CEO Equity vs. Inside Debt and the Dynamics of Firm Performance ☆

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Abstract

This paper provides new evidence on the comparative dynamic effects of CEO inside debt and equity compensation on firm performance as measured by Tobin's Q. In contrast to the extant literature, we find significant empirical evidence for the classic Jensen and Meckling (1976) premise that managers should receive debt vs. equity compensation in proportion to their ownership structure in the firm. We also provide new evidence that shows that the effects of the different components of CEO compensation are dependent on the CEO's time horizon, as measured by the expected period of employment to retirement. Inside debt and equity incentives are beneficial to performance when they decrease with the CEO's projected time to retirement. Cash incentives are more beneficial to the firm when concentrated near the end of the CEO's tenure.

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1. Introduction

With the precarious state of many sectors of the US economy as a consequence of the Global Pandemic, the question of how to dynamically tie executive compensation packages to firm performance has been of considerable interest to academics, practitioners and policymakers. Some companies facing liquidity and cash flow problems, especially those obtaining relief under the Coronavirus Aid Relief and Economic Security Act (the "CARES Act") signed into law on March 27, 2020 have seen such adjustments.[2] However, in a recent survey, Mahabier, Gushi, and Nguyen (2020) document persistent inflexibility in executive compensation amounts and structure that seem at odds with pay to performance norms for most companies through the pandemic.[3] They find that when the occasional adjustments are implemented, they are in the form of reductions to base salary than long-term incentive compensation, which would include inside debt (executive pensions), and annual cash bonuses.[4]

The inflexibility of CEO pay structure through major economic upheavals from the Great Recession to COVID-19 is somewhat puzzling. How does the sticky nature of executive pay structure through time affect firm performance? The purpose of this study is to provide new evidence on this score, focusing on the dynamic comparative effects of CEO inside debt and equity compensation on firm valuation.

[2] As Bachelder (2020) notes, the CARES Act constrains executive compensation and severance for companies receiving loans from, or loans guaranteed by, the U.S. Treasury Department.
[3] They find that only 634 companies comprising the Russell 3000 issued compensation adjustments to executives since the onset of the pandemic.
[4] For companies that reduced CEO salaries, the amounts involved on average expected for 2020 is only $180 million in total, which represents less than 10 percent or less of the value of the total CEO compensation package in 2019. See https://cglytics.com/wp-content/uploads/2020/07/The-Pandemic-and-Executive-Pay-A-Russell-3000-Study-FINAL.pdf

Since the key stakeholders are shareholders and creditors, aligning mangers' incentives to both shareholders' and creditors' interests is crucial to maximizing firm value. Numerous studies suggest that using equity compensation of CEOs can reduce agency cost due to executive's self-serving behaviors, which will improve firm performance, consistent with the classical agency cost perspective (e.g. Jensen and Murphy,1990b; Lippert and Moore, 1995; Guay, 1999; Core, Holthausen and Larcker, 1999; Ittner, Lambert and Larcker, 2003; Switzer, 2007). Adding equity or equity equivalents into compensation could increase firm performance by reducing agency costs, therefore benefiting not only shareholders but also creditors. However, there are trade-offs: for example, imbalanced packages that overweight equity compensation relative to inside debt, which includes defined benefit pensions and deferred compensation, as articulated in Jensen and Meckling (1976)'s seminal paper, could lead to lower performance. Managers may invest in risky value destroying projects, and firms may lack the means to invest in promising valuable projects, including projects that could help them pay off their debt (Myers, 1977). Second, based on the absolute priority rule, the payoff to inside debt to executives, such as (unfunded) pension claims, receives lower priority than secured debt during bankruptcy (Altman, Hotchkiss and Wang, 2019), so it is highly likely that the claims of executives' inside debt won't be paid or be paid in full in bankruptcy. Therefore, with inside debt in their compensation, managers have incentives to avoid bankruptcy in the first place. Indeed, managers may have higher incentives than senior creditors to avoid bankruptcy. In sum, in addition to equity compensation, inside debt is an important component in compensation packages to a) link managers' incentives to those of creditors; b) deter firms from deviating from their optimal investment decisions; and c) reduce bankruptcy risk. Bebchuk and Jackson (2005) were amongst the first scholars to quantify the importance of inside debt in executive compensation packages.

While increasing the portion of inside debt in compensation can reduce the agency cost of debt, it may lead to other inefficient decisions. Jensen and Meckling (1976) caution that high debt compensation might motivate the executive to manage the firm too conservatively. Overly conservative managers act more on behalf of debt holders, eschewing risky yet value increasing projects that boost firm's value.

Given the delicate balancing of incentives, the optimal dynamic structure of compensation is critical to firm performance. In this paper, we provide new evidence on the Jensen and Meckling (1976) hypothesis, which posits that there is an optimal mix of executive debt ownership: the debt and equity held by the manager should have the same ratio as the firm's equity to debt ratio. Edmans and Liu (2011) develop this argument theoretically and demonstrate that if levels of the manager's relative inside debt to equity incentive ratios are too high (too low), bondholders should gain (lose) at the expense of shareholders. In an influential study that is closely related to ours, Wei and Yermack (2011) provide limited empirical evidence supporting this hypothesis. They conduct event studies for inside debt disclosures for firms in 2007, the year in which first mandated such disclosures. Based on a sample of 299 firms, they show that the abnormal returns for the firms' stocks and bonds are insignificant around the 2007 SEC disclosure reform event, both economically and statistically. They further separate companies into two groups based on their CEOs' relative incentive ratios. These results are also not uniformly significant at conventional levels. This lack of significance of their tests underscores the problem that event studies conducted using abnormal returns over a one or two-day event period windows may not capture longer- term effects. Furthermore, they also do not consider the relationship between executive compensation as it relates to the dynamics of the executives contractual tenure with the firm.

Our paper serves to provide new direct tests of Jensen and Meckling (1976) argument, using a larger sample of firms over the period of 2006-2016. We focus on valuation effects, using Tobin's Q as our measure of performance. We show that the smaller the *absolute* deviation of inside debt vs. equity in managers' compensation from a firm's debt to equity ratio, the higher the firm's performance, as measured by Tobin's Q. In contrast to Wei and Yermack (2011) who use abnormal returns based on a short event day windows, our results are significant, and are consistent with Jensen and Meckling's (1976) normative proposition. We consider a comprehensive set of equity vs. inside debt components of executive compensation. Specifically, we disaggregate executive compensation into three major categories: i. salary and bonus; ii. equity that comprises value of stock awards, value of unvested shares, the estimated value of in-the-money options and the fair value of all the other option awards; iii. inside debt that consists of the increase in pension benefits and the contribution to deferred compensation.

We also contribute to the literature by providing evidence showing that the optimal compensation design should be time varying. Our results show that the optimal compensation structure depends on CEO's career/tenure horizon. As the time to retirement of the CEO decreases, value enhancing compensation should gradually shift from inside debt incentives and equity components to short term incentives such as salary and bonus.

