Do Higher Paid CEOs Weather The Storm Better?

Evidence from the Great Recession

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Abstract

Using the 2008 financial crisis as an exogenous shock, this paper examines whether "excessive" CEO pay – above median industry adjusted CEO pay slice (CPS) developed by Bebchuk et al. (2011) – can be a proxy for CEO ability. We find that high CPS firms experienced lower increases in credit default swap spreads and lower declines in firm value (measured by Tobin's q) during the Great Recession than low CPS firms. These findings are consistent with the CEO ability hypothesis that higher paid CEOs appear to navigate through troubled times better than lower paid CEOs but contradict the notion that CPS proxies only for the CEO rent extracting agency problem.

1. Introduction

Getting and keeping a good boss matters more to a firm's owners than how much he or she is paid.[1]

CEO compensation has been a popular topic debated extensively over the years by the press. Following the collapse of Lehman Brother in 2008, the enormous pay received by bank CEOs in contrast with their astonishing failures stimulated another outcry of this issue. It also triggered the Say-on-Pay rules in the Dodd-Frank legislation. For the first time, beginning in 2011, the rule requires that shareholders vote on executive-pay packages. Contrary to the public perception that shareholders cannot do much about CEO pay (without this rule), Kaplan (2011) finds that more than 98 percent of the companies in the Standard & Poor's 500 Index received majority shareholder support. This surprising result appears to be in stark contrast to empirical evidence that the agency problem is a main factor behind the overpaid compensation scheme (see, for example, Bebchuk and Fried (2004)). It is puzzling as to why shareholders did not exercise their newly granted right to halt CEO compensation if it is considered or believed to be excessive.

One persistent challenge in studying CEO pay is that corporate policies and governance structure (including CEO incentive pay) are endogenously determined by the unobserved underlying project payoff distributions as suggested by Boot and Thakor (2011). Baranchuk, MacDonald, and Yang (2011) further show that firm size is endogenously determined by managerial talent. Without an exogenous event, it is very difficult to identify the relations among these complicated intertwined elements. The Great Recession triggered by the 2008 financial crisis provides an ideal platform to examine several key components related to the debates over CEO pay. In this paper, we utilize the price information contained in the credit default swap

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[1] "Executive pay: Bosses under fire," The Economist, January 14th, 2012.

(CDS) market during the Lehman Crisis and firm value (Tobin's q) during the subsequent Great Recession to examine the following question: do higher paid CEOs weather the storm better? In other words, we test the CEO ability hypothesis that, if "excessive" CEO pay is a proxy for unobserved CEO ability, then firms with such CEOs should experience lower increases in CDS spreads during the Lehman Crisis and lower declines in Tobin's q during the Great Recession.

CDS is a new financial innovation and similar to an insurance policy on a company's credit event. A higher CDS spread indicates higher firm default risk. Longstaff, Mithal, and Neis (2005) determine the default components in corporate bond spreads by using CDS spreads. CDS spread analysis is particularly useful in the context of identifying CEO ability during crisis because it is closely related to the wealth effect of creditors. Firm value drops in general during financial crisis, but if higher ability CEOs can manage the exogenous shock better than lower ability CEOs, then the firm value of higher ability CEOs will drop less than that of lower ability CEOs. However, because equity holders are residual claimants, whether equity holders benefit from higher ability CEOs during crisis also depends on how much firm value has dropped. It is not surprising that, in some cases, all benefits may be captured by creditors. Therefore, the value implication for creditors is relatively cleaner than that for equity holders.

One concern of using CDS spreads is that if a CEO took lower risk in the first place, which is also a form of the agency problem from the equity holders' perspective, then, during crisis, CDS spreads of a low risk taker will not increase as much as those of a properly incentivized CEO. We address CEO risk taking incentive by using the CEO inside debt-equity ratio employed in Wei and Yermack (2011), which control for how CEOs balance interests between the creditors

and the shareholders.[2] We also employ other risk taking control variables, such as delta and vega, which measure the wealth change of CEOs given one percent change in stock price and 0.01 change in stock return volatility, respectively, suggested by Core and Guay (2002).

For completeness, we examine both CDS spread and Tobin's q with a greater focus on the CDS analysis. For this reason, our sample only includes firms with CDS spreads available for analysis during our event windows. Because only very large and high quality firms have traded CDS contracts, the sample is more homogeneous than other studies using broader samples. It also means that, for these firms, the CEO ability component will be relatively larger in the "excessive" CEO pay measure – CEO pay slice (CPS) split among the top five executives (CPS) developed by Bebchuk et al. (2011).[3] Therefore, such a sample may provide enough statistical power to have CEO ability outweigh agency problem. This empirical strategy is also employed by Rajgopal, Shevlin, Zamora (2006). In search of greater support for their CEO outside opportunities hypothesis, they argue that talented managers tend to move to large firms, such as S&P 500 firms used in their sample.

We focus on industry adjusted CEO pay slice (CPS) to control for the tournament incentives driven by the pay gaps between CEOs and lower rank executives (VPs) (see, for example, Lazear and Rosen (1981) and Bognanno (2001)).[4] Kale, Reis, and Venkateswaran (2009) empirically show that the higher pay gaps provide incentives for VPs to work harder in hope of being promoted to the CEO rank and obtaining such high compensation in the future. The positive

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[2] We are grateful to Chenyang Wei and David Yermack for sharing their CEO inside debt data.

[3] There are little statistically discernible differences in various firm characteristics and governance attributes between high and low CPS firms except for CEO pay, which is different by construction.

[4] Gormley and Matsa (2012) argue that industry adjusted variables may produce biased estimates and suggest to control industry effect in the fixed effects model. We also follow their suggestions to test our hypothesis and find that our results are robust to the alternative method.

competition among VPs then contributes to higher firm values.[5] To tease out the tournament effect from CEO ability, Kale et al. (2009) use median industry pay gap as an instrumental variable in their regressions.[6] On the contrary, in our study, we need to net out the tournament effect and leaving the portion of CEO ability in the CPS measure. Therefore, we use industry adjusted CPS. To further control for the total ability of top five executives as a team that enhances firm value, we include abnormal total compensation from these executives.

Although the CEO pay gaps have been viewed as a proxy for tournament incentives in many studies and find positive effect on firm values, extant literature also provides overwhelming evidence that CEO pay gap is driven by the agency problem – misuse of CEO power that are value destroying. Bebchuk et al. (2011) find that CPS is negatively correlated with firm value, accounting profitability, acquisition announcement returns, and performance sensitivity of CEO turnover. Core, Holthausen, and Larcker (1999) find that more entrenched CEOs receive higher pay and more perks, which reduce firm cash flows. Therefore, it is harmful for both shareholders and creditors. Liu and Jiraporn (2010) provide empirical evidence showing that firms with more powerful CEOs (high CPS) have lower credit ratings and pay higher at-issue bond yields.

Our paper has a different focus. We intend to test if this "excessive" CEO pay is driven by unobserved CEO ability. There is no reason that both factors cannot coexist in the system. In fact, a standard information asymmetry problem argument would support the coexistence of both factors. Therefore, rent extracting CEOs can pool with high ability CEOs, which also makes the

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[5] Using a cross country analysis, Burns, Minnick, and Starks (2012) demonstrate that the usage of tournament and its effect on firm values are influenced by cultures.

[6] Kale et al. (2009) argue that. Based on Murphy (1999), the level and structure of managerial compensation are driven by firm size and industry. The appropriate level of tournament size is likely to be similar within an industry.

debates on this issue unsettling and policies tough to craft.[7] Otherwise, the issue would be easy to resolve if CPS and other powerful CEO proxies are clean measures for only one factor.[8]

Alternatively, the puzzling high CPS and lower firm value relation can be explained by the theoretical model of Boot and Thakor (2011). Based on the premise that investors and managers may have different beliefs about project values, they show that this disagreement can lead to lower equity (and potentially bond) valuation from new investors. Although Boot and Thakor (2011) do not include CEO ability in their analysis, if firms having a higher potential for manager-investor disagreement are more challenging to manage, then such firms would have to pay more to attract more capable CEOs. Therefore, it is possible that, empirically, higher paid CEOs are a proxy for better CEO ability, but at the same time, equity and bond values for these firms appear to be lower. It follows that CPS can be a noisy proxy for the CEO rent extracting agency problem, manger-investor disagreement, and CEO ability.[9] However, the noise of potential agency problems and manager-investor disagreement indeed biases toward not finding evidence supporting the CEO ability hypothesis because both factors predict depressed firm value from outside investors' perspectives. Nonetheless, manager-investor disagreement is likely similar within an industry, which renders using industry adjusted CPS as a measure of "excessive" CEO pay besides the reason of controlling for the tournament effect.

Consistent with the CEO ability hypothesis, firms with higher CPS experienced a significantly lower increase in CDS spreads between the month prior to and following the

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[7] This is consistent with the view raised by Weisbach (2007) that CEO compensation reform is likely outside the realm of regulatory improvements because a CEO's bargaining power is endogenously determined within the firm. If the bargaining power is partly due to better CEO ability, it further diminishes the role of regulation.

[8] Murphy (2012) provides excellent discussions and literature review on these debates.

[9] Using a rare dataset that collects CEO attributes for private equity invested firms, Kaplan, Klebanov, and Sorensen (2011) are able to study CEO abilities and find that execution skill and resoluteness are positively related to firm performance. Chemmanur, Paeglis, and Simonyan (2010) use hand-collected management quality data from IPO prospectuses and find that higher managerial quality firms tend to have more antitakeover provisions and firms high on both dimensions outperform other types of firms low on both or either dimension.

Lehman Crisis. A one percent increase in industry adjusted CPS is associated with a 1.7 bps lower increase in CDS spreads. Given the 10% difference in median CPS between high and low CPS firms, this 17 bps difference is economically significant because CDS spread represents an annual insurance premium and the pre-crisis median CDS spread is about 35 bps for all firms. The findings are further supported by the analysis of Tobin's q. Higher CPS firms experienced significantly lower firm value declines than lower CPS firms during the Great Recession.

