Human Capital Risk and Initial CEO Compensation Contracts[☼]

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Abstract: CEOs experience large reductions in the value of their human capital when their firms declare bankruptcy. We examine how this human capital risk affects the initial level of compensation and stock-based incentives offered to new CEOs. We use the firm's *ex ante* risk of financial distress to proxy for human capital risk. We find that new CEOs at firms with moderate (high) levels of financial distress risk receive 16% (29%) more in total compensation than new CEOs at low-risk firms, consistent with CEOs receiving a pay premium for bearing human capital risk. Consistent with human capital risk reducing the magnitude of agency problems, we find that pay-performance sensitivity is negatively associated with financial distress risk. Finally, we find a positive association between financial distress risk and CEO pay-risk sensitivity, primarily for firms with moderate distress risk.

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1 Introduction

Executives are concerned about how their performance affects the long-term value of their human capital or reputation in the executive labor market (Fama (1980)) in addition to how it affects their current financial wealth. Executives will evaluate the potential risks to their human capital as well as the potential financial and reputational rewards when they consider accepting a new position. The firm's financial distress risk is likely to be an important consideration in this process for potential new CEOs given the huge reputation loss that occurs when a CEO leads a firm into bankruptcy.

In this paper, we examine whether this type of human capital risk affects the contracts provided to new CEOs. We address this question by examining the association between human capital risk and three aspects of compensation for a large sample of new CEOs. First, we study how the level of total CEO pay is related to the financial distress risk facing the firm. Second, we examine how the pay-performance sensitivity is related to financial distress risk. Third, we analyze the relation between financial distress risk and incentives for risk-taking.

We use the *ex ante* probability of financial distress to proxy for differences in the human capital risk faced by a sample of 2,347 new CEOs in ExecuComp between 1992 and 2007. We divide the sample into low, moderate, and high financial distress risk groups. Doing so allows us to compare the contracts of new CEOs at firms with substantial financial distress risk to their counterparts at firms where the possibility of distress is remote. The principle advantage of this approach is that it allows us to separate the effects of distress risk from performance – effects that are inherently linked for continuing CEOs – on the compensation levels and incentives.

First, we predict and find that new CEOs who accept positions with firms that have higher levels of financial distress risk receive significantly higher initial levels of compensation

compared to new CEOs at firms with low financial distress risk. This result is robust to using alternative measures of financial distress, including credit ratings for a reduced sample of firms. These finding are consistent with new CEOs receiving additional pay when they bear more human capital risk. Our estimates suggest that the human capital risk premium is economically significant; new CEOs at moderate (high) distress risk firms receive 16% (29%) more in total compensation compared to new CEOs at low distress risk firms. Furthermore, the risk premium is significantly larger at high distress risk firms compared to moderate distress risk firms, which further supports the notion that compensation is increasing in distress risk.

Our interpretation of these results is that they reflect the CEOs' concerns about the potential damage to their reputations in the executive labor market if their firms declare bankruptcy. We use the variation in CEO age to provide additional evidence supporting our interpretation. We predict that the reputation costs of leading a firm into bankruptcy are greater for younger CEOs since they have more potential working years that will be affected by their loss of reputation; vice-versa for older CEOs. Accordingly, we expect that for any given level of financial distress risk, the amount of human capital risk premium demanded by new CEOs is lower for older CEOs. We find that older CEOs receive significantly lower compensation for a given level of distress risk, which further supports our human capital risk interpretation.

Second, we examine how the CEO's pay-performance sensitivity is related to financial distress risk. We measure pay-performance sensitivity as the change in the value of the CEO's stock and options holdings for a $1,000 increase in shareholder wealth. The results support our hypothesis that firms provide new CEOs with fewer equity-based incentives when financial distress risk is higher. These results are consistent with the magnitude of shareholder-CEO agency problems being reduced when the risk of financial distress is higher. We expect that

CEOs' desire to protect the value of their human capital acts as a substitute for the financial incentives firms provide to align their interests with shareholders' interests. This alignment reduces the explicit amount of financial incentives that the firm needs to provide to induce the CEO to increase efficiency and maximize cash flows. Additionally, we find no difference in the incentives provided to new CEOs based on their age, which suggests that time-horizon issues (Dechow and Sloan (1991)) are not an important source of agency costs with new CEOs in contrast to the situation for well-established CEOs. This finding is reasonable as, irrespective of age, new CEOs are unlikely to retire shortly after taking office.

Our final set of tests examines the relation between financial distress risk and incentives for risk-taking. We measure pay-risk sensitivity as the vega of the CEO's stock and options holdings, where vega measures the change in value due to a one percentage point increase in equity return volatility. We expect that concerns about their human capital will cause CEOs to behave in a more risk-averse fashion. This change occurs if undertaking risky investments increases firm volatility, which in turn increases the probability of bankruptcy. To avoid reputation costs, CEOs will rationally favor investment and financing policies that reduce the probability of financial distress (Friend and Lang (1988), Smith and Stulz (1985)). If greater human capital risk causes new CEOs to use greater caution when assessing risky investment than normal, then firms need to provide additional risk-taking incentives to induce their desired level of risk tolerance compared to situations where new CEOs are less concerned about their human capital. Thus, we predict a positive association between financial distress risk and risk-taking incentives. Our results provide some support for our hypothesis as pay-risk sensitivity is significantly higher for new CEOs at firms with moderate (but not high) levels of financial

distress risk compared to new CEOs at low-distress risk firms. We also find a positive relation between pay-risk-sensitivity and alternative measures of financial distress risk.

We add to the extensive literature on executive compensation and incentives by focusing on the influence that the risk to the CEO's human capital exerts on the contracting process. This specific issue has not be examined previously. Our paper is perhaps most closely related to Gilson and Vetsuypens (1993), who study pay packages for CEOs of 77 financially distressed firms which either declared bankruptcy or privately restructured their debt. They conclude that "… compensation policy is often an important part of firms' overall strategy for dealing with financial distress." We extend their insight by determining that merely the risk of financial distress affects the contracts firms provide to their CEOs; financial distress risk is significantly associated with compensation contracts at firms that have only moderate to high levels of financial distress risk (roughly 21% of our sample firms), but are not distressed when the compensation contracts are being negotiated. We also add to the large literature that examines the provision of performance and risk-taking incentives by examining whether the CEO's human capital risk incrementally affects the provision of stock-based incentives.

The remainder of the paper proceeds as follows: We develop our hypotheses in Section 2 and discuss our empirical methodology in Section 3. In Section 4, we present our analyses of the relations between financial distress risk and the level of pay, pay-to-performance incentives, and risk-taking incentives. We also discuss some robustness tests related to the time the CEO spends in office during the first fiscal year. We conclude in Section 5.

2. Hypothesis Development

In this section, we discuss the economic factors that we predict will affect the relation between financial distress risk and both the overall level of CEO compensation and their stock-based

incentives.

2.1 Financial distress risk and the level of compensation

Agency theory suggests that compensation contracts should reflect the amount of risk to which the agent is subject. In practice, the biggest risks for CEOs often involve the financial risks associated with the value of their stock and options holdings. Leading a firm into bankruptcy, of course, imposes high financial costs on the CEO due to the loss in value of their stock and options holdings. In addition, the CEO will suffer to the extent that the stigma from leading their firm into bankruptcy permanently reduces the value of his human capital. As noted in Fama (1980), an executive's job performance also affect his reputation in the labor market, and hence, his potential compensation from future employers. As discussed below, the CEO will likely find his reputation in the executive labor market to be severely damaged if his firm experiences financial distress or bankruptcy (Fama and Jensen (1983a), Fama and Jensen (1983b)). This source of job-related risk is undiversifiable and increases the risk premium that a risk-averse CEO will demand in order to take the position. For new CEOs, the amount of human capital risk will be larger, *ceteris paribus*, when the firm's *ex ante* probability of bankruptcy is higher. Employers must compensate employees for job-related risk, so this factor suggests higher pay for new CEOs at firms with significant financial distress risk.[1]

Another consideration is the extent to which the executive labor market discounts the effect of leading a firm into bankruptcy if the firm was viewed as already having a substantial probability of bankruptcy at the time of the CEO's appointment. The additional noise in the performance signal (bankruptcy) associated with higher initial distress risk might limit the market's ability to make negative inferences about the CEO's ability. To the extent true, this

[1] Consistent with our argument, the theories in Berk *et al.* (2007) and Berkovitch *et al.* (2000) predict that firms with higher levels of distress risk will pay higher levels of compensation.

discounting would lower the human capital risk associated with higher distress risk firms, and hence, any associated compensation premium. However, the limited evidence available suggests that the executive labor market is not so nuanced in its assessments following bankruptcy. Instead, it appears that CEOs that lead their firms into bankruptcy find their reputations severely tarnished irrespective of the firm's financial condition at the time of the appointment.