The remainder of the paper is organized as follows. The next section provides a review of the literature and develops our hypotheses. Section 3 discusses data and methodology. Section 4 presents empirical results, and the paper concludes with a summary in section 5.

2. Hypothesis Development

2.1 Optimal compensation structure

The problem of optimal compensation of executives has been the subject of considerable debate among researchers, practitioners and policymakers for decades. In recent years, this debate has centred around the issue of excessive compensation, which culminated in regulatory changes such as in the "say on pay" provision in the Dodd-Frank Wall Street Reform and Consumer Protection Act enacted on July 21, 2010. In Jensen and Meckling's (1976) formalization of the agency problem, compensation including stock option awards or similar equity pay is expected to entice executives to adopt an optimal balance of risk and return to improve shareholders' wealth, as cash compensation is arguably unsuccessful in establishing this balance (e.g., Bryan, Hwang and Lilien, 2000; Bryan, Hwang and Lilien, 2005). Several early studies support the hypothesis that increasing CEO equity ownership mitigates agency costs (e.g. Jensen and Murphy, 1990b; Lambert and Larcker, 1987; Lippert and Moore, 1995; Guay, 1999; Core et al., 1999; Ittner et al., 2003; Switzer, 2007). More recently, the literature has underscored the risk shifting problem of Jensen and Meckling (1976). Managers with higher equity stakes have incentives to take riskier investments that benefit shareholders at the expense of debtholders. Defusco, Zorn and Johnson (1991) provide empirical evidence of risk shifting when executive stock option plans are introduced. Convexity in cash flow payoffs to shareholders will increase levered firms' default probabilities and transfer wealth from debtholders to shareholders (Tung and Wang, 2012; Fahlenbrach and Stulz, 2011). Inside debt can help reduce this risk shifting problem, as well as the debt overhang problem (Myers, 1977).

In sum, inside debt can be an effective and low-cost solution to reduce the agency costs of debt. However, to the extent that managers are induced to favor conservative decisions, this could hamper firm performance (Bolton, Mehran and Shapiro, 2015; Anantharaman, Fang and Gong, 2013; Edmans and Liu, 2010).

Jensen and Meckling (1976) provide a simple rule of thumb for executive compensation structure to minimize agency costs due to managers' self interested and inefficient decisions, and better align managers' interests with those of other stakeholders: **managers should be granted compensation with debt and equity in proportion to the capital structure of the firm**. This is the optimal compensation structure, in which managers would have no incentive to reallocate wealth between debt holders to stockholders. Risk shifting activities to benefit equity holdings, would be offset by losses from their debt holdings and vice versa (see also Edmans and Liu, 2011). Wei and Yermack (2011) provide an early test of this hypothesis, based on the 2007 SEC disclosure reform using an event study approach, but their results are not statistically significant. Our study provides new evidence on this score, using a Tobin's Q approach and looks at the relative valuation effects of inside debt to equity for a longer horizon. We provide a direct approach for testing how deviations *per se* between the firm's debt to equity ratio and the CEO's compensation debt to equity ratio affect performance, as shown in our hypothesis 1 below:

HYPOTHESIS 1: Firm performance is negatively related to the *absolute* difference between the inside debt to equity incentive ratio of the CEO and the debt to equity ratio of the firm.

2.2 Manager's Employment Horizon

An executive's employment horizon directly affects his or her incentives and actions, and consequently impacts the firm's capital structure, cost of capital, and short- and long-term

investment decisions. Using a sample 500 Fortune companies from 1996 to 2002, Sundaram and Yermack (2007) find that CEO compensation typically shifts from equity-based compensation toward pension benefits and deferred compensation as the CEOs' tenure approaches. Specifically, the pension component of CEO compensation increases monotonically with and highly sensitive to CEO's age, and the rate of pension growth displays an increasing rate as CEO ages. Such horizon change in the final years of CEO's tenure may lead to several issues. For instance, CEOs tend to act overly conservatively (e.g., reducing R&D spending, investing in less risky projects, unlevering firm's assets) to safeguard the value of their pensions and deferred compensation in the final years of their tenure. To counteract the effect of distorted decisions due to larger pension value as a CEO ages, some firms (such as General Electric) provide large equity-based compensation tied to the firms' performance after the CEOs' retirement in the CEOs' final years in office. Consistently, Dechow and Sloan (1991) show that CEOs with greater ownership are less likely to cut R&D investments when they are close to retirement. We therefore expect that a CEO's equity stake in the firm is important, and the optimal contract continues to include equity usage toward the end of CEO tenure.

From a different perspective, Marinovic and Varas (2019) construct theoretical models showing that under the possibility of managerial manipulation of short-term performance metrics (such as the timing of cash flows, and accruals) at the expense of firm value, the optimal contract defers compensation and includes performance-based vesting provisions in order to encourage effort while minimizing manipulation across CEO tenure. The authors point out that long-term incentives decrease while short-termism increases over time, and that vesting of manager's incentives accelerates by the end of CEO tenure. This change will shift the balance of incentives toward short-term compensation. At the beginning, the duration of long-term incentives increases upon positive

shock of firm performance. However, positive shocks accelerate vesting and reduce long-term incentives. Therefore, long-term incentives are most effective at the beginning of a CEO's tenure and decay toward the end of CEO tenure. Although deferred compensation can be used to deter manipulation, higher compensation deferred until CEO retirement can be costly to the firm (although may be used to reduce manipulation at later years of CEO tenure), because post-retirement incentives do not incentivize effort as pre-retirement incentives do. While deferred compensation is usually long-term, pension almost always provides a long-term incentive. Therefore, based on Marinovic and Varas (2019), we expect the optimal contract includes inside debt most effectively at the early stage of CEO tenure.

Ladika and Sautner (2020) show that CEOs' incentive horizons are determined predominantly by the length of the vesting periods on their equity compensation grants. Using the adoption of accounting standard FAS 123-R as experiment, the authors show that option acceleration cause CEOs to cut both R&D and capital expenditure, and larger cuts are associated with shorter CEO incentive horizons. The authors conclude that CEOs with greater short-term incentives spend less on long-term investment projects. Consistently, Antia, Pantzalis and Park (2010) show that CEOs with shorter employment horizons or shorter expected tenure, have a greater propensity to forego long-run investments and tend to be myopic. This myopia could lead CEO manipulation (Marinovic and Varas, 2019), and/or encourage short-termism that includes prematurely recognizing revenues and returns (Jensen, 2004), inflating reported earnings (Sun and Hovey, 2012), short-term earnings (Ladika and Sautner, 2020) and/or reducing long-term investment at the expense of firm. Therefore, pay structure should not be static, and optimal structure should adjust as executives' incentives evolve with expected tenure.

