchs, 2015). Yet given the possible ineffectiveness of board monitoring and the subjectivity of such reviews, their role (and even their existence) is questionable. Our paper provides the first explicit empirical analysis of subjective performance reviews. The analysis is closely related to the literature on discretionary bonus compensation (see e.g. Bushman, Indjejikian, and Smith, 1996; Ittner, Larcker, and Rajan, 1997; Hayes and Schaefer, 2000; Murphy and Oyer, 2001). According to that research, discretionary compensation is used more frequently in environments where objective

performance measures are less indicative of true performance. In contrast, we document evidence about individual reviews that explicitly monitors subjective performance criteria and link their outcomes to subsequent returns. , With that, we show that subjective performance reviews exist and that boards use them to reward good performance. Our research also contributes to the developing empirical literature that links abnormal returns to corporate governance. Von Lilienfeld-Toal and Ruenzi (2014) report that a strategy based on public information about managerial ownership delivers positive abnormal returns; such returns are most pronounced among firms with weak external governance, weak product market competition, and/or substantial managerial discretion. Mueller, Ouimet, and Simintzi (2016) establish that firms with greater within-firm pay inequality have higher returns to equity.

A growing literature suggests that the market underreacts to information contained in R&D, incorporating that information into stock returns only with a delay. Chan, Lakonishok, and Sougiannis (2001) find that companies with high ratios of R&D to equity market value earn large excess returns; Eberhart, Maxwell, and Siddique (2004) show that large increases in R&D investment predict positive future abnormal returns; Cohen, Diether, and Malloy (2013) demonstrate that innovation "ability", as determined by the firm's past success at R&D, predicts future R&D success and higher returns; and Hirshleifer, Hsu, and Li (2013) document that firm-level innovative "efficiency" (measured as patents scaled by R&D) forecasts future returns. We show that successful CEO performance reviews predict future returns—even after we control for firm-level innovation ability (as defined in Cohen, Diether, and Malloy, 2013). In fact, our compensation measure of soft information explains nearly 58% of the mispricing captured by their measure of innovation ability. This finding indicates that the market undervalues innovation potential owing to a lack of soft information that is known only to the firm.

Finally, this paper contributes to the empirical literature on CEO contracts. Schwab and Thomas (2005) describe a sample of 375 contracts from a legal perspective. Yermack (2006) examines CEO separation agreements and finds that most severance pay is awarded on a discretionary basis by the board of directors. Gillan, Hartzell, and Parrino (2009) report that many CEOs operate without an

explicit contract, and they 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. Ours is the first study to show that CEO contracts explicit cater for subsequent dynamics in compensation.

The paper proceeds as follows. Section I summarizes the data, and Section II introduces subjective performance reviews. Section III links subjective performance reviews to subsequent returns. We discuss the mechanism underlying observed effects in Section IV, and robustness results are presented in Section V. Section VI concludes.

1. Data

We analyze the CEO compensation of all firms that were part of the S&P 500 in one of the years between 1994 and 2008. 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.[2] Whenever those agreements are not available, we screen the same filings for indications of whether the CEO is subject to any agreement containing clauses related to compensation. Of our entire sample CEOs, 649 employment agreements are publicly available. We obtain realized compensation data for these CEOs from ExecuComp. Our data set consists of 8,190 firm-year observations, including 3,250 observations of firms that disclose the existence of a CEO employment agreement. We then exclude the first and the last years of a CEO's tenure because CEOs are often compensated for fewer months than one full year and so compensation changes during those years could be due to reasons other than performance. After excluding such years, we are left with 5,242 observations.

[2] US Securities and Exchange Commission (SEC) Regulation S-K (§229.601) requires the disclosure of any management contracts or any compensatory plan of named executive officers as defined by item 402(a)(3) (§229.402(a)(3)).

It is worth mentioning that, despite making an exhaustive search of many filings, we cannot be certain that those firms not disclosing an employment agreement do not actually have one. Hence a nondisclosing firm might be wrongly classified as one whose CEO operates without a contract. However, such misclassification would bias results concerning subjective performance reviews toward having no effect on compensation changes, which means that our findings represent a *lower* bound on the strength of such effects.[3] The portion (40%) of our sample firms whose CEOs have an explicit contract is in line with reports in the literature: according to Gillan, Hartzell, and Parrino (2009), about 46% of S&P 500 firms had comprehensive written employment agreements with their CEOs in the year 2000; Yermack (2006) finds that 33% of CEOs have employment contracts at the time of their exit; and Schwab and Thomas (2005) report that 42% of the firms they surveyed had contracts with their CEOs.

We hand-collect reasons for compensation changes from firms' proxy statements. This information is reported in the "compensation table" of those statements. The other data used in our analysis come from standard sources. In particular, we obtain firms' financial information from Compustat, stock returns from the Center for Research in Security Prices (CRSP), board and corporate governance information from Institutional Shareholder Services (ISS), financial analyst estimates from the Institutional Brokers' Estimate System (I/B/E/S), and product announcements from S&P Capital IQ.

[[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 $24.8 billion in assets and $10.8 billion in sales; their average leverage ratio is 33% and average return on assets (ROA) is 7%. The idiosyncratic

[3] This is because some CEO compensation increases are the result of subjective performance reviews and could be wrongly treated as occurring in the absence of such evaluations.

risk (as defined by Wurgler and Zhuravskaya, 2002) of our sample firms averages 32%, and the analyst forecast dispersion is 13%. The mean of CEO tenure is seven years, and the mean CEO age is 55. 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). About 13% 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 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. Compensation Changes and Subjective Reviews

This section introduces our measure of positive subjective performance reviews. In the next section, we test whether such positive reviews are justified by increases in objective performance measures in future. This section further verifies that contracts contain clauses on subjective performance reviews and stated reasons for compensation changes.

2.1. Changes in Compensation as Return Predictors

A delay in the absorption of performance information in hard measures makes it costly to encourage risk-averse CEOs to undertake promising long-term investment projects, especially when the CEO faces high discount factors or needs more liquidity. This problem can be circumvented if the firm uses subjective performance reviews (Holmstrom, 1979; Baker, Gibbons, and Murphy, 1994; Fuchs, 2015), rewarding executives with raises based on soft information not yet reflected in market or accounting measures. To the extent that firms indeed use subjective performance reviews for that purpose, subsequent compensation raises should predict long-term stock returns.

Of course, raises in compensation may be related to subsequent performance for reasons other than positive subjective performance reviews. For example, equity compensation may offer the CEO equity grants to encourage greater effort, which leads to better performance after the reward (Mehran,

1995; Murphy, 1999; Laffont and Martimort, 2002). Also, some CEOs are able to influence the board so that the award of equity grants is timed just before the release of positive information (Yermack, 1997; Lie, 2005). To isolate the predictive power of subjective performance reviews, we ignore simultaneous raises in salary and equity-based compensation; that is, we focus instead on stand-alone salary increases.

In defining such increases, we take a conservative approach: we classify a change in salary as a *raise* only if the CEO's "real" (i.e., inflation-adjusted) salary growth is positive. In other words, an upward adjustment that does not exceed the inflation rate is not considered to be a raise. Also, we classify a salary increase as a subjective performance reward only if there are no contemporaneous changes in equity-based compensation. When calculating changes in such compensation, we use the change in grant values because our objective is to study compensation decisions rather than realized changes in wealth. Equity-based compensation is typically granted in multiyear cycles (Hall, 1999), and recipients are not entirely vested until a pre-specified period of time has elapsed (Cadman, Campbell, and Klasa, 2011). 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. We then compare the current grant value to the previous grant's value. Finally, to ensure that we include only nontrivial 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. This approach of 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 are in fact related to soft performance.

[[INSERT Table 2 about Here]]

Table 2 reports summary statistics of changes in salary. For comparison, we report the incidence—in columns 1, 2, and 3, respectively—of salary cuts, stability, and raises for all firm-years. Salary cuts are rare, though we include all nominal cuts; they occur in only 5.2% of all firm-years and average -13.3%. Salary raises are frequent; they occur in 69.4% of all firm-years and average 9.5%. In

only 25.4% of firm-years do CEOs receive the same salary or a salary increase of less than the inflation rate. Table 2 also gives the average compensation for CEOs that received cuts or raises. Those who received salary cuts have a lower average salary than those who did not ($0.65 million versus $0.72 million, respectively).

Panel B of Table 2 summarizes the incidence of our final predictor. Our indicator of positive subjective performance reviews—increases in CEO salary with no contemporaneous change in equity-based pay—applies in 46% of all firm-years. For comparison: in 12.6% of our sample firm-years we observe CEOs receiving more salary *and* equity, and in 10.2% of all firm-years we observe them receiving more salary but *less* equity-based pay.

2.2. Review Clauses in Contracts

Firms may award raises for many reasons. To verify that subjective performance reviews exist and are linked to compensation raises, in this section we investigate actual CEO employment contracts. We find that, indeed, a majority of contracts explicitly describe subjective performance reviews and link them to compensation raises. In particular, employment contracts prescribe salary increases as the outcome of positive subjective reviews; only a few contracts in our sample explicitly allow for discretionary adjustments in the CEO's bonus or equity-based compensation.

Many compensation contracts describe subjective reviews. Appendix 2 provides an example of such contract clauses. In the example, the CEO's base salary "shall be reviewed" by the board without any specific performance target given, and "for increase only". We use these (and related) keywords to search for review clauses, including "subject to the review of the board", "at the discretion of the board", "to be reviewed/determined by the board", and so forth. Such clauses explicitly indicate that compensation levels are subject to future reviews. Panel A of Table 3 provides an overview of the frequency of review clauses and their content. More than half (54.7%) of the contracts require future

reviews. In addition, most contracts specify the review frequency (usually each year). For CEOs with such clauses, reviews are mandatory.