Anecdotally, few CEOs of failed firms get another opportunity to become CEO (Lublin, Wall Street Journal, 2/3/2009).[2] For example, George Shaheen is the former CEO of the bankrupt Internet grocer, Webvan. Despite previously leading Andersen Consulting during a period of record annual revenue growth in the 1990s, Shaheen blames Webvan's demise for his inability to land another CEO position. As he states, "I will never bounce back. That's the law of the jungle." Similarly, BBC News (1/13/2009) questioned whether the well-regarded former Autodesk CEO Carol Bartz' recent appointment as CEO of Yahoo! was "an opportunity or poison chalice?" In discussing the risks to her reputation, seasoned analyst Rob Enderle declared "if she fails, [her career] will be over."

The limited empirical evidence supports these anecdotal observations. Hotchkiss (1995), Nini *et al.* (2009), and Schwartz and Menon (1985) find that top managers are substantially more likely to be replaced when their firms become financially distressed relative to either when their firms were not in financial distress (but still performing poorly) or relative to the population of non-distressed firms. More pertinent is Gilson (1989), who finds that none of the replaced managers from his sample of distressed firms are employed by a public firm over the next three

[2] This article provides numerous examples of former CEOs who are unable to find new executive positions. Also see Sutton and Callahan (1987). Another example is Gary Wendt, who had been a very well-regarded top executive at General Electric until he become CEO at a financially distressed insurer, Conseco. As a Bear Stearns' analyst commented at the time, "He's got his reputation on the line. Filing [for bankruptcy] is a failure. He'll do everything possible to avoid it." (New York Times, Aug. 10, 2002). Despite the firm's well-known financial difficulties and his own previously sterling reputation, the value of Wendt's human capital was severely diminished after he failed to save Conseco from bankruptcy. "The reputation of Gary Wendt, the celebrated ex-GE executive, now lies in tatters." (TheStreet.com, Aug. 9, 2002)

years. Cannella *et al.* (1995) examine the effects of firm failure on managerial careers using a sample of Texas banks. Managers of failed banks are substantially less likely to find new banking posts than managers from non-failed banks, although the impact is lessened if the failure is viewed to be beyond the manager's control. However, even these "innocent bystander" managers were 63% less likely to find banking posts compared to managers at non-failed banks. Thus, the available empirical evidence suggests that the reputations of CEOs who lead firms into bankruptcy are severely diminished and their ability to find comparable positions in the future is quite curtailed. Accordingly, we hypothesize (all hypotheses are stated in the alternative form):

> H1: New CEOs at firms with higher financial distress risk receive higher levels of compensation compared to new CEOs at firms with lower financial distress risk.

2.2 Financial distress risk and incentives

Agency theory suggests that shareholder-CEO agency problems are mitigated when leverage is high. High leverage reduces free cash flow problems (Jensen (1986)), forces CEOs to focus on value creation (Grossman and Hart (1982)), and induces lenders to increase their monitoring of the CEO (Ortiz-Molina (2007)). Thus, when leverage is high, the need to provide CEOs with stock-based incentives is reduced since debt and stock-based incentives act as substitutes. Consistent with these arguments, Ortiz-Molina (2007) finds that pay–performance sensitivity decreases in total leverage.

In addition, the degree of incentive alignment between shareholders and the CEO is higher due to the CEO's inherent incentives to maximize the value of his human capital. The value of the CEO's human capital is increasing in firm performance, so human capital considerations will partially mitigate shareholder-CEO agency problems irrespective of financial distress risk. However, since the human capital consequences of bankruptcy are so high, these incentives are increasing in the level of distress risk. In essence, when there is some risk that the

CEO's career is on the line, we expect career considerations will motivate high effort levels by the CEO. This greater alignment between the interests of CEO and shareholders reduces the explicit amount of financial incentives the firm needs to provide to induce a given level of effort.[3] Thus, we expect that the use of stock-based performance incentives is lower when distress risk is higher. This prediction is incremental to the leverage effect discussed above. Leverage is not a good indicator of financial distress by itself since distress risk is a (non-linear) function of leverage and volatility.[4] That is, firms with low leverage can have high distress risk if they are highly volatile, and vice-versa. Accordingly, we make the following hypothesis:

> H2: New CEOs at firms with higher financial distress risk have lower pay-performance sensitivity compared to new CEOs at firms with lower financial distress risk.

We expect that CEO's concerns about their reputations affect the amount of explicit, stock-based risk-taking incentives provided to them by their firms. *Ceteris paribus*, we expect that human capital concerns will cause CEOs to behave in a more risk-averse fashion in order to reduce the probability of financial distress. For example, CEOs may choose more conservative debt levels (Friend and Lang (1988)) or take other actions to reduce the variance of the firm's operations (Smith and Stulz (1985)). Accordingly, we expect that executives are less likely to undertake risky investments such as R&D projects, new product development, and marketing campaigns when the personal costs of the firm's failure are especially high. If greater human capital risk causes new CEOs to use even more caution when assessing risky investments than normal, then firms will need to provide additional explicit risk-taking incentives to induce their desired level of risk tolerance.

There is a potentially offsetting effect that will cause higher distress risk firms to prefer

[3] Grossman and Hart (1982) and Jensen (1988) suggest that incentives to protect their human capital may be an important source of the wealth gains associated with leveraged buyouts and other types of corporate restructuring.
[4] In our sample, the Spearman (Pearson) correlation between *Leverage* and *BSM-Prob* is only 0.14 (0.11).

lower levels of risk-taking by their CEOs. It has long been recognized in the financial literature that when firms have risky debt, shareholders can gain at the expense of bondholders by taking risk-increasing projects even when the incremental expected net present value is negative (Jensen and Meckling (1976)). Shareholder-bondholder conflicts of interest increase with the risk of bankruptcy. Since rational lenders anticipate such actions by shareholders, the expected shareholder-debtholder agency costs are ultimately borne by shareholders. For levered firms, lowering the risk-taking incentives embedded in the compensation contract acts as a commitment device to reduce these agency costs (Brander and Poitevin (1992), John and John (1993)). Thus, the firm rationally trades off shareholder-CEO incentive alignment in order to mitigate shareholder-debtholder agency costs when determining the pay packages of new CEOs by giving them fewer equity-based risk-taking incentives when financial distress risk is higher.[5] Thus, firm efforts to reduce shareholder-debtholder agency costs will reduce our ability to document a positive association between financial distress risk and financial risk-taking incentives. To the extent the firms' desire to instill a particular degree of risk-taking incentives empirically dominates their desire to reduce shareholder-debtholder agency costs, we make the following hypothesis:

> H3: New CEOs at firms with higher financial distress risk have higher levels of pay-risk sensitivity compared to new CEOs at firms with lower financial distress risk.

3 Methodology

Our goal is to examine whether the human capital risk imposed on CEOs of financially distressed firms affects the contracting process. Our primary approach is to compare three properties of newly-appointed CEO's pay packages at firms with low, moderate, and high(er)

[5] The prior literature has not specifically examined the relation between risk taking incentives and distress risk. Ortiz-Molina (2007) examines the association between leverage and pay-performance sensitivity while Kadan and Swinkels (2008) examine the relation between distress risk and the use of restricted stock.

levels of distress risk. The principle advantage of restricting our analyses to new CEOs is that it allows us to separate the effects of distress risk and performance – effects that are inherently linked for continuing CEOs – on the compensation variables. As an example of how performance and distress risk are intricately linked, consider Gilson and Vetsuypens (1993). They find that incumbent CEOs at firms in financial distress experience large reductions in compensation. One interpretation of this finding is that compensation is negatively associated with financial distress risk. However, an alternative interpretation is that the poor prior performance that leads to financial distress also causes compensation to fall. By comparing new CEOs at firms with different levels of financial distress risk, we avoid the confounding effects of performance on compensation.

We begin by identifying potential CEO turnovers as those firm-years where ExecuComp lists a different CEO in year t than in year t-1. For many of the observations, ExecuComp provides a field containing the date the executive became CEO of the firm, "becameceo." When we found a potential CEO turnover but the "becameceo" field was missing, we hand-collected the date the executive became CEO date from the proxy statements. We then checked that this date occurred during the year the executive was first listed as CEO. When these dates were inconsistent, we checked both the CEO designation and the CEO's start date using the proxy statements and made corrections where necessary. This process yielded between 2,347 new-CEO observations between 1992 and 2007 with sufficient information to calculate our probability of financial distress variable, *BSM-Prob*, and the control variables. The number of observations in each empirical test varies somewhat depending on the availability of the compensation variables.

We examine the association between the new CEO's human capital risk and three aspects of

their compensation packages: the level of total compensation, pay-performance sensitivity (*PPS*), and pay-risk sensitivity (*PRS*). Total direct compensation (*TDC*) is the *TDC1* variable from Execucomp, which consists of the sum of salary, bonus, other annual pay, long-term incentive payouts, the value of restricted stock and option grants, and all other compensation. *Pay-performance sensitivity* (*PPS*) is defined as the dollar change in CEO wealth for a $1,000 change in shareholder wealth. We calculate *PPS* as the sum of the pay-performance sensitivity of stock holdings (fractional ownership × 1,000) and the pay-performance sensitivity of options (the number of options divided by shares outstanding × 1,000 × Δ, where Δ ("delta") measures the change in the value of an option for a one dollar change in the stock price). Our final compensation variable measures the CEO's pay-risk sensitivity, *PRS*. *PRS* captures the extent to which shareholders use stock-based compensation to affect the CEO's preferences regarding risk. We measure *PRS* using vega, the change in value of the CEO's options and stock holdings for a small change in equity volatility. The details of calculating delta and vega are provided in the appendix. Examining the incentives inherent in the CEO's stock and option portfolios allows us to capture the *ex ante* effect of human capital risk on the contracting process, resulting in cleaner tests and inferences.