Using an exogenous event, such as financial crisis, this study teases out the managerial ability component in commonly used proxy for managerial agency problem. It provides a better understanding of the factors determining CEO pay levels, which Bebchuk and Weisbach (2010) point out as an important research topic. Our results are consistent with recent studies on a market-based explanation of CEO compensation. Kapalan and Rauh (2010) show that income of other professions increased by a greater extent than non-financial-firm top executives in the ExecuComp database during the period of 1994-2004. The finding of Kaplan and Rauh (2010) provides support that the rise of CEO pay is consistent with the theories of skill-biased technological change (Garicano and Rossi-Hansberb 2006), superstars (Rosen 1981), greater scale (Gabaix and Landier 2008) and the interactions of these factors. Furthermore, Fernandes, et al. (2012) compare CEO compensation across fourteen countries and find that these is no statistically discernable US pay premium by 2007 and the risk premium for stock-option compensation is the main driver of the differences.

Our analysis using financial crisis provides another aspect of CEO ability with regard to crisis management as globalization and technology developments also increase the level of competition and uncertainty in the business world. CEOs with better capacity to navigate through

a difficult environment are likely to be paid higher even though firm value and profitability appear to be similar to other type of firms during normal times.

The remainder of this paper is organized as follows. Section 2 discusses the hypothesis, the CDS market, and the literature. Section 3 explains the sample selection, data, and variables. Section 4 reports the empirical analyses. Section 5 concludes.

2. Hypothesis Development and Literature

2.1. The CEO ability hypothesis

The main hypothesis of this paper follows the theoretical model proposed by Boot and Thakor (2011). In their model, managers (also representing initial owners) may disagree with new investors regarding project choice because different beliefs about the precision of a commonly observed prior signal about a project. Higher managerial autonomy in terms of project choice provides managers the flexibility to maximize initial owners' wealth. However, the manger-investor disagreement in beliefs leads to a more sensitive positive relation between managerial autonomy and the cost of external financing, i.e. a lower equity value. It is important to note that their model does not rely on the typical agency problem raised by Jensen and Meckling (1976).

Although Boot and Thakor did not consider CEO ability and compensation in their model, it provides a useful framework to offer an alternative explanation to the empirical evidence documented by Bebchuk et al. (2011). They show that CPS is negatively correlated with firm value measured by Tobin's q. As discussed by the authors, CPS may reflect the relative importance of the CEO (relatively high ability) and the CEO abnormal rent extraction (agency

problem). If a firm with a high potential for manager-investor disagreement in project choices is also more difficult to manage, then such a firm needs to hire a high ability CEO who will be paid relatively more than others for the more challenging task. Such an environment can also foster agency problem easier than firms with low manger-investor disagreement. In this case, CPS is not only the proxy for agency problem but also for both CEO ability and the extent of manager-investor disagreement in project choices. Because it is difficult to isolate these effects empirically, it makes the policy making on CEO compensation particularly challenging.

Bebchuk et al. (2011) has documented convincing evidence that high CPS can be a sign of high agency problem through various analyses during normal times. In this paper, we examine whether CPS is also a proxy for CEO ability by using the financial crisis in 2008 and the subsequent Great Recession. If high CPS is also a proxy for high CEO ability, then during difficult time, such a firm will experience lower probability of failure, i.e., lower default risk. We test this CEO ability hypothesis by using CDS spreads. The hypothesis predicts that high CPS firms will experience lower CDS spread increases than low CPS firms when crisis hits. If CPS is a pure CEO rent extraction proxy, then we would observe the opposite because lower quality firms tend to be screened out during economic downturns, while both high and low quality firms can do well during economic upturns.

We recognize that, the value implication of agency problem for creditors can be different from that for shareholders because there are two kinds of agency costs (see, for example, Billett, Hribar, and Liu (2011)). The first type of agency cost comes from the misalignment of interests between managers and shareholders. The second type –the agency cost of debt – occurs when managers take actions that benefit shareholders at the expense of debt holders (Jensen and

Meckling (1976)). The later type would predict lower value implication for creditors, thus, indeed makes it hard to find evidence that is consistent with the CEO ability hypothesis.

Within the first type, there are two finer categories of agency costs: risk taking and value destruction. The risk taking agency problem arises from that risk-averse mangers tend to choose lower risk projects than those desired by shareholders (See, for example, Bertrand and Mullainathan (2003), Shleifer and Vishny (1986)). Because CPS is a within firm measure, there is no obvious reason that CPS is related to high or low risk taking of CEOs in a particular fashion, but if a CEO takes lower risk than what shareholders desire, this type of agency problem may indeed enhance the value of creditors and bias our analysis of CDS spreads towards finding CEO ability. However, this is not what Liu and Jiraporn (2010) found in their study of bond rating and at-issue bond yields. Their results are consistent with Bebchuk et al. (2011) that the value destruction agency problem prevails in the high CPS firms.

Despite the little chance that our findings of CEO abilities can be attributed to the low risk taking agency problem of CEOs, we take care of the issue in two ways. First, we control for CEO risk taking incentive through compensation structures. We use the CEO's inside debt-equity ratio as defined by Wei and Yermack (2011) to control for how a CEO balance the interests between the creditors and the shareholders. Secondly, we formally examine Tobin's q, so we can analyze how shareholders view firms with different levels of CPS throughout the crisis. If shareholders also value high CPS firms higher during crisis than low CPS firms, then we can rule out this low risk taking (lower than desired by shareholders) problem while testing CEO ability. The second type of agency problem – value destruction (or rent extraction by CEOs) – intended by Bebchuk et al. (2011) definitely go against our CEO ability hypothesis because it is harmful for both creditors and shareholders.

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The recent financial crisis provides an exogenous shock to industrial firms, which is ideal to test our hypothesis because other corporate events or policies may be endogenously related to the CPS measures. As suggested by Boot and Thakor (2011), corporate governance structure is first determined based on managers' expectation of the level of manger-investor disagreement about project choice. Such an expectation and the value of asset in place then determine the type of financing, followed by project selection. Therefore, the exogenous shock from the financial sector allows us to analyze firm performance without such an endogeneity concern, which can be differencing out within firms.

Finally, we should emphasize that our analysis tries to decompose what fundamental economic factors constitute the CPS measure, i.e., for what CPS is a proxy. It is different from the type of analysis trying to identify "treatment effect," such as tournament incentives. In the context of proxy variable, CPS is naturally derived from underlying economic forces – the level of agency problem, difficulty of managing the firms, and CEO ability in our context. In this case, the outside exogenous events that tilt these forces into relatively different levels of importance can help us identify whether such forces exist. Thus, if we identify that high CPS (net of median industry CPS to control for tournament effect) is also a proxy for high CEO ability, we cannot interpret this in a "treatment effect" fashion by saying that if we increase the level of CPS we can make a CEO more capable. It is obvious that such a statement is oblivious. Therefore, the normal techniques and concerns in identifying treatment effect do not apply to this study.

2.2. CDS spreads

A CDS allows one party transfers the default risk of a reference entity (or a firm) to another by paying an annual premium during the term of the contract. The premium (CDS spread) is

quoted in basis points. For a CDS spread of 100 bps, to insure $100 million of debt claim for 5 years, the buyer will pay $1 million per year to the seller. In the event of default or credit events specified in the contract, one of two types of settlement can be used. If physical settlement is used, the seller has to pay the buyer the face value of insured debt in exchange of physical delivery of the debt claim. In a cash settlement, the seller pays the buyer the difference between the face value and the market value of the defaulted debt claim.

The spread of CDS has become an important information source regarding a reference entity's credit condition. Norden and Weber (2004) compare the stock and CDS market reactions to rating announcements and find that the CDS market leads the stock market in the event of reviewing for downgrades. Hull, Predescu, and White (2004) also document that the CDS market anticipates downgrade, review for downgrade, and negative outlook of a firm. In addition, Blanco, Simon, and Marsh (2005) argue that the CDS market is the most efficient platform for trading credit risk because the CDS market leap frogs the bond market in the price discovery process.

Our analysis focuses on CDS spreads – default risk crucial for creditors for several reasons. First, the revelation of a high ability CEO to weather storm during crisis will mitigate the drop in firm value relative to a low ability CEO, but such a benefit is more likely to be captured by creditors because equity holders are residual claimers. Second, CDS contracts are actively traded. The price information is more reliable than that of thinly traded bonds or loans, which may not even have prices available for analysis. Third, CDSs are traded by large sophisticated institutional investors. Therefore, CDS spreads tend to be more information-efficient than stock prices. Acharya and Johnson (2006) show that there is an information flow from the CDS market to the equity market possibly due to private information utilized by informed banks, the primary

participants in the CDS market. The liquidity constraint of investors during crisis may further distort stock prices if they choose to sell better quality firms to avoid deeper "hair cut" due to temporary market illiquidity triggered by the financial crisis.

2.3. CEO compensation literature

There is an extensive literature on CEO compensations. Several recent papers document a large increase of CEO compensation since the 1970 (Bebchuk and Grinstein, 2005; Frydman and Saks, 2010). The rise in CEO pay has drawn attentions from the press and academia although Jensen and Murphy (1990) have argued that it is more important to focus on the structure of CEO compensation than how much CEOs are paid. More recently, the debates on CEO compensation focus on the following issues. First, are CEOs overpaid? Second, are CEOs paid for performance? Third, what does explain the rise in CEO pay? Explanations for CEO compensation can be divided into two main views: managerial rent extraction vs. market-based explanation (Frydman and Jenter, 2010). In this subsection we briefly summarize the main findings from previous studies on these issues.

Managerial rent extraction views that CEOs have the ability to decide their own pay and thus predicts overpay to CEOs. In support of this view, Core et al. (1999) show that higher CEO compensation is associated with a larger board, more outside directors appointed by the CEO, and more busy outside directors. Bebchuk and Grinstein (2005) show that, during 1993 to 2003, the growth of CEO pay is way beyond that could be explained by the size, performance, and the industry of the firm. The results suggest that CEOs are overpaid and their compensation is not linked to performance. Using CEO Pay Slice (CPS) to reflect the CEO dominance and the ability of CEO to extract rents on shareholders, Bebchuk et al. (2011) show that CPS is negatively associated with firm value and accounting performance.