[[INSERT Table 3 about Here]]

Some clauses indicate the factors on which a review is based. However, such factor clauses exist in only 9% of our sample contracts; see Panel B of Table 3 for an overview. Examples of review factors include the firm's financial condition and firm performance. The absence of such clauses in most contracts indicates that adjustments to the CEO's base pay are usually based on a subjective assessment of the executive's contribution.

Most subjective performance review clauses directly link positive reviews to increases in base salary. More than 75.5% of contracts explicitly prescribe possible salary adjustments, as compared with 4.93% and 13.41% that prescribe bonus and equity adjustments respectively (see Panel C of Table 3). Mr. Mack's contract in Appendix 2 is a typical example. It calls for performance reviews of the CEO 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.

The theoretical literature is silent on the appropriateness of using base salary raises to reward positive reviews, yet the focus on salary is consistent with institutional factors. Equity compensation is subject to rules designed to protect shareholders from dilution. Both New York Stock Exchange (NYSE) and Nasdaq (Lund, 2006) require shareholder approval of all equity-based compensation plans. In short, firms must convince shareholders before adjusting the CEO's equity-based compensation, a process that involves releasing information to justify the raise. Firms may choose to award salary raises precisely to avoid releasing such information early, especially when it is related to the progress of R&D projects.

In a contract's section on salary, the review clauses that we document are indicative of other contract clauses related to subjective performance reviews. Appendix 3 establishes that review clauses are, in fact, representative of other related clauses. As reported there, our principal component analysis

of numerous contract clauses yields only one component whose eigenvalue exceeds 3. This component is most strongly related to review clauses (0.4 loading) yet also, albeit less, to clauses such as those linking reviews to CEO performance (0.1) or those providing explicit discretion with regard to the bonus plan (0.1). However, this component is unrelated to discretion regarding future equity grants (−0.03). These results suggest that review clauses are an important component of compensation contracts, especially for the adjustment of salaries.

2.3. Reasons for Salary Increases

We have established that subjective review clauses usually appear in the salary section of CEO employment contracts. Here we show that such review clauses predict stand-alone salary increases and so should not be viewed as "empty" clauses. Using the narrative provided in the proxy statements to justify compensation raises, we further document that such raises are not due to other reasons.

In order to study the stated reasons for salary raises, we categorize the narratives for such raises into three types: due to good *subjective* performance, *objective* performance and/or *general* performance.[4] Panel A of Table 4 gives summary statistics for these reasons and lists the keywords we use to signify different types.

[[INSERT Table 4 about Here]]

First, certain salary increases are the direct result of good objective financial performance—as reflected by net income, ROA, and so on. However, raises based on specified financial performance account for only 7.41% of increased compensation instances. Many more changes in compensation—almost 40% of them—are rewards for general, nonspecified financial performance.

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

Second, the board of directors may reward the CEO for more subjective criteria, in line with our evidence from the contractual clauses for subjective performance reviews. Nearly 16.8% of salary increases are described as a reward for subjectively evaluated performance—leadership, strategic planning, accomplishing an expansion or restructuring, and so on. These narratives do not link the compensation increases to tangible financial performance as direct outcomes of those activities.

No reason is given (in proxy statements) for nearly a third of salary increases. Such raises may simply reflect the board's arbitrarily increasing CEO pay. In that case, there should be no systematic differences between firms that increase CEO salary with or without reasons. We must bear in mind, however, that the board is not obliged to offer a specific reason if the (publicly available) ex ante contract already requires periodic subjective performance reviews. That reticence can be beneficial if the firm—say, for competitive reasons—prefers not to disclose its motivation for increasing CEO compensation until a more advantageous time. If this motive explains why no reasons are stated for salary increases, then we should expect to observe systematic differences between firms that do and do not give reasons for increasing CEO pay.

Therefore, in Panel B of Table 4 we compare compensation increases that are justified in terms of (good) subjective performance with those lacking an explicit justification, aiming thereby to identify systematic differences between the involved firms. We find that CEOs with explicit review clauses receive salary increases in 45.3% of all firm-years when no reason is given and in 61.1% of firm-years when either no reason is given or their performance is evaluated subjectively. The corresponding numbers for CEOs whose contracts do *not* incorporate review requirement are significantly lower: 31.5% and 51.9%, respectively.

In contrast, CEOs with review clauses receive salary increases in only 5% of all firm-years when a specific, objective reason is given and in 30.5% of firm-years when performance more generally is recognized as good. The corresponding numbers for CEOs whose contracts do *not* incorporate

subjective reviews are significantly higher: 7.7% and 41.2%, respectively. Results for CEOs who must undergo annual reviews are reported in Panel C; they are similar to those in Panel B.

Thus, salary increases are unlikely to reflect an arbitrary board decision—even when no specific reasons are given for the raise. Otherwise, we would observe similar frequencies of stand-alone salary increases for CEOs with and without review clauses. Alternative explanations for a salary increase are that it is simply part of an overall company compensation plan or is due to a contract renewal. But we find that less than 1% of compensation changes are explicitly attributable to these reasons (unreported).

Are CEOs with *explicit subjective* performance review clauses more likely to receive salary increases? Table 5 tests the idea by regressing salary changes on review clauses. The dependent variables in columns 1 and 2 of Panel A are indicators for a stand-alone salary increase; those used in columns 3 and 4 are indicators for an overall increase in salary and equity compensation.[5] Since not all CEOs sign contracts and not all firms that sign contracts disclose their particulars, we control for the possibility of selection into our contract sample.[6] The table reports results of the second-stage regressions on contract clauses in columns 2 and 4.

[[INSERT Table 5 about Here]]

Our main finding is that a review requirement clause predicts stand-alone salary raises. The presence of that clause in a CEO's contract increases by 7.5% the likelihood of a stand-alone salary increase when the only control is year fixed effects. This result is robust to controlling for CEO tenure and age, for the inverse Mills ratio, and for year and industry fixed effects. We also include a review

[5] In unreported tests, we regress two other factors on contract clauses: (i) a salary increase combined with a decrease in equity-based compensation; and (ii) a change in total compensation. We find no association between review requirement clauses and either of these compensation changes.

[6] For this purpose we use a Heckman (1979) approach and report the inverse Mills ratio for all second-stage regressions. Appendix 4 details the first-stage regression. In the second stage, we regress indicator variables for subsequent compensation change on our explanatory variable: contractual clauses requiring periodic review.

factor dummy to control for salary increases that are based on factors explicitly written into the contract; our results are robust to controlling for this indicator variable.

As expected, none of the review requirement clauses in our regressions is significantly associated with salary raises that occur simultaneously with changes in equity-based pay. We therefore conclude that stand-alone salary raises are more likely to be part of a compensation scheme based on subjective and nonverifiable performance; otherwise, such raises would also be positively associated with overall compensation increases.

In columns 1, 2, and 3 of Panel B in Table 5, we test for whether CEOs working under contracts that include review clauses are more likely to have their compensation adjusted based on subjective reasons or rather for no explicit reasons. In column 1 of Panel B we see that CEOs with subjective performance review clauses are 5.1% more likely to receive stand-alone salary increases without a stated reason. In column 2 of Panel B, we regress stand-alone salary increases following good subjective performance on compensation changes and find that CEOs with subjective performance review clauses are 8.1% more likely to receive stand-alone salary increases based on good subjective performance. The values reported in column 3 of Panel B indicate that contracts with subjective performance review clauses are *not* more predictive of stand-alone salary increases based on good objective performance.

3. Linking Compensation Changes to Firm Performance

Subjective performance reviews provide an opportunity for firms to link compensation to qualitative measures of performance via soft information that is still not perceptible in quantitative measures. Such reviews, however, may not be effective if the underlying soft information is rigged by the CEO and thus result in unjustified compensation increases. To see if stand-alone salary increases are actually justified by a CEO's good performance, we examine the long-run improvement in returns following these increases.

3.1. Portfolio Returns

To test this hypothesis, we examine average returns on portfolios formed using information about compensation changes. We compute 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. In addition, we adjust the portfolio returns by DGTW characteristics-based benchmarks. Those benchmarks are constructed from the returns of 125 passive portfolios that are matched with stocks held in the evaluated portfolio on the basis of market capitalization, book-to-market ratio, and prior-year stock return characteristics.

Specifically, we conduct a calendar-time portfolio analysis whereby stocks are sorted by changes in compensation using the filing dates of proxy statements in which firms report their most recent CEO compensation. We form equal-weighted portfolios for each month; these portfolios include all companies that made the same type of compensation changes and filed their proxy statements within the preceding 12 months. The portfolios so constructed are rebalanced monthly.

[[INSERT Table 6 about Here]]

Table 6 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 both for three- and four-factor alphas and also for characteristic-adjusted returns. As reported in Panel A of Table 6, a one-year long–short portfolio spread ("Spread")—between the portfolio that offers stand-alone salary increases and the one that does not—is significant and large under all risk adjustment specifications. For example, when three-factor adjustment is used, the magnitude of abnormal returns to the long–short portfolio is 14 basis points (bps) ($t = 2.45$), which translates to 1.7% annually. However, significance of the long–short portfolio spread disappears in the second year after compensation changes.

As a further robustness check, 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 so could result in such grants being replaced with cash-based pay. As shown in Panel B of Table 6, excluding those years renders the returns more statistically significant and economically substantial than when the full sample is used. For instance, when three-factor adjustment is employed, the magnitude of abnormal returns to the long–short portfolio is about 35 bps ($t = 3.13$) one year after compensation changes, which is 21 bps higher than in the full sample.

The tests in Panel A and B include all firms for the respective sample periods. Toward the end of confirming that subjective performance evaluations are related to abnormal returns, in Panel C of Table 6, we sort firms with stand-alone salary increases into two subgroups based on the reasons given for compensation changes: one portfolio consists of firms with stand-alone salary increases with subjective reasons; the other consists of firms with salary increases with objective reasons. A long–short portfolio spread ("Spread_subjective reason") between the portfolio with subjective reasons and the portfolio with no stand-alone salary increases is significant and large under all risk adjustment specifications. When three-factor adjustment is used, the magnitude of abnormal returns to the long–short portfolio is 17 bps ($t = 2.36$), which translates to 2% annually. Here, too, significance of the long–short portfolio disappears in the second year after compensation changes. In contrast, a long–short portfolio spread ("Spread_objective reason") between the portfolio with objective reasons and the portfolio with no stand-alone salary increases is not significant. This result suggests that compensation changes with subjective reasons do contain soft information that is not captured by objective performance measures.