We conduct a series of cross-sectional regression analyses where either the level of pay, the pay-to-performance sensitivity, or the pay-risk sensitivity is the dependent variable. We regress these variables on distress risk indicators along with several control variables, discussed below. Similar to Baker and Hall (2004), we employ robust regressions to ensure that our results are not driven by outliers, which are prevalent in executive compensation data (Aggarwal and Samwick (1999)).[6]

[6] We implement this procedure with SAS's ROBUSTREG M estimation procedure, which places less weight on outliers than OLS does.

We are interested in the *ex ante* effect of human capital risk on the contracting process. We expect that the value of a CEO's human capital is severely diminished whenever the firm becomes bankrupt. Accordingly, we use the *ex ante* probability of bankruptcy, *BSM-Prob*, measured at the beginning of the month when the new CEO assumes office to capture the CEO's human capital risk. *BSM-Prob* is a market-based measure that relies on the Black-Scholes-Merton (BSM) option pricing model to estimate the probability of bankruptcy using equity market data. We estimate *BSM-Prob* using the method developed in Hillegeist *et al.* (2004), which is described in the appendix.

We expect distress risk to affect compensation only once it reaches a certain threshold level. This suggests that the association between our compensation variables and financial distress risk will be non-linear. Therefore, our main independent variables of interest are two indicator variables, *DR-Mod* and *DR-High*, that equal one when the level of distress risk is moderate and high, respectively. To empirically identify the threshold points between low, moderate, and high levels of distress risk, we use two important credit rating transition points: between A and BBB to identify the transition from low to moderate distress risk, and between B and CCC to identify the transition from moderate to high distress risk. We then use the average probabilities associated with credit rating to identify the breakpoints. For example, we use a 0.25% probability of bankruptcy to separate low distress risk firms from moderate distress risk firms because 0.25% falls between the average probability of bankruptcy for A and BBB rated firms. Similarly, we use a 2.5% probability of bankruptcy to separate moderate and high distress risk firms.[7]

We test the reasonableness of these cutoff points by allowing the estimated coefficients on

[7] Our cutoff values also fall between the corresponding average one-year default rates of credit rating agencies, which further supports their use. For example, between 1990 and 2003, the average annual one-year default rates for firms with a Fitch rating of A (BBB) was 0.05% (0.38%), while the average rate for B-rated firms was 2.33%.

BSM-Prob in the compensation regressions to vary depending whether the BSM-Prob values are above or below the proposed cutoff point. The untabulated results for the Chow tests confirm at the 5% level or better that 0.25% and 2.5% represent break points in the relation between financial distress risk and each of the compensation variables we examine. As robustness checks, we also tabulate results using *BSM-Prob* and *BSM-Rank*, the rank of *BSM-Prob* normalized between zero and one, as alternative measures of distress risk. We also use credit ratings for the fewer than half of our sample firms that have rated debt issues.

In addition to the two financial distress risk indicators, *DR-Mod* and *DR-High*, we include several additional variables to control for other known determinants of CEO compensation and incentives. We include two CEO specific variables; *Age*, the CEO's age when he becomes CEO and *External*, an indicator variable that equals one if the new CEO was not a current employee of the firm, and zero otherwise. We obtain the CEO's age from Execucomp. We hand-collect the information regarding the new CEO's prior employment from the proxy statements.

Importantly, we include controls that proxy for the CEO's firm-specific financial risk in order to facilitate our interpretation of the incremental effect of bankruptcy risk as being due to human capital risk. Prior evidence (Jin (2002)) suggests that new CEOs are less likely to be able to hedge the market risk of their holdings, so we proxy for the total risk associated with the new CEO's stock and option holdings using *Leverage* and *$VarRank*. *Leverage* is the ratio of long-term debt to total assets as of the previous fiscal year. Following Bertrand and Mullainanthan (2000), Jin (2002) and others, *$VarRank* is measured as the rank of the firm's dollar return volatility. Using dollar return volatility is consistent with standard agency theory (Aggarwal and Samwick (1999)). We use the rank of dollar volatility since the raw measure is extremely right-skewed and fat-tailed ((Jin (2002)). To calculate *$VarRank*, we first calculate the variance of the

real monthly total percentage returns (including dividends and other distributions) to shareholders over the 60 months (if available) preceding the month when the new CEO took office. We then calculate the variance of the dollar returns to shareholders by multiplying the variance of the percentage returns by the square of the market capitalization of the firm measured at the beginning of the month the new CEO took office. Finally, we create a cumulative density function (CDF) of the risk measure by ranking all of the risk measures for our sample with 0 for the lowest risk observation and N-1 for the highest risk observation, and dividing by N-1.

We include a number of other firm-based control variables. All of the accounting-based variables are measured as of the beginning of the fiscal year when the new CEO takes office. We proxy for firm size using the natural logarithm of sales, *LogSales*. We include two variables, *B/M* and *SalesGr* to proxy for the firm's growth opportunities. *B/M* is the ratio of the book value of equity and the book value of assets and *SalesGr* is the lagged annual growth in sales. *Return*, measured as the trailing twelve month stock return, controls for recent firm performance. Following Ittner *et al.* (2003), we include two cash-based variables, *CFO/Emp* and *Cash/Emp*, as measures of cash constraints. *CFO/Emp* is defined as cash flow from operations divided by the number of employees and *Cash/Emp* is defined as cash divided by the number of employees.

4 Analysis and Results

In this section, we analyze the relation between financial distress risk and the compensation contracts given to new CEOs. First, we discuss descriptive statistics and the correlation matrix. We then discuss each of our analyses with the three compensation variables in term. Finally, we discuss a number of robustness tests related to when the CEO takes office during the fiscal year.

4.1 Descriptive Statistics

Table 1 presents summary statistics for the firms in our sample. For the overall sample, the

mean (median) probability of bankruptcy is 1.47% (0.00%). As is clear from the median, the majority of the sample has a probability of bankruptcy that is virtually zero. As discussed earlier, we partition the sample into three groups: low-risk firms with BSM-Prob less than 0.25%, moderate-risk firms with BSM-Prob values between 0.25% and 2.5%, and high-risk firms with BSM-Prob values greater than or equal to 2.5%. We define indicator variables DR-Low, DR-Mod, and DR-High to take the value one for firms in the low, moderate, and high distress risk groups, respectively. Low-risk firms make up 78.6% of the sample, with moderate- and high-risk firms comprising 11.8% and 9.6%, respectively. For the high-risk partition, the mean (median) probability of bankruptcy is 14.0% (7.6%).

We note that mean and median firm size, as measured by sales, decreases in financial distress risk. Average sales in the fiscal year prior to the new CEO assuming office is $4.6 billion for the low-risk firms, $3.4 billion for the moderate risk firms, and $3.0 billion for the high risk firms. The mean (median) book-to-market ratio is decreasing across the distress risk partitions, suggesting that financially distressed firms have fewer growth opportunities than their healthier counterparts. Similarly, mean (median) sales growth is decreasing across the partitions. The mean and median values of ranked variance of dollar returns, *$VarRank*, are also decreasing in distress risk. This association is sensible given the role of size in determining the volatility of *dollar* returns. When we examine the volatility of stock price returns, *Std%Ret* (for comparison purposes) and *Leverage*, we find that variables are increasing across our financial distress partitions. This is not surprising as both variables are used to estimate *BSM-Prob*. In addition, trailing stock returns are decreasing with financial distress risk. While mean and median returns for the low-distress risk group are positive, the mean (median) return for the moderate financial distress risk group is -20.3% (-31.0%) and -36.7% (51.6%) for the high distress group. We find

our cash balance variable (cash divided by number of employees – *Cash/Emp*) is decreasing across the financial distress risk partitions, but our cash flow variable (cash from operations divided by number of employees – *CFO/Emp*) shows no consistent pattern.

We present both Pearson and Spearman correlations between the firm characteristics in Table 2. Given the presence of outliers in the some of the data, we focus our discussion on the Spearman correlation. As expected and consistent with the differences across the distress risk partitions, *Sales* and *$VolRank* are significantly and negatively correlated with *BSM-Prob* while *Leverage* and *Std%Ret* are significantly and positively correlated with *BSM-Prob*, although the correlation with *Leverage* is modest (0.11). In addition, the correlation between *Std%Ret* and *Leverage* is negative (-0.23). Together, these findings suggest that leverage is not an especially powerful proxy of financial distress risk.[8] Several other variables also exhibit the expected relation with the probability of financial distress: trailing stock returns are strongly negatively correlated with *BSM-Prob* (-0.55). We find a large positive correlation between financial distress risk and the book-to-market ratio (0.25), which has been viewed as a proxy for financial distress in some prior research (for example, see the discussion in Daniel and Titman (1997)). Thus, financial distress risk is negatively correlated with a firm's growth opportunities. Lagged sales growth is negatively associated with financial distress risk (-0.15).