Guay, Kepler and Tsui (2019) summarize the application of contract theory in executive compensation and find inconclusive evidence that cash bonus surprisingly does not provide individual incentives to CEOs. However, the authors provide insightful directions for future research. On the one hand, according to contract theory, Guay et al. (2019) argue that if both cash and equity incentives are available and used collectively to provide incentives to individuals over a CEO's tenure, the optimal compensation structure may have proportional weights changes in bonus and equity incentives over time. As noted by Armstrong (2016), even without the ownership guidelines that often require CEOs to hold a minimum of a certain multiple of their annual salary in firm equity, many CEOs have the incentive and tend to hold much larger than the minimum amount. However, at the beginning of CEO tenure, executives are unlikely to have large personal wealth available to invest in the firm's equity and it takes time to gradually build a substantive personal equity portfolio. Based on this argument, cash-based incentives are more effective in the early of CEOs' tenure but are later eclipsed by their accumulated equity incentives. On the other hand, Guy et al. (2019) also mention the substitute feature of explicit incentive (e.g. pay-performance sensitivity) and implicit incentive (e.g. career concerns) in total optimal executive incentive and compensation. For example, younger or inexperienced CEOs have stronger career concern than those who are closer to retirement. As a result, firms do not need to provide high explicit incentive of cash bonus for relatively unseasoned CEOs because their implicit incentive is already high. Based on this argument, cash-based incentives should be higher for seasoned CEOs closer to retirement. Although there are no conclusive results of impact of cash bonus on individual incentives from Guy et al. (2019), we favor the argument that cash-based incentives, salaries and bonuses are more effective in the later stages of CEOs' tenure. High cash payouts that are given early in a CEO's career, when the time to retirement is far into the future, are detrimental to the

firm's value. There is no guarantee that the CEO will actually retire with the firm. Instead, equity and debt provide longer term incentives than cash in this context.

In sum, the optimal compensation structure depends on the dynamic nature of the managers' tenure with the firm. Based on the above discussion, the CEO's debt-like compensation and equity-based incentives are most relevant at the early stage of the tenure for the purpose of incentivizing the long horizon view and optimal firm performance over CEO tenure. CEO inside debt and equity should be a decreasing function of time remaining to retirement. Cash incentives, on the other hand, are effective in discouraging excessive risk aversion during the final years of CEO's tenure and should be greater at the later stage of CEO tenure. We summarize our hypothesis 2 as below:

HYPOTHESIS 2: An optimal compensation structure depends on CEO time horizons and their influence on incentives in the form of equity, inside debt and salary. The debt and equity incentives are expected to be optimal when they decrease with time. Cash incentives are expected to be optimal when they are greatest toward the end of the CEO's tenure.

3. Data and Methodology

3.1 Data Construction

Our sample consists of all U.S. firms over the period of January 2006 to January 2016. Following previous literature (e.g., Chung and Pruitt, 1994), we calculate Tobin's Q to measure firm performance, which is defined as market value of a company divided by its book value of total assets. Specifically, market value includes the market value of equity, preferred stock liquidation value, and value of a firm's short-term liabilities net of its short-term assets plus long-term debt. We also collect variables of firm characteristics that may affect firm performance, such as firm

size, measured by the logarithm of total assets, R&D expenditure scaled by sales to account for valuable yet risky investment, debt to equity ratio to measure firm's capital structure. Fundamental financial data and stock information are obtained from Compustat and CRSP through WRDS, respectively.

The firm's board of directors is an important mechanism to monitor management actions in order to reduce managerial moral hazard, is responsible for executive compensation design, and is shown to affect firm's performance, based on previous literature (e.g., Hull, Predescu and White, 2004; Kim and Lu, 2011). We therefore include common variables related to the quality of a board such as board size, board independence and CEO duality. Those variables reflect the board's expertise and ability to provide professional and diverse expertise and independent monitoring of executives. Board size is measured as the total number of directors in a board and board independence is measured as the percentage of independent members in a board. A larger board can provide more resources to the firm (Pfeffer and Salancik, 1979), but could have other problems such as coordination, communication and internal conflicts (e.g., Jensen, 1993; Eisenberg, Sundgren and Wells, 1998). CEO duality (i.e., if a CEO is also the chairman of a board) also indicates the independent monitoring ability of a board and the conflicts of interest between CEO and a board. Previous literature shows mixed evidence on the relationship between CEO duality and firm performance. Jensen (1993) and Fama and Jensen (1981) some argue that a CEO duality leads to higher exposure to agency costs. Other scholars show a weak relationship (Baliga, Moyer and Rao, 1996) or no insignificant relation (Iyengar and Zampelli, 2009; Carty and Weiss, 2012). In addition to above board related variables, a recent study by Usman et al. (2019) finds that the board's gender diversity strengthens the relationship between CEO pay and firm performance. We

also consider the affects of gender diversity, which is measured by the percentage of women directors in a board.

For executive compensation, we focus on CEO's compensation instead of all the executives, as CEO has the strongest power to make a firm's daily decisions, therefore can greatly affect a firm's performance. We collect a set of comprehensive variables to measure CEO's compensation in three main categories, i. salary and bonus, ii. equity part: value of stock awards, value of unvested shares, estimated value of in-the-money options and value of other option awards, iii. Inside debt: annual change in pension and deferred contributions and additional annual contribution to deferred compensation. We also take the impact of the crisis period into consideration, by adding a crisis dummy variable to indicate years 2007 to 2009, and 0 otherwise. CEO gender is added as a variable to control the possibility in inherent difference in propensity to risk taking and potential impact on firm performance. Governance data and compensation data are from BoardEx and Execucomp, respectively. After excluding financial firms (SIC codes from 6000 to 6999) and firms with incomplete financial information, our final sample consists of 6,149 firm-year observation. Variable construction details and data sources are summarized in Appendix.

[Insert Table 1 about here]

Table 1 provides descriptive statistics of the main variables. Our sample firms have average size of $6 million in total assets, and R&D represents about 28% of total sales for an average firm. An average firm has equity almost four times the size of debt. The sample firms have about 80% board members independent on average, and 60% of our firms have CEO who are also the chairman of a board. The percentage of women represented on boards is about 11%, over the entire period, Figure 1 shows, however, and increasing trend since 2012. By 2015, close to 17% directors were

women. A similar trend is found in the percentage of women CEOs over time. However, the number of women directors every year is still very small at less than 100.

[Insert Figures 1 and 4 about here]

The average CEO age in our sample firms is 56 years old, with the oldest being 88 and the youngest at 28 years old. The average time to retirement is 9 years, based on an expected retirement age of 65 years old, and the average tenure as CEO is 5.4 years. Figures 2 and 3 show the distribution of CEO age and time to retirement, in which most CEOs are clustered at ages 53 to 57, and most of CEOs retire in the next 7-11 years.