In Panel D of the table we test a subsample of stand-alone salary increases: those offered by firms whose CEO contracts contain explicit review clauses. Firms are double sorted into portfolios using stand-alone salary increases and explicit review clauses. Recall that CEOs with such contracts are more likely to receive stand-alone salary increases accompanied by subjective reasons. It follows that

stand-alone salary increases in conjunction with explicit review clauses should predict greater abnormal returns provided those clauses call for subjective performance reviews. A long–short portfolio spread ("Spread_review clause") between the portfolio of stand-alone salary increases in firms with explicit review clauses and the portfolio of no stand-alone salary increases in firms with explicit review clauses is both significant and large under the three adjustment specifications. When three-factor adjustment is used, the magnitude of abnormal returns to the long–short portfolio is 49 bps (t = 2.33), or 35 bps higher than when all firms are considered. In contrast, a long–short portfolio spread ("Spread_without review clause") between the portfolio of stand-alone salary increases in firms without explicit review clauses and the portfolio with no stand-alone salary increases in firms without explicit review clauses is not significant.

Because R&D activities usually have a long horizon, firms with a recent and substantial increase in R&D expenditures should be more actively engaging in subjective performance evaluations. Panel E of Table 6 tests this idea. We double sort firms based on stand-alone salary increases and yearly percentage increases in R&D expenditures. We rank those firms by R&D growth above and below that year's *Industry median*. When three-factor adjustment is used, a long–short portfolio spread ("Spread_R&D growth high") between the portfolio with stand-alone salary increases in firms with high R&D growth and the portfolio with no stand-alone salary increases in firms with high R&D growth has positive abnormal returns of 41 bps (t = 2.86) in the year after compensation changes, which translates to 4.9% annually. In contrast, a long–short portfolio spread ("Spread_R&D growth low") between the portfolio with stand-alone salary increases in firms with low R&D growth and the portfolio with no stand-alone salary increases in firms with low R&D growth is not significant.

Whereas R&D growth is indicative of investment in potentially new research projects, the ratio of R&D to sales reflects the amount of R&D projects in place. As a robustness check, in Panel F of Table 6 we double sort firms based on stand-alone salary increases and the ratio of R&D to sales. We rank them by R&D/sales above and below that year's *Industry median*. When three-factor adjustment

is used, a long–short portfolio spread ("Spread_R&D/sales high") between the portfolio with stand-alone salary increases in firms with high R&D/sales and the portfolio with no stand-alone salary increases in firms with high R&D/sales has positive abnormal returns of 18 bps ($t = 2.63$) one year after compensation changes. In contrast, a long–short portfolio spread ("Spread_R&D/sales low") between the portfolio with stand-alone salary increases in firms with low R&D/sales and the portfolio with no stand-alone salary increases in firms with low R&D/sales is not significant. Sorting based on quintiles yields similar (even stronger) results.

Panel G of Table 6 presents additional characteristics of these portfolios. In particular, the three-factor loadings suggest that the portfolio consisting of firms with stand-alone salary increases and also the portfolio with no changes in CEO salary load positively on value. The first portfolio also loads positively on size.

In sum, the results from Table 6 demonstrate that compensation changes explain a large and significant spread in future abnormal returns.

3.2. Cross-Sectional Regressions

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

$$\mathrm{RET}_{i,s} = \alpha + \beta * \mathbf{1}(\Delta Salary_{i,t} > 0) + \gamma * Control + \varepsilon_{i,s}$$

where the dependent variable is the monthly stock return for firm i in the subsequent period s, and the independent variable of interest is the indicator variable for stand-alone salary increase in year t. Additional control variables include firm size (Banz, 1981), book-to-market ratio (Rosenberg, Reid, and Lanstein, 1985; Fama and French, 1992), and past returns (Jegadeesh, 1990). 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–MacBeth (1973) return forecasting regressions.

[[INSERT Table 7 about Here]]

The regression estimates reported in Table 7 confirm our earlier portfolio results: firms that offer stand-alone salary increases outperform others in the future. More specifically, stand-alone salary increases significantly predict stock returns in the year after compensation changes in both one- and two-way clustering and Fama–Macbeth regressions. That result persists in year two, but less significantly and only in return forecasting regressions with one- and two-way clustering.

The coefficients reported in columns 2 and 4 of Table 7 imply that a stand-alone salary increase results, with one year, in a 30-bps ($t = 3.7$) increase in stock returns under one-way clustering, a 30-bps ($t = 3.7$) increase under two-way clustering, and a 20-bps ($t = 2.46$) increase in Fama–Macbeth regressions. Both the magnitude and significance of these increases decline two years after the stand-alone salary increase to only 20 bps ($t = 2.27$) under one-way clustering, 20 bps ($t = 2.31$) under two-way clustering, and 0 bps ($t = 0.3$) in Fama–Macbeth regressions.

These return regressions lend further support to our hypothesis that non–performance-based compensation is used to reward CEOs for good performance that is not yet reflected in the firm's stock returns.

4. Mechanism

We have just shown that certain compensation increases predict long-run stock performance. In this section we describe further how CEO performance that can only be observed in the outcome (i.e., salary increases) of subjective evaluations can predict long-term returns. We begin with innovation as one example of an activity for which information about success is seldom incorporated into stock returns until later. In addition, we explore how corporate governance can affect our results: if the salary raises we use as a predictor are indeed an outcome of subjective performance reviews, then their return predictability should be more pronounced when more effective boards conduct performance reviews.

Third, we show in an event study whether and when investors incorporate any of the compensation changes into the returns at the moment of their publication.

4.1. Innovation

Because R&D activities often have a long investment horizon and are explorative in nature, subjective performance evaluations could be especially informative for firms that are more active in R&D. Table 8 tests this idea.

[[INSERT Table 8 about Here]]

This table repeats the regression specifications used in Table 5, but now for stand-alone salary increases by firms with annual percentage increases in R&D expenditures above versus below the industry median (one year before the compensation change). Columns 1–5 show that CEOs with explicit subjective performance review clauses are 10.1% more likely to receive stand-alone salary increases in firms with a high increase in R&D investment; but as shown in columns 6–10 of the table, no such raises are evident in firms with a low increase in R&D investment. This result is significant, and it is robust to controlling for the inverse Mills ratio, review factors, and various fixed effects (column 5).

If financial measures have not yet absorbed the effect of novel research and/or new product development, then we should be more likely to observe such firm activities coming to fruition after rewards based on subjective evaluation of those activities. 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 for Table 9. We control for other forms of compensation increases—namely, salary increases with contemporaneous changes (increases or decreases) in equity compensation. In doing so, we further validate our assumption that, in response to subjective performance evaluations, it is the CEO's *salary* that is most likely to be adjusted.

[[INSERT Table 9 about Here]]

In columns 1 and 2 of Table 9, we regress the number of product announcements the following two years on compensation changes. To avoid any inflation in the number of product announcements due to various industry effects, we divide the number of each firm's product announcements by the average number of product announcements made in the same year by all firms that operate in the same industry; in this we follow the innovation literature (see e.g. Hall, Jaffe, and Trajtenberg, 2001, with regard to patents). We control for both year and firm fixed effects. We find that, one year after an increase in stand-alone salary, the number of product announcements increases by 16.9% relative to the industry average. Other changes in compensation exhibit no such pattern.

In the event of a positive subjective 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 Table 9, 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 ($t = 0$). Parameters for the market model are estimated 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 over each year. We find that stand-alone salary increases predict returns that increase significantly (by 0.6%) over the ±5-day windows that we observe.

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, which is consistent with the results in portfolio analysis and return forecasting regressions.

4.2. Event Studies on Information Asymmetry

Our previous results on firm performance suggest that the market underreacts to initial disclosure of the soft information contained in compensation changes. Since proxy statements usually

include a wide range of governance issues, it is costly for investors with limited attention to decipher—among many other issues—the soft information contained in CEO compensation changes. Following Dierkens (1991), Thomas (2002), and Moeller, Schlingemann, and Stulz (2007), we use idiosyncratic risk and analyst forecast dispersion as measures of information asymmetry and test the hypothesis that investors underreact more to compensation information in firms characterized by greater information asymmetry. Such firms should be the ones for which soft information is most valuable in predicting long-run returns.

[[INSERT Table 10 about Here]]

In Table 10 we study the immediate stock market reaction to a proxy filing. To estimate abnormal stock returns, we use the same market model approach—using the equal-weighted CRSP index and ±5-day windows—described in Section IV.A. The independent variable in column 1 of the table is the stand-alone salary increase. We include an interaction term between stand-alone salary increase and analyst forecast dispersion in column 3, and an interaction term between stand-alone salary increase and idiosyncratic risk in column 4. Because firm activity may be affected by variations in time or in firm characteristics, we control for both year and firm fixed effects in all specifications. To isolate the effect of stand-alone salary increases on CARs, in columns 2–4 we also control for changes in other compensation[7] and for factors related to annual shareholder meetings, namely, changes in institutional ownership, types of annual meeting sponsors, and shareholder proposals (as defined in Cvijanovic, Groen-Xu, and Zachariadis, 2016). Our data on these variables are limited to the years after 2003, so we use a subsample of CEO compensation changes in columns 2–4.

The results reported in columns 1 and 2 of Table 10 suggest that, in general, the market does not react immediately to the soft information content of compensation changes around the filing dates

[7] "Other compensation" includes perquisites and other personal benefits, termination or change-in-control payments, contributions to defined contribution plans (e.g., 401(k) plans), life insurance premiums, gross-ups and other tax reimbursements, discounted share purchases, and so forth.

of the proxy statements. However, the interaction terms in columns 3 and 4 suggest that this is not the case for all incidences.