Summary statistics for our CEO-related variables are presented in Table 3. As with the firm characteristics, we present statistics for the entire sample as well as for each of the three financial distress risk partitions. Total direct compensation (*TDC*) is the *TDC1* variable from Execucomp, which consists of the sum of salary, bonus, other annual pay, long-term incentive payouts, the

[8] This weakness could provide an explanation for some of the prior literature's mixed results regarding the relation between leverage and CEO incentives. For example, see the conflicting results in Lewellen *et al.* (1987), Yermack (1995), and Bryan *et al.* (2000).

value of restricted stock and option grants, and all other compensation.[9] The mean (median) total compensation in our sample is $5,038,000 ($2,249,000). Both mean and median total compensation are decreasing across the financial distress risk partitions, with the mean (median) level falling from $5,278,000 ($2,330,000) in the low risk partition to $4,001,000 ($1,679,000) in the high risk partition.

For the new CEOs in our sample, median pay-performance sensitivity is increasing slightly in the level of financial distress risk while there is no clear pattern in the mean values. The mean value of PPS is highest in the moderate-risk partition (13.1) and lowest in the low-risk partition (9.6). In terms of pay-risk sensitivity, Table 3 shows that mean (median) PRS increases (decreases) across the three financial distress risk partitions.

The next column of Table 3 shows the percentage of newly appointed CEOs who are hired from outside the firm. We set the indicator variable *External* to equal one if the new CEO was not a current employee of the firm at the time he/she was hired, and zero otherwise. We hand-collect this information primarily from the proxy statements, but occasionally from other sources, such as Forbes.com. In our overall sample, 24.2% of new CEOs were not current employees when they became CEO. This percentage is higher than that typically reported in prior studies (which range between 10% and 15%).[10] Additional analyses reveal that hiring from outside the firm has increased substantially during the later years of our sample. Untabulated results indicate that the average value of *External* is significantly higher in the 2002-2007 period compared to the 1992-2001 period. The percentage of outsiders hired is increasing with the risk of financial distress risk, with 21.6% of low risk, 31.5% of moderate risk, and 36.4% of high risk

[9] We use the log of *TDC* in the regressions, but the summary table presents the raw values for ease of interpretation.
[10] Other studies sometimes use stricter definitions of external by classifying former employees and current or former board members as internally-promoted CEOs. Using this stricter definition, 16.7% of our new CEOs would be classified as external hires.

firms hiring external candidates as CEO.

The mean and median age of the new CEO at the time they take office equals 51. The mean and median values for *Age* are remarkably similar across the three distress risk partitions. We note that the standard deviation for the entire sample is 7.1. The untabulated minimum age is 28 and the maximum age is 79. In our regressions, we subtract the sample median age, 51, from the actual age to obtain the *Age* variable.

4.2 Human capital risk and the level of new CEO compensation

To assess the relation between financial distress risk and pay levels, we estimate cross- sectional regressions using the log of total direct compensation (TDC) measured in the CEO's first year in the position as the dependent variable. Our primary regression equation is as follows:

$$\begin{aligned} TDC = {} & \alpha + \beta_1 * DR\text{-}Mod + \beta_2 * DR\text{-}High + \beta_3 * External + \beta_4 * Age + \beta_5 * Sales + \beta_6 * B/M \\ & + \beta_7 * \$VarRank + \beta_8 * Returns + \beta_9 * Leverage + \beta_{10} * CFO / Emp + \beta_{11} * Cash / Emp \quad (1) \\ & + \sum \beta_i * Year_i + \sum \beta_j * Industry_j + \varepsilon \end{aligned}$$

where $Year_i$ represent untabulated year indicators and $Industry_j$ represent 15 untabulated industry indicators based on Barth *et al.* (1998). Our main explanatory variables of interest are the indicator variables introduced above, *DR-Mod* (*BSM-Prob* between 0.25% and 2.5%) and *DR-High* (*BSM-Prob* greater than 2.5%). We expect both distress risk indicators to have positive coefficients based on hypothesis H1. We present the results of this specification in Column (1) of Table 4.

The results indicate that new CEOs of firms with moderate and high levels of financial distress risk earn significantly more than new CEOs of firms with low levels of financial distress. The coefficients on *DR-Mod* and *DR-High* are 0.161 and 0.285, respectively, and are statistically significant at the 1.00% and 0.02% levels, respectively. The coefficients indicate that new CEOs at firms with a moderate (high) risk of financial distress earn approximately 16% (29%) more

than their counterparts at low-risk firms. The point estimate for the *DR-High* variable is nearly twice as large as the *DR-Mod* coefficient and an untabulated F-test reveals that the two estimates are significantly different.[11] Overall, these findings are consistent with CEOs receiving additional compensation when they put their human capital at risk by accepting positions at firms with moderate to high levels of distress risk.

We find that new CEOs hired from outside the firm receive significantly higher (56%) total compensation compared to those hired internally (p-value = < 0.0001). We also estimated an augmented regression where we interact *External* with our two distress risk indicators. While the untabulated results for *DR-Mod*, *DR-High*, and *External* remain similar to those in Column (1), neither of the coefficients on the interaction terms is significantly different from zero. In fact, untabulated regressions show *External* interactions with distress risk are never significant in any of the alternative specifications we consider. Thus, we find no evidence suggesting that the external compensation premium depends on the firm's distress risk.[12]

The results for the other explanatory variables generally conform to our expectations based on previous research. Interestingly, we find that new CEOs that are older tend to receive significantly less total compensation (p-value < 0.0001). We revisit this finding below. Pay is higher for new CEOs who are hired at more successful firms, as characterized by higher sales, higher sales growth, and higher stock returns. In addition, we find stock volatility (*$VarRank*) is strongly and positively associated with total compensation.[13] The results show that neither the

[11] This finding supports our assumption about the importance of threshold effects.
[12] Gilson and Vetsuypens (1993) report that external hired at severely financially distressed firms typically earn 36% more cash compensation than the previous CEOs. Our analyses suggest that their result is likely driven by an outsider effect that is unrelated to the firm's financial position.
[13] As Aggarwal and Samwick (1999) note, the principal-agent model does not give an unambiguous prediction as to whether the *level* of compensation is increasing with the firm's dollar return variance. Empirically, we find that it is.

book to market ratio nor cash-to-employees ratio is significantly associated with total compensation.

We use three alternative specifications to test the robustness of the positive relation between *ex ante* distress risk and initial CEO compensation levels. In the first specification, we replace the two distress risk indicator variables with the continuous *BSM-Prob* variable. Second, we replace the two distress risk indicator variables with the rank of *BSM-Prob*, which we label *BSM-Rank*. Effectively, this creates the cumulative density function (CDF) of the probability of bankruptcy with a value of zero for the lowest bankruptcy risk observation and one for the highest bankruptcy risk observation. Third, we use the firm's credit rating obtained from Compustat for a reduced sample of 996 firms with available credit ratings.[14] The results of these specifications are reported in Columns 2, 3, and 4, respectively. In all three cases, there is a significantly positive coefficient for the distress risk variable (*p*-value = 0.005 for *BSM-Prob*; *p*-value < 0.0001 for *BSM-Rank*; *p*-value < 0.0001 for *Credit Rating*). These results confirm the associations documented in Column 1.

Thus far, we have presented evidence that distress risk is positively associated with the initial level of CEO total compensation. Our interpretation is that the association reflects CEOs' concerns about the potential damage to their reputations if their firms end up in bankruptcy. An alternative interpretation is that we have not sufficiently controlled for the additional financial risks associated with higher distress risk firms, and thus, our distress risk variables are merely picking up this residual financial risk (i.e., the financial risks associated with the CEO's stock and option holdings). We use the CEO's age to distinguish between these two explanations.

Our reasoning is as follows: when a CEO leads their firm into bankruptcy, their ability to

[14] We assign the variable *Credit Rating* a value of 2 for the highest rating in our sample (AAA) and a value of 21 for the lowest rating in our sample (CCC). No sample firms have a DDD "default" rating. The untabulated Spearman (Pearson) correlations between *Credit Rating* and *BSM-Prob* is 0.49 (0.27).

find a similar executive position in the future is severely diminished (Gilson (1989)). We also expect that prospects to gain (or keep) board memberships are also diminished. The dollar magnitude of this loss of reputation is greater for younger CEOs since they have more potential working years affected by the loss of reputation; and vice-versa for older CEOs.[15] Accordingly, we expect that for any given level of financial distress risk, the amount of human capital risk premium demanded by new CEOs is lower for older CEOs. A potentially offsetting effect is that people tend to become more risk-averse as they become older. Therefore, the expected premium per unit of human capital risk will increase with the CEO's age. We expect this risk aversion effect will moderate but not reverse the negative association between the human capital risk premium and age given the very large losses of future income that occurs when the CEO's firm becomes financially distressed. Accordingly, we estimate an augmented regression that includes interaction variables between the CEO's age and distress risk indicators (*DR-Mod*Age* and *DR-High*Age*), along with the other variables in Equation 1.

