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Internal Governance and Creditor Governance:
Evidence from Credit Default Swaps
Second Draft

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Internal Governance and Creditor Governance: Evidence from Credit Default Swaps*

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Abstract

I study the relation between internal governance and creditor governance. A deterioration in creditor governance may increase the agency costs of debt and managerial opportunism at the expense of shareholders. I exploit the introduction of credit default swaps (CDS) as a negative shock to creditor governance. I provide evidence consistent with shareholders pushing for a substitution effect between internal governance and creditor governance. Following CDS introduction, CDS firms reduce managerial risk-taking incentives relative to other firms. At the same time, after the start of CDS trading, CDS firms increase managerial wealth-performance sensitivity, board independence, and CEO turnover performance-sensitivity relative to other firms.

Keywords: creditor governance, credit default swaps, empty creditors

JEL Classification: G32, G34

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1 Introduction

Corporate governance can be defined as “the ways in which suppliers of finance to corporations assure themselves of getting a return on their investment” (Shleifer and Vishny, 1997). As a consequence, corporate governance is key to both shareholders and creditors. Although creditor governance has been traditionally deemed important only for distressed firms, Nini, Sufi, and Smith (2012) provide evidence suggesting that it also matters for firms that are far from of default.¹ The customary mechanisms of corporate governance and creditor governance are thus likely to interact. However, how does internal governance respond to changes in creditor governance?

The introduction of credit default swap (CDS) contracts on a firm’s debt provides an ideal testing ground to shed light on the relation between internal governance and creditor governance. The dramatic growth of the CDS market over the last decade, with the notional amount peaking at \$57 trillion in 2008, has sparked an intense debate on the real effects of these financial instruments (Stulz, 2010). There are indeed reasons to believe that CDS trading has a substantial impact on creditor governance. Creditors that hedge against credit risk through CDSs relinquish cash flow rights while retaining control rights on their claims, and such separation may alter the creditor-borrower relationship, creating so-called *empty creditors* (Hu and Black, 2008). The theoretical literature has identified two non-mutually exclusive channels through which the empty creditor problem could manifest itself. First, CDS-insured creditors might be tougher in debt renegotiations. Under certain conditions, CDS-insured creditors might over-insure and even be better off by pushing the firm into an inefficient bankruptcy to trigger a CDS payment (Bolton and Oehmke, 2011). Second, because CDS-insured creditors are hedged against credit risk, their incentive to monitor borrowing firms might be weakened (Ashcraft and Santos, 2009). There is evidence that both channels are at work (e.g., Subrahmanyam, Tang, and Wang, 2014; Chakraborty, Chava, and Ganduri, 2015; Shan, Tang, and Yan, 2016b).

Therefore, I interpret the introduction of CDSs on a firm’s debt as a negative shock to creditor governance. A deterioration in creditor governance might exacerbate both the agency costs of debt (e.g., risk-shifting and underinvestment) and managerial opportunism. Managerial opportunism comes at the expense of shareholders. Further, under rational expectations, shareholders also bear the agency costs of debt and benefit from limiting them ex ante. Thus, shareholders have an incentive to enhance internal

¹Hu and Black (2008) define creditor governance as “the overall relationship between creditor and debtor, including creditors’ exercise of contractual rights and legal rights with respect to firms and other borrowers”.

governance after a negative shock to creditor governance. By contrast, weaker creditor governance might increase managerial power, and more powerful managers might oppose improvements in internal governance or even push for weaker internal governance. I test whether a *substitution effect* or a *complementarity effect* between creditor governance and internal governance prevails. To this end, I study the evolution of several governance mechanisms (such as executive compensation structure, board structure, and managerial turnover) around the start of CDS trading.

Using a sample of U.S. public firms over the period 2000 to 2012, I find evidence in favor of a substitution effect between creditor governance and internal governance. I examine executive compensation structure, looking both at CEOs and at non-CEO executives. In my main analysis, I focus on the evolution of managerial risk-shifting incentives around the start of CDS trading on a firm's debt. To proxy for managerial risk-shifting incentives, I rely on the cash-to-stock ratio proposed by [Carlson and Lazrak \(2010\)](#), i.e., the ratio of salary to the value of equity incentives. I show that the cash-to-stock ratio declines by 18.64% and 25.00% for CEOs and non-CEO executives, respectively in CDS firms after CDS introduction relative to non-CDS firms. Similar results hold when using option vega as a proxy for risk-taking incentives. At the same time, managerial wealth-performance sensitivity, as proxied by effective ownership, increases following CDS introduction, thereby improving the alignment of management and shareholders. Overall, these results are consistent with shareholders ex ante adjusting the executive compensation structure after CDS introduction to prevent an increase in agency costs of debt (through the cash-to-stock ratio) and in agency costs of managerial discretion (through effective ownership).