We examine the effect of analyst forecast dispersion in column 3 of Table 10. Variations in analyst forecasts reflect divergence of opinions on a firm's future success. We find that a 1% reduction in analyst forecast dispersion for firms with stand-alone salary raises is associated with a 4.9-bps increase in the 10-day CARs following compensation changes. In column 4 of the table we examine the effect of idiosyncratic risk, which reflects the volatility of firm-specific information (Campbell et al., 2001). Similarly to the results in column 3, we find that a 1% decrease in idiosyncratic risk for firms that offer stand-alone salary raises is associated with an 18.2-bps increase in the 10-day CARs following compensation changes.

If investors underreact more to *soft* information in compensation changes offered by firms with greater information asymmetry, then compensation changes in those firms should—in the long run—be even more predictive of returns and innovation activities after *hard* information (e.g., product development news) is released. Table 11 tests this idea.

[[INSERT Table 11 about Here]]

In columns 1 and 2 of Table 11, we conduct return forecasting regressions as in Table 7 and interact stand-alone salary increases with analyst forecast dispersion and idiosyncratic risk respectively. A 1% increase in analyst forecast dispersion (resp., idiosyncratic risk) for firms that offer stand-alone salary raises leads to a 0.3-bps (resp., 2.1-bps) increase in monthly stock returns one year after compensation changes.

In columns 3 and 4 of Table 11, we regress CARs to product announcements on stand-alone salary increases (as in Table 9) but also include the two interaction terms. A 1% increase in analyst forecast dispersion (resp., idiosyncratic risk) for firms that offer stand-alone salary raises leads to a 1.5-bps (resp., 3.7-bps) increase in CARs one year after compensation changes. Table 11 suggests that compensation changes due to subjective performance evaluations are indeed more predictive of future

returns and innovation activities for firms with higher analyst forecast dispersion or higher idiosyncratic risk.

These results suggest that our finding is more in line with the market's undervaluation of soft information in compensation changes than with the existence of an omitted risk factor, since the latter would predict consistent abnormal returns not only in event studies but also in return forecasting regressions. Hence we interpret these results as suggesting that investors underreact to subjective performance review–related compensation changes when confronted with noisy information.

4.3. Board Effectiveness

Soft information regarding early R&D success is hard to quantify and easy to manipulate toward the end of persuading a benevolent board of directors. An easily convinced board is more likely to award CEO salary increases irrespective of the executive's actual performance. If instead a well-governed board conducts the review, then compensation increases following subjective performance reviews should be more predictive of long-run returns. Table 12 tests this idea via return forecasting regressions.

[[INSERT Table 12 about Here]]

We examine two board-related characteristics in Table 12: whether the board has a high number of directors with other engagements (Fich and Shivdasani, 2006) and whether the board is dominated by independent directors (Nguyen and Nielsen, 2010). Thus we set a "busy board" indicator to 1 if the fraction of directors serving on more than two outside public boards exceeds 0.5, and we set the "independent_directors%_high" to 1 only if the fraction of independent directors exceeds the industry median (otherwise, these dummy variables are set equal to 0). The latter adjustment is to accommodate industry differences in the availability of competent directors.

In columns 1 and 2 of Table 12, we interact these variables with the stand-alone salary raise indicator and run pooled regressions of monthly stock returns on those variables while controlling for

firm size, book-to-market ratio, and past returns. We find that stand-alone salary increases are indeed more predictive of future returns for firms with better-governed boards. Stand-alone salary raises offered by a busy board predict a 40-bps decrease in monthly stock returns one year after compensation changes. In contrast, stand-alone salary raises offered by a more independent board predict a 30-bps increase in monthly stock returns one year after compensation changes.

In columns 3 and 4 of Table 12, we regress CARs to product announcements on stand-alone salary increases; we also include the two interaction terms. Although the coefficients for the two interaction terms have the same signs as those in our return forecasting regressions, they are not statistically significant.

5. Robustness

In this section, we provide a series of additional tests to show that our results are inherently consistent and robust.

5.1. Determinants of Review Clauses

In Section III we showed that CEOs with subjective review clauses are more likely to receive stand-alone salary increases. One might argue that those clauses may also be written into contracts for other reasons. 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 subjective evaluations. To explore the possible alternative explanations, we directly investigate the determinants of review clauses; we find that firm–CEO pairs for which subjective performance evaluations are more useful are more likely to sign contracts that contain review clauses.

According to Baker, Gibbons, and Murphy (1994), subjective performance evaluations should be used by firms whose objective performance measures are noisy. For example, firms typically face a

long delay before early R&D success comes to fruition in accounting terms; hence, as we have described, subjective performance reviews can be especially useful for firms with substantial R&D investment. Subjective performance reviews are especially useful also for firms characterized by greater information asymmetry with respect to investors and/or by more volatile returns.

Of course, subjective performance reviews are only one of several possible reasons for preferring contractual flexibility as regards compensation. An extensive literature studies the various factors affecting compensation, including outside options, the extent of managerial power, and the firm's financial constraints.

Compensation changes may result from ex post renegotiation, for example in response to changes in a CEO's outside options. Indeed, firms explain in the proxy statement 29% of salary increases as benchmarking to the compensation of peer CEOs in the same industry. Thus a firm must offer compensation high enough that its CEO is willing to forgo outside options. Along these lines, matching theories (e.g., Gabaix and Landier, 2008) argue that larger firms need more able CEOs and so must offer higher compensation to attract them. Following Gabaix and Landier, we use total assets to proxy for firm size; we use industry CEO turnover and homogeneity to measure labor market depth (as in Gillan, Hartzell, and Parrino, 2009).

Monitoring subjective performance reviews is difficult for investors and perhaps even for outside board members. As a result, CEOs can influence such reviews far more easily than they can influence objective criteria. In fact, Bebchuk and Fried (2004) argue that managers wield substantial influence over their own pay arrangements. We use indicators for busy boards and board independence to assess managerial power.

Firms facing financial constraints have less cash to offer as salary and so may prefer to offer more equity-based pay than do less constrained firms. Babenko, Lemmon, and Tserlukevich (2011) posit that financially constrained firms may finance investments using cash inflows from employees exercising their stock options. Consistently, Core and Guay (2001) document a greater use of options

for compensation by firms with financial constraints. We use a dummy variable "distress" (based on Altman, 1968) to control for financial constraints.

[[INSERT Table 13 about Here]]

In Table 13 we link these potential determinants to an indicator variable for review clauses as dependent variable using a Probit specification. The explanatory variables used in our regressions include—for years in which the CEO's contract is effective—proxies for information asymmetry, firm characteristics, corporate governance, and CEO characteristics. Columns 3 and 4 in the table include industry characteristics, while columns 2 and 4 include industry fixed effects.

Columns 1 and 4 in Table 13 show that a firm investing heavily in R&D 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 the table 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 resulting from compensation review (i.e., since 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 in opposite directions. 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 where 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. In particular, the coefficient for busy boards is significant at the 10% level in two of the four specifications.

Together these findings suggest that, when information asymmetry between the firm and investors can be high, firms are more inclined to offer flexible CEO contracts incorporating subjective reviews, confirming the appropriateness of our identification strategy based on stand-alone salary increases. We also find evidence that review clauses are predicted (albeit much more weakly) by potential outside options and CEO power.

5.2. Firm Innovation Ability

In addition to CEO's contribution to improving the firm's innovation efficiency, persistent firm characteristics—for example, the ability to transform R&D investment into sales (Cohen, Diether, and Malloy, 2013)—may also explain early R&D success. Subjective evaluation should reward CEOs based on their contributions, or on outcomes that cannot be explained solely by persistent firm characteristics. Otherwise, our variable for compensation change does not reflect subjective evaluations and may instead be capturing only soft information regarding other firm characteristics.

We therefore conduct the same regressions as in Table 7 but including the "innovation ability" variable introduced by Cohen, Diether, and Malloy (2013). This control variable is constructed based on a firm's past sales/R&D ratio and measures its ability to turn R&D investment into sales. We run separate regressions for five different lags of R&D (i.e., from year $t - 1$ to year $t - 5$) and then use the average of these five R&D regression coefficients as a proxy for ability. An indicator variable for high ability is set equal to 1 for the top quartile in a given month. A dummy for high R&D is set to 1 only if R&D scaled by sales is above the 70th percentile.

[[INSERT Table 14 about Here]]

Table 14 shows that the return predictability of CEO compensation changes is not affected when our regressions include the persistent firm characteristic of innovation ability. Thus a stand-alone salary increase still leads to a 30-bps (resp., 20-bps) increase in monthly returns one year (resp., two years) after compensation changes. This result suggests that our compensation change variable captures soft information that cannot be explained by persistent firm characteristics.

In unreported tests, we conduct a two-way analysis of variance of monthly stock returns one year after stand-alone salary increases on stand-alone salary increases and innovation ability. Innovation ability alone explains 3.77% of return variation, and the interaction accounts for 5.17%. This finding indicates that 57.83% of the mispricing captured by our measure of innovation ability can be explained by the soft information known to the board but not to outside investors.

5.3. Bonus and Equity Changes

Here we provide additional support for our assumption that subjective performance reviews are more likely to result in changes to salary than in changes to bonus or equity. Also, we briefly discuss why firms use salaries to reward positive subjective performance.

In Section II we provided contractual evidence for the assumption: namely, a majority of our sample contracts contain performance review clauses in their respective salary sections, whereas more than half of the sample contracts contain no clauses that explicitly allow for flexible adjustments of bonus or equity. We have also shown that review clauses are more predictive of stand-alone salary increases than of overall increases in salary and equity.

In unreported tests on equity changes, 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.[8] With a four-factor adjustment, the spread portfolio has insignificant returns of negative 6 bps ($t = -0.69$) in the year after compensation changes. Recall from Table 9 that overall compensation increases in salary and equity also do *not* predict any improvement in product development.