The results are presented in Column 5. We first note that the coefficients on the distress risk indicators remain positive, highly significant, and of roughly the same magnitude when the interaction variables are included in the regression. In addition, the coefficient on *Age* remains negative and significant, although slightly smaller in magnitude (-0.007 vs. -0.012 previously). Focusing on the *DR-Mod*Age* and *DR-High*Age* interaction variables, we find that both variables are negative (-0.020 and -0.023, respectively) and highly significant (*p*-values = 0.009 and 0.007, respectively).[16] These results demonstrate that the risk premium effects associated

[15] Consistent with this idea, Holmstrom (1982) shows that the marginal effect of current job performance on subsequent wages falls as an employee's track record increases. Thus, bankruptcy will likely have a larger impact on future wages for a young CEO than for an older CEO, and this difference should lead to differences in risk premia and hence wages.

[16] Untabulated results show that interactions of *Age* with *BSM-Prob* and *BSM-Rank* are both negative in augmented regressions corresponding the results in Columns 2 and 3, but only *BSM-Rank*Age* is significant (*p*-value = 0.0004).

with financial distress risk are significantly lower for older CEOs despite their likely being personally more risk-averse. These results support our interpretation that the compensation premium associated with distress risk is associated with the CEO's human capital risk, and not (solely) due to alternative explanations.

In Column 5, untabulated F-tests indicate that the sum of each of the distress risk indicators and its interaction term is still significantly positive. Thus, most CEOs still receive a compensation premium due to their firm's default risk. Examining the ratio of the indicator and interaction variables indicates that new CEOs at moderate (high) distress risk firms who are roughly 8 (11) years older the median new CEO age (i.e., 59 and 62, respectively) do not receive a compensation premium associated with distress risk.

4.3 Human capital risk and pay-performance sensitivity for new CEOs

In this section, we examine the relation between the equity-based performance incentives provided to new CEOs and their level of human capital risk, proxied by their firms' financial distress risk. We focus on pay-performance sensitivity, which is the derivative of CEO wealth with respect to shareholder wealth, expressed in terms of the dollar change in CEO wealth associated with a $1,000 change in shareholder wealth. We examine the relation between financial distress risk and PPS using cross-sectional analyses based on Equation 1 where the dependent variable is *PPS*. Based on hypothesis H2, we expect firms to provide new CEOs with fewer equity-based incentives when financial distress risk is higher.

The results reported in Table 5, Column (1) are consistent with our prediction that incentive intensity provided to new CEOs is decreasing in the level of human capital risk imposed on them. Specifically, both the *DR-Mod* and *DR-High* coefficients are negative and significant (*p*-values = 0.029 and 0.012, respectively). The magnitude of the *DR-High* coefficient (-0.327) is about a

third larger than the magnitude of the *DR-Mod* coefficient (-0.240), consistent with the idea that greater distress risk imposes greater human capital risk on CEOs. An untabulated F-statistic indicates that the difference in magnitudes is not significantly different. These results suggest that the magnitude of the shareholder-CEO agency problems is reduced when the risk of financial distress is higher due to the CEO's inherent incentives to maximize the value of his human capital. In other words, the CEO's incentives to protect the value of their human capital act as a substitute for the financial incentives firms provide to align CEOs' interests with shareholders' interests.

Gilson and Vetsuypens (1993) find that pay-performance sensitivities increase substantially in the years following a bankruptcy or restructuring. Since distress risk decreases following the resolution of financial distress, this result is consistent with our evidence that PPS decreases when financial distress risk is higher. Recall, however, that agency problems facing a firm as it enters into, manages, and attempts to emerge from severe financial distress are likely to be very different from a firm with a substantial, but still relatively small, distress risk.

Prior research suggests that older CEOs receive higher incentives to overcome the time horizon problem (Dechow and Sloan (1991)). However, we find no difference in the incentives provided to new CEOs based on their age (p-value = 0.465). This lack of a significant association is consistent with Yermack (1995), while Bryan *et al.* (2000) unexpectedly find a significant but negative association. One explanation is that for new CEOs, regardless of their age, the time horizon problem is not an important source of agency costs since they are not expecting to retire in the near future.

To explore this issue further, we augment our baseline regression with interactions between the distress risk indicators and CEO age. The results are presented in Column 2. The *DR-Mod*

and *DR-High* coefficients remain negative and significant while the coefficient on *Age* is still insignificant. In addition, neither interaction variable is significant. Thus, it does not appear that the provision of value-increasing stock-based incentives depends on the age of the CEO, even in firms with moderate to high levels of financial distress risk.

Table 5 also demonstrates that new CEOs hired externally have pay-performance sensitivities that are significantly less than for new CEOs promoted internally (p-value < 0.0001). Once explanation is that while external CEOs are granted all of their stock-based incentives during their first year in office, internally-promoted CEOs have often accumulated large portfolios of stock and options through the years. Untabulated results indicate that there is no incremental association between *External* and *PPS* depending on the level of distress risk as interactions between *External* and *DR-Mod* and *DR-High* are insignificant.

Examining the other control variables, we find that incentives are significantly lower when the dollar variance of returns is higher. This relation is one of the primary predictions of agency theory and our findings are consistent with those in Aggarwal and Samwick (1999), among others. In addition, we find that pay-performance sensitivity is increasing in past returns and decreasing in the per employee cash flow from operations. The other control variables are not significant.

Finally, we use our alternative financial distress risk measures, *BSM-PB, BSM-Rank*, and *Credit Rating* in Columns 3, 4, and 5, respectively. While both the *BSM-PB* and *BSM-Rank* coefficients are negative, as predicted and consistent with the results in Columns 1 and 2, neither are statistically different from zero. Together, these findings suggest the threshold effects for financial distress risk underlying the *DR-Mod* and *DR-High* indicator variables (and validated with our Chow tests) are especially important in determining the degree of pay-performance

sensitivity. This suggestion is further supported by the fact that the *Credit Rating* coefficient in Column 5 is positive and significant (*p*-value = 0.005) and credit ratings are inherently based on breakpoints.

4.4 Human capital risk and pay-risk sensitivity for new CEOs

In this section, we study the relation between financial distress risk and CEO incentives for risk-taking. Hypothesis H3 predicts a positive association between financial distress risk and risk-taking incentives provided by the CEO's stock and options holdings. We use pay-risk sensitivity, which measures the strength of CEO incentives for risk-taking, as the dependent variable in Equation 1. A higher value means the firm provides stronger incentives to increase firm risk. The results are presented in Table 6.

In Column (1), we present the results from regressing *PRS* on *DR-Mod*, *DR-High*, *External*, *Age*, and the same set of control variables used previously along with untabulated year and industry indicators. The coefficient on *DR-Mod* is positive and significant (*p*-value = 0.046) while the *DR-High* coefficient is negative but insignificant (*p*-value = 0.905). We find some support for hypothesis H3 as PRS is significantly higher for new CEOs at firms with moderate levels of financial distress risk. The coefficient on *DR-Mod* equals 0.039 and is significant at the 5% level (*p*-value = 0.046). However, the *DR-High* coefficient is not significant (*p*-value = 0.905). One explanation for the difference between the two results is that when distress risk is only moderately high, the effects of distress risk on the CEO's degree of risk aversion is the dominant effect. However, when distress risk exceeds moderate levels, the firm's incentives to reduce risk taking incentives in order to mitigate shareholder-debtholder agency costs are strong enough to counter the risk aversion effect.

To explore the relation between distress risk and risk-taking incentives further, we augment

the regression by interacting our distress risk indicators with *Age* and with *External*. The results are reported in Column 2. Introducing the interaction variables does not change the main tenor of the results: the coefficient on *DR-Mod* remains positive and becomes more significant (*p*-value = 0.006) while the *DR-High* coefficient remains insignificant (*p*-value = 0.400). For the most part, the interaction variables are also insignificant. The one exception is that the *DR-Mod*Age* coefficient is marginally significant (*p*-value = 0.088), although the magnitude is small (0.004). This result implies that at moderate distress risk firms, older CEOs receive slightly higher risk-taking incentives.

In Columns 3, 4, and 5, we examine the robustness of our results by replacing the two distress indicator variables with one of our alternative measures of distress risk: *BSM-Prob*, *BSM-Rank*, and *Credit Risk*, respectively. These analyses provide some support for a positive association between distress risk and risk-taking incentives. The coefficients on all three variables are positive but the level of significance depends on the distress risk proxy. The *BSM-Rank* coefficient is strongly significant (*p*-value < 0.0001) while *BSM-Prob* is only marginally significant (*p*-value = 0.073), and the coefficient on *Credit Rating* is insignificant (*p*-value = 0.691). Overall, the results in Table 6 indicate that there is a positive association between distress risk and risk-taking incentives for new CEOs, but that the association is mainly present in firms with moderate levels of distress risk.