Both endogeneity and selection in CDS availability are potential concerns for my findings. With regards to endogeneity, for instance, there might be omitted variables driving both executive compensation structure and the presence of CDSs on a firm's debt. In my baseline tests, I follow [Ashcraft and Santos \(2009\)](#) and exploit differences in the timing of CDS introduction while including firm fixed effects to control for time-invariant differences across firms. Under the assumption that differences in the timing of CDS introduction are exogenous to corporate policies, such an approach allows me to identify the effect of CDS trading on executive compensation structure. However, whereas the timing of CDS introduction is not a reference firm's decision, one may still be concerned about endogeneity. To address this issue, I conduct a battery of tests. First, I explore the details of the economic mechanism to better understand how CDS availability affects executive compensation structure, thus favoring a causal interpretation of my results ([Rajan and](#)

Zingales, 1998). For instance, I exploit cross-sectional variation in the credit event definition of CDS contracts, distinguishing between “No restructuring” CDSs, i.e., contracts that do not include debt restructuring among the credit events, and “Modified restructuring” CDSs, i.e., contracts that include debt restructuring among the credit events.² I argue that the availability of “No restructuring” contracts enhances creditors’ bargaining power by making the threat of liquidation more credible. By contrast, I contend that “Modified restructuring” contracts hinder creditors’ incentives to monitor to a larger extent by providing better insulation from credit risk. Consistent with shareholders mainly responding to a reduction in monitoring by creditors, I show that my results are primarily driven by “Modified restructuring” CDSs. My second approach to address endogeneity is to carry out a quasi-natural experiment based on the CDS Big Bang Protocol of 2009. The CDS Big Bang eliminated “Modified restructuring” contracts, thus providing me with a positive exogenous shock to creditors’ incentives to monitor. Third, I employ a shock-based instrumental variables (IV) approach, building on a plausibly exogenous shock to relationship banks’ propensity to purchase CDS protection. My IV is based on the 2004 Securities and Exchange Commission (SEC) decision to allow broker-dealers that are affiliated with major investment banks to use internal risk models and recognize CDS hedges when computing capital requirements. This regulatory change plausibly increased CDS availability for firms that had relationships with these investment banks. Both the quasi-natural experiment and the IV approach provide results consistent with my main analysis. Furthermore, to take care of potential non-random selection of CDS firms, I apply a matching procedure in a difference-in-differences framework around the initiation of CDS trading. I show that my findings are also robust in this case.

Finally, I provide further evidence on the relation between internal governance and creditor governance by extending the analysis to other governance mechanisms, namely board structure and managerial turnover performance-sensitivity. After the initiation of CDS trading, I observe an enhancement of the board’s monitoring function, as proxied by the fraction of independent directors sitting on the board. The increase in board independence after the introduction of CDSs is substantial, especially compared to the effect of other determinants of board structure that are widely recognized as important, such as managerial ownership. Similarly, I document that forced CEO turnovers become more sensitive to firm performance following CDS introduction relative to non-CDS firms. Again, these findings suggest that shareholders seek to offset the negative shock to creditor governance engendered by CDSs through the more intense monitoring of management.

²For ISDA’s credit event definitions, see <http://credit-deriv.com/isdadefinitions.htm>.

This paper contributes to two strands of literature. First, it relates to the literature on creditor governance and its interaction with other governance mechanisms.³ The research on creditor governance has traditionally focused on distressed firms (e.g., [Gilson, 1989](#); [Gilson and Vetsuypens, 1993](#)). Until recently, only anecdotal evidence existed on the role of creditor governance outside of distress (e.g., [Baird and Rasmussen, 2006](#); [Triantis and Daniels, 1995](#); [DeAngelo, DeAngelo, and Wruck, 2002](#)). However, the recent work of [Nini, Sufi, and Smith \(2012\)](#) presents large-sample evidence of the active role of creditors in governance after covenant violations, i.e., in technical default (but generally not distressed) states. [Akins, De Angelis, and Gaulin \(2016\)](#) show that creditors are able to influence governance even outside technical default states. Particularly relevant are the works by [Gande and Saunders \(2012\)](#) and [Wang and Xia \(2014\)](#), who analyze how creditor governance is affected by two important financial innovations, the growth of the secondary loan market and of the collateralized loan obligation market, respectively. Whereas [Gande and Saunders \(2012\)](#) find that banks remain important monitors in the presence of an active secondary loan market, [Wang and Xia \(2014\)](#) provide evidence that banks exert less monitoring effort when they are able to securitize loans. Both of these financial innovations, which mark the transition from the traditional “originate-to-hold” banking model to the “originate-to-distribute” model, speak to the disintermediation of debt markets, similarly to the rise of the CDS market. Moreover, I complement the work of [Byers, Fields, and Fraser \(2008\)](#), who examine whether internal corporate governance and creditor monitoring are substitutes, finding supportive evidence by means of an event study around loan announcements. This paper goes beyond analyzing market reactions to infer the value of creditor governance and shows that shareholders actively respond to a deterioration in the creditor-borrower relationship by improving internal governance.