We conduct similar, unreported tests on the bonus. Executive bonuses are often calculated as a multiple of base salary (De Angelis and Grinstein, 2014). We therefore identify the actual change in bonus—rather than the "mechanical" change arising simply from any base salary change—by viewing each bonus strictly as a *multiple* of salary. In unreported results, we find that a CEO's 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. Note also that we find no significant correlation between a stand-alone increase in bonus and the firm's product development or performance.

Two reasons might explain why firms use salaries to reward positive subjective performance. First, a salary is easy to adjust whereas any adjustment of bonus or equity is usually subject to company-wide compensation plans or to rules protecting shareholders from dilution; for these two aspects of compensation, the board is left with little discretion in the matter. Second, salary raises—unlike one-off bonuses—normally signify a permanent increase in CEO compensation. It is possible that firms use salaries raises to reward CEOs for their talent which is not yet reflected in immediate financial measures.

6. Conclusion

This paper introduces empirically the subjective performance review as a component of CEO compensation as well as a novel early predictor of R&D success and abnormal stock returns. Theoretical literature suggests that subjective performance reviews are an essential tool to align incentives when stock prices incorporate performance with a delay, which is particularly the case with long-term

[8] We tried to construct a portfolio that takes the same long position while taking a short position in firms that offer an increase in equity but not in salary. However, less than 5% of firms employ that scheme for us to make any statistically meaningful statements about it.

decisions. We document for the first time that executive contracts indeed explicitly schedule subjective reviews of performance. We find that CEOs whose contracts have explicit review clauses are more likely to receive subjectively justified stand-alone salary increases, which implies that compensation changes following subjective reviews are part of the firm's incentive scheme.

We demonstrate subjective performance reviews are not only rigged by CEOs to their favour. Positive outcomes of such reviews are followed by positive stock price development. A long–short portfolio strategy that invests in firms with stand-alone salary increases and takes a short position in firms without salary increases—earns abnormal returns of 2%–4% annually. Return forecasting regressions further show that a stand-alone salary increase results, with one year, in a 30-bps increase in monthly stock returns.

Further, we find an upswing in real firm activities following stand-alone salary increases. Specifically, the number of product announcements increases in firms that give such raises one year after the compensation change; abnormal returns likewise increase around subsequent announcements of product developments. We also find that, for firms with more effective boards, the soft information embedded in subjective performance reviews is more predictive of future returns. In addition, compensation changes in firms with more information asymmetry predict higher future returns. These results all indicate that executive compensation changes contain soft information about a firm's innovation activities, whose interpretation is subject to the board's effectiveness and the information environment of investors.

Finally, we conduct several robustness checks to show that stand-alone salary increases are indeed related to subjective evaluation. We show that firms with more R&D investment are more likely to sign contracts containing explicit review clauses. Such CEO contracts are also more likely in firms characterized by greater dispersion among analyst forecasts and/or higher return volatility.

Our paper complements a growing literature on the market's inability to value R&D investment as well as the theoretical literature on subjective evaluation of executives. Instead of studying

compensation based on explicit performance measures, we provide evidence gathered from CEO contracts whose terms do not rely on such measures and show how they play a key role in encouraging long-term innovation decisions. An important tool of corporate governance, subjective performance review enables a board to encourage long-term investment when the market is delayed in recognizing them.

There is still much scope for future work on the channels through which contract clauses affect CEO compensation. It would be worthwhile also to study how explicit and implicit performance measures interact and, more generally, the optimal compensation structure for rewarding good subjective performance. Doing so would help us better understand the performance sensitivity of executive compensation.

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Table 1: Summary statistics

Variable	Mean	Median	STD	Min	Max
Firm characteristics					
Total assets (in $ millions)	24,787	7,387	40,404	7	153,413
Total sales (in $ millions)	10,789	5,284	12,934	0	46,090
ROA	0.07	0.07	0.06	-0.62	0.17
Product announcement	3.85	0	15.80	0	295
Idiosyncratic risk	0.32	0.27	0.17	0.06	2.16
Analyst forecast dispersion	0.13	0.05	0.29	0.00	3.32
R&D/sales	0.03	0	0.21	0	16.44
Leverage (net)	0.33	0.36	0.25	-0.88	4.27
Distress (dummy variable)	0.32	0	0.47	0	1
CEO characteristics					
Outside CEO (dummy variable)	0.13	0	0.34	0	1
Tenure CEO	7.15	5	6.55	1	46
Age CEO	54.98	56	7.86	36	74
Chairman CEO (dummy variable)	0.69	1	0.46	0	1
Independent directors (% of board)	0.67	0.66	0.15	0	1
Busy board (dummy variable)	0.29	0	0.45	0	1
Gindex	9.50	9.44	1.48	3	15
Labor market characteristics					
Industry homogeneity	0.06	0.05	0.02	0.04	0.14
Industry CEO turnover	0.12	0.11	0.07	0	0.75
Industry outside CEOs%	0.58	0.58	0.07	0.17	0.86

Note: This table presents summary statistics for our sample, which consists of 8,190 annual observations (5,242 observations, 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 and 5 show the mean, median, standard deviation (STD), minimum and maximum values in the sample, respectively, for each variable.

Table 2: Compensation changes

Panel A: Changes in salary			
	(1)	(2)	(3)
Change in salary	**-**	**0**	**+**
% of all years	5.2%	25.4%	69.4%
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%
Change in bonus multiple	41.7%	5.8%	11.2%
Change in equity-based compensation	0.0%	0.1%	0.5%
Panel B: Changes in salary and equity			
Change in salary		**+**	
Change in equity-based pay	**-**	**0**	**+**
% of all years	10.2%	46.0%	12.6%
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%
Change in bonus multiple	19.7%	54.1%	2.8%
Change in equity-based compensation	-25.8%	0.0%	23.7%

Note: This table presents summary statistics for CEO compensation. The sample contains S&P 500 companies between 1994 and 2008. Panel A presents the frequency and magnitude of salary increases and decreases. Panel B presents the frequency and magnitude of equity increases and decreases when salary increases. We classify a change in salary as a raise only if the CEO's real (i.e., inflation adjusted) salary growth is positive; in contrast, our salary cut classification is based on nominal salary growth. If a CEO receives no equity in the years between two grants, we classify as no change in equity-based compensation. We then compare the current grant value to the previous grant's value. We classify as stable in equity-based compensation if the change does not exceed (in absolute value terms) that year's change in salary. The bonus multiple is defined as the bonus divided by the salary.

Table 3: 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	75.5%
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 is shown in column 2, and column 3 presents the incidence of such clauses. Panels A and B detail clauses regarding review requirement, review frequency and contract-mandated factors that should be considered in reviews. Panel C shows the compensation components over which boards have the discretion to adjust based on CEO performance.

Table 4: Performance-related reasons for compensation changes

Panel A: Reasons for compensation changes		
Reasons for changes	N	% of Total
	(1)	(2)
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%
Objective performance	322	7.41%
General performance	1,735	39.90%
No reasons given	1,446	33.26%

Panel B: Review clauses				
	Without	With	Review requirement	
Variable	Mean	Mean	t-stats	
	(1)	(2)	(3)	
No reasons given	0.315	0.453	-6.375	***
Soft measures or no reasons 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				
	Without	With	Annual review	
No reasons given	0.318	0.464	-6.081	***
Soft measures or no reasons 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 reasons 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 stated reasons 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 the 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 5: Stand-alone salary increases and reasons

Panel A: Compensation changes				
Dependent variable	Stand-alone salary increase		Overall compensation increase	
	(1)	(2)	(3)	(4)
Review requirement	0.075**	0.067*	0	0.011
	(0.038)	(0.039)	(0.022)	(0.020)
Review factor		0.021		0.042*
		(0.045)		(0.022)
Mills		0.062		-0.049**
		(0.057)		(0.020)
Year fixed effects	Yes	Yes	Yes	Yes
Tenure group	No	Yes	No	Yes
Age group	No	Yes	No	Yes
Industry fixed effects	No	Yes	No	Yes
N	954	954	862	862

Panel B: Reasons for stand-alone salary increases			
Dependent variable	Stand-alone salary increase*No reason	Stand-alone salary increase*Subjective Reason	Stand-alone salary increase*Objective reason
	(1)	(2)	(3)
Review requirement	0.051**	0.081***	0.001
	(0.021)	(0.027)	(0.022)
Review factor	0.039	0.037	0.033
	(0.081)	(0.055)	(0.202)
Mills	0.021	0.009	-0.037
	(0.041)	(0.053)	(0.040)
Year fixed effects	Yes	Yes	Yes
Tenure group	Yes	Yes	Yes
Age group	Yes	Yes	Yes
Industry fixed effects	Yes	Yes	Yes
N	937	937	937

Note: This table presents the marginal effects of compensation changes on contract clauses from probit regressions. Standard errors (in parentheses) are heteroskedasticity robust. In Panel A, the dependent variables are dummy variables of stand-alone salary raises in columns 1 and 2 and overall raises in salary and equity in columns 3 and 4. In Panel B, the dependent variables are indicator variables, equal to one for stand-alone salary increases with no reasons provided in column 1, equal to one for stand-alone salary increases with either no reasons provided or based on subjective reasons in column 2, and equal to one for stand-alone salary increases based on objective reasons only in column 3. The review requirement dummy is the explanatory variable. Control variables include the Mills ratio and the review factor dummy. Age group consists of five dummies for CEO age: under 45, between 45 and 50, between 50 and 55, between 55 and 60, and above 65. Tenure group consists of three dummies for a CEO who has worked in the same firm for at most 2 years, 3-6 years and more than 6 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 6: Calendar-time portfolio returns