[Insert Figures 2 and 3 about here]

In terms of CEO compensation, an average CEO in our sample has annual salary and bonus of $911,000; CEO's annual salary averaged $800,000 with an average bonus of $111,000. The average inside debt compensation for CEOs is $490,000 annually, with $390,000 in pension change, and $100,000 in contributions to deferred compensation. CEOs hold an average $2.2 million in stock awards, and $4 million in unvested shares across our sample firms. Following others (Bebchuk and Grinstein, 2005; Core, Guay and Larcker, 2008), we include option value as the total value of options granted in the year, to reflect the CEO's perceived yearly compensation, assuming he or she is incentivized when he/she receives the option grant, and not the value of the options when they are exercised[5]. On average, CEOs receive $800,000 in option grants, and have in-the-money options of $10.4 million.

[5] Prior to 2006, Compustat WRDS data included both a variable for Restricted Stock Grant and one for the Black Scholes Value of Options Awards, but after the changes in SEC guidelines, these two variables were combined into Option Awards Fair Value.

3.2 Methodology

To test Hypothesis 1, that firm performance is optimal when the compensation structure of the CEO is identical to that of the firm, we construct a measure to indicate how close a CEO's compensation structure is to the capital structure of the firm. Particularly, we calculate the absolute difference of the spread between the debt to equity ratio of a CEO's annual compensation and the debt to equity ratio of the firm. The smaller the number of this variable, the closer the CEO compensation structure is to the optimal level. Then we estimate equation 1 below to test our hypothesis:

$$Tobin's\ Q = a_0 + a_1 Kdiff + a_2 \log(Total\ Assets\ of\ the\ Firm) + a_3 RnD\ to\ Sales + a_4 Board\ Size + a_5 Board\ Independence + a_6 CEO\ Duality + a_7\ Percentage\ of\ Women\ on\ the\ Board + + a_8\ CEO\ Gender + a_9\ Financial\ Crisis\ Dummy + \varepsilon \quad (1)$$

Where

$$Kdiff = \left| \frac{Inside\ Debt\ compensation\ of\ the\ manager}{Equity\ compensation\ of\ the\ manager} - \frac{Longterm\ debt\ of\ the\ firm}{Equity\ of\ the\ firm} \right|$$

Inside debt held by the manager includes the change in pension value from previous year, the earnings on deferred compensation and the contributions to deferred compensation plans in the last fiscal year. Equity held by manager includes the fair value of granted option awards, the value of unearned/unvested shares, stock awards, and the estimated value of all other option awards. Detailed data descriptions are included in Appendix.

To test our Hypothesis 2 that whether CEO horizon matters in determining optimal executive pay structure, we introduce two-way interactive terms into the model for the salary, equity and debt incentives. The best available proxy for expected tenure, as opposed to past or current tenure, is

the time to retirement. It assumes that CEOs retire at 65 years old, and the time to retirement variable becomes negative after the CEO turns 66. For the most part, this assumption seems plausible, although if one assumes hard-working person with intrinsic motivations beyond "paying the mortgage" become CEOs, then 65 years old may be underestimated.[6] We use below three measures to indicate the incentives of CEOs from the salary, equity and inside debt parts, respectively, and estimate equation 2 to test our second hypothesis.

$$
\begin{aligned}
Tobin's\ Q = {} & a_1 Kdiff + a_2 Cash\ Ratio + a_3\ Equity\ Ratio + a_4\ Inside\ Debt\ Ratio + \\
& a_5 Cash\ Incentive + a_6\ Equity\ Incentive + a_7\ Inside\ Debt\ Incentive + \\
& a_8 \log(Total\ Assets\ of\ the\ Firm) + a_9 RnD\ to\ Sales + a_{10} Board\ Size + \\
& a_{11} Board\ Independence + a_{12} CEO\ Duality + \\
& a_{13}\ Percentage\ of\ Women\ on\ the\ Board + a_{14}\ CEO\ Gender + \\
& a_{15}\ Financial\ Crisis\ Dummy + \\
& \varepsilon
\end{aligned}
\tag{2}
$$

where

$$Cash = (Annual\ Salary + Annual\ Bonus)$$

$$
\begin{aligned}
Equity = {} & (Value\ of\ Stock\ Awards + Value\ of\ Unvested\ Shares \\
& + Fair\ Value\ of\ Option\ Awards + Estimated\ Value\ in\ Money\ Options)
\end{aligned}
$$

$$
\begin{aligned}
Inside\ Debt = {} & (Annual\ Change\ in\ Pension \\
& + Annual\ Contribution\ to\ Deferred\ Compensation)
\end{aligned}
$$

$$Total\ Pay = (Cash + Equity + Inside\ Debt)$$

$$Cash\ Ratio = \frac{Cash}{Total\ Pay}$$

$$Equity\ Ratio = \frac{Equity}{Total\ Pay}$$

$$Inside\ Debt\ Ratio = \frac{Inside\ Debt}{Total\ Pay}$$

[6] In our data 10.34% of CEOs are 65 years old or older. The variable of time to retirement could have noise, but in the absence of clairvoyant or individually hand-collected CEO survey data, it will suffice as the proxy for expected tenure.

$$Cash\ Incentive = Cash\ Ratio \times Time\ to\ Retirement$$

$$Equity\ Incentive = Equity\ Ratio \times Time\ to\ Retirement$$

$$Inside\ Debt\ Incentive = Inside\ Debt\ Ratio \times Time\ to\ Retirement$$

Table 2 shows the Pearson correlation of the main variables use in our regression models. Those variables do not show problematic collinearity or correlation, based on Pearson correlation tests and Variance Inflation Factor tests. Only the board size shows a correlation of 0.645 to firm size. We can see that *Kdiff* is negatively correlated with *Tobin's Q* and significant at 1% level, consistent with out first hypothesis. In addition, for the correlation of employment horizon to firm performance, CEO's time to retirement and long-term equity incentive both show significantly positive impact, indicating that CEO time horizon does matter. To formally test our hypotheses, we perform multivariate tests and present our results in next section.

[Insert Table 2 about here]

4. Empirical Results

Table 3 presents the regression results of model (1) to test our first hypothesis, based on Jensen and Meckling (1976) that the closer the executive capital structure to firm capital structure, the higher the firm's performance. As show in the table, the coefficients of *Kdiff* in all the three columns are significantly negative at 1% level, no matter industry fixed effects are included (column 3) or not (columns 1 and 2). As the Pearson correlation shows that board size has a high correlation of 0.645 with firm size. To account for this potential multicollinearity problem, in column 2, we exclude firm size from the analysis. Overall, the results in Table 3 confirm that tying executive compensation structure to firm capital structure is positively related to firm performance. Our first hypothesis is supported.