On the other hand, Frydman and Saks (2010) analyze the trends in executive compensation from 1936 to 2005 and show that CEO compensation has steady increased since 1970. Frydman and Jenter (2010) argue that the managerial rent extraction as well as CEO compensation should fall since most evidence suggests that corporate governance has strengthened during this period (Holmström and Kaplan 2001, Hermalin 2005, Kaplan 2008). Thus, Frydman and Saks (2010) argue that managerial rent extraction fails to explain the upward trend of CEO compensation after 1970. However, Bizjak, Lemmon, and Nguyen (2011) show evidence that part of the increasing in CEO pay is driven by the practice of biased peer group benchmarking.

In contrast to the managerial rent extraction, several studies examine the rise in CEO pay with the market-based view. Rosen (1981) develop a model showing that a small number of superstars dominate the market in which they work and earn enormous pay from their professions. Similarly, in Garicano and Rossi-Hansberg's (2006) model, they show that improvements on communication technology allow high skill managers to leverage their knowledge through large teams, thus generate the superstar effect. Building on Rosen (1981), Gabaix and Landier (2008) further model that CEOs with better managerial talent are matched to larger firms and the marginal product of the CEO is proportional to the firm size. They argue that the rise in CEO pay is due to the increase in market capitalization of firms. Murphy and Zabojnik (2007) further argue that a shift in the importance of transferable "managerial ability" relative to "firm-specific human capital" improves CEOs' bargaining position, which leads to the growth in CEO pay levels.

To investigate whether the growth of CEO pay is driven by market forces, Kaplan and Rauh (2010) compare top executive pay with other professionals at the top brackets of the income distribution, including lawyers, hedge fund managers, private equity and venture capital

professions, athletes, and celebrities. Although income of top executives increased from 1994 to 2004, their results suggest that income of other professions increased to a greater extent. To show that CEOs are paid for performance, they report that firms with CEO compensation at the top (bottom) 20% outperform (underperform) their peers by 61% (19%) in stock returns. This evidence strongly supports that the actual CEO compensation is highly related to performance. The finding of Kaplan and Rauh (2010) provide support that the rise of CEO pay is consistent with the theories of skill-biased technological change (Garicano and Rossi-Hansberb 2006), superstars (Rosen 1981), greater scale (Gabaix and Landier 2008), and the interactions of these factors.

Kaplan (2008) further argues that good CEOs are not overpaid, but underpaid with several facts: (1) he cited news from the New York Times that private equity firms offer high pay to attract CEOs (Sorkin and Dash, 2007); (2) instead of staying as public company CEOs, many CEOs chose to work for private equity-funded firms; (3) some successful public company CEO have gone to work for private equity firms. Our analysis is in line with the above literature by examining whether higher paid CEOs can navigate troubled time – an event different from the above literature – better than lower paid CEOs.

3. Data and Variables

3.1. Sample selection

We obtain the CDS data from Credit Market Analysis Limited (CMA). The CMA data are consensus quotes, which approximate the true market prices for the reference entities and provide continuity in CDS prices that is useful in time-series analysis. We follow the literature by using senior 5-year term CDS quotes, which are the most liquid series and account for over

85% of the entire CDS market. We merge the CDS data to Standard and Poor's (S&P) ExecuComp database and to the governance data from IRRC. Our initial CDS sample consists of more than 600 unique reference entities. Following the sample selection criteria of Bebchuk et al. (2011) by restricting CEOs having at least one year tenure (to avoid partial year compensation) and firms reporting top five executive compensation, we obtain 407 firms. Among them, 332 are industrial firms and 75 are financial firms. Our key independent variable – CPS is the fraction of the total top five executives' compensation that goes to CEO. Total compensation includes salary, bonus, other annual pay, long-term incentive payouts, the total value of restricted stock, and the Black-Scholes value of stock options granted that year, i.e., the tdc1 item in ExecuComp database. Firms with above (below) median industry adjusted CPS during the fiscal year prior to the Lehman Crisis are classified as high (low) CPS firms. Industries are classified based on four digits SIC codes using all firms in ExecuComp database.

Sample distributions are provided in Table 1. There is no obvious industry clustering between CPS types. Throughout the paper, we use industry adjusted CPS and Tobin's q for our main analysis to mitigate any asset characteristic and industry effects. Although in the raw data, we retained financial firms and intended to analyze both financial and industrial firms separately. However, in most of the analysis, the results are not as robust for financial firms. We find large negative estimates indicating that higher CPS financial institutions are associated with lower CDS spreads but the findings are not significant.[10] Nonetheless, the findings of Tobin's q are significant and consistent with the CEO ability hypothesis. In order to avoid the complication of interpreting our results because of regulatory intervention in the financial sector, we only use industrial firms for our main analysis.

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[10] The results are available upon request.

Table 1 also reports the sample distribution by credit rating. About 97% of industrial firms are rated. The majority of industrial firms (81%) are middle quality firms, i.e., A, BBB, and BB rated firms. Low CPS firms appear to have lower credit ratings than High CPS firms. However, the differences are not significant statistically. To prevent any effect driven by the differences in credit ratings, we control for credit ratings in all regression analyses.

3.2. Event windows and CDS spreads

We focus our analysis surrounding the Lehman bankruptcy filing on September 15, 2008. However, the crisis has been unfolded gradually since June of 2007 when two of Bear Stearns' hedge funds tried to sell $4 billion of mortgage-backed securities to raise cash.[11] It followed by the event on March 14, 2008 when the Federal Reserve Bank of New York arranged a fire sale of Bear Stearns to J. P. Morgan for $2 per share. Appendix A shows the exact event dates for these three events – the Subprime Crisis, the Bear Crisis, and the Lehman Crisis.

There were several concurrent events during the Lehman Crisis. Merrill Lynch was arranged to merge with Bank of America also on September 15, 2008. Goldman Sachs and Morgan Stanley converted to commercial banks two days later. Both Citigroup and AIG, the latter was heavy involved in the CDS market, posed a big threat to the stability of financial system. The U.S. government signed into law the Troubled Asset Relief Program (TARP) on October 3, 2008, but the details of TARP were not announced until October 14, 2008.[12]

Figure 1 shows that median CDS spreads for low CPS firms are higher than those for high CPS firms, particularly surrounding and following the Lehman Crisis. The high volatility and the nature of information revelation during crises suggest that a longer event window is more

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[11] See "Bear's Fund Is Facing Mortgage Losses: Bond Sale Set for Today in Attempt to Raise Cash; Woes Could Be Another Sobering Sign for Market," Wall Street Journal, June 14, 2007.

[12] Treasury Secretary Henry M. Paulson announced the details of the TARP plan on October 14, 2008. See "Drama Behind a $250 Billion Banking Deal," the New York Times, October 14, 2008,

appropriate for analysis. Therefore, we calculate the median CDS spread of each firm during 21 trading days prior to (from -21 to -1) and following (from 0 to 20) each event, which is about one calendar month. We then compare these median CDS spreads between high and low CPS firms in Table 2. There are no differences between these two types of firms surrounding the Subprime Crisis and one year prior to this event (not reported in the table). The median "median" CDS spread for low (high) CPS firms as a group was 38.9 (34.2) basis points (bps) prior to the Subprime Crisis and increased to 40.4 (39.9) bps following the event.[13]

Using the one-month window, low CPS firms had significantly higher CDS spreads in median than high CPS firms during both Bear and Lehman Crises. The average spreads are significantly different between CPS types surrounding the Lehman Crisis. However, the difference-in-differences tests are significant only for the Lehman Crisis but not for the Bear Crisis. The market appears to react significantly to the Lehman Crisis but not the Bear and the Subprime Crises. Following the Lehman Crisis, the mean CDS spread of low CPS firms increased by 91.7 to 453.8 bps, while that of high CPS firms increased by 51.6 to 314.2 bps.

3.3. Summary statistics of variables

Further requirement for firm characteristics in Compustat and CRSP results a sample ranging from 237 to 279 industry firms depending on the required explanatory variable sets in the regression analyses. Univariate comparisons of firm and governance characteristics between CPS firm types during 2007 fiscal year are reported in Table 3. The majority of variables have 332 observations – 163 (169) for low (high) CPS firms. The key variables that reduce our sample size dramatically are cash flow volatility and its industry adjusted version. The sample appears to be rather homogenous because, except for the compensation variables, all other governance

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[13] For the remaining of the paper, we drop the term "median" for brevity, although all CDS spreads used in the analyses are median CDS spreads during a month for firms.

variables are insignificantly different between groups with the exception of CEO is the only director on board. The fact that CEO age, CEO tenure, and outside CEO indicator are insignificantly different between CPS types indicates that tournament incentive effect driven by the probability of promotion is likely similar.

By construction, high CPS firms have significantly higher CPS, industry-adjusted CPS, and total CEO compensation than low CPS firms. The median total CEO compensation is more than nine (six) million for high (low) CPS firms. Relative equity compensation is significantly higher for high CPS firms than for low CPS firms in median. The sums of top five executives' compensation are not significantly different between CPS types, but the log of abnormal top five executives' total compensation are significantly different between firm types. Log of abnormal top five executives' total compensation is the residual of a regression of total compensation of the top five executives on the log of total assets and industry dummies (based on one-digit SIC codes) using 2007 fiscal year data. The results suggest that the top management teams in high CPS firms are paid relatively more than those in low CPS firms after controlling for firm size and industry.

To control for CEO risk taking incentive, we follow Wei and Yermack (2011) to construct CEO inside debt variables. All of them are not significantly different between firm types. The CEO's inside debt-equity ratios are defined by the value of inside debt (pension + deferred compensation) divided by the value of inside equity (stock + options). More information regarding the construction of variables is in Appendix B.[14]

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[14] We obtain three inside-debt measures reported in Table 1 of Wei and Yermack (2011) - CEO inside debt-equity ratio, CEO relative debt-equity ratio, and CEO relative incentive ratio. We find that all produce similar results, thus we only use the first one in our study. The variables are measured using 2006 fiscal year since these types of compensations are meant to be long-term, we do not expect they change too much within one year. If the inside debt information is missing, we set the number to 0.