Compensation changes	3-factor alpha	4-factor alpha	DGTW adjusted	3-factor alpha	4-factor alpha	DGTW adjusted
	1 year after portfolio formation			2 years after portfolio formation		
	(1)	(2)	(3)	(4)	(5)	(6)
Panel A: Stand-alone salary increases						
Stand-alone salary increase	0.56%	0.59%	0.67%	0.51%	0.56%	0.58%
No change in salary	0.42%	0.48%	0.37%	0.66%	0.69%	0.44%
Spread	**0.14%**	**0.11%**	**0.29%**	-0.16%	-0.13%	0.13%
T-stat	2.45	2.08	2.50	-0.79	-0.63	1.15
Panel B: Stand-alone salary increases—excluding 2001-2003						
Stand-alone salary increase	0.53%	0.56%	0.63%	0.43%	0.50%	0.29%
No change in salary	0.18%	0.24%	0.24%	0.52%	0.55%	0.20%
Spread	**0.35%**	**0.32%**	**0.39%**	-0.08%	-0.05%	0.09%
T-stat	3.13	2.85	2.80	-1.27	-1.12	0.70
Panel C: Stand-alone salary increases: reasons						
Spread_subjective reason	**0.17%**	**0.15%**	**0.23%**	-0.15%	-0.12%	0.08%
T-stat	2.36	2.08	1.91	-0.73	-0.60	0.68
Spread_objective reason	-0.37%	-0.45%	0.63%	0.06%	0.04%	0.35%
T-stat	-0.20	-0.65	1.44	1.32	1.01	0.18
Panel D: Stand-alone salary increases: review clauses						
Spread_review clause	**0.49%**	**0.44%**	**0.45%**	0.23%	0.18%	0.12%
T-stat	2.33	2.07	2.96	1.04	0.89	1.26
Spread_without review clause	0.24%	0.07%	0.07%	-1.13%	-1.02%	-0.02%
T-stat	1.58	0.79	0.45	-1.58	-1.54	-0.14
Panel E: Stand-alone salary increases: R&D growth						
Spread_R&D growth high	**0.41%**	**0.39%**	**0.24%**	0.00%	0.07%	0.04%
T-stat	2.86	2.63	1.78	0.99	1.04	0.30
Spread_R&D growth low	-0.37%	-0.36%	0.16%	-0.20%	-0.14%	-0.09%
T-stat	-1.16	-1.21	0.97	-0.27	-0.27	-0.55
Panel F: Stand-alone salary increases: R&D/sales						
Spread_R&D/sales high	**0.18%**	**0.14%**	**0.34%**	-0.13%	-0.11%	0.13%
T-stat	2.63	2.26	2.86	-0.91	-0.74	1.06
Spread_R&D/sales low	-0.02%	-0.06%	0.19%	-0.27%	-0.24%	0.18%
T-stat	-1.14	-0.83	1.49	-0.17	-0.08	1.37
Panel G: Three factor loadings						
	MKT	T-stat	SMB	T-stat	HML	T-stat
Stand-alone salary increase	1.10	38.32	0.15	4.39	0.37	9.02
No change in salary	0.89	15.56	-0.08	-1.08	0.21	2.83
Spread	0.21	1.49	0.23	0.82	0.15	3.80

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; these portfolios include all companies that made the same type of compensation change and filed their proxy statements 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. Panel B reports subsample analysis excluding years 2001 to 2003. In Panel C, we further sort firms with stand-alone salary increases based on the reasons for salary changes listed, namely, subjective reasons and objective reasons. In Panel D, we double sort firms based on stand-alone salary increases and explicit review clauses. In Panel E, we double sort firms based on stand-alone salary increases and the yearly percentage increase in R&D expenditures. We rank those firms by R&D growth above and below industry median in that year. In Panel F, we double sort firms with stand-alone salary increases and R&D/sales. We rank firms by R&D/sales above and below industry median in that year. We compute three- and four-factor alphas (as in Fama and French (1996), and Carhart (1997)) by running time-series regressions of excess portfolio returns on the market (MKT), size (SMB), value (HML), and momentum (UMD) factor returns. In addition, we characteristically adjust the portfolio returns using 125 size/book to market/momentum benchmark portfolios as in Daniel, Grinblatt, Titman, and Wermers (1997). Panel G reports the factor loadings based on the three-factor model for portfolios in Panel A and their t-statistics. The spreads of long-short portfolio returns are indicated in bold if they are positive and significant at the 10% level.

Table 7: Stock return regressions

Dependent variable	Monthly stock return after 1 year			Monthly stock return after 2 years		
	(1)	(2)	(3)	(4)	(5)	(6)
Stand-alone salary increase	0.003***	0.003***	0.002**	0.002**	0.002**	0.000
	(0.001)	(0.001)	(0.010)	(0.001)	(0.001)	(0.010)
Other controls	Yes	Yes	Yes	Yes	Yes	Yes
Firm cluster	Yes	No	No	Yes	No	No
Two way cluster	No	Yes	No	No	Yes	No
Fama-Macbeth	No	No	Yes	No	No	Yes
N	96,695	96,695	96,695	96,683	96,683	96,695

Note: This table reports the coefficients and standard errors (in parentheses) of forecasting regressions of monthly stock returns on compensation changes. The dependent variables in columns 1, 2, and 3 are the monthly stock returns 1 year after compensation changes; in columns 4, 5 and 6, they are the monthly stock return 2 years after compensation changes. The independent variable is the dummy variable indicating stand-alone salary increases. Control variables include one-, two-, and three-month lagged returns, firm size and market-to-book ratio. We estimate pooled regression in columns 1, 2, 4, and 5. Standard errors are clustered by firm in columns 1 and 4 and by firm and year-month in columns 2 and 5. Fama and Macbeth (1973) regressions are estimated in columns 3 and 6.

*** Significant at the 1% level.

** Significant at the 5% level.

* Significant at the 10% level.

Table 8: Compensation changes and contract clauses—R&D

Dependent variable	Stand-alone salary increase									
	High R&D growth					Low R&D growth				
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Review requirement	0.101**	0.093**	0.100**	0.106**	0.107**	0.013	0.015	0.006	0.06	0.058
	(0.047)	(0.048)	(0.048)	(0.054)	(0.055)	(0.047)	(0.048)	(0.049)	(0.062)	(0.063)
Mills			0.045	0.048	0.05			0.04	0.024	0.024
			(0.051)	(0.085)	(0.083)			(0.095)	(0.089)	(0.088)
Review factor					-0.116					0.061
					(0.097)					(0.165)
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Tenure group	No	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes
Age group	No	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes
Industry fixed effects	No	No	No	Yes	Yes	No	No	No	Yes	Yes
N	502	502	502	502	502	464	464	464	464	464

Note: This table presents the marginal effects of contract clauses from probit regressions. Standard errors (in parentheses) are heteroskedasticity robust. The sample used in these regressions consists of only firms for which we find a CEO contract. The dependent variable is a dummy variable indicating stand-alone salary increases. Columns 1 to 5 (resp., 6 to 10) report the results for the subsample of firms with R&D increases one year prior to stand-alone salary increases that are higher (resp., lower) than the industry median based on the first two digits of the SIC code. Explanatory variables are the review requirement dummy, the inverse Mills ratio and the review factor dummy. Age group is captured by five dummies for CEO age: under 45, between 45 and 50, between 50 and 55, between 55 and 60, and above 65; the tenure group consists of three dummies for a CEO who has worked in the same firm for at most 2 years, 3-6 years and more than 6 years. Industry classifications 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 9: Firm activity

Dependent Variable	Number of product announcements		CARs to product announcements	
	After 1 year	After 2 years	After 1 year	After 2 years
	(1)	(2)	(3)	(4)
Stand-alone salary increase	0.169**	0.016	0.006***	0.001
	(0.085)	(0.089)	(0.002)	(0.004)
Overall compensation increase	0.107	-0.059	0.003	-0.005
	(0.16)	(0.164)	(0.003)	(0.005)
Salary increase & equity decrease	-0.012	-0.008	-0.001	-0.001
	(0.109)	(0.135)	(0.004)	(0.005)
Year fixed effects	Yes	Yes	Yes	Yes
Firm fixed effects	Yes	Yes	Yes	Yes
R-squared	0.321	0.276	0.373	0.134
N	2,569	2,588	2,569	2,588

Note: This table reports the coefficients of OLS regressions of product development on compensation changes. Standard errors (in parentheses) are heteroskedasticity robust. Due to the data availability of product announcements at S&P Capital IQ, the sample contains S&P 500 companies between 2002 and 2008. The dependent variables in columns 1 and 2 are the number of product announcements divided by the industry average 1 and 2 years after compensation changes. Industry classifications are based on the first two digits of the SIC code. The dependent variables in columns 3 and 4 are the average 10-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.

*** Significant at the 1% level.

** Significant at the 5% level.

* Significant at the 10% level.

Table 10: Information asymmetry: event studies

Dependent variable	CARs +/- 5 days			
	(1)	(2)	(3)	(4)
Stand-alone salary increase	0.000	-0.005	-0.001	0.029*
	(0.002)	(0.005)	(0.006)	(0.016)
Stand-alone salary increase*analyst forecast dispersion			-0.049**	
			(0.021)	
Analyst forecast dispersion			0.026*	
			(0.014)	
Stand-alone salary increase*idiosyncratic risk				-0.182**
				(0.085)
Idiosyncratic risk				0.016
				(0.095)
Other controls	No	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes
Firm fixed effects	Yes	Yes	Yes	Yes
R-squared	0.15	0.50	0.51	0.51
N	4516	583	583	583

Note: This table reports the coefficients of OLS regressions of 10-day cumulative abnormal returns (CARs) around the filing date of proxy statements. Standard errors (in parentheses) are heteroskedasticity robust. We use a standard market model approach to estimate abnormal stock returns. The parameters of the market model are estimated over a 90-day period ending 46 days before the event day using the equal-weighted CRSP index. The independent variable in column 1 is the stand-alone salary increase. We include interactions with analyst forecast dispersion in columns 3 and with idiosyncratic risk in column 4. Control variables include other compensation changes, institutional ownership changes, shareholder proposal types and annual meeting sponsor types in columns 2 to 4.