[Insert Table 3 about here]

For control and other variables of interest, we find that larger firms tend to have poorer performance. R&D expenditures are shown to increase firm performance and value, implying that risky investment in the future may lead to increasing valuations. In terms of governance variables, we find that board size is not significant. However, a more independent board is negatively related to firm performance, although it is only significant at the 10% level. Furthermore, when CEO is also the chairman of the board – typically symptomatic of a less independent board, firm's performance is higher. We do not find significant evidence of the relationship between the percentage of women on the board and firm performance. As shown previously in Figure 1, the average number of women on boards is relatively low at 11.5%, but has a relatively promising upward trend reaching 18.49% in 2015. Similarly, our results do not indicate a significant link between women CEOs and firm performance. However, the number of women CEOs in our sample was notably low. Out of 6,149 firm-year observations, only 221 of those had women CEOs (3.6%). The same percentage persists in the data before cleaning; 581 women CEOs out of 17,175 firm-years. Though our sample includes only a subset of American firms, the general trend is not terribly encouraging, with only modest increases in female CEOs from 2006 to 2017, as indicated in Figure 4 previously. Finally, and not surprisingly, the financial crisis has a significantly negative impact on firm performance, as show by the negative sign of the coefficient of *crisisDummy*. Overall, our results are robust when the estimation is conducted without the crisis dummy variable, and our results are consistent when we include firm and year fixed effects.[7]

[7] These results are available upon request.

Table 4 summarizes the results of the regression model testing for CEO horizon and incentives. Overall, the regression results in all the three columns (with or without industry fixed effects and firm size) support our second hypothesis as well.

[Insert Table 4 about here]

When combining time to retirement with the three major components of compensation variables to indicate short-term and long-term incentives, those incentives are significantly related to firm performance. Particularly, the long-term incentive from equity compensation, *Equity Incentive Ratio*, is significantly positively related to firm performance at the 1% level in all the three columns, indicating that equity compensation is a better motivator for younger CEOs who may have longer time to retirement, to align their interests with the firm. Debt incentives are not significant, though the results show a potentially positive relationship, which would indicate the long term inside debt compensation is effective earlier in the CEO's career, and less so for older CEOs who may have shorter time to retirement. Using salary as short-term incentive to boost firm performance and value is more effective when the CEO is nearing retirement, as show by the positive sign of *Cash Ratio* and negative sign of the Cash Incentive variable (i.e. interaction term of *Cash Ratio*Time to Retirement*). Our firm level control variables, such as financial variable, governance variables, as well as the crisis dummy remain robust and consistent with results in Table 3.

5. Conclusion

CEO compensation is an essential decision and not necessarily an issue of self-selection. However, the decision on how to construct the compensation structure is the firm's decision, often under influence from its top manager. The choice of CEO compensation structure is not exogenous, and

should be time varying. In addition to consider general external factors, such as business environment and risk exposure, executive compensation should be designed to better align executives' incentive to the firm, by reducing any potential conflicts of interests due to executives' self serving, and inefficiency caused by agency cost of debt. Firms and stakeholders need to understand how executive compensation structures affect firm performance and risk. Is balancing the stockholder-bondholder conflict using both equity and debt-like compensation enough to motivate performance with an optimal amount of executive risk-taking over time, without exposing the firm to managerial short-termism? We find empirical evidence support the classic Jensen and Meckling (1976) premise that managers should receive debt and equity in proportion to the ownership structure of the firm. We also show that the effects of different components of CEO compensation are dependent on the CEO's time horizon, as measured by the expected period of employment to retirement. Exploring in further detail how variation in compensation contracts, such as potential negotiation of pension agreement terms, and vesting time of various deferred payments may affect firm performance remain topics for future research.

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Figure 1 shows the percentage of women on boards in final dataset which includes 6149 firm-years.

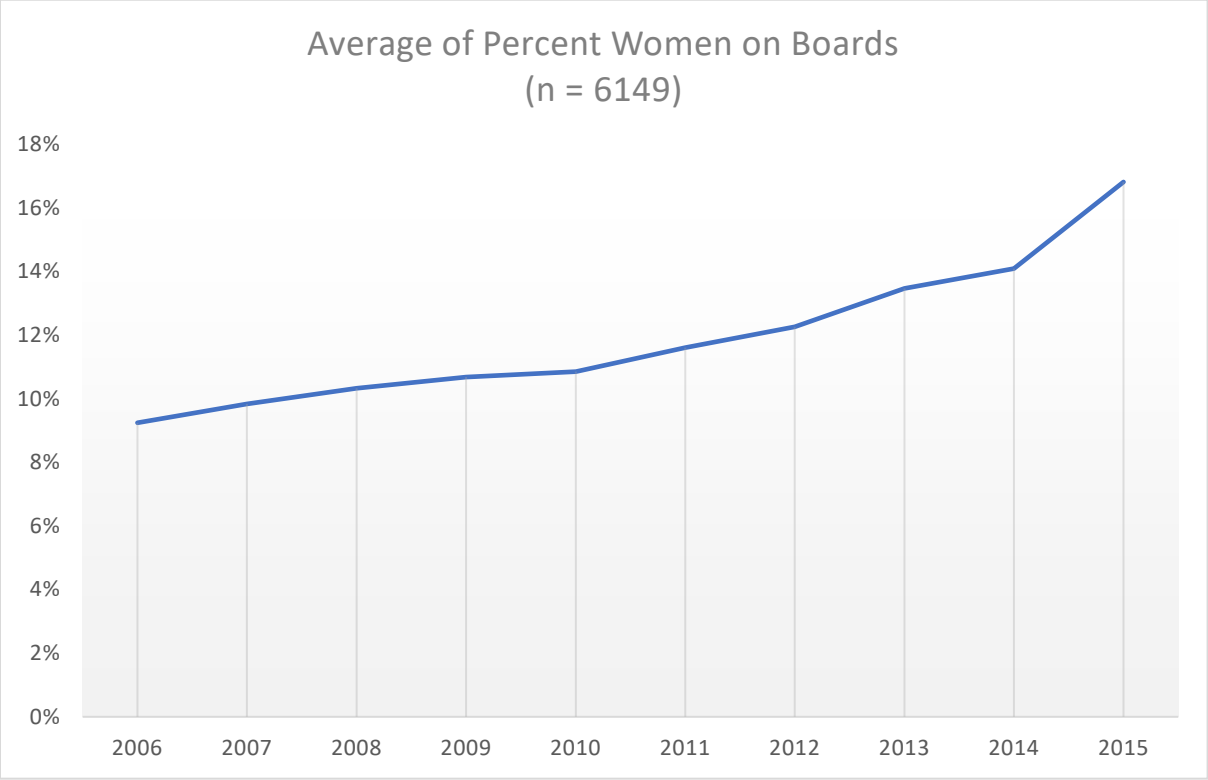

Figure 2 shows the age distribution of CEOs in the final dataset. (N = 6149)