Another two common CEO incentive control variables are delta and vega suggested by Core and Guay (2002). *Delta* is the dollar change in the value of the option and/or restricted stock grants, share holdings, and any restricted stock and option holdings for a 1% change in the stock price. *Vega* is the dollar change in the value of the CEO's option grants and any option holdings for a 0.01 change in the annualized standard deviation of stock returns. Both variables are not significantly different between firm types. To control for asset risk characteristic, we further construct a cash flow volatility variable following Parrino and Weisbach (1999). It is the standard deviation of percentage change in EBITDA for the past 15 years. High CPS firms have significantly lower industry adjusted cash flow volatility than low CPS firms in median, but there is no significant difference in raw measure.

When constructing governance variables, we also follow Bebchuk et al. (2011). The e-index is based on Bebchuk, Cohen, and Ferrell (2009). It counts whether a firm's charter has a certain shareholder rights provision. The six provisions considered are classified boards, poison pills, golden parachutes, and supermajority voting requirements for charters, by-laws, and mergers. The index ranges between 0 and 6 with the higher number indicating more entrenched management. The details are in Appendix B. The mean e-index of 3.0 in our CDS sample is much higher than the 2.2 reported by Bebchuk et al. (2011) because our sample only contains very large firms. This also explains why insider ownership, which is the fraction of shares held by insiders reported in ExecuComp, is very low, only five CEO owns shares greater than or equal to 20%, and a meager 11.5% of CEOs are founders. Founder CEOs equals to one if a CEO starting date is earlier than the date that the firm first appeared in CRSP. The proportion of CEOs hired from outside the companies (outside CEO) is also lower at 12% for both types of firms. This dummy variable is 1 if the CEO joined the company within one year prior to becoming

CEO. The proportion of CEOs who are also chairmen of boards for both types of firms is 69%, which is slightly lower than the 73% reported by Bebchuk et al. (2011) using much larger sample. The median age of company is 35 for low CPS firms and 36 for high CPS firms. The median age of CEO is 56 years for both types of firms. The only significant variable in this category is the indicator that CEO is the only director on board, which is 54% for high CPS firms and only 38% for low CPS firms.

During the fiscal year prior to the Lehman Crisis, the firm characteristics are very similar between both types of firms. We examine firm values, liquidity ratios, leverages, investment policies, dividend payout, profitability, and stock performance. Low CPS firms are marginally significantly larger than high CPS firms in mean total assets but very similar in median. High CPS firms appear to be more profitable than low CPS firms measured by mean ROA (EBIT/TA) and median industry adjusted ROA. The one-year prior stock performance of high CPS firms is also statistically better than that of low CPS firms regardless of index used. The results suggest that high CPS firms have been doing relatively well than low CPS firms surrounding the Subprime Crisis. We also check the profitability and stock performance during 2006 and 2005 fiscal years and find that both types of firms are not significantly different with the only exception that high CPS firms had significantly higher industry adjusted ROA in 2006 than low CPS firms.

4. Empirical results and discussions

4.1. CDS spreads

We formally test the CEO ability hypothesis in regressions. All independent variables are from the fiscal year prior to the year when dependent variables are measured. In Table 4, the key

dependent variable is change in CDS spreads, which is the median CDS spread during the month following an event minus that prior to an event. Panel A, Table 4 shows that industry adjusted CPS is significantly negatively related to CDS spread changes during the Lehman Crisis, but not significant for both Subprime and Bear Crises. One percent increase in industry adjusted CPS is associated with 1.6 bps less increase in CDS spreads. Given about 10% difference in median CPS between high and low CPS firms in Table 3, the 16 bps difference is economically significant because CDS spread represents an annual insurance premium and pre-crisis median CDS spread is about 35 bps for all firms. The finding is consistent with the CEO ability hypothesis because a "CEO rent extracting" agency problem hypothesis would not predict such a result.

The regression for Leman Crisis in Panel A, Table 4 also shows that larger firms and firms with higher leverage, higher prior industry adjusted Tobin's q, and less profitability experienced significantly higher increase in CDS spreads. Firms with insiders owning more shares exhibited significantly lower increase in CDS spreads, but the marginal effect reduced at a higher level of insider ownership as the square term is significantly positive. Firms' CEOs with more relative equity compensation shows significantly higher increase in CDS spreads, but the indicators for CEO being Chairman of the board and for CEO being the only director on board are both significantly negative. These findings are inconsistent with the agency problem hypothesis because they indicate that powerful CEOs performed better during the Lehman Crisis. The control for total top management team ability (abnormal total compensation) is insignificant which indicate that capable CEOs are the main drivers of lower CDS spread increases.

We use the model specification for CDS spread and Tobin's q regressions similar to that in Bebchuk et al. (2011) in Panel A to facility the ease of comparisons. However, we also add cash

holdings, collaterals, and short-term debt due in one year as additional control variables. We further restrict our sample to exclude firms whose fiscal year does not end in December to ensure data consistency. We find that our main results are robust. Therefore, they are not reported for brevity. To further control for CEO risk taking incentive and asset risk characteristics, we include CEO inside debt incentive, delta, vega, and industry adjusted cash flow volatility in Panel B of Table 4. However, none of these additional control variables are significant and our main findings on the CPS variables remain robust.

The CDS market did not react much during the Subprime Crisis and appeared to show differences during the Bear Crisis. However, it is only significant in the univariate tests in Table 2 rather than in Table 4. Therefore, for the remaining of the paper, we focus on the periods surrounding the Lehman Crisis. In all regressions, credit rating and one-digit SIC industry dummies are included but the results are not reported for brevity.

4.2. Tobin's q and other selected variables

We replicate regression (2) in Table 3 of Bebchuk et al. (2011) – the industry adjusted Tobin's q analysis – using our industrial sample firms from 1993 to 2004. The results are reported in Panel A of Table 5. We used both continuous CEO tenure measure and dummy variables and find that the results are similar. For brevity, we only report the continuous version. The estimates on both CPS and industry adjusted CPS variables are not significant. As discussed in the introduction section, firms with traded CDS contracts are relatively better quality firms with less severe agency problem than a broader sample. Therefore, it is not surprising that we obtain the same sign of estimates on CPS measures as those reported by Bebchuk et al. (2011), but they are not significant. We also use firm fixed effects and find that the estimates on CPS become positive but very insignificant. Consistent with their findings, industry adjusted Tobin's

q is significantly positively associated with prior Tobin's q and ROA but negatively associated with leverage.

The third and forth regressions in Panel A of Table 5 use the change in industry adjusted Tobin's q (2009– 2007 fiscal year) as dependent variable, but use industry adjusted CPS and original CPS as independent variables, respectively. The estimate on industry adjusted CPS is significantly positive, which is consistent with the CEO ability hypothesis. However, that on original CPS (without the control for tournament effect) is insignificantly positive, which indicates that our main findings are not driven by tournament effect. Otherwise, we should see more positive effect on firms. Firms with prior high industry adjusted Tobin's q experienced more declines in Tobin's q during the Lehman Crisis. Firms with higher level of R&D activities also exhibited more decreases in Tobin's q. Panel B in Table 5 includes various CEO risk taking controls, however, none of these variables are significant and again our main results on CPS remain robust. For brevity, we only report one inside debt measure (inside_DE_Ratio), although we have tried all three measures.

We also examine ROA, cash holdings, dividend payouts, and leverage using the same analysis as Tobin's q. None of the changes are significantly related to CPS except for leverage. However, prior to the Lehman Crisis, industry adjusted CPS is significantly negatively related to dividend payouts and leverage as reported in Appendix C but significantly positively related to ROA. It suggests that high CPS firms tend to pay out smaller proportion of earnings (measured as EBIT to avoid many negative net income numbers during crisis) and use lower leverage prior to the Lehman Crisis. During the crisis, high CPS firms were able to increase leverage significantly. However, these numbers are not significantly different in the univariate comparisons (not reported) except for median industry adjusted ROA in 2006 and 2007.

5. Conclusions

The debates on CEO compensation reached another climax during the 2008 financial crisis when the market was stunned by the devastatingly poor performance of financial institutions led by obscenely high-paid Wall Street executives. This harsh public criticism led to the Say-on-Pay rules in the Dodd-Frank legislation. However, when shareholders are given the opportunity to halt CEO pay, the majority do not seem to exercise their newly granted right as anticipated by the public. This paper provides empirical evidence to explain this phenomenon by testing the CEO ability hypothesis using information during the Great Recession.

Employing the well-established proxy for rent extracting CEOs – CEO pay slice – put forth by Bebchuk et al. (2011), we show that high CPS firms indeed performed better than low CPS firms during the Great Recession based on the analyses of both CDS spreads and Tobin's q. Our findings are consistent with the CEO ability hypothesis that higher paid CEOs can navigate through tough times better than lower paid CEOs. We would not find such results if CPS is a pure proxy for the agency problem that rent extracting CEOs are acting on their self-interests and making value reducing decisions or that CEOs are better paid despite no better ability.

Our analysis does not refute the image of the agency problem depicted by Bebchuk et al. (2011). On the contrary, under the paradigm of information asymmetry, it suggests that CPS captures both elements of CEO ability and agency problem. Therefore, it is difficult to resolve the pay issue and formulate effective policies on CEO compensation. Our study contributes to the debates on CEO pay by providing empirical evidence to balance out the negative view of "seemingly excessive" CEO compensation in some cases. We also use a different empirical

strategy to reveal the component of CEO ability embedded in a commonly acceptable CEO power measure, which to our best knowledge has never been shown.

Appendix A: Time-line for event windows

This figure shows the event windows for various periods. For example, the one month window for the Lehman Crisis and TARP covers the trading day on September 15, 2008 (event day 0) and 20 more trading days following the event day. In other words, there are 21 trading days for the one month window following the Lehman Crisis and TARP event window. The other two crisis periods, Subprime Crisis and Bear Crisis, and TARP are defined in the same fashion.