4.5 Time in office during the first year

We use compensation from the CEO's first year in office because we are interested in examining the determinants of the CEO's initial compensation package. Doing so allows us to separate the effects of distress risk and performance – effects that are inherently linked for continuing CEOs – on the compensation variables. A potential complication with this choice is that new CEOs

assume office at different times throughout their firms' fiscal years, and thus, the reported numbers reflect compensation over different terms in office. This issue is especially relevant for cash compensation paid to external hires since salary and bonuses are more likely to be prorated, while the equity-based incentives are likely independent of when the CEO assumed office during the fiscal year. For internal CEOs, reported salary and bonus figures are the amounts earned over the entire fiscal year, and not just the portion during which the executive served as CEO. Thus, the magnitude of timing problems, while still present, should be reasonably small.

To analyze the robustness of our results to this timing issue, we perform four alternative analyses. First, we repeat our pay-level analyses using the annualized salary ((reported salary/days as CEO) × 365) for external CEOs instead of the reported salary used to construct TDC. Second, we examine a specification where we use both annualized salary and annualized bonus ((reported bonus/days as CEO) × 365). The untabulated results are qualitatively similar to those reported in the tables. Specifically, the point estimates and significance levels of the distress risk variables (including interaction terms) are quite similar to those reported in Table 4, with the small exception that the significance levels are slightly higher using the annualized data.

While annualizing the cash pay for external hires is reasonable, a disadvantage of the above approach is that the analyses mix real and estimated data. To avoid this issue, we restricted the sample to new CEOs that were in office at least six months during the firm's fiscal year. The results from our third robustness test are also quite similar to those reported in Table 4, with the exception that the significance levels are slightly reduced, likely due to the smaller sample size. We note that each of the distress risk variables remains significant at the 0.05 level or better.

In our fourth robustness test, we use the total direct compensation from the CEO's second fiscal year in office, which is his first full year in office. Again, the results are generally

consistent with those reported in Table 4, although the coefficient magnitudes and significance levels are reduced. This reduction is to be expected since the year 2 compensation variables will also be influenced by the CEO's performance and the probability of bankruptcy will likely have changed. In two cases, the distress risk coefficients are not longer significant: the coefficient on *BSM-PB* in Column 3 and *DR-Mod*Age* in Column 4.

5 Conclusion

Executives are concerned about how their performance affects the long-term value of their human capital or reputation in the executive labor market (Fama (1980)) in addition to how it affects their financial wealth. CEOs experience large reductions in the value of their human capital when their firms declare bankruptcy. In this paper, we examine how the human capital risk associated with bankruptcy affects the initial level of compensation paid to CEOs as well as the stock-based incentives they are provided with.

We use the *ex ante* probability of bankruptcy to proxy for differences in the human capital risk faced by a sample of 2,347 new CEOs in ExecuComp between 1992 and 2007. We divide the sample into low, moderate, and high financial distress risk groups. Doing so allows us to compare the contracts of new CEOs at firms with substantial financial distress risk to their counterparts at firms where the possibility of distress is remote. The principle advantage of this approach is that it allows us to separate the effects of distress risk from performance – effects that are inherently linked for continuing CEOs – on the compensation levels and incentives.

We predict and find that new CEOs who accept positions with firms that face higher levels of financial distress risk receive significantly higher initial levels of compensation compared to new CEOs at firms with low financial distress risk. Our point estimates suggest that new CEOs at moderate (high) distress risk firms receive 16% (29%) more in total compensation compared

to new CEOs at low distress risk firms. In addition, we expect that the reputation costs of leading a firm into bankruptcy are greater for younger CEOs since they have more potential working years that will be affected by their loss of reputation; vice-versa for older CEOs. Consistent with our expectations, we find that older CEOs have significantly lower human capital risk premiums.

The results of our examination of the relation between the equity-based pay-performance sensitivity and the CEO's human capital risk support our hypothesis that firms provide new CEOs with fewer equity-based incentives when financial distress risk is higher. These results suggest that the magnitude of the shareholder-CEO agency problems is reduced when the risk of financial distress is higher.

Our final set of tests examines the relation between financial distress risk and equity-based pay-risk sensitivity. We expect that concerns about their human capital will cause CEOs to behave in a more risk-averse fashion. To the extent true, firms will need to provide additional risk-taking incentives to induce their desired level of risk tolerance for CEOs at firms with higher distress risk. Our results provide some support for our hypothesis as pay-risk sensitivity is significantly higher for new CEOs at firms with moderate levels of financial distress risk.

We add to the extensive literature on executive compensation and incentives by focusing on the influence that the CEO's human capital risk exerts on the contracting process. We extend the insight in Gilson and Vetsuypens (1993) by determining that the risk of financial distress is significantly associated with compensation contracts at firms that have only moderate to high levels of financial distress risk (roughly 21% of our sample firms). We also add to the literature examining the provision of performance and risk-taking incentives by examining whether the CEO's human capital risk incrementally affects the provision of stock-based incentives.

Appendix: Estimating BSM-Prob, PPS, and PRS

Our measure of distress risk, BSM-Prob, is a market-based measure that relies on the Black-Scholes-Merton (BSM) option pricing model to estimate the probability of bankruptcy using equity market data. Within the BSM framework, the probability that the market value of assets, V_A, is less than the face value of liabilities, X , when the debt matures at time T, prob($V_A(T) <$ X), is

$$N\left[-\ln\frac{V_A}{X}+\left(\mu-\delta-\frac{\sigma_A^2}{2}\right)T\Big/\sigma_A\sqrt{T}\right]=BSM-\text{Prob} \qquad \text{(A1)}$$

where N(·) is the standard normal distribution, σ_A is the standard deviation of asset returns, μ is the expected return on the market value of assets, and δ is the continuous dividend rate expressed in terms of V_A.

We estimate BSM-Prob from Equation (A1) as of the end of the month prior to when the new CEO takes office. We use the following procedure based on Hillegeist *et al.* (2004) to estimate the three unobservable variables: V_A, σ_A, and μ. First, we estimate V_A and σ_A by simultaneously solving the BSM call option equation ($V_E = V_A e^{-\delta T} N(d_1) - Xe^{-rT} N(d_2)$) and the optimal hedge equation: ($\sigma_E V_E = V_A e^{-\delta T} N(d_1)\sigma_A$), where

$d_1 = \dfrac{\ln\left[\dfrac{V_A}{X}\right]+\left(r-\delta+\dfrac{\sigma_A^2}{2}\right)T}{\sigma_A\sqrt{T}}$ and $d_2 = d_1 - \sigma_A\sqrt{T}$. V_E is set equal to the total market value of equity based on the closing price at the end of the month prior to when the CEO takes office. Stock return volatility, σ_E, is computed using daily return data from CRSP over the twelve months preceding when the new CEO assumes office. The strike price X is set equal to the book value of total liabilities based on the most recent financial statements, r is the one-year Treasury

bill rate, and T is set equal to one year. The dividend rate, δ, is the sum of common and preferred dividends and interest expense over the preceding twelve months divided by the approximate market value of assets (total liabilities plus the market value of equity). We solve the two equations simultaneously for the two unknown variables, V_A and σ_A, where the starting value for V_A is equal to book value of liabilities plus the market value of equity and the starting value for σ_A is $\sigma_E V_E / V_E + X$.

We estimate the expected market return on assets based on the actual return on assets during the previous year; $\mu_t = \frac{V_A(t) + Dividends - V_A(t-1)}{V_A(t-1)}$. We set the minimum expected growth rate equal to the risk-free rate and the maximum rate to 100%. While one could use a more sophisticated method to estimate μ, Hillegeist et al. (2004) report that their results are not sensitive to the exact method of calculating μ.[17]

We calculate delta, the change in the value of an option for a one dollar change in stock price, using the following equation, which is based on Black-Scholes-Merton option pricing model: $\Delta = \partial(\text{option value})/\partial(\text{stock price}) = e^{-\delta_E T_O} N(Z)$, where δ_E is the common equity dividend rate, T_O is the weighted-average time to expiration for the new CEO's option portfolio multiplied by 0.70 to account for early exercise, N(•) is the standard normal density function, $Z = \frac{\ln V_E / K + \left(r - \delta_E + \sigma_E^2 / 2\right) T_O}{\sigma_E \sqrt{T_O}}$, and other variables are as defined previously. We multiply delta by the number of options held by the CEO times 1,000 and divide by the number of shares outstanding. This product provides the change in the value of the CEO's option portfolio for a

[17] One possible concern is that our estimates of μ(t) may be noisy and hence introduce error into our BSM-Prob estimates. In a future robustness check, we plan on using the risk-neutral probability of bankruptcy, which simply involves replacing μ with the risk-free rate r in Equation A1.

$1,000 change in shareholder wealth. Finally, we add the option portfolio PPS to the stock portfolio PPS to obtain the total PPS.