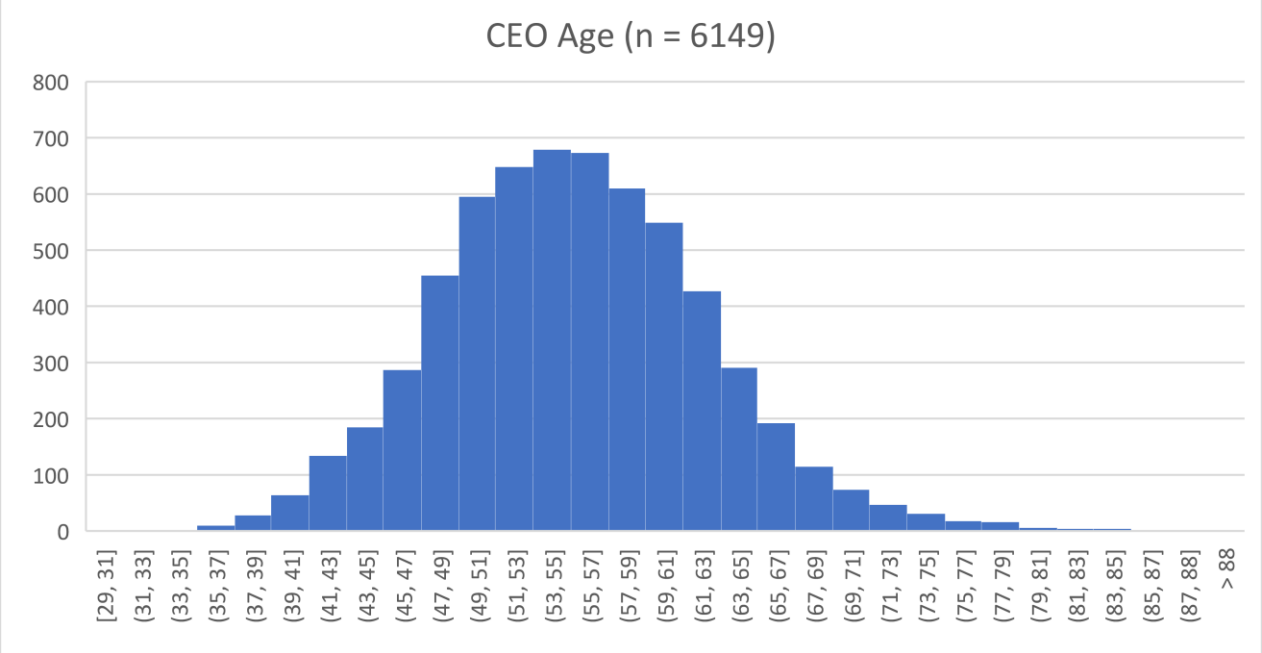

Figure 3 shows the variable Time to Retirement distribution, which has more precision. (N = 6149)

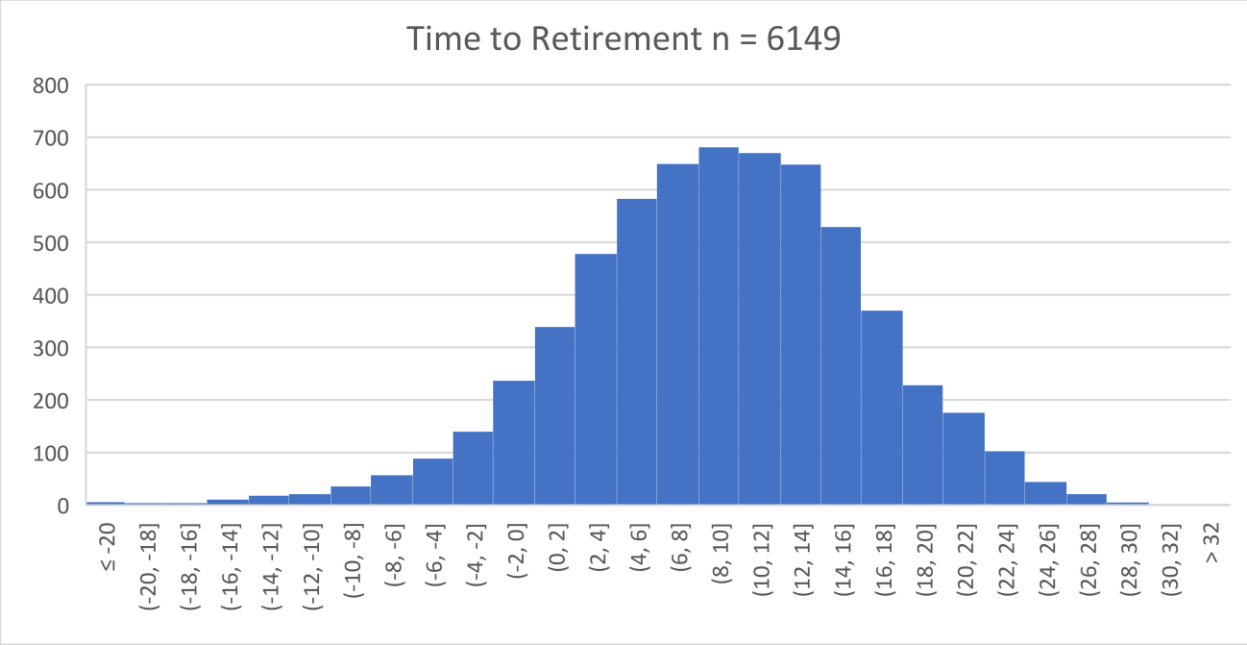

Figure 4: Number of women CEOs (exclude financial firms) N=17,175

The figure shows the percentage and number of CEOs in the dataset after financial firms were removed.

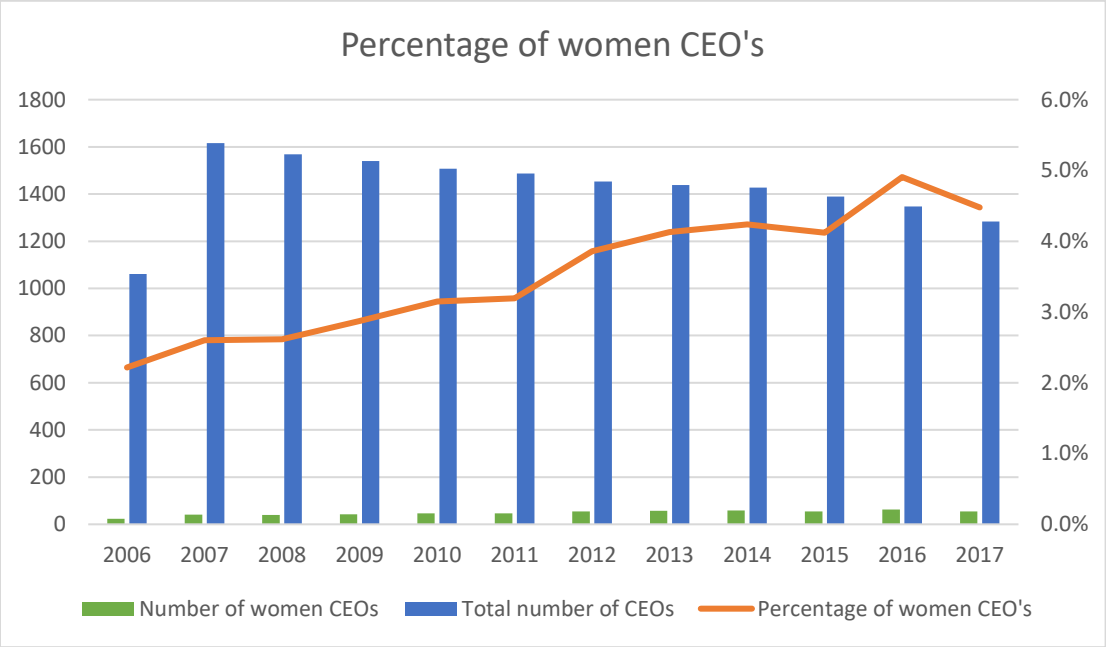

Table 1: Descriptive Statistics

This table provides the summary statistics of the variables that were used in the models, or in calculating model variables.