Second, a number of studies examine the effects of CDSs on corporate policies. [Ashcraft and Santos \(2009\)](#) assess the impact of CDS trading on the cost of debt, finding mixed evidence. [Saretto and Tookes \(2013\)](#) show that the introduction of CDSs relaxes capital supply constraints, but this translates mainly into non-price effects (quantity and maturity of credit). [Subrahmanyam, Tang, and Wang \(2014\)](#) illustrate that both the probability of default and the probability of a credit rating downgrade surge after the

³There is a burgeoning body of literature assessing the interactions between different corporate governance mechanism. These papers, among others, study the interaction between takeover vulnerability and blockholder ownership ([Cremers and Nair, 2005](#)), between executive pay-for-performance sensitivity and other mechanisms of corporate governance ([Fahlenbrach, 2009](#)), between takeover vulnerability and product market competition ([Giroud and Mueller, 2010](#)), and between executive risk-shifting incentives and covenant strictness ([Francis, Hasan, Liu, and Sun, 2016](#)).

start of CDS trading. [Danis and Gamba \(2016\)](#) study the real effects of CDSs in a general equilibrium framework. [Colonnello, Efung, and Zucchi \(2016\)](#) find that CDS trading negatively affects real corporate policies in firms with powerful shareholders.⁴ To the best of my knowledge, I am the first to comprehensively explore the impact of CDS availability on internal governance outside distressed and technical default states.

The remainder of this paper is organized as follows. Section 2 discusses the relation between creditor governance and internal governance. Section 3 illustrates the empirical approach and the data sources. Section 4 presents the results on executive compensation structure. Section 5 extends the analysis to the board of directors and managerial turnover. Section 6 concludes.

2 Creditor governance and other governance mechanisms

This paper examines how governance mechanisms evolve following CDS-induced changes in the creditor-borrower relationship. A large body of literature has studied how the presence of CDSs affects creditors' behavior. CDS-insured creditors typically relinquish cash flow rights while fully retaining control rights on the loan. Protection sellers are generally not entitled to any control right. Thus, CDSs may give rise to empty creditors ([Hu and Black, 2008](#)), whose incentives in creditor governance are potentially distorted.⁵ [Bolton and Oehmke \(2011\)](#) show that CDS-insured creditors may over-insure in equilibrium, so they will be better off by pushing the firm into inefficient bankruptcy triggering the CDS settlement rather than accepting debt renegotiation. [Subrahmanyam, Tang, and Wang \(2014\)](#) and [Danis \(2016\)](#) find that CDSs increase credit risk and that bondholders of CDS firms participate to a lesser extent in distressed exchange offers, respectively.⁶

Empty creditors, in addition to being tougher in renegotiation, may be less involved in the firm's governance outside renegotiation states. In other words, CDS-insured creditors may have an incentive to reduce monitoring, given that they are insulated from borrowers' default. Such a mechanism is proposed heuristically by [Ashcraft and Santos \(2009\)](#) and developed rigorously by [Parlour and Plantin \(2008\)](#), who, in a framework where loan sales and CDS protection are equivalent, show that a liquid CDS market reduces banks' incentives to monitor. There is growing evidence that this is the case. [Shan, Tang,](#)

⁴Further references on the CDS literature can be found in [Augustin, Subrahmanyam, Tang, and Wang \(2014\)](#) and [Augustin, Subrahmanyam, Tang, and Wang \(2016\)](#).

⁵Protection sellers will rationally price these distortions into CDS spreads, but they do not have any control right, so they are not involved in the firm's governance after the CDS contract has been written.

⁶By contrast, [Bedendo, Cathcart, and El-Jahel \(2016\)](#) do not find evidence that distressed CDS firms are more likely to file for bankruptcy rather than opting for an out-of-court renegotiation.

and Winton (2016a) document that loans have less strict covenants and are less likely to be secured after CDS introduction. Shan, Tang, and Yan (2016b) show that CDSs weaken bank lending relationships, as reflected by the increase in loan spreads and the likelihood of firms switching to new lenders. Chakraborty, Chava, and Ganduri (2015) find that, following covenant violations, creditors play a less active role (as measured by changes in borrowers' investment policy) when CDSs on the firm's debt are available. Gong, Martin, and Roychowdhury (2015) observe a decline in accounting conservatism following the initiation of CDS trading.⁷ Finally, Ivanov, Santos, and Vo (2016) show that CDSs weaken creditors' incentives to monitor also through their usage for market-based pricing of loans.

Building on the studies above, which show that CDS availability is indeed linked to a deterioration in creditor governance (whether through inefficient liquidations or reduced monitoring), I investigate the consequences for key internal governance mechanisms such as managerial compensation, board structure, and managerial turnover.

On the one hand, shareholders may anticipate the deterioration in creditor governance and push for an enhancement of other mechanisms (substitution effect). Indeed, creditor governance is arguably also beneficial to shareholders. Under rational expectations, shareholders have an incentive to ex ante limit debt-equity conflicts because they would eventually bear the agency costs of debt. A similar argument holds for the agency costs of managerial discretion. After CDS introduction, shareholders may thus make managerial compensation more sensitive to debt-equity conflicts, enhance board scrutiny, and increase the sensitivity of managerial turnover to performance.

On the other hand, worse creditor governance may lead to a deterioration in other governance mechanisms (complementarity effect). Under weakened creditor oversight, firm insiders may be able to increase their rents by impairing governance. The extent to which these forces are at work is ultimately an empirical question. In the remainder of the paper, I thus investigate whether the substitution or the complementarity effect prevails.