We calculate the stock option vega, the change in the value of the options for a small change in the stock volatility, using the following equation, which is based on Black-Scholes-Merton option pricing model: $vega = \partial(\text{option value})/\partial(\text{stock volatility}) = e^{-\delta_E T_E} N'(Z) V_E \sqrt{T_E}$, where $N'(\cdot)$ is the density of the standard normal distribution, and with the exception of T_E, the other variables are defined as above. T_E is the weighted average maturity of the firm's liabilities estimated using Compustat data on corporate liabilities maturing in less than 1 year, 2 years, 3 years, 4 years, 5 years, and more than five years. For maturities greater than 5 years, we assume an average maturity of 7.5 years. We then multiply *vega* by 0.01 to obtain the change in value for a one percentage point change in volatility and multiply by the number of options held by the CEO divided by the number of shares outstanding. This product provides the change in the value of the CEO's option portfolio for a one percentage point increase in stock volatility.

Calculating the stock vega requires an additional adjustment step since applying the previous equation (substituting V_A for V_E, σ_A for σ_E,, and δ for δ_E) results in the asset vega; the change in value of equity for a small change in *asset* volatility. The adjustment factor comes from rearranging the optimal hedge equation to adjust for the relation between equity and asset volatility ($\sigma_A/\sigma_E = V_E/V_A e^{-\delta T} N(d_1)$. Multiplying the asset vega value by the adjustment factor provides the sensitivity in the value of the CEO's stock holdings to changes in equity volatility. Finally, we add the option portfolio vega to the stock portfolio vega to obtain the total vega.

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Table 1: Summary Statistics of Firm Variables

	BSM-Prob	Sales	B/M	SalesGr	$VarRank	Std%Ret	Return	Leverage	CFO/Emp	Cash/Emp
All firms										
Mean	0.015	4329	0.507	0.153	0.50	12.4	0.092	0.193	0.055	0.037
Median	0.000	1071	0.447	0.074	0.50	11.2	0.023	0.170	0.010	0.016
StdDev	0.061	12597	0.611	0.737	0.28	5.8	0.613	0.192	0.183	0.148
N	2347	2233	2232	2229	2342	2345	2345	2328	2216	2215
Firms with BSM-Prob < 0.0025										
Mean	0.000	4635	0.458	0.165	0.54	11.1	0.192	0.183	0.053	0.044
Median	0.000	1202	0.424	0.081	0.55	10.0	0.101	0.165	0.100	0.019
StdDev	0.000	13380	0.308	0.785	0.27	5.0	0.590	0.167	0.147	0.158
N	1846	1749	1748	1745	1844	1845	1845	1830	1736	1735
Firms with 0.0025 ≤ BSM-Prob < 0.025										
Mean	0.010	3414	0.603	0.128	0.39	16.0	-0.203	0.202	0.074	0.022
Median	0.008	734	0.542	0.050	0.33	15.2	-0.310	0.174	0.010	0.011
StdDev	0.006	10630	0.628	0.040	0.27	5.6	0.532	0.259	0.361	0.132
N	276	267	267	267	275	275	275	276	265	265
Firms with BSM-Prob ≥ 0.025										
Mean	0.140	2993	0.781	0.084	0.26	18.9	-0.367	0.264	0.053	0.004
Median	0.076	572	0.659	-0.001	0.16	17.5	-0.516	0.248	0.012	0.004
StdDev	0.145	6945	1.580	0.650	0.27	5.9	0.561	0.261	0.099	0.050
N	225	217	217	217	223	225	225	222	215	215

Financial variables measured in year prior to new CEO's appointment. BSM-Prob is the Black-Scholes-Merton measure of the profitability of bankruptcy, measured in the month prior to new CEO's appointment, and estimated according to the method in Hillegeist et a. (2004). Sales = annual sales in millions. B/M = book to market ratio. SalesGr = sales growth. $VarRank = rank of dollar return volatility. Std%Ret = standard deviation of percentage return. Return = 12 month stock return prior to new CEO's appointment. Leverage = long-term debt divided by total assets. CFO/Emp = Cash from operations divided by number of employees. Cash/Emp = Cash divided by number of employees.

Table 2 : Correlation coefficients and *p*-values.

	BSM-Prob	LogSales	BM	SalesGr	$VarRank	Std%Ret	Return	Leverage	CFO/Emp	Cash/Emp
BSM-Prob	1.000	-0.680	0.149	-0.045	-0.213	0.297	-0.222	0.141	-0.005	-0.051
		0.001	< 0.001	0.032	< 0.001	< 0.001	< 0.001	< 0.001	0.813	0.017
LogSales	-0.199	1.0000	-0.042	-0.105	0.750	-0.448	-0.040	0.131	-0.222	0.049
	< 0.001		0.048	< 0.001	< 0.001	< 0.001	0.062	< 0.001	< 0.001	0.022
BM	0.247	-0.040	1.0000	-0.052	-0.265	0.035	-0.127	-0.104	0.020	-0.013
	< 0.001	0.060		0.014	< 0.001	0.096	< 0.001	< 0.001	0.354	0.548
SalesGr	-0.153	-0.072	-0.257	1.0000	0.011	0.129	-0.006	-0.024	0.051	0.004
	< 0.001	0.001	< 0.001		0.598	< 0.001	0.786	0.248	0.017	0.850
$VarRank	-0.380	0.760	-.0382	0.091	1.0000	-0.266	0.172	-0.011	0.005	0.098
	< 0.001	< 0.001	< 0.001	< 0.001		< 0.001	< 0.001	0.603	0.824	< 0.001
Std%Ret	0.599	-0.450	-0.023	0.085	-0.291	1.0000	0.014	-0.121	0.235	-0.102
	< 0.001	< 0.001	0.286	< 0.001	< 0.001		0.498	< 0.001	< 0.001	< 0.001
Return	-0.547	0.068	-0.183	0.093	0.248	-0.194	1.0000	-0.031	0.034	0.031
	< 0.001	0.001	< 0.001	< 0.001	< 0.001	< 0.001		0.131	0.112	0.147
Leverage	0.114	0.264	0.142	-0.105	0.046	-0.228	0.007	1.0000	-0.123	0.034
	< 0.001	< 0.001	< 0.001	< 0.001	0.02817	< 0.001	0.746		< 0.001	0.113
CFO/Emp	0.014	-0.246	-0.173	0.092	0.090	0.355	0.013	-0.370	1.0000	0.127
	0.510	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	0.549	< 0.001		< 0.001
Cash/Emp	-0.329	0.173	-0.137	0.063	0.388	-0.285	0.175	0.072	0.287	1.0000
	< 0.001	< 0.001	< 0.001	0.003	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	

Spearman (Pearson) correlations are provided below (above) the diagonal. p-values presented below correlations. Financial variables measured in year prior to new CEO's appointment. BSM-Prob is the Black-Scholes-Merton measure of the profitability of bankruptcy, measured in the month prior to new CEO's appointment, and estimated according to the method in Hillegeist et a. (2004). LogSales = log of annual sales in millions. BM = book to market ratio. SalesGr = sales growth. $VarRank = rank of dollar return volatility. Std%Ret = standard deviation of percentage return. Return = 12 month stock return prior to new CEO's appointment. Leverage = long-term debt divided by total assets. CFO/Emp = Cash from operations divided by number of employees. Cash/Emp = Cash divided by number of employees.

Table 3: Summary Statistics: Executive Variables

	TDC	PPS	PRS	External	Age
All firms					
Mean	5038	10.195	10.064	0.242	51.03
Median	2249	1.092	0.178	0	51
StdDev	9750	37.506	129.973	0.428	7.100
N	2202	2347	2154	2347	2342
Firms with BSM-Prob < 0.0025					
Mean	5277.81	9.555	8.705	0.216	51.03
Median	2329.91	1.073	0.116	0	51
StdDev	10412.68	35.474	138.345	0.412	6.940
N	1747	1846	1700	1846	1842
Firms with 0.0025 $\leq$ BSM-Prob < 0.025					
Mean	4205.08	13.091	15.014	0.315	51.00
Median	2117.81	1.102	0.821	0	50
StdDev	6050.33	47.106	77.571	0.465	7.521
N	256	276	249	276	276
Firms with BSM-Prob $\geq$ 0.025					
Mean	4001.09	11.893	15.314	0.364	51.08
Median	1679.00	1.400	0.754	0	51
StdDev	7134.34	40.340	107.235	0.482	7.871
N	199	225	205	225	224

BSM-Prob is the Black-Scholes-Merton measure of the profitability of bankruptcy, measured in the month prior to new CEO's appointment, and estimated according to the method in Hillegeist et a. (2004). TDC = log of total direct compensation. PPS = dollar change in CEO wealth per $1,000 change in firm value based on the value of the CEO's stock and options holdings. PRS = pay-risk sensitivity measured as the change in value of the CEO's stock and options holdings for a one percentage point increase in equity volatility. See the appendix for details. External = 1 if new CEO is an outsider. Age = Age of CEO when he/she takes office.