Event dates   6/14/2007   3/14/2008   9/15/2008

Trading days   -21 -1 0   20   -21 -1 0 20   -21 -1 0 20

Crisis period: Subprime Crisis   Bear Crisis   Lehman Crisis and TARP

Last fiscal date   5/31/2007   5/31/2008

Fiscal year: 2006   2007   2008
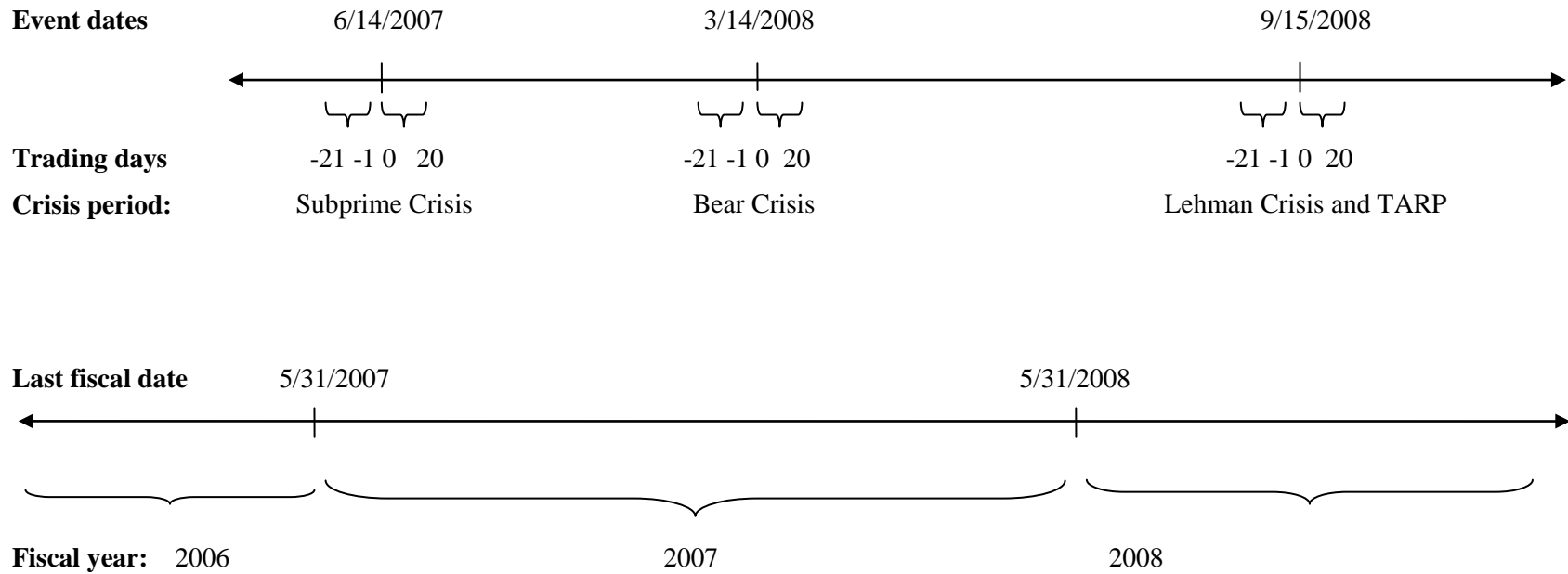
Appendix B Selective variable definitions and sources

Variable	Definition	Formula	Source
Firm characteristic			
Cash/TA (%)	Cash and Short-Term Investments/ total assets	CHE/at*100	Compustat, Balance sheet
Net working capital/TA (%)	(Current Asset-Current Liability)/ total assets	(ACT-LCT)/at*100	Compustat, Balance sheet
Current ratio	Current Asset/ Current Liability	ACT/LCT*100	Compustat, Balance sheet
TD/TA (%)	Total Liability/ total assets	LT/at*100	Compustat, Balance sheet
Long-term Debt/TA (%)	Long-Term Debt/ total assets	DLTT/at*100	Compustat, Balance sheet
Debt due in 1 year/TA (%)	Long-Term Debt Due in One Year/ total assets	DD1/at*100	Compustat, Balance sheet
Capex/TA (%)	Capital Expenditures	CAPX/at*100	Compustat, Cash flow statement
R&D/sales (%)	Research and Development Expense	=XRD/sale*100 ; =0 if XRD=.	Compustat, Income statement
Collateral/TA (%)	(Inventories + Property Plant and Equipment - Total (Net))/ total assets	(INVT+PPENT)/at*100	Compustat, Balance sheet
Dividend payout (%)	(Dividends Common/Ordinary)/ operating income	DVC/EBITDA*100	Compustat, Income statement
CEO risk taking incentive			
Inside_DE_Ratio	CEO's inside debt-equity ratio from Wei and Yermack (2011)	the value of inside debt (pension+deferred compensation)/the value of inside equity (stock+options)	Wei and Yermack (2011)
Relative_de_ratio	CEO's relative debt-equity ratio from Wei and Yermack (2011)	CEO's inside debt-equity ratio divided by the firm's external debt-equity ratio	Wei and Yermack (2011)

Relative incentive ratio	CEO's relative incentive ratio for Wei and Yermack (2011)	the CEO's and firm's changes in debt and equity value for a unit change in the value of the firm	Wei and Yermack (2011)
Inside debt_equity	(Present Value of Accumulated Pension Benefits From All Pension Plans ($)+Total Aggregate Balance in Deferred Compensation Plans at Fiscal Year End ($))/Equity Based Compensation	(PENSION_VALUE_TOT+DEFER_BALANCE_TOT)/EBC	ExecuComp
Equity based compensation (EBC)	Restricted shares granted + the Black-Scholes value of options granted, if both item are missing, then assign 0 to EBC.	RSTKGRNT(if missing, use STOCK_AWARDS)+ OPTION_AWARDS_BLK_VALUE (if missing, use OPTION_AWARDS)	ExecuComp
Cash flow volatility	standard deviation of % change in EBITDA for the past 15 fiscal years		Compustat, Income statement
Ind-adj Cash flow volatility	industry adjusted cash flow volatility (4-digit SIC code)		Compustat, Income statement
Corporate governance			
E-index	=CBOARD+LABYLW+LACHTR+ SUPERMAJOR+GOLDENPARACHUTE+PPILL		Combine IRRC and Bebchuk's data (up to 2008). If both the above two sources are missing, then hand collect E-index and check the information from 2005-2010. E-index is still missing if DEF14A, 10-K, bylaws or charter are not available.
Classified Board (CBOARD)	a board in which directors are divided into separate classes (typically three) with each class being elected to overlapping terms	=1 if YES;=0 if NO classified board	Search DEF 14A with 'election', 'nominees', 'election of director', and 'classified', etc. to find the information about classified board
Limitation on amending bylaws (LABYLW)	a provision limiting shareholder's ability through majority vote to amend the corporate bylaws; i.e. Vote	=1 if Vote % Required to amend bylaws>=50.01%	Search 10K to find all versions of bylaws

	% Required to amend bylaws>=50.01%		
Limitation on amending the charter (LACHTR)	a provision limiting shareholder's ability through majority vote to amend the corporate charter; i.e. Vote % Required to amend charter>=50.01%	=1 if Vote % Required to amend charter>=50.01%	Search 10K to find all versions of the Articles of Incorporation or Certificate of Incorporation
Supermajority to approve a merger (SUPERMAJOR)	A requirement that requires more than a majority of shareholders to approve a merger; i.e. Supermajority - mergers in percent>=66.67%	=1 if Supermajority - mergers in percent>=66.67%	Search bylaws or the Certificate of Incorporation
Golden parachute (GOLDENPARACHUTE)	a severance agreement that provides benefits to management/board members in the event of firing, demotion, or resignation following a change in control		Search DEF 14A with 'change in control', 'termination', 'Executive Termination Benefit', 'severance benefit', and 'trigger' to find the information about golden parachute
Poison pill (PPILL)	a shareholder right that is triggered in the event of an unauthorized change in control that typically renders the target company financially unattractive or dilutes the voting power of the acquirer		Search DEF 14A with 'Employee Stock Purchase Plan', 'shareholder rights plan', 'preferred stock plan', 'flip over rights plan', 'ownership flip-in plan', 'back-end rights plan', 'voting plan', 'unsolicited attempt to acquire control', and 'discourage certain abusive takeover techniques' to find the information about poison pill

Appendix C Pre-crisis and changes in ROA, cash holdings, dividend payout, and leverage

The sample consists of U.S. industrial firms with CDS spreads available from June 2006 to October 2009 and top 5 executives' compensation reported in ExecuComp prior to the Lehman Crisis. CEO tenure is at least one year to avoid partial year pay bias. Following Bebchuk et al. (2011), CPS is the fraction of the total compensation to the group of top five executives that goes to CEO. Firms with above (below) median CPS during the fiscal year prior to the Lehman Crisis are classified as high (low) CPS. Credit rating and one-digit SIC code dummies are included, but the results are not reported.

Dependent var. (FY 2007):	EBIT/TA		Cash/TA		Div. Payout		TD/TA	
	Coef.	t-test	Coef.	t-test	Coef.	t-test	Coef.	t-test
Panel A: Pre-crisis ROA, cash holdings, dividend payout, and leverage (%)								
Ind-adj CPS	8.99	2.82 ***	-7.47	-1.93 *	-1.76	-0.12	-5.02	-0.68
Ind-adj Tobin's Q	0.63	1.10	2.27	3.25 ***	-3.53	-1.30	2.11	1.60
E-index	0.12	0.52	0.19	0.66	1.55	1.40	0.48	0.89
Log total assets	-0.27	-0.70	0.05	0.12	-0.35	-0.19	1.65	1.86 *
Insider ownership (%)	-0.23	-1.96 **	-0.30	-2.12 **	0.26	0.48	-0.17	-0.65
Insider ownership^2	0.00	1.47	0.01	2.37 **	-0.01	-0.85	0.01	1.27
EBIT/Assets (%)	0.75	12.25 ***	0.06	0.77	0.03	0.09	-0.07	-0.52
Capex/Assets (%)	0.37	5.61 ***	-0.25	-3.19 ***	-0.20	-0.65	-0.21	-1.41
Long-term debt/Assets (%)	-0.02	-0.80	-0.17	-5.41 ***	0.02	0.17	0.63	10.41 ***
R&D/Sales (%)	-0.08	-1.53	0.26	4.30 ***	-0.23	-0.97	-0.33	-2.86 ***
=1 if R&D missing	-1.51	-1.73 *	-0.78	-0.73	5.67	1.39	-2.03	-1.02
Log company age	-0.47	-1.01	0.07	0.13	2.59	1.17	1.40	1.30
=1 if CEO is founder	1.16	0.80	0.47	0.27	12.52	1.83 *	3.91	1.17
Abnormal total compensation	-2.22	-3.03 ***	-2.66	-2.99 ***	3.95	1.15	0.24	0.14
Relative equity compensation	-0.49	-1.49	-0.13	-0.33	-0.06	-0.04	0.53	0.70
=1 if CEO ownership>=20%	4.33	1.12	10.81	2.31 **	29.36	1.62	-20.72	-2.34 **
CEO tenure (years)	-0.02	-0.23	0.16	1.85 *	-0.57	-1.69 *	-0.12	-0.74
Diversified	-1.86	-0.71	-1.36	-0.43	0.52	0.04	-1.51	-0.25
=1 if outside CEO	-0.15	-0.15	-0.48	-0.40	1.23	0.26	-1.34	-0.59
=1 if CEO is Chair	0.18	0.24	-1.49	-1.61	1.92	0.53	1.35	0.77
=1 if CEO is only director	-0.50	-0.68	0.16	0.18	-1.45	-0.42	2.62	1.57
Intercept	8.71	1.23	6.03	0.70	22.38	0.67	19.86	1.22
No. of obs.	291		291		290		291	
Adjusted R^2	0.63		0.38		0.06		0.53	

*, **, *** Significant at the 10, 5, and 1 percent levels, respectively, for a two-tailed test.