Before proceeding to the empirical analysis, however, it is worth discussing how prevalent the use of credit derivatives for hedging purposes is. Because bank creditors have a more pervasive role in creditor governance than bondholders, who are usually dispersed (e.g., Diamond, 1984), my discussion of CDS usage focuses on banks. CDSs trade on a private dealer over-the-counter market. Together with hedge funds and monoline insur-

⁷However, Streitz (2016), in the context of loan syndication, does not find evidence that CDSs exacerbate creditors' moral hazard.

ers, banks are major protection sellers and buyers for both trading and hedging purposes. (Weistroffer, 2009). This is partly due to the Basel framework, which has long recognized CDSs as a credit risk mitigation technique, thus allowing commercial banks to obtain capital relief on CDS-hedged exposures. Although the CDS reference obligations are usually bonds rather than loans of the firm, the Basel regulation still recognizes CDSs as a valid hedge as long as the reference bonds are junior relative to the insured exposure, which is generally the case for private bank loans (Feldhütter, Hotchkiss, and Karakas, 2016). Therefore, bond CDSs have been an important loan credit risk management tool for banks in the last decade.

Moreover, whereas banks make an overall limited use of credit derivatives for hedging purposes, commercial and industrial (C&I) loans are hedged with these instruments to a larger extent (Minton, Stulz, and Williamson, 2009). Hirtle (2009) finds that credit derivatives positively affect bank credit supply to large borrowers, which are more likely to be “named credits” on the CDS market. Beyhaghi, Massoud, and Saunders (2016) provide disaggregated evidence that banks actively buy single-name CDSs to hedge credit risk on syndicated loans at origination. Bedendo and Bruno (2012) show that U.S. commercial banks continued using CDSs for hedging purposes even during the 2007–2009 crisis, and especially so for C&I loans. Hasan and Wu (2015) illustrate that banks’ hedging activity on C&I loans through CDSs complements loan sales.

3 Empirical approach and data

3.1 Empirical approach

The purpose of my analysis is to study whether and how creditors’ stance towards borrowing firms affects internal corporate governance mechanisms. In my empirical strategy, I rely on the start of CDS trading as an adverse shock to creditor governance.

I pursue an approach similar to Ashcraft and Santos (2009), who rely on the assumption that the timing of the introduction of CDSs on a particular firm comes as an exogenous shock. As can be seen from Figure 1, the start of trading is staggered, with most of the firms becoming traded between 2001 and 2005, permitting a clearer identification of its impact on corporate governance. I estimate the following specification:

$$y_{i,t} = \beta \cdot CDS\ trading_{i,t} + \theta \cdot Control\ variables_{i,t} + v_i + \nu_t + \epsilon_{i,t}. \quad (1)$$

$y_{i,t}$ is the variable of interest (managerial compensation measures and board structure

measures).⁸ $CDS\ trading_{i,t}$ is an indicator variable equal to one after the introduction of CDSs on a firm’s debt. *Control variables* $_{i,t}$ include the market-to-book ratio, profitability, asset tangibility, firm size, book leverage, stock volatility, profitability, and indicator variables for the presence of a rating and for the investment grade rating status. The subscripts i and t indicate firms and years, respectively. I include firm fixed effects, ν_i , and year fixed effects, ν_t . Standard errors are clustered at the firm-level.

Although the timing of CDS trading initiation is not a reference firm’s decision, there may be concerns about endogeneity due to simultaneity and omitted variables, and about sample selection. To address endogeneity of CDS availability, I follow a fourfold approach. First, I analyze in detail the economic mechanism as suggested by [Rajan and Zingales \(1998\)](#). For instance, to understand the relative importance of increased renegotiation frictions and weakened monitoring in the presence of empty creditors, I exploit cross-sectional variation in the credit event definition of CDS contracts. Second, I use the CDS Big Bang Protocol in April 2009 as a quasi-natural experiment ([Danis, 2016](#)). Third, I follow a shock-based IV approach, exploiting the SEC’s 2004 change in the net capital rule for broker-dealers as a source of exogenous variation in CDS availability ([Colonnello, Efung, and Zucchi, 2016](#)). Finally, in a battery of further tests, I confirm my results by relying on alternative measures of executive compensation structure, additional control variables, and variation in CDS liquidity.

To address sample selection issues, I adopt a matching technique. I perform a short-term difference-in-difference analysis around CDS introduction over the CDS-traded sample and a matched control sample that I select on the basis of a set of covariates aimed at identifying firms with similar probability of becoming CDS reference entities.

3.2 Data and summary statistics

I use a sample of U.S. public firms from the CRSP-Compustat merged database over the period from 2000 to 2012, excluding financial institutions and utilities.⁹ I also exclude firm-years with missing assets, sales, number of outstanding shares, and stock price at fiscal year end. I obtain executive compensation data from Standard and Poor’s Execucomp, institutional holdings data from Thomson’s 13f filings, and segment and rating

⁸When examining CEO turnover performance-sensitivity, rather than using a linear specification, I estimate a probit model where $CDS\ trading_{i,t}$ is interacted with the firm’s stock return.

⁹In such industries, the presence of a regulator amounts to an additional source of outside monitoring, which may dampen the effects of CDSs on creditor governance, thus jeopardizing my empirical strategy. For instance, [John, Mehran, and Qian \(2010\)](#) study the interaction between monitoring by nondepository (subordinated) creditors and regulators in U.S. banks.

data from Compustat. I then match these data with CDS pricing data from Markit (available from January 2001) and CDS volume data from the Depository Trust & Clearing Corporation (DTCC, available from October 2008).