*** Significant at the 1% level.

** Significant at the 5% level.

* Significant at the 10% level.

Table 11: Information asymmetry: long-run performance

Dependent Variable	Monthly stock return		CARs to product announcements	
	(1)	(2)	(3)	(4)
Stand-alone salary increase	-0.005	0.006***	0.002	-0.006
	(0.005)	(0.002)	(0.002)	(0.004)
Stand-alone salary increase*analyst forecast dispersion	0.003**		0.015**	
	(0.001)		(0.006)	
Analyst forecast dispersion	0.001		-0.010*	
	(0.003)		(0.006)	
Stand-alone salary increase*idiosyncratic risk		0.021***		0.037***
		(0.007)		(0.011)
Idiosyncratic risk		-0.024***		-0.019**
		(0.005)		(0.008)
Controls	Yes	Yes	Yes	Yes
Year fixed effects	No	No	Yes	Yes
Firm fixed effects	No	No	Yes	Yes
Two way cluster	Yes	Yes	No	No
R-squared	0.004	0.003	0.372	0.378
N	42636	46,025	2,569	2,569

Note: The dependent variables in columns 1 and 2 are monthly stock returns 1 year after compensation changes. The dependent variables in columns 3 and 4 are average 10-day abnormal returns around the product announcement date 1 year after compensation changes. We use a standard market model approach to estimate abnormal stock returns and then take the mean for all product announcement events over each year. The parameters of the market model are estimated over a 90-day period ending 46 days before the event day using the equal-weighted CRSP index. Standard errors (in parentheses) are clustered by firm and year-month in columns 1 and 2 and are heteroskedasticity robust in columns 3 and 4. We interact stand-alone salary increases with analyst forecast dispersion in columns 1 and 3 and with idiosyncratic risk in columns 2 and 4. Other independent variables in columns 1 and 2 include stand-alone salary increases, analyst forecast dispersion, idiosyncratic risk, one-, two-, and three-month lagged returns, firm size and market-to-book ratio. Other independent variables in columns 3 and 4 include stand-alone salary increases, analyst forecast dispersion, idiosyncratic risk, year fixed effects, and firm fixed effects.

*** Significant at the 1% level.

** Significant at the 5% level.

* Significant at the 10% level.

Table 12: Board effectiveness

Dependent variable	Monthly stock return		CARs to product announcements	
	(1)	(2)	(3)	(4)
Stand-alone salary increase	0.001	-0.002**	0.008***	0.005*
	(0.001)	(0.001)	(0.003)	(0.003)
Stand-alone salary increase*busy board	-0.004*		-0.005	
	(0.002)		(0.003)	
Busy board	0.005***		0.001	
	(0.001)		(0.003)	
Stand-alone salary increase* independent directors%_high		0.003*		0.002
		(0.002)		(0.003)
Independent directors%_high		-0.007***		0.003
		(0.001)		(0.003)
Other controls	Yes	Yes	Yes	Yes
Year fixed effects	No	No	Yes	Yes
Firm fixed effects	No	No	Yes	Yes
Two way cluster	Yes	Yes	No	No
R-squared	0.005	0.004	0.374	0.376
N	59287	95206	2569	2569

The dependent variables in columns 1 and 2 are monthly stock returns 1 year after compensation changes. The dependent variables in columns 3 and 4 are average 10-day abnormal returns around the product announcement date 1 year after compensation changes. We use a standard market model approach to estimate abnormal stock returns and then take the mean for all product announcement events over each year. The parameters of the market model are estimated over a 90-day period ending 46 days before the event day using the equal-weighted CRSP index. Standard errors (in parentheses) are clustered by firm and year-month in columns 1 and 2 and are heteroskedasticity robust in columns 3 and 4. In columns 1 and 2, the interaction term is between stand-alone salary increase and busy board. In columns 3 and 4, the interaction term is between stand-alone salary increase and independent directors%_high, a dummy equal to 1 if the fraction of the firm's outside directors exceeds the industry median in a given year. Industry classifications are based on the first two digits of the SIC code. Other independent variables in columns 1 and 2 include stand-alone salary increases, busy board, independent directors%_high, one-, two-, and three-month lagged returns, firm size and market-to-book ratio. Other independent variables in columns 3 and 4 include stand-alone salary increases, busy board, independent directors%_high, year fixed effects, and firm fixed effects.

*** Significant at the 1% level.

** Significant at the 5% level.

* Significant at the 10% level.

Table 13: 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 for which we find 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. Age group consists of five dummies for CEO age: below 45, between 45 and 50, between 50 and 55, between 55 and 60, and above 65. Tenure group consists of three dummies for a CEO who has worked in the same firm for at most 2 years, 3-6 years and more than 6 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 14: Innovation ability

Dependent variable	Monthly stock return after 1 year		Monthly stock return after 2 years	
	(1)	(2)	(3)	(4)
Stand-alone salary increase	0.003***	0.003***	0.002**	0.002**
	(0.001)	(0.001)	(0.001)	(0.001)
R&D high*ability high	-0.000	-0.000	0.000	0.000
	(0.002)	(0.002)	(0.002)	(0.002)
Ability high	-0.003*	-0.003	-0.003*	-0.003
	(0.002)	(0.002)	(0.002)	(0.002)
R&D high	0.002	0.002	0.001	0.001
	(0.001)	(0.001)	(0.001)	(0.001)
Other controls	Yes	Yes	Yes	Yes
Firm cluster	Yes	No	Yes	No
Two way cluster	No	Yes	No	Yes
N	96,683	96,683	96,671	96,671

Note: This table reports the coefficients and standard errors (in parentheses) of forecasting regressions of stock returns on stand-alone salary raises including innovation ability, as defined in Cohen, Diether, and Malloy (2013). Innovation ability is computed by estimating rolling firm-by-firm regressions of firm-level sales growth on lagged R&D over sales. We estimate separate regressions for 5 different lags of R&D from year t-1 to t-5; we then compute the average of five R&D regression coefficients as the measure of innovation ability. Ability high equals one if the ability estimate of a stock is in the top quartile in a given month. R&D high equals one if its R&D scaled by sales of a stock is above the 70th percentile. The dependent variable in columns 1 and 2 is the monthly stock return 1 year after compensation changes. The dependent variable in columns 3 and 4 is the monthly stock return 2 years after compensation changes. Additional control variables include one-, two-, and three-month lagged returns, firm size and market-to-book ratio. Standard errors are clustered by firm in columns 1 and 3 and by firm and year-month in columns 2 and 4.

*** Significant at the 1% level.

** Significant at the 5% level.

* Significant at the 10% level.

Appendix 1. Variable Definitions

Variables	Definitions
Age group	Dummies for CEO age <45, ≥45 and <50, ≥50 and <55, ≥55 and <60, and ≥65
Analyst forecast dispersion	Standard deviation of EPS estimates scaled by the actual value and compute the standard deviation of forecasts across analysts
At-will exception	1 if the contract is governed by the law of a state with a good faith and fair dealing at-will exception
Busy board	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
Cashflow/assets or sales	Cash flow over total assets or sales
CEO age	CEO age in years
CEO tenure	Number of years the CEO has been in office
Contract	1 if we observe an employment agreement between the firm and the CEO
Depr.&Amort.%	Depreciation and amortization as percentage of assets
Distress	Distress indicator based on Altman (1968)
Garmaise	Index of Garmaise (2011)
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	1 if the percentage of independent directors exceeds the industry median based on the two-digit SIC classification
Industry adjusted return	Log annualized return adjusted by industry average or median return (compounded)
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	Debt minus cash over assets
Log assets	Log book assets (in $ millions)
Outside CEO	1 if the CEO is hired from the outside or works in the firm for less than a year before becoming a CEO
Product announcement	The number of product announcements in each year of each firm
R&D /sales	R&D expenditure as percentage of sales
Renewal	Indicator variable for CEOs who were in office at the time of the contract start
ROA	Return on assets
Tenure group	Three dummies for a CEO who has worked in the same firm for at most 2 years, 3-6 years and more than 6 years

Appendix 2. Excerpt of a CEO Employment Contract

Exhibit 10

AMENDED AND RESTATED EMPLOYMENT AGREEMENT

This AMENDED AND RESTATED EMPLOYMENT AGREEMENT (this “Agreement”) by and between Morgan Stanley (the “Company”), and John J. Mack (the “Executive”) dated as of September 20, 2005 amends and restates the original employment agreement entered into by and between the Company and the Executive on June 30, 2005.

[…]

(b) Compensation. (i) Base Salary. During the Employment Period, the Executive shall receive an annualized base salary ("Annual Base Salary") of not less than the individual who served as Chief Executive Officer of the Company immediately prior to the Executive (the "Prior CEO"), payable pursuant to the Company’s normal payroll practices. During the Employment Period, the current Annual Base Salary shall be reviewed for increase only (and once increased shall never be decreased) at such time as the salaries of senior executives of the Company are reviewed generally, provided that, the Executive’s first such review shall occur no earlier than fiscal year 2006.

(ii) Annual Bonus. For each fiscal year completed during the Employment Period, the Executive shall be eligible to receive an annual bonus (“Annual Bonus”) on terms and conditions and based upon performance targets that are established by the Compensation, Management Development and Succession Committee of the Board or its successor (the “Committee”), provided that in no event shall such terms and conditions or performance targets be less favorable to the Executive than to senior executives of the Company generally.

(iii) Long-Term Incentive Compensation. For each fiscal year completed during the Employment Period, the Executive shall be eligible to receive long-term incentive compensation

("Long-Term Incentive Compensation", and together with Annual Base Salary and Annual Bonus, "Total Compensation") on terms and conditions no less favorable to the Executive than (x) members of the Management Committee of the Company (the "Management Committee") generally and (y) the terms and conditions of the Equity Incentive Compensation Plan, 2004 Discretionary Retention Awards Award Certificate (the "2004 EICP"); provided that for purposes of the Long-Term Incentive Compensation (other than the Special RSU Grant (as defined below)), the Executive shall be treated as if the Executive had been continuously employed by the Company and had not terminated employment with the Company in January 2001; provided, further, that the Executive shall not be so treated in the event that prior to the first anniversary of the Effective Date the Executive is terminated for Cause (as defined below). The proportion of Total Compensation provided to the Executive as Annual Base Salary, Annual Bonus and Long-Term Incentive Compensation, respectively, for each of fiscal years 2005 and 2006 shall be substantially similar to the proportion of Total Compensation provided as Annual Base Salary, Annual Bonus and Long-Term Incentive Compensation, respectively, to members of the Management Committee generally.