Dependent variables:	Change in EBIT/Assets (%)		Change in Cash/TA (%)		Change in Div. Payout (%)		Change in TD/TA (%)	
	Coef.	*t*-test	Coef.	*t*-test	Coef.	*t*-test	Coef.	*t*-test
Panel B: Changes in firm characteristics (FY 2009-2007)								
Ind-adj CPS	-2.72	-0.67	-2.77	-0.76	10.09	0.45	11.92	1.72 *
Ind-adj Tobin's Q	1.37	2.01 **	-0.09	-0.15	1.02	0.27	0.88	0.75
E-index	-0.42	-1.50	-0.31	-1.21	-0.19	-0.12	0.20	0.42
Log total assets	-0.40	-0.88	-0.90	-2.19 **	0.28	0.11	-0.38	-0.48
Insider ownership (%)	-0.38	-2.03 **	0.44	2.59 ***	0.19	0.18	-0.27	-0.82
Insider ownership^2	0.01	1.26	-0.01	-2.45 **	0.01	0.34	0.02	2.48 **
EBIT/Assets (%)	-0.34	-4.29 ***	-0.14	-1.96 **	0.76	1.71 *	-0.49	-3.57 ***
Capex/Assets (%)	-0.38	-4.08 ***	-0.19	-2.20 **	0.27	0.52	0.06	0.36
Long-term debt/Assets (%)	0.14	4.64 ***	0.01	0.26	-0.27	-1.55	-0.12	-2.33 **
R&D/Sales (%)	0.13	1.81 *	0.00	0.02	0.41	0.99	-0.22	-1.71 *
=1 if R&D missing	-1.87	-1.69 *	0.53	0.53	-5.41	-0.88	-0.47	-0.25
Log company age	-0.27	-0.49	-0.49	-0.98	2.54	0.81	0.49	0.52
=1 if CEO is founder	-0.40	-0.22	-0.52	-0.32	-12.98	-1.28	-0.77	-0.25
Abnormal total compensation	-1.14	-1.34	-2.56	-3.33 ***	-4.93	-1.02	-0.19	-0.13
Relative equity compensation	-0.08	-0.30	0.08	0.32	1.78	1.20	0.18	0.39
=1 if CEO ownership>=20%	4.24	0.97	9.88	2.51 **	-4.28	-0.18	-17.81	-2.38 **
CEO tenure (years)	0.06	0.65	-0.06	-0.76	0.09	0.19	-0.12	-0.79
Diversified	3.32	0.98	-0.60	-0.20	-5.77	-0.30	5.98	1.03
=1 if outside CEO	0.01	0.01	1.04	0.98	-7.89	-1.18	1.43	0.71
=1 if CEO is Chair	0.39	0.42	1.36	1.60	2.18	0.41	-0.73	-0.45
=1 if CEO is only director	-0.57	-0.71	-0.59	-0.80	6.74	1.48	0.18	0.13
Intercept	2.81	0.32	7.54	0.96	-16.96	-0.35	6.98	0.47
No. of obs.	271		271		269		271	
Adjusted R^2	0.29		0.18		0.06		0.18	

*, **, *** Significant at the 10, 5, and 1 percent levels, respectively, for a two-tailed test.

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Figure 1 Median CDS spreads by CEO Pay Slice (CPS)

This graph shows daily median CDS spreads between high versus low CPS firms. The data consist of U.S. industrial firms that have traded CDS contracts and report top 5 executives' compensation in ExecuComp. CEO tenure is at least one year to avoid partial year pay bias. Following Bebchuk et al. (2011), CPS is the fraction of the total compensation to the group of top five executives that goes to CEO. Firms with above (below) median CPS during the fiscal year prior to the Lehman Crisis are classified as high (low) CPS. A few firms do not have CDS spreads every trading day, but the number of firms for each trading day during the month prior to the Lehman Crisis is rather constant ranging from 137 to 140 with an average about 138 firms in each CPS group.
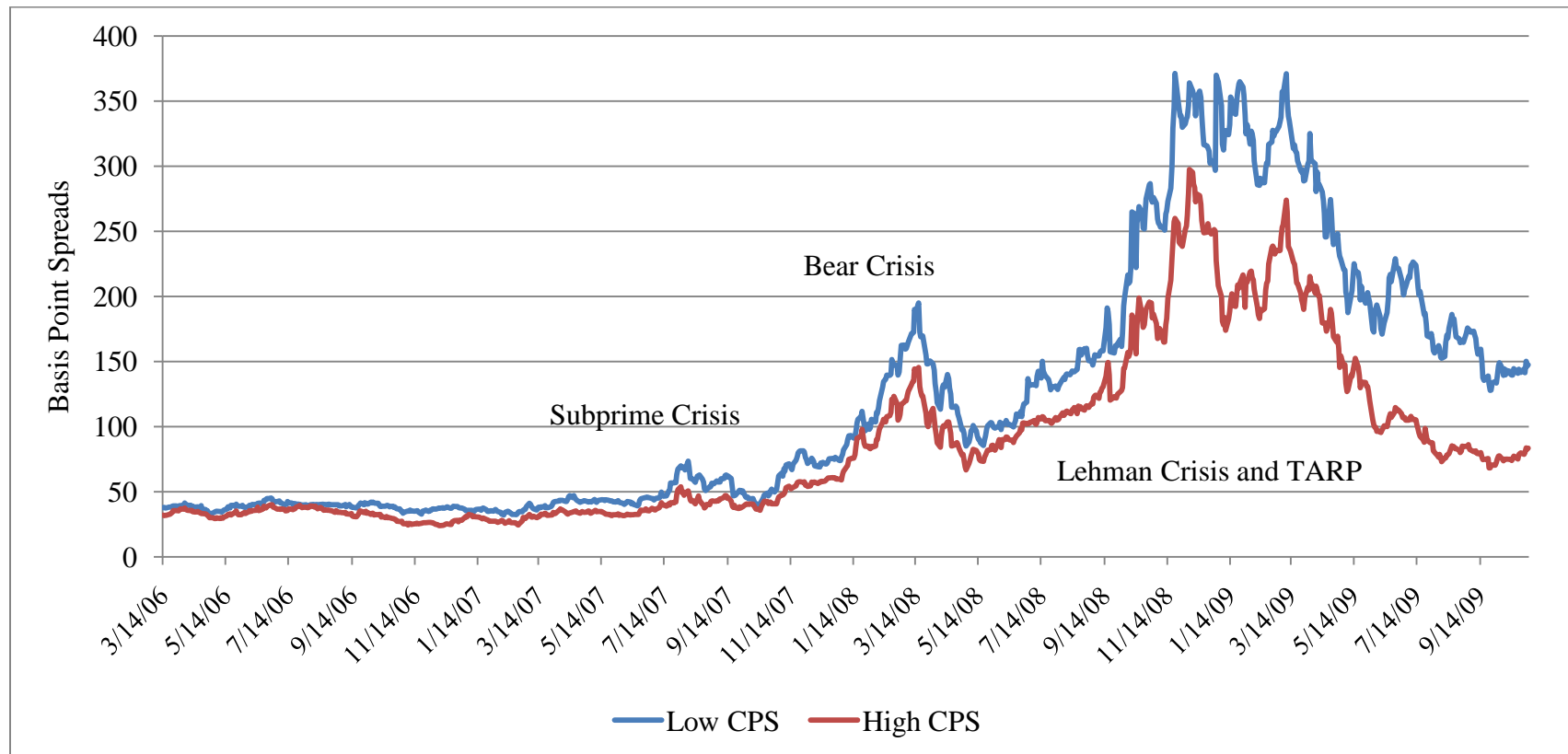
Table 1 Sample distribution by industry, by credit rating, and by CPS type

The sample consists of U.S. firms with CDS spreads available from June 2006 to October 2009 and top 5 executives' compensation reported in ExecuComp prior to the Lehman Crisis. CEO tenure is at least one year to avoid partial year pay bias. Following Bebchuk et al. (2011), CPS is the fraction of the total compensation to the group of top five executives that goes to CEO. Firms with above (below) median CPS during the fiscal year prior to the Lehman Crisis are classified as high (low) CPS. The last row reports the mean credit rating by assigning the value of 1 to AAA rated firms, 2 to AA+, etc. There are no significant differences between CPS types for both all and industrial firm samples.