In additional tests, I rely on data from other sources. To study the impact of CDSs on other governance mechanisms, I use forced CEO turnover data available up to 2010 from [Jenter and Kanaan \(2015\)](#) and [Peters and Wagner \(2014\)](#), and board of directors data from the Investor Responsibility Research Center (IRRC) before 2007, and from Riskmetrics from 2007 onwards.¹⁰ To match IRRC and Riskmetrics data with the CRSP-Compustat merged database, I follow the procedure proposed by [Coles, Daniel, and Naveen \(2014\)](#). Finally, to implement the IV approach, I obtain loan data from the Loan Pricing Corporation’s Dealscan database and non-convertible debt issues data from the Thomson Financial’s SDC Platinum Global New Issues database. I merge Dealscan data with my main dataset using the link file made available by Michael Roberts ([Chava and Roberts, 2008](#)). I winsorize all variables at the 1st and 99th percentile to lessen the influence of outliers. Detailed definitions of the variables are given in Appendix Table A.1. All dollar amounts are expressed in 2012 dollars.

Using these data sources, I compute the following variables.

Managerial incentives. The main dependent variables for my tests concern managerial compensation structure. Creditor governance is arguably most important for conflicts between creditors and shareholders, such as risk-shifting and underinvestment. Hence, to study the consequences of a negative shock to creditor governance on executive compensation, my baseline tests focus on the cash-to-stock ratio, a measure capturing managerial sensitivity to agency costs of debt. [Carlson and Lazrak \(2010\)](#) illustrate that a manager’s risk-shifting incentives are increasing in his/her cash-to-stock ratio.¹¹ In other words, a risk-averse manager will take on more risk as the performance-insensitive component of his/her pay increases, because the insurance against bad states of the world provided by cash compensation reduces the manager’s actual risk-aversion. The cash-to-stock ratio is measured as the ratio of salary to the value of equity incentives. For brevity, following [Carlson and Lazrak \(2010\)](#), I will also denote this ratio as A/pS , where A is the salary, p is the effective ownership (accounting for stock and option holdings), and S is the end-of-year firm’s market capitalization.

¹⁰I thank Dirk Jenter, Fadi Kanaan, Florian Peters, and Alexander Wagner for sharing their data on forced CEO turnovers.

¹¹Also [Francis, Hasan, Liu, and Sun \(2016\)](#) rely on this measure to capture managerial risk-shifting incentives.

In further tests, I also use other compensation measures. First, looser creditor governance may also result in increased managerial opportunistic behavior. To capture managerial sensitivity to conflicts of interest between management and shareholders, I look at wealth-performance sensitivity. Wealth-performance sensitivity can be interpreted as effective ownership, namely the dollar change in the managerial wealth for a \$1 change in equity value. Second, as a measure of risk-taking incentives alternative to the cash-to-stock ratio, I use the vega of option holdings, namely the sensitivity of option holdings value to stock return volatility. Finally, as another measure of managerial sensitivity to agency costs of debt, I look at inside debt, namely pension and deferred compensation plans, which are akin to debt claims of managers on the firm. In particular, I compute the relative incentive ratio proposed by [Wei and Yermack \(2011\)](#). Intuitively, this measure combines the sensitivity of managerial wealth to debt and equity value.

The allocation of power within a firm’s management team cannot be easily observed (e.g., [Bebchuk, Cremers, and Peyer, 2011](#)). Hence, to better capture the incentives given to the firm’s top decision makers, I compute all the compensation measures for the managerial team, the CEO, and the management team excluding the CEO. In line with [Coles, Daniel, and Naveen \(2006\)](#), management team’s incentives are calculated by cumulating incentives given to the executives reported in Execucomp.¹²

Other governance mechanisms. Besides managerial compensation, I also analyze the response of other governance mechanisms (such as the board of directors and CEO turnover) to changes in creditor governance. As measures of board structure, I use number of independent directors and the total number of directors sitting on the board. To investigate CEO turnover sensitivity to firm performance around the start of CDS trading, I look both at all turnover events and forced turnover events only, based on the classification by [Jenter and Kanaan \(2015\)](#) and [Peters and Wagner \(2014\)](#).

CDS trading activity. As in [Ashcraft and Santos \(2009\)](#) and [Saretto and Tookes \(2013\)](#), I measure CDS trading activity by means of two binary variables. *CDS traded* is an indicator variable equal to one if the firm has a CDS traded at any point over the sample period. *CDS trading* is an indicator variable equal to one in the years in which CDSs are available for a given firm and zero before the start of CDS trading. I also distinguish between CDS contracts on the basis of their credit event definition (documentation

¹²For instance, the management team’s cash-to-stock ratio is given by the ratio of cumulative salary to the cumulative value of equity incentives across executives. Note that Execucomp usually reports the top five executives, but for some firms up to nine executives are reported.

clause). In my sample, CDS contracts trade either with “No restructuring” (XR clause), i.e., a debt restructuring does not trigger CDS settlement, or “Modified restructuring” (MR clause), i.e., restructuring is a credit event. I assign each observation to the clause with the largest number of daily observations in the period (XR clause vs. MR clause). *CDS trading (XR)* (*CDS trading (MR)*) is an indicator variable equal to one in the years in which CDSs are available for a given firm if the XR (MR) contract is the most frequently traded at the time CDS trading starts. Finally, I proxy for the liquidity of a firm’s CDS contracts by means of outstanding net protection sold and of the negative of the illiquidity measure proposed by [Junge and Trolle \(2015\)](#).¹³