[…]

/s/ John J. Mack

John J. Mack

MORGAN STANLEY

/s/ Karen C. Jamesley

By: Karen C. Jamesley

Title: MD-Human Resources

Appendix 3. Principal Component Analysis

Panel A: Eigenvalue

Component	Eigenvalue	Difference	Proportion	Cumulative
	(1)	(2)	(3)	(4)
Comp1	3.526	0.908	0.122	0.122
Comp2	2.618	0.563	0.090	0.212
Comp3	2.055	0.267	0.071	0.283
Comp4	1.787	0.208	0.062	0.344
Comp5	1.580	0.080	0.055	0.399
Comp6	1.499	0.149	0.052	0.451
Comp7	1.351	0.089	0.047	0.497
Comp8	1.261	0.101	0.044	0.541
Comp9	1.161	0.042	0.040	0.581
Comp10	1.119	0.088	0.039	0.619
Comp11	1.031	0.014	0.036	0.655
Comp12	1.017	0.078	0.035	0.690
Comp13	0.939	0.017	0.032	0.722
Comp14	0.922	0.073	0.032	0.754
Comp15	0.849	0.007	0.029	0.783
Comp16	0.842	0.066	0.029	0.812
Comp17	0.776	0.116	0.027	0.839
Comp18	0.659	0.085	0.023	0.862
Comp19	0.575	0.041	0.020	0.882
Comp20	0.534	0.018	0.018	0.900
Comp21	0.516	0.011	0.018	0.918
Comp22	0.505	0.059	0.017	0.935
Comp23	0.446	0.042	0.015	0.951
Comp24	0.404	0.070	0.014	0.965
Comp25	0.334	0.052	0.012	0.976
Comp26	0.282	0.054	0.010	0.986
Comp27	0.228	0.042	0.008	0.994
Comp28	0.186	0.186	0.006	1.000

Panel B: Eigenvectors

	Variable	Comp1	Comp2	Comp3	Comp4	Comp5	Comp6	Comp7	Comp8
		(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Entry compensation	Contract length	-0.041	-0.045	0.258	0.275	0.294	0.148	0.199	-0.266
	Entry salary to industry	-0.062	-0.025	0.072	0.209	-0.027	-0.085	-0.093	0.507
	Entry equity to industry	-0.023	-0.083	0.287	0.018	0.198	-0.383	0.111	0.229
	Entry bonus multiple to industry	-0.039	0.034	0.030	-0.138	0.274	0.297	0.234	0.150
	Entry PPS	0.048	-0.168	-0.038	-0.010	0.083	-0.137	0.332	0.296
Bonus clause	Participation in a firm-level bonus plan	0.124	0.000	-0.050	-0.315	0.264	0.104	-0.137	-0.236
	Explicit discretion	0.110	-0.045	0.014	0.217	-0.347	-0.146	0.210	-0.119
	Multiples of salary	0.191	0.086	-0.011	-0.134	0.124	-0.047	0.376	-0.219
	Given as a value	-0.008	-0.038	0.247	0.031	-0.389	-0.068	0.162	-0.102
	Functions of performance measures	-0.022	-0.067	0.312	0.240	0.214	-0.222	-0.150	-0.153
Equity clause	Future equity grant specified	0.158	-0.072	0.427	-0.303	-0.109	0.246	0.052	0.021
	Discretionary future equity grant	-0.027	-0.059	0.196	0.396	0.226	0.102	0.184	-0.270
	Equty grant as a function of salary	0.089	-0.050	0.383	-0.303	0.007	-0.084	-0.131	-0.060
	Equity grant as a function of performance	0.030	0.006	0.068	-0.124	-0.183	0.093	-0.053	-0.320
	Have vest information	0.060	-0.059	0.267	-0.193	-0.100	0.363	0.204	0.303
Flexibility clause	No flexible clause	0.367	0.016	0.040	0.190	0.089	0.135	-0.183	0.158
	Upcan clause	0.370	0.022	0.066	0.158	0.111	0.007	-0.103	0.135
	Lower bound clause	0.035	-0.063	0.108	0.196	0.073	0.407	-0.390	0.098
	No cut clause	0.255	-0.070	0.110	0.277	-0.165	0.093	0.100	-0.014
Review clause	Review requirement	0.443	0.050	-0.102	-0.103	0.016	-0.113	-0.062	-0.040
	Review annual clause	0.394	-0.050	-0.040	-0.001	-0.052	-0.131	-0.008	-0.052
	Review party - Compensation committee	0.301	-0.031	-0.015	0.059	-0.258	0.018	-0.054	-0.017
	Review party -Board	0.292	0.004	-0.274	0.035	0.173	-0.037	0.091	0.004
	Review party - Human resource committee	0.049	-0.048	0.269	-0.204	0.156	-0.429	-0.210	0.018
Review factor	Factor CEO performance	0.124	0.191	-0.102	-0.073	0.315	0.026	0.157	0.055
	Factor financial condition	0.002	0.577	0.117	0.053	-0.034	-0.017	-0.059	0.041
	Factor market condition	-0.016	0.456	0.111	0.029	-0.059	-0.032	0.122	-0.002
	Factor firm performance	0.002	0.577	0.117	0.053	-0.034	-0.017	-0.059	0.041

Note: This table presents the results of a principal component analysis of contract clauses. Eigenvalues for each principal component are shown in column 1 of Panel A. Difference, proportion of variance explained and cumulative proportion of variance explained are shown in columns 2, 3 and 4, respectively. Panel B lists the eigenvectors and the loading on each contract clause.

Appendix 4. 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.[9] This rule protects rank-and-file employees with shorter contracts or without contracts, which makes such forms of employment more attractive. The ensuing popularity of shorter contracts makes it difficult for executives to negotiate longer contracts for themselves.

The direct judicial consequences of the rule to CEOs are likely to be limited, however, since they are protected by individual contracts. The listing of these so-called at-will exceptions is reported in Table A.1 as in 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 the 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 (2011). All regressions contain industry and year fixed effects to control for exogenous shocks to the labor market.

[9] 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.

We run Probit regressions of contract disclosure and results are reported in Table A.2. We use Mills ratio in Table 5 and Table 8 to control for the possibility of selection into our contract sample, because not all CEOs sign contracts and not all firms that sign contracts disclose their particulars.

Table A.1: At-will exceptions

		At-will exceptions					
Code	State	Public policy	Implied contract	Good faith and fair dealing	Garmaise	Anti-takeover	Patents
AL	Alabama	0	1	1	5	0	9,017
AK	Alaska	1	1	1	3	0	1,075
AZ	Arizona	1	1	1	3	1	27,065
AR	Arkansas	1	1	0	5	0	3,867
CA	California	1	1	1	0	0	303,592
CO	Colorado	1	1	0	2	0	31,339
CT	Connecticut	1	1	0	3	1	45,008
DC	District of Columbia	1	1	0	6	0	1,576
DE	Delaware	1	0	1	7	1	10,827
FL	Florida	0	0	0	9	0	55,303
GA	Georgia	0	0	0	5	1	23,774
HI	Hawaii	1	1	0	3	0	1,946
ID	Idaho	1	1	1	6	1	14,903
IL	Illinois	1	1	0	5	1	92,974
IN	Indiana	1	0	0	5	1	33,766
IA	Iowa	1	1	0	6	0	13,330
KS	Kansas	1	1	0	6	1	9,086
KY	Kentucky	0	1	0	6	1	9,738
LA	Louisiana	0	0	0	4	0	11,803
ME	Maine	0	1	0	4	1	3,099
MD	Maryland	1	1	0	5	1	29,470
MA	Massachusetts	1	0	1	6	1	69,616
MI	Michigan	1	1	0	5	1	82,589
MN	Minnesota	1	1	0	5	1	48,550
MS	Mississippi	1	1	0	4	0	3,597
MO	Missouri	1	0	0	7	1	20,864
MT	Montana	1	0	1	2	0	2,623
NE	Nebraska	0	1	0	4	1	4,697
NV	Nevada	1	1	1	5	0	5,591
NH	New Hampshire	1	1	0	2	0	10,766
NJ	New Jersey	1	1	0	4	1	95,136
NM	New Mexico	1	1	0	2	0	6,345
NY	New York	0	1	0	3	1	139,544
NC	North Carolina	1	0	0	4	0	31,587
ND	North Dakota	1	1	0	0	0	1,603
OH	Ohio	1	1	0	5	1	83,265
OK	Oklahoma	1	1	0	1	0	16,955
OR	Oregon	1	1	0	6	0	23,386
PA	Pennsylvania	1	0	0	6	1	84,618
RI	Rhode Island	0	0	0	3	1	6,413
SC	South Carolina	1	1	0	5	1	12,229
SD	South Dakota	1	1	0	5	1	1,385
TN	Tennessee	1	1	0	7	1	17,301
TX	Texas	0	0	0	3	0	106,463
UT	Utah	1	1	1	6	0	12,413
VT	Vermont	1	1	0	5	0	5,613
VA	Virginia	1	0	0	3	1	23,797
WA	Washington	1	1	0	5	1	32,901
WV	West Virginia	1	1	0	2	0	4,321
WI	Wisconsin	1	1	0	3	1	36,818
WY	Wyoming	1	1	1	4	1	1,282

Note: This table presents at-will exceptions, anti-takeover regulations, Garmaise (2011) index, and 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	7804

Note: This table presents the marginal effects from a probit regression. 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.