Variable	Mean	Std Dev	Minimum	Maximum
Total Assets (millions)	5983.54	20362.67	9.90	346808.00
R&D to Sales	0.28	6.84	0	496.62
Debt to Equity	0.26	0.76	0	23.66
Board Size	8.87	2.10	4	20
Board Independence	80%	11%	17%	94%
CEO Duality (CEO + Chairman or Executive Chair on Board)	58%	49%	0%	100%
% of Women on the Board	11%	10%	0%	67%
Women CEOs	4%	19%	0%	100%
Financial Crisis Dummy	36%	48%	0%	100%
Time to Retirement	8.92	7.19	-30.3	35.4
Executive Age	56.10	7.08	28	88
Time in Role (BoardEx)	5.42	5.44	0	60.7
Salary (annual 000’s)	800.50	353.22	0	4875
Bonus (annual 000’s)	111.35	477.57	-8.72	8000
Salary + Bonus (annual 000's)	911.85	637.38	0	9994.62
Change in Pension (annual 000’s)	389.86	1201.67	-422.30	24211.3
Deferred Compensation (annual 000’s)	100.08	1401.75	-53.32	85700
Inside Debt Change (annual 000's)	489.94	1882.45	-422.30	85858.85
Value of Stock Awards (annual 000’s)	2208.78	3197.13	-2175.89	55915.74
Value of Unvested Shares (annual 000’s)	4035.71	13565.01	0	750493.13
Fair Value of Options Granted (000’s)	800.50	353.22	0	4875
Sum of Stock and Options (annual 000's)	7537.84	15205.15	-1204.53	750493.13
Estimated Value of In-the-Money Unexercised Exercisable Options (000’s)	8250.62	33891.47	0	1593600
Estimated Value of In-the-Money Unexercised Unexercisable Options (000’s)	2097.24	7198.96	0	229127.5
Estimated Value of In-the-Money Unexercised Options Total (000’s)	10347.86	38065.63	0	1593600

Table 2 Pearson Correlation

This table provides the Pearson correlation coefficients of all the variables used in the regression models.

Pearson Correlation Coefficients, N = 6149, Prob > |r| under H0: Rho=0

		tobinsQ	1	2	3	4	5	6	7	8	9	10	11	12	13	14
kdiff	1	-0.13815														
		<.0001														
Cash Ratio	2	-0.20185	0.11119													
		<.0001	<.0001													
Equity Ratio	3	0.23069	-0.19866	-0.91982												
		<.0001	<.0001	<.0001												
Debt Ratio	4	-0.11919	0.24761	0.01786	-0.4087											
		<.0001	<.0001	0.1577	<.0001											
Cash Incentive Ratio	5	-0.11678	0.04972	0.57102	-0.5093	-0.02938										
		<.0001	<.0001	<.0001	<.0001	0.0203										
Equity Incentive Ratio	6	0.12189	-0.06826	-0.31043	0.36033	-0.1965	0.19395									
		<.0001	<.0001	<.0001	<.0001	<.0001	<.0001									
Debt Incentive Ratio	7	-0.07387	0.05794	0.01001	-0.28249	0.69593	0.10065	-0.01287								
		<.0001	<.0001	0.4288	<.0001	<.0001	<.0001	0.3091								
Log of total assets	8	-0.10387	0.07313	-0.38469	0.25539	0.24402	-0.26382	0.02146	0.20846							
		<.0001	<.0001	<.0001	<.0001	<.0001	<.0001	0.0899	<.0001							
R&D to sales	9	0.05935	-0.00795	0.06249	-0.05135	-0.01453	0.02354	-0.01859	-0.01094	-0.06819						
		<.0001	0.5297	<.0001	<.0001	0.2506	0.0629	0.1419	0.3873	<.0001						
crisisDummy	10	-0.096	0.05312	0.08895	-0.09589	0.03743	0.09808	0.03468	0.04353	-0.06773	0.01264					
		<.0001	<.0001	<.0001	<.0001	0.0031	<.0001	0.0061	0.0006	<.0001	0.3173					
Board Independence	11	-0.03302	-0.07766	-0.21606	0.16762	0.07545	-0.02113	0.12447	0.11709	0.19457	-0.00399	-0.0331				
		0.0093	<.0001	<.0001	<.0001	<.0001	0.095	<.0001	<.0001	<.0001	0.7525	0.0088				
CEO Duality	12	0.01717	0.01964	-0.07521	0.01969	0.12478	-0.13024	-0.13115	0.0681	0.22444	-0.00561	0.04026	-0.08708			

		0.1767	0.1202	<.0001	0.1193	<.0001	<.0001	<.0001	<.0001	<.0001	0.657	0.0014	<.0001		
% of Women on Board	13	-0.01902	0.0128	-0.15274	0.08962	0.12692	-0.05435	0.05721	0.12546	0.35764	-0.03063	-0.07259	0.21761	0.08356	
		0.1343	0.3113	<.0001	<.0001	<.0001	<.0001	<.0001	<.0001	<.0001	0.0154	<.0001	<.0001	<.0001	
Board Size	14	-0.06937	0.07372	-0.23082	0.11626	0.24066	-0.11959	0.01737	0.19281	0.64519	-0.02188	-0.01212	0.19675	0.12962	0.35964
		<.0001	<.0001	<.0001	<.0001	<.0001	<.0001	0.1699	<.0001	<.0001	0.0835	0.3378	<.0001	<.0001	<.0001
genderDummy	15	-0.00677	-0.0127	0.00863	-0.01032	0.00621	0.03444	0.03428	0.02817	0.00436	-0.00626	-0.00156	0.04372	-0.04573	0.27836	-0.00158
		0.5954	0.3167	0.4962	0.416	0.6245	0.0067	0.007	0.0266	0.731	0.6215	0.9022	0.0006	0.0003	<.0001	0.9011

Table 3: Optimal compensation structure

The table below shows all regression results for the model testing H1, Jensen and Meckling's debt proportion premise, with dependent variable Tobin's Q. P-values are reported in the parentheses. The number of observations, adjusted R^2 and the coefficient of variation for the model are provided. ***, **, and * indicate significance at the 1%, 5% and 10% levels, respectively.