Table 1 reports summary statistics for our main variables of interest. Our final sample consists of 2,274 firms, of which 590 have CDS traded on their debt over the sample period. Panel A presents the descriptive statistics for the entire sample, whereas Panel B presents summary statistics for CDS and non-CDS firms separately. Managerial compensation packages of CDS firms contain less salary relative to equity incentives than those of non-CDS firms. This preliminary evidence suggests that there may indeed be a substitution effect between creditor governance and executive compensation structure in restricting managerial risk-taking. However, CDS firms are larger, more levered, older, and exhibit lower market-to-book ratios. They are characterized by less concentrated institutional ownership. Hence, below I employ a formal regression framework.

4 Changes in executive compensation structure

4.1 Main results

I study the risk-taking incentives of executives after the start of CDS trading. The goal is to understand whether and how executive compensation structure is adjusted following a negative shock to creditor governance (as proxied by CDS introduction).

I estimate equation (1) using the cash-to-stock ratio as dependent variable. I perform this analysis for the entire management team (columns 1 and 2), the CEO (columns 3 and 4), and the management team excluding the CEO (columns 5 and 6). One could argue that the control variables in equation (1) are outcome variables themselves and may cause selection bias. To address such concern about “bad controls” ([Angrist and Pischke, 2009](#)), I estimate each specification both without (odd-numbered columns) and

¹³The illiquidity measure by [Junge and Trolle \(2015\)](#) is computed as the quarterly average of absolute 5-year CDS spread changes divided by the number of quotes available on a given contract.

with control variables (even-numbered columns). In each case, I observe a statistically significant decrease (either at the 1% or 5% level) in the cash-stock ratio following the initiation of CDS trading.

These results are not only statistically significant, but also economically large. The coefficient of *CDS trading* can be interpreted as the treatment effect over the entire post-CDS introduction period. The point estimate of -0.033 in column 2 indicates that, following CDS introduction, firms reduce the management team’s cash-to-stock ratio by 33.00% relative to the mean ($= 0.100$) or 18.64% relative to the standard deviation ($= 0.177$). Similarly, the point estimate of -0.020 in column 4 (column 6) corresponds to a decrease of 25.00% relative to the mean ($= 0.080$) or 12.05% relative to the standard deviation ($= 0.166$) in the cash-to-stock ratio of CEOs. Finally, the point estimate of -0.053 in column 6 corresponds to a decrease of 31.55% relative to the mean ($= 0.168$) or 16.46% relative to the standard deviation ($= 0.322$) in the cash-to-stock ratio of non-CEO executives.

Overall, these results are consistent with shareholders adjusting executive incentives following a negative shock to creditor governance. The negative effect of CDS introduction on the cash-to-stock ratio points to a substitution effect between creditor governance and executive compensation structure. More intuitively, shareholders anticipate the deterioration in creditor governance (and the potential increase in risk-shifting) due to CDS introduction and react by decreasing risk-taking incentives as proxied by the cash-to-stock ratio.

4.2 *Economic mechanism*

As a first way to address endogeneity, I better pin down the theoretical mechanism behind my baseline results (Rajan and Zingales, 1998). Table 3 reports the results of several tests exploring the economic channel through which CDS trading influences executive compensation.

First, I exploit cross-sectional variation in the credit event definition of CDS contracts. Before the CDS Big Bang Protocol of April 4, 2009, most of the North American single-name CDSs traded either with “No restructuring” (XR clause), i.e., excluding debt restructuring from credit events, or “Modified restructuring” (MR clause), i.e., including debt restructuring among the credit events. The CDS Big Bang Protocol set the standard credit event for North American names to “No restructuring”.¹⁴ To avoid po-

¹⁴The XR clause was typical for non-investment grade reference entities, while the MR clause was widespread among investment grade ones. Note that I control for a firm’s rating status.

tential confounding effects of the CDS Big Bang Protocol, I end the sample in 2008 for these tests.¹⁵ The goal is to understand which of the two channels of the empty creditor problem (increased renegotiation frictions vs. reduced monitoring) is most important in explaining the observed reduction in the cash-to-stock ratio associated with CDS trading initiation. I expect XR contracts to exacerbate the renegotiation frictions related to empty creditors. Intuitively, creditors of firms with XR contracts are not covered in case of restructuring, and so are more likely to favor borrowers' bankruptcy over out-of-court restructuring to trigger a CDS payment (Subrahmanyam, Tang, and Wang, 2014). By contrast, creditors that hedge with MR contracts are better insulated from credit risk, thus I expect them reduce monitoring incentives to a larger extent than creditors hedged with XR contracts. Panel A of Table 3 shows that, for all executives in the management team, *CDS trading (MR)* has a negative and significant coefficient, whereas *CDS trading (XR)* is insignificant. This result suggests that firms reduce cash-to-stock ratios because of an anticipated weakening in monitoring by creditors.