Table 4: Financial distress risk and total compensation for new CEOs

	(1)	(2)	(3)	(4)	(5)
DR-Mod	0.161				0.162
	0.010				0.009
DR-High	0.285				0.254
	0.0002				0.001
BSM-Prob		0.926			
		0.005			
BSM-Rank			0.607		
			<0.0001		
Credit Rating				0.052	
				<0.0001	
External	0.560[a]	0.562	0.527	0.513	0.558
	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Age	-0.012	-0.012	-0.011	-0.014	-0.007
	<0.0001	<0.0001	<0.0001	0.001	0.017
DR-Mod*Age					-0.020
					0.009
DR-High*Age					-0.023
					0.007
LogSales	0.066	0.070	0.052	0.112	0.063
	0.003	0.002	0.018	0.000	0.004
B/M	-0.026	-0.028	-0.035	-0.011	-0.015
	0.500	0.477	0.356	0.822	0.703
SalesGr	0.083	0.088	0.072	-0.160	0.079
	0.044	0.034	0.079	0.001	0.055
$VarRank	2.438	2.372	2.612	2.377	2.457[a]
	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Return	0.116	0.087	0.152	0.053	0.119
	<0.0001	0.007	<0.0001	0.343	<0.0001
Leverage	0.165	0.195	0.054	-0.178	0.183
	0.119	0.066	0.617	0.336	0.082
CFO/Emp	0.470	0.486	0.408	-0.131	0.462
	<0.0001	<0.0001	<0.0001	0.668	<0.0001
Cash/Emp	-0.193	-0.197	-0.149	0.322	-0.178
	0.142	0.135	0.254	0.134	0.173
R-square	0.43	0.43	0.44	0.45	0.43
Observations	2,053	2,053	2,053	996	2,053

p-values are provided below each coefficient. Financial variables are measured in year prior to new CEO's appointment. TDC = log of total direct compensation is the dependent variable. DR-Mod = 1 if BSM-Prob is between 0.0025 and 0.025. DR-High = 1 if BSM-Prob is greater than 0.025. BSM-Prob is the Black-Scholes-Merton measure of the profitability of bankruptcy, measured in the month prior to new CEO's appointment, and estimated according to the method in Hillegeist et a. (2004), which is described in the appendix. BSM-Rank = rank of the firm's BSM-Prob where the lowest value of BSM-PB equals zero and the highest value equals 1. Credit Rating = Standard & Poor's long-term issuer credit ratings taking on values between 2 (AAA) and 21 (C). External = 1 if the new CEO is outsider. Age = Age of CEO minus median age of the sample. LogSales = log of annual sales in millions. B/M = book to market ratio. SalesGr = sales growth. $VarRank = rank of dollar return volatility. Return = 12 month stock return immediately prior to new CEO's appointment. Leverage = long-term debt divided by total assets. CFO/Emp = Cash from operations divided by number of employees. Cash/Emp = Cash divided by number of employees. Year and industry indicators are included in all of the regressions.

Table 5: Financial distress risk and pay-performance sensitivity for new CEOs

	(1)	(2)	(3)	(4)	(5)
DR-Mod	-0.240	-0.240			
	0.029	0.029			
DR-High	-0.327	-0.325			
	0.012	0.012			
BSM-Prob			-0.409		
			0.488		
BSM-Rank				-0.019	
				0.906	
Credit Rating					0.049
					0.005
External	-0.501	-0.497	-0.512	-0.512	-0.297
	<0.0001	<0.0001	<0.0001	<0.0001	<0.001
Age	0.004	0.003	0.003	0.003	0.000
	0.465	0.622	0.483	0.476	0.991
DR-Mod*Age		0.007			
		0.584			
DR-High*Age		-0.003			
		0.866			
LogSales	0.037	0.038	0.027	0.027	-0.084
	0.334	0.313	0.469	0.484	0.060
B/M	0.074	0.075	0.067	0.058	0.026
	0.256	0.256	0.314	0.383	0.702
SalesGr	-0.047	-0.048	-0.048	-0.048	0.109
	0.298	0.291	0.286	0.290	0.113
$VarRank	-1.028	-1.031	-0.895	-0.884	-0.438
	<0.0001	<0.0001	<0.0001	<0.0001	0.083
Return	0.230	0.231	0.260	0.264	0.262
	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Leverage	0.262	0.259	0.178	0.165	-0.244
	0.163	0.168	0.339	0.391	0.349
CFO/Emp	-0.480	-0.470	-0.514	-0.516	-0.943
	0.015	0.018	0.009	0.009	0.032
Cash/Emp	-0.016	-0.018	0.008	0.012	-0.493
	0.948	0.939	0.975	0.956	0.111
R-square	0.021	0.021	0.020	0.020	0.037
Observations	2196	2196	2196	2196	1033

p-values are provided below each coefficient. Financial variables are measured in year prior to new CEO's appointment. PPS = dollar change in CEO wealth per $1,000 change in firm value is the dependent variable. DR-Mod = 1 if BSM-Prob is between 0.0025 and 0.025. DR-High = 1 if BSM-Prob is greater than 0.025. BSM-Prob is the Black-Scholes-Merton measure of the profitability of bankruptcy, measured in the month prior to new CEO's appointment, and estimated according to the method in Hillegeist et a. (2004), which is described in the appendix. BSM-Rank = rank of the firm's BSM-Prob where the lowest value of BSM-PB equals zero and the highest value equals 1. Credit Rating = Standard & Poor's long-term issuer credit ratings taking on values between 2 (AAA) and 21 (C). External = 1 if the new CEO is outsider. Age = Age of CEO minus median age of the sample. LogSales = log of annual sales in millions. B/M = book to market ratio. SalesGr = sales growth. $VarRank = rank of dollar return volatility. Return = 12 month stock return immediately prior to new CEO's appointment. Leverage = long-term debt divided by total assets. CFO/Emp = Cash from operations divided by number of employees. Cash/Emp = Cash divided by number of employees. Year and industry indicators are included in all of the regressions.

Table 6: Financial distress risk and pay-risk sensitivity for new CEOs

	(1)	(2)	(3)	(4)	(5)
DR-Mod	0.039	0.064			
	0.046	0.006			
DR-High	-0.003	0.024			
	0.905	0.400			
BSM-Prob			0.228		
			0.073		
BSM-Rank				0.224	
				< 0.0001	
Credit Rating					0.005
					0.691
External	-0.028	-0.017	-0.020	0.014	-0.051
	0.059	0.338	0.181	0.684	0.447
DR-Mod*External		-0.050			
		0.220			
DR-High*External		-0.054			
		0.216			
BSM-Prob*External			-0.421		
			0.024		
BSM-Rank*External				-0.120	
				0.024	
Age	0.001	0.000	0.001	-0.002	0.007
	0.311	0.792	0.366	0.383	0.097
DR-Mod*Age		0.004			
		0.088			
DR-High*Age		0.003			
		0.359			
BSM-Prob*Age			-0.000		
			0.975		
BSM-Rank*Age				0.007	
				0.026	
LogSales	0.033	0.035	0.032	0.038	0.015
	< 0.0001	< 0.0001	< 0.0001	< 0.0001	0.651
B/M	0.041	0.040	0.040	0.034	0.034
	<0.0001	<0.001	<0.0001	0.005	0.492
SalesGr	0.003	0.003	0.003	0.001	0.055
	0.717	0.768	0.756	0.895	0.490
$VarRank	-0.075	-0.075	-0.074	-0.021	0.012
	0.066	0.070	0.053	0.629	0.950
Return	0.002	0.002	-0.001	0.019	0.096
	0.855	0.883	0.898	0.095	0.099
Leverage	0.252	0.249	0.231	0.193	0.440
	< 0.0001	< 0.0001	< 0.0001	< 0.0001	0.023
CFO/Emp	-0.008	-0.008	-0.004	-0.014	-0.338
	0.818	0.825	0.904	0.714	0.310
Cash/Emp	0.015	0.013	0.016	0.016	-0.104
	0.712	0.756	0.691	0.712	0.650
R-square	0.028	0.029	0.027	0.033	0.051
Observations	2022	2022	2022	2022	1025

p-values are provided below each coefficient. Financial variables are measured in year prior to new CEO's appointment. PRS = CEO's pay-risk sensitivity is the dependent variable. DR-Mod = 1 if BSM-Prob is between 0.0025 and 0.025. DR-High = 1 if BSM-Prob is greater than 0.025. BSM-Prob is the Black-Scholes-Merton measure of the profitability of bankruptcy, measured in the month prior to new CEO's appointment, and estimated according to the method in Hillegeist et a. (2004), which is described in the appendix. BSM-Rank = rank of the firm's BSM-Prob where the lowest value of BSM-PB equals zero and the highest value equals 1. Credit Rating = Standard & Poor's long-term issuer credit ratings taking on values between 2 (AAA) and 21 (C). External = 1 if the new CEO is outsider. Age = Age of CEO minus median age of the sample. LogSales = log of annual sales in millions. B/M = book to market ratio. SalesGr = sales growth. $VarRank = rank of dollar return volatility. Return = 12 month stock return immediately prior to new CEO's appointment. Leverage = long-term debt divided by total assets. CFO/Emp = Cash from operations divided by number of employees. Cash/Emp = Cash divided by number of employees. Year and industry indicators are included in all of the regressions.