	All sample			Industrial firms		
	All	**Low**	**High**	**All**	**Low**	**High**
No. of Obs.	407	203	204	332	163	169
Panel A. Industry classification (one-digit SIC code)						
(0) Agriculture, Forestry, and Fishing	0.01	0.01	0.00	0.01	0.01	0.01
(1) Mining, oil and gas, construction	0.08	0.07	0.09	0.10	0.09	0.11
(2) Non durables manufacturing	0.20	0.20	0.21	0.25	0.25	0.25
(3) Durables manufacturing	0.16	0.18	0.13	0.19	0.23	0.16
(4) Transport and communication	0.19	0.17	0.20	0.23	0.21	0.24
(5) Wholesale and retail trade	0.11	0.11	0.10	0.13	0.13	0.12
(6) Financial services	0.18	0.20	0.17	0.00		
(7) Services	0.06	0.05	0.06	0.07	0.07	0.07
(8) Health services	0.02	0.00	0.03	0.02	0.01	0.04
Panel B. S&P credit rating						
AAA and AA	0.07	0.06	0.07	0.05	0.04	0.05
A	0.25	0.24	0.26	0.23	0.21	0.25
BBB	0.39	0.36	0.41	0.37	0.35	0.40
BB	0.17	0.22	0.12	0.20	0.26	0.14
B	0.09	0.09	0.10	0.11	0.11	0.12
CCC and CC	0.00	0.00	0.00	0.00	0.01	0.00
SD and D	0.00	0.00	0.00	0.00	0.00	0.01
Non-rated	0.02	0.01	0.03	0.03	0.02	0.04
	Mean	Mean	Mean	Mean	Mean	Mean
Credit rating score	8.89	9.09	8.70	9.33	9.55	9.12

Table 2 CDS spreads by CPS type and by event window

The sample consists of U.S. firms with CDS spreads available from June 2006 to October 2009 and top 5 executives' compensation reported in ExecuComp prior to the Lehman Crisis. CEO tenure is at least one year to avoid partial year pay bias. Following Bebchuk et al. (2011), CPS is the fraction of the total compensation to the group of top five executives that goes to CEO. Firms with above (below) median CPS during the fiscal year prior to the Lehman Crisis are classified as high (low) CPS. Median CDS spreads are calculated for each firm based on each event window (one month) described in Appendix. The differences in mean and median of "median CDS spread" between low and high CPS firms are tested using t-test and Wilcoxon tests. Significant levels of tests are indicated in Panel A.

	(1) Prior to event			(2) Following event			Difference: (2)-(1)		
	N	Mean	Med	N	Mean	Med	N	Mean	Med
Panel A: Low CPS firms									
Subprime Crisis	141	94.8	43.5	141	117.5	43.6	141	22.6	4.9
Bear Crisis	144	338.8	136.5	157	332.5	134.0 **	143	-11.9	-11.3
Lehman Crisis	146	354.7 **	137.4	148	427.5 **	161.4 **	145	66.0 **	13.5 *
Panel B: High CPS firms									
Subprime Crisis	138	74.5	40.1	137	91.8	41.0	137	17.8	4.4
Bear Crisis	144	282.7	125.7	157	262.3	112.1	144	-8.3	-10.3
Lehman Crisis	153	239.4	123.9	152	268.1	140.3	151	26.9	11.4

*, **, *** Significant at the 10, 5, and 1 percent levels, respectively, for a two-tailed test.

Table 3 Summary statistics by CPS type – fiscal year prior to the Lehman Crisis

The sample consists of U.S. industrial firms with CDS spreads available from June 2006 to October 2009 and top 5 executives' compensation reported in ExecuComp prior to the Lehman Crisis. CEO tenure is at least one year to avoid partial year pay bias. Following Bebchuk et al. (2011), CPS is the fraction of the total compensation to the group of top five executives that goes to CEO. Firms with above (below) median CPS during the fiscal year prior to the Lehman Crisis are classified as high (low) CPS. Significant differences between CPS types are indicated along means (using *t*-tests) and medians (using Wilcoxon tests) of high CPS firms. Some variables have the numbers of observations fewer than those reported in the table. For example, the number of observations for cash flow volatility and industry adjusted version is 137 for low CPS firms and 140 for high CPS firms. See Appendix B for selective variable definitions.

	Low CPS firms		High CPS firms	
	Mean	**Median**	**Mean**	**Median**
CEO and executive compensation				
CEO pay slice (CPS)	0.34	0.35	0.48 ***	0.46 ***
Industry-adjusted CPS	-0.06	-0.03	0.09 ***	0.06 ***
Total CEO compensation ($mil)	8.94	6.69	13.74 ***	9.81 ***
Sum of top 5 compensation ($mil)	26.23	21.33	28.26	21.00
Log abnormal top 5 compensation	0.08	0.07	0.18 *	0.18 **
Relative Equity Compensation	1.32	1.08	1.22	1.22 ***
Risk taking incentive variables				
Inside_DE_Ratio	0.13	0.01	0.10	0.01
Relative_de_ratio	0.40	0.06	0.40	0.03
relative_incentive_ratio	0.28	0.04	0.28	0.03
insidedebt_equity	2.72	0.99	2.45	1.20
delta_1per	1,280.37	247.50	16,339.25	355.11
vega_01	1,187.15	503.78	1,251.94	810.34
Cash flow volatility	1.79	0.24	0.48	0.27
Industry-adjusted cash flow volatility	1.19	-0.06	-0.24	-0.10 **
Governance variables				
E-index	2.96	3.00	3.11	3.00
Insider ownership (%)	1.72	0.00	1.83	0.00
Insider ownership^2	27.11	0.00	41.99	0.00
Company age	35.81	35.00	38.21	36.00
Log company age	3.32	3.56	3.39	3.58
CEO age	55.54	56.00	55.75	56.00
=1 if CEO is founder	0.09	0.00	0.14	0.00
=1 if CEO ownership>=20%	0.01	0.00	0.02	0.00
CEO tenure (years)	6.30	5.09	6.73	4.92
Diversified	0.98	1.00	0.96	1.00

=1 if outside CEO	0.12	0.00	0.12	0.00
=1 if CEO is Chair	0.69	1.00	0.69	1.00
=1 if CEO is only director	0.38	0.00	0.54 ***	1.00 ***
Firm characteristics				
Tobin's Q	1.67	1.47	1.74	1.51
Industry-adjusted Tobin's q	0.07	0.00	0.16	0.05
Total assets (TA; $bn)	26.56	11.76	19.21 *	11.90
log Total assets	9.51	9.37	9.42	9.38
Market value of equity ($bn)	28.25	9.01	21.94	10.49
Cash/TA (%)	7.67	4.97	7.32	5.05
Net working capital/TA (%)	8.60	6.49	7.39	5.02
Current ratio	1.41	1.28	1.35	1.22
Long-term Debt/TA (%)	28.60	25.34	25.91	24.33
Debt due in 1 year/TA (%)	1.89	1.02	1.79	0.73
Capex/TA (%)	5.36	4.28	6.22	4.86
R&D/sales (%)	2.04	0.00	2.42	0.00
=1 if R&D missing	0.47	0.00	0.49	0.00
Collateral/TA (%)	45.18	43.21	46.34	45.55
Dividend payout (%)	15.70	7.93	11.35	8.63
ROA (EBIT/TA; %)	8.78	8.91	10.29 *	9.90
Industry-adjusted ROA (%)	4.70	1.06	6.17	2.97 ***
One-year stock returns (%)	0.41	-2.38	8.30 **	6.61 **
One-year stock returns - value adj. (%)	-4.94	-4.82	1.61 *	-0.53 **
One-year stock returns - eq. adj. (%)	4.80	5.49	11.98 *	9.60 **
No. of observations	163		169	

*, **, *** Significant at the 10, 5, and 1 percent levels, respectively, for a two-tailed test.

Table 4 Change in CDS spread surrounding the Subprime, Bear and Lehman Crises

The sample consists of U.S. industrial firms with CDS spreads available from June 2006 to October 2009 and top 5 executives' compensation reported in ExecuComp prior to the Lehman Crisis. The dependent variable is the difference in median CDS spreads surrounding a one-month event window. CEO tenure is at least one year to avoid partial year pay bias. Following Bebchuk et al. (2011), CPS is the fraction of the total compensation to the group of top five executives that goes to CEO. Panels A and B reports results with the baseline regression and those with controls for the risk-taking incentive of CEOs surrounding the Lehman crisis, respectively. Credit rating and one-digit SIC code dummies are included, but the results are not reported. See Appendix B for selective variable definitions.

Dependent variable: Change in CDS spread	(1) Subprime Crisis Coef.	(1) Subprime Crisis t-test	(2) Bear Crisis Coef.	(2) Bear Crisis t-test	(3) Lehman Crisis Coef.	(3) Lehman Crisis t-test
Panel A: Baseline regression						
Ind-adj CPS	-10.44	-0.66	6.17	0.15	-169.59	-2.27 **
Ind-adj Tobin's Q	1.96	0.82	0.28	0.04	9.88	0.78
E-index	0.35	0.30	-0.33	-0.12	4.24	0.81
Log Total Assets	-1.63	-0.88	5.69	1.22	9.92	1.18
Insider ownership (%)	-0.68	-0.55	-0.31	-0.16	-7.31	-1.40
Insider ownership^2	0.12	1.94 *	-0.01	-0.21	0.28	1.26
EBIT/Assets (%)	-0.70	-2.53 **	1.19	1.45	-2.81	-2.13 **
Capex/Assets (%)	-1.00	-3.02 ***	-0.37	-0.37	2.66	1.70 *
Long-term debt/Assets (%)	0.32	2.51 **	-0.29	-0.90	0.21	0.36
R&D/Sales (%)	-0.09	-0.39	-0.11	-0.12	0.26	0.17
=1 if R&D missing	5.99	1.36	-17.72	-1.49	13.75	0.66
Log company age	-2.78	-1.17	5.20	0.92	-3.99	-0.40
=1 if CEO is founder	-12.46	-1.65 *	25.63	1.29	37.72	1.10
Abnormal total compensation	7.09	2.08 **	-5.83	-0.66	10.45	0.65
Relative equity compensation	-0.78	-0.51	-0.18	-0.04	11.99	2.04 **
=1 if CEO ownership>=20%	-70.40	-2.57 **	14.37	0.23	-42.35	-0.37
CEO tenure (years)	0.29	0.89	0.11	0.13	0.19	0.12
Diversified	-1.27	-0.11	31.13	0.97	-12.55	-0.22
=1 if outside CEO	-13.88	-2.84 ***	-0.27	-0.02	38.20	1.82 *
=1 if CEO is Chair	-0.48	-0.13	6.76	0.68	-36.48	-2.13 **
=1 if CEO is only director	7.39	2.15 **	3.70	0.44	-28.39	-1.93 *
Intercept	35.17	0.92	-148.82	-1.45	38.67	0.22
No. of observations	279		273		277	
Adjusted R^2	0.48		0.27		0.47	

*, **, *** Significant at the 10, 5, and 1 percent levels, respectively, for a two-tailed test.