Second, I examine how the evolution of the cash-to-stock ratio following CDS introduction varies with shareholder bargaining power. I use two proxies of shareholder bargaining power. The first measure, *Inst. own. (HHI)*, is the concentration of institutional ownership computed as its Herfindahl index. The second measure, *Block own.*, is the fraction of equity owned by blockholders. For both measures, the intuition is that large shareholders are better able to coordinate among themselves and thus tend to have higher bargaining power. Panel B of Table 3 reports the estimated coefficients from a specification in which I interact *CDS trading* with the two measures of shareholder bargaining power. Both interaction terms enter with a negative and significant sign. The decrease of cash-to-stock ratios appears to be driven by firms with powerful shareholders. By contrast, in the presence of weak shareholders, firms may not be able to offset the deterioration of creditor governance through an improvement of internal governance.

Third, in Panel C of Table 3, I estimate equation (1) using additional measures of executive compensation structure as dependent variables. The deterioration in creditor governance associated with CDS introduction, besides exacerbating agency costs of debt, may also translate into increased managerial opportunistic behavior. Wealth-performance sensitivity captures the degree of alignment between management and shareholders, thus it provides some indication on equity-management alignment. In columns 1, 5, and 7, the dependent variable is the wealth-performance sensitivity (as proxied by effective owner-

¹⁵Below, I exploit the changes introduced by the CDS Big Bang Protocol in a quasi-natural experiment setting.

ship) of the management team, the CEO, and non-CEO executives, respectively. In each case, the coefficient of *CDS trading* is positive and statistically significant. This is consistent with reduced creditors’ attention to managerial opportunism inducing shareholders to increase wealth-performance sensitivity, i.e., a substitution effect. I also use alternative measures of managerial risk-taking incentives as dependent variables. Columns 2, 6, and 8 show estimation results for the option holdings vega of the management team, the CEO, and non-CEO executives, respectively. Columns 3 and 4 report results for the median and mean cash-stock ratio within the management team, respectively. In line with my baseline results, each of these measures declines significantly after the start of CDS trading.

4.3 A quasi-natural experiment: The 2009 CDS Big Bang Protocol

The tests above rely on the assumption that the timing of CDS introductions is exogenous. I now address endogeneity concerns by using the CDS Big Bang Protocol of April 4, 2009 as a quasi-natural experiment. Besides favoring an increase in CDS market liquidity through an harmonization of contract terms, the CDS Big Bang redefined credit event definitions. Before the CDS Big Bang, virtually all North American single-name CDSs traded either with “No restructuring” (XR clause) or “Modified restructuring” (MR clause). The CDS Big Bang excluded debt restructuring from credit events for North American names.¹⁶ As a result, the CDS Big Bang exacerbated renegotiation frictions for CDS firms (Danis, 2016; Subrahmanyam, Tang, and Wang, 2014). At the same time, the exclusion of debt restructuring from credit events arguably reduced the creditors’ degree of insulation from credit risk, thus inducing them to monitor borrowers more intensely. The consequences of the CDS Big Bang for the creditor-borrower relationship are thus to some extent ambiguous. However, the results in Section 4.2 show that executive compensation structure is especially sensitive to CDS-induced monitoring issues rather than renegotiation frictions. Because of this, I argue that, in the context of compensation-setting policies, the CDS Big Bang constitutes a positive exogenous shock to creditor governance.

Table 4 reports the results from a difference-in-differences estimation for the cash-to-stock ratio around the CDS Big Bang. I focus on short-term changes in compensation structure by restricting the sample to the period 2008 to 2010. Treated firms are those that had CDS traded on their debt as of 2008. Odd-numbered columns show that the

¹⁶For a detailed explanation, see Markit (2009).

cash-to-stock ratio increased for CDS firms after the CDS Big Bang, but the effect is statistically significant only for CEOs. In even-numbered columns, I improve my identification strategy by distinguishing between firms that traded with MR clause and XR clause as of 2008. While the CDS Big Bang affected both groups through an increase of market liquidity (thanks to the harmonization of CDS contracts), the provision on credit event definitions affected only firms that traded with an MR clause as of 2008.¹⁷ Consistently, I find that the effect of the CDS Big Bang is positive and statistically significant for MR firms, whereas I do not find significant effects for XR firms. Intuitively, the CDS Big Bang mitigated monitoring issues in MR firms, thus allowing shareholders to reduce the sensitivity of managerial compensation structure to agency costs of debt.

4.4 IV estimation: The 2004 net capital rule exemption

To further establish a causal link between CDS trading and executive compensation structure, here I employ a shock-based IV technique. This approach, being based on an exogenous shock (e.g., a reform), is more likely to provide an IV estimation that satisfies the exclusion condition (Atanasov and Black, 2016). Following Colonnello, Efung, and Zucchi (2016), I exploit the SEC’s 2004 exemption of a group of broker-dealers from the net capital rule to instrument for CDS availability. The net capital rule was introduced in 1975 and is based on haircuts to be applied to the market value of securities held by broker-dealers. The exemption to this rule came into effect on August 20, 2004 and allowed several broker-dealers to use their internal risk models to compute regulatory capital requirements.