(1) Results for the model: $Tobin^{'}s\ Q = a_0 + a_1 Kdiff + a_2 \log(Total\ Assets\ of\ the\ Firm) + a_3 RnD\ to\ Sales + a_4 Board\ Size + a_5 Board\ Independence + a_6 CEO\ Duality + a_7\ Percentage\ of\ Women\ on\ the\ Board + + a_8\ CEO\ Gender + a_9\ Financial\ Crisis\ Dummy + \varepsilon$

(2) The model without log of total assets. (3) The model with Industry fixed effects.

Variables	Tobin's Q	Tobin's Q	Tobin's Q
	(1)	(2)	(3)
Kdiff	-0.148***	-0.153***	-0.131***
	[0.000]	[0.000]	[0.000]
Log of total assets	-0.087***	-	-0.069***
	[0.000]	-	[0.000]
R&D to sales	0.010***	0.011***	0.008***
	[0.000]	[0.000]	[0.000]
Board independence	-0.282*	-0.374**	-0.335**
	[0.069]	[0.016]	[0.031]
CEO Duality	0.111***	0.070**	0.062*
	[0.001]	[0.035]	[0.058]
Percentage of women on board	0.243	0.062	-0.058
	[0.182]	[0.756]	[0.749]
Board size	0.02	-0.036***	0.006
	[0.859]	[0.000]	[0.544]
Tenure	0.000	0.000	0.001
	[0.955]	[0.942]	[0.7357]
crisisDummy	-0.255***	-0.238***	-0.261***
	[0.000]	[0.000]	[0.000]
genderDummy	-0.066	-0.047	-0.115
	[0.454]	[0.5979]	[0.183]
Intercept	2.352***	2.175***	2.675***
	[0.000]	[0.000]	[0.000]
Industry Fixed Effects	No	No	Yes
Observations	6149	6149	6149
Adj R-Sq	0.041	0.034	0.129
Coeff Var	83.115	83.402	79.202

Table 4: The impact of CEO employment horizon

The table below shows all regression results for the model testing H2, the CEO horizon incentives, with dependent variable Tobin's Q. P-values are reported in the parentheses. The number of observations, adjusted R^2 and the coefficient of variation for the model are provided.

(1) Results for the model: $Tobin's\ Q = a_1 Kdiff + a_2 Cash\ Ratio + a_3\ Equity\ Ratio + a_4\ Inside\ Debt\ Ratio + a_5 Cash\ Incentive + a_6\ Equity\ Incentive + a_7\ Inside\ Debt\ Incentive + a_8 \log(Total\ Assets\ of\ the\ Firm) + a_9 RnD\ to\ Sales + a_{10} Board\ Size + a_{11} Board\ Independence + a_{12} CEO\ Duality + a_{13}\ Percentage\ of\ Women\ on\ the\ Board + a_{14}\ CEO\ Gender + a_{15}\ Financial\ Crisis\ Dummy + \varepsilon$ (2) The model without log of total assets. (3) The model with Industry fixed effects.

Variables	Tobin's Q	Tobin's Q	Tobin's Q
	(1)	(2)	(3)
Kdiff	-0.098***	-0.111***	-0.098***
	[0.000]	[0.000]	[0.000]
Cash Ratio	1.634***	1.410***	2.122***
	[0.000]	[0.000]	[0.000]
Equity Ratio	3.299***	2.744***	3.610***
	[0.000]	[0.000]	[0.000]
Debt Ratio	2.451***	1.841***	3.251***
	[0.000]	[0.000]	[0.000]
Cash Incentive Ratio	-0.018*	-0.011	-0.020**
	[0.063]	[0.251]	[0.033]
Equity Incentive Ratio	0.013***	0.014***	0.013***
	[0.000]	[0.000]	[0.000]
Debt Incentive Ratio	0.034	0.003	0.005
	[0.286]	[0.927]	[0.880]
Log of Total Assets	-0.164***	-	-0.142***
	[0.000]	-	[0.000]
R&D to Sales	0.011***	0.013***	0.009***
	[0.000]	[0.000]	[0.000]
Board independence	-0.736***	-0.804***	-0.734***
	[0.000]	[0.000]	[0.000]
CEO Duality	0.124***	0.061*	0.065**
	[0.000]	[0.061]	[0.041]
% of women on board	0.244	-0.056	-0.063
	[0.165]	[0.750]	[0.722]
Board size	0.016	-0.048***	0.014
	[0.113]	[0.000]	[0.143]
Tenure	0.005	0.004	0.005
	[0.136]	[0.191]	[0.107]
crisisDummy	-0.225***	-0.203***	-0.231***
	[0.000]	[0.000]	[0.000]
genderDummy	-0.038	-0.009	-0.101
	[0.6573]	[0.921]	[0.226]
Industry Fixed Effects	No	No	Yes
Observations	6135	6135	6135
Adj R-Sq	0.628	0.617	0.657
Coeff Var	80.240	81.190	76.838

Appendix: Variable construction and sources.

Variables	Definition	Source
Firm performance and control variables		
Tobins Q	Measure of firm performance. Calculated as the sum of the firm market value, the preferred stock liquidating value and the difference between current liabilities and current assets, divided by the firm's total assets.	Compustat
Log of Total Assets	Log of the firm's total assets	Compustat
R&D to Sales	Research and Development Expense over Sales/Turnover (Net)	Compustat
crisisDummy	Financial crisis indicator equals 1 for fiscal years 2007, 2008 and 2009, using FYEAR.	Compustat
kdiff	Absolute value of the difference between the debt-to-equity ratio of the firm and the annual debt to equity ratio of the manager.	Compustat/ Execucomp
Cash Ratio	The sum of the CEO's salary and bonus divided by the total pay of the CEO (cash + equity + inside debt)	Execucomp
Equity Ratio	The sum of the CEO's compensation of stock, unvested stock, granted options and in-the-money options, divided by the total pay of the CEO (cash + equity + inside debt)	Execucomp
Debt Ratio	The sum of the CEO's total inside debt (pension change, deferred compensation contribution) divided by the total pay of the CEO (cash + equity + inside debt)	Execucomp
Cash Incentive Ratio	Cash ratio multiplied by the CEO's estimated time to retirement	Execucomp
Equity Incentive Ratio	Equity ratio multiplied by the CEO's estimated time to retirement	Execucomp
Debt Incentive Ratio	Debt ratio multiplied by the CEO's estimated time to retirement	Execucomp
Pension Related Variables		
Executive Age	Executive's age at the data date	Execucomp
Time to retirement	Based on a retirement age of 65	Execucomp
Governance Variables		
Time in role	Tenure as CEO	BoardEx
Board Size	Number of directors on the firm's board	BoardEx
Board Independence	Percentage of non-executive directors	BoardEx
CEO Duality	CEO duality or executive chairman present (1- Yes, 0 - No)	BoardEx
CEO Gender	Executive's gender (1 = female, 0 = male)	Execucomp
Percentage of women on the board	Percentage of women on the board	BoardEx