Table 4 (Continued)

Dependent variable:	Lehman Crisis		Lehman Crisis		Lehman Crisis	
Change in CDS spread	Coef.	*t*-test	Coef.	*t*-test	Coef.	*t*-test

Panel B: Control for CEO risk-taking incentive surrounding the Lehman Crisis

	Coef.	*t*-test	Coef.	*t*-test	Coef.	*t*-test
Ind-adj CPS	-173.18	-2.30 **	-208.79	-2.26 **	-206.14	-2.22 **
Ind-adj Tobin's Q	9.21	0.72	16.27	0.99	16.12	0.98
E-index	4.10	0.78	4.50	0.72	4.32	0.69
Log total assets	6.61	0.71	5.72	0.53	5.34	0.49
Insider ownership	-8.12	-1.50	-9.41	-1.34	-9.43	-1.34
Insider ownership^2	0.32	1.39	0.37	1.04	0.37	1.05
EBIT/Assets	-2.96	-2.22 **	-3.72	-2.29 **	-3.63	-2.21 **
Capex/Assets	2.81	1.73 *	3.08	1.58	3.15	1.61
Long-term debt/Assets	0.23	0.39	-0.01	-0.02	-0.01	-0.01
R&D/Sales	0.18	0.12	-0.05	-0.03	0.02	0.01
=1 if R&D missing	12.83	0.61	-2.38	-0.09	-1.63	-0.06
Log company age	-3.53	-0.36	-5.23	-0.36	-6.25	-0.42
=1 if CEO is founder	39.00	1.12	100.14	1.76 *	101.12	1.77 *
Abnormal total compensation	7.47	0.45	8.68	0.45	8.56	0.44
Relative equity compensation	11.75	1.99 **	4.18	0.44	5.00	0.51
=1 if CEO ownership>=20%	-67.70	-0.56	-98.59	-0.56	-100.11	-0.57
CEO tenure (years)	-0.13	-0.08	-0.57	-0.29	-0.63	-0.32
Diversified	-15.61	-0.27	-3.79	-0.05	-5.99	-0.08
=1 if outside CEO	37.93	1.79 *	36.58	1.51	36.61	1.51
=1 if CEO is Chair	-36.40	-2.11 **	-45.16	-2.22 **	-45.42	-2.23 **
=1 if CEO is only director	-29.41	-1.95 *	-26.36	-1.50	-26.11	-1.49
Inside_DE_Ratio					18.30	0.41
delta_1pr×10^{-1}	0.02	0.15	-0.03	-0.21	-0.02	-0.20
vega_01×10^{-1}	0.04	0.54	0.05	0.73	0.06	0.77
Ind-adj Cash flow volatility			0.09	0.08	0.12	0.11
Intercept	75.96	0.42	348.90	1.15	337.60	1.11
No. of observations	276		237		237	
Adjusted R^2	0.46		0.45		0.44	

*, **, *** Significant at the 10, 5, and 1 percent levels, respectively, for a two-tailed test.

Table 5 Change in Tobin's q surrounding the Lehman crisis

The sample consists of U.S. industrial firms with CDS spreads available from June 2006 to October 2009 and top 5 executives' compensation reported in ExecuComp prior to the Lehman Crisis. CEO tenure is at least one year to avoid partial year pay bias. Following Bebchuk et al. (2011), CPS is the fraction of the total compensation to the group of top five executives that goes to CEO. Panels A and B reports results with the baseline regression and those with controls for the risk-taking incentive of CEOs, respectively. Credit rating and one-digit SIC code dummies are included, but the results are not reported. Tests for regressions replicating Bebchuk et al. (2011) are based on the heteroscedasticity-robust standard errors clustered by firm. The model replicated is regression (2) in Table 3 of Bebchuk et al. (2011) using our sample firms from 1993 to 2004. See Appendix B for selective variable definitions.

Table 5 (Continued)

Dependent variable: Industry adjusted Tobin's q/Changes in industry adjusted Tobin's q	(1) Replicating Bebchuk Ind-adj CPS		(2) Replicating Bebchuk CPS		(3)FY2009-FY2007 Ind-adj CPS		(4)FY2009-FY2007 CPS	
	Coef.	t-test	Coef.	t-test	Coef.	t-test	Coef.	t-test
Panel A: Baseline regression								
Ind-adj CPS or CPS	-0.17	-1.21	-0.10	-0.81	0.47	2.23 ***	0.29	1.45
Ind-adj Tobin's Q	0.68	24.68 ***	0.68	24.60 ***	-0.45	-12.00 ***	-0.44	-11.77 ***
E-index$\times 10^{-1}$	-0.08	-0.94	-0.08	-0.96	-0.04	-0.25	-0.02	-0.15
Log total assets	0.00	-0.05	0.00	-0.09	-0.04	-1.58	-0.04	-1.58
Insider ownership	0.97	1.08	1.00	1.10	-0.09	-0.09	-0.15	-0.15
Insider ownership^2	-1.21	-1.51	-1.23	-1.52	3.56	1.26	3.78	1.33
EBIT/Assets	3.22	5.31 ***	3.22	5.30 ***	0.39	0.98	0.40	0.98
Capex/Assets	-0.02	-0.09	-0.02	-0.10	0.15	0.34	0.15	0.33
Long-term debt/Assets	-0.36	-2.12 **	-0.36	-2.11 **	0.22	1.33	0.21	1.26
R&D/Sales	0.22	0.44	0.22	0.44	-1.84	-4.51 ***	-1.78	-4.34 ***
=1 if R&D missing	-0.06	-1.42	-0.06	-1.43	-0.07	-1.18	-0.07	-1.20
Log company age$\times 10^{-1}$	-0.30	-1.26	-0.29	-1.23	0.03	0.09	0.04	0.12
=1 if CEO is founder	-0.05	-0.66	-0.05	-0.64	-0.08	-0.82	-0.08	-0.78
Abnormal total compensation	0.01	0.19	0.01	0.15	-0.02	-0.37	-0.01	-0.25
Relative equity compensation$\times 10^{-2}$	-0.03	-0.21	-0.04	-0.31	0.10	0.05	0.33	0.18
=1 if CEO ownership>=20%	-0.01	-0.06	-0.02	-0.07	-0.26	-1.08	-0.26	-1.07
CEO tenure (years) $\times 10^{-2}$	0.09	0.36	0.08	0.34	-0.30	-0.65	-0.28	-0.60
Diversified	-0.21	-1.35	-0.21	-1.35	0.09	0.45	0.08	0.38
=1 if outside CEO	0.02	0.51	0.02	0.47	-0.01	-0.22	-0.02	-0.26
=1 if CEO is Chair	-0.01	-0.27	-0.01	-0.31	-0.06	-1.27	-0.06	-1.27
=1 if CEO is only director$\times 10^{-1}$					0.03	0.06	0.04	0.09
Intercept	0.39	1.44	0.45	1.58	-0.03	-0.05	-0.14	-0.27
No. of observations								
Adjusted R^2	3,089		3,089		291		291	

*, **, *** Significant at the 10, 5, and 1 percent levels, respectively, for a two-tailed test.

Table 5 (Continued)

Dependent variable:	(1)		(2)		(3)	
Changes in industry adj. Tobin's q	Coef.	*t*-test	Coef.	*t*-test	Coef.	*t*-test
Panel B: Control for CEO risk-taking incentive surrounding the Lehman Crisis						
Ind-adj CPS	0.40	1.86 *	0.54	2.23 **	0.56	2.29 **
Ind-adj Tobin's Q	-0.44	-11.65 ***	-0.49	-10.77 ***	-0.49	-10.79 ***
E-index$\times 10^{-1}$	-0.03	-0.19	-0.03	-0.18	-0.04	-0.24
Log total assets	-0.04	-1.36	-0.04	-1.52	-0.05	-1.59
Insider ownership	-0.02	-0.02	-1.89	-1.02	-1.94	-1.05
Insider ownership^2	3.12	1.08	14.96	1.61	15.33	1.65 *
EBIT/Assets	0.44	1.09	0.78	1.69 *	0.84	1.81 *
Capex/Assets	0.21	0.45	0.29	0.57	0.33	0.65
Long-term debt/Assets	0.21	1.26	0.36	1.99 **	0.35	1.92 *
R&D/Sales	-1.79	-4.38 ***	-1.95	-4.69 ***	-1.92	-4.60 ***
=1 if R&D missing	-0.08	-1.32	-0.06	-0.84	-0.05	-0.79
Log company age$\times 10^{-1}$	0.01	0.04	0.14	0.36	0.07	0.19
=1 if CEO is founder	-0.08	-0.78	0.27	1.85 *	0.27	1.87 *
Abnormal total compensation	-0.03	-0.63	-0.04	-0.74	-0.03	-0.70
Relative equity compensation$\times 10^{-2}$	-0.22	-0.12	-1.56	-0.80	-1.24	-0.63
=1 if CEO ownership>=20%	-0.24	-0.98	-0.73	-1.55	-0.74	-1.59
CEO tenure (years) $\times 10^{-2}$	-0.31	-0.64	-0.51	-0.98	-0.52	-1.00
Diversified	0.09	0.44	0.07	0.30	0.06	0.25
=1 if outside CEO	-0.01	-0.22	0.01	0.08	0.01	0.08
=1 if CEO is Chair	-0.07	-1.32	-0.09	-1.75 *	-0.10	-1.79 *
=1 if CEO is only director$\times 10^{-1}$	0.07	0.16	-0.39	-0.85	-0.37	-0.80
Inside_DE_Ratio					0.12	1.02
delta_1pr$\times 10^{-4}$	-0.06	-1.50	-0.05	-1.24	-0.05	-1.21
vega_01$\times 10^{-4}$	0.06	0.38	0.03	0.19	0.05	0.29
Ind-adj Cash flow volatility			0.03	0.97	0.03	1.04
Intercept	-0.07	-0.14	1.02	1.48	1.04	1.51
No. of observations	291		247		247	
Adjusted R^2	0.45		0.43		0.43	

*, **, *** Significant at the 10, 5, and 1 percent levels, respectively, for a two-tailed test.