This regulatory event has three features that make it suitable for an IV estimation. First, it recognized a wide range of credit risk transfer (CRT) tools for the computation of capital requirements against derivatives-related credit risk, among which CDSs. The possibility to use CDSs as a CRT tool (thus lowering regulatory capital requirements) arguably increased broker-dealers’ demand for these instruments.¹⁸ Second, the exemption did not apply to all broker-dealers but only to those that were part of so-called consolidated supervised entities (CSEs), i.e., the five major U.S. investment banks back then: Bear Sterns, Goldman Sachs, Lehman Brothers, Merrill Lynch, and Morgan Stanley.¹⁹ To

¹⁷The stand-alone treatment indicators are absorbed by firm fixed effects.

¹⁸“As part of its initial application or in an amendment, the broker or dealer may request Commission approval to reduce deductions for credit risk through the use of credit derivatives”. A similar provision applies to the holding company of the broker-dealer. See Federal Register, Volume 69, Number 118.

¹⁹The exemption applied only to broker-dealer subsidiaries of CSEs. CSE holding companies were never subject to the net capital rule.

capture this aspect, I define treated firms as those that had public debt underwritten or loans extended by a CSE in the years prior to the exemption. Third, the exemption came into effect on August 20, 2004, but CSE-affiliated broker-dealers still needed to apply for SEC’s approval to use internal risk models. Such approval was granted to CSE-affiliated broker-dealers at different times. Hence, firms in the treatment group were affected by the exemption at staggered times.²⁰

Based on these considerations, I instrument for CDS availability (*CDS trading*) with an indicator variable (*CSE relationship*) equal to one in a given firm-year if (i) a CSE has underwritten public debt or extended loans to the firm in the previous five years, and (ii) the CSE has already obtained the SEC’s authorization to use internal models (and thus recognize CDSs as a CRT tool).²¹ Given that the endogenous variable, *CDS trading*, is binary, I employ the method proposed by Wooldridge (2010) and applied, among others, by Dimitrov and Tice (2006) and Saretto and Tookes (2013). In a preliminary step, I estimate a probit model for CDS trading, where the right-hand-side variables comprise my instrument, *CSE relationship*, the control variables of equation (1), and Fama-French 48-industry and year fixed effects. Based on the probit coefficient estimates, I generate the fitted probability of CDS trading, which I then use as the instrument in a standard IV framework.

Appendix Table A.2 reports estimates from the preliminary probit model for CDS trading. The instrument, *CSE relationship*, satisfies the relevance condition and displays the expected positive coefficient sign. A likelihood ratio (LR) test rejects the null hypothesis that the inclusion of *CSE relationship* does not improve model fit, reducing concerns about weak identification. Given this preliminary step, Table 5 re-estimates the main regressions in Table 2 instrumenting for CDS availability with the fitted CDS trading probability. The reduced sample size results from limited availability of lender and underwriter information from Dealscan and SDC, given that not all firms rely on these sources of finance. I estimate the second-stage regression for the cash-to-stock ratio of the management team, the CEO, and non-CEO executives, both with Fama-French

²⁰These are the dates at which CSE-affiliated broker-dealers obtained SEC’s authorization: Merrill Lynch (January 2005), Goldman Sachs (May 2005), Bear Sterns, Lehman Brothers, and Morgan Stanley (December 2005). Moreover, variation in fiscal year-end month across firms induces variation in the timing of treatment.

²¹Both underwriting and lending banks are likely to importantly affect the availability of CDSs (Saretto and Tookes, 2013). Note that all the bank subsidiaries reported as lead arrangers or underwriters are matched to their ultimate parent company. I trace the history of mergers and acquisitions of each of them, so that in each period I am able to match it to its ultimate parent company. In line with the literature, I assume that the relationships of target institutions are inherited by acquiring financial institutions following mergers.

48-industry and with firm fixed effects. In each column, the estimated coefficients for instrumented *CDS trading* remain negative and statistically significant. Also the economic magnitude of the effect of CDS trading is consistent with the baseline results.²²

4.5 Selection in CDS availability

The analysis carried out so far (except the quasi-natural experiment based on the CDS Big Bang) examines the long-term effect of CDS introduction on executive compensation structure, i.e. the total change in the years following the start of CDS trading. To better identify the link between compensation policy and CDS availability, another line of inquiry is to study changes around CDS introduction. I perform a difference-in-difference analysis relative to a matched sample of non-CDS firms with a similar probability of becoming reference entities. Matching serves as a remedy for potential non-randomness of treatment, where the treatment is the start of CDS trading.

To identify the matched control sample, I use the [Abadie and Imbens \(2011\)](#) matching estimator. This estimator minimizes the matching error (the Mahalanobis distance) on a vector of continuous covariates and allows to have exact matching on a set of categorical variables. As the matching on continuous covariates cannot be exact, a bias-correction is applied to the estimated treatment effect. Moreover, this procedure provides heteroskedasticity-consistent standard errors.

Using this technique, I estimate the average treatment effect of the treated (ATT), i.e., the difference in the evolution of executive compensation structure after CDS introduction. Each CDS-firm is matched to the closest non-CDS firm, allowing for replacement. All the matching variables are lagged by one year relative to CDS introduction. I require exact matching on the size quartile, an indicator equal to one if the firm has a rating, an indicator equal to one if the firm has an investment-grade rating, and Fama-French 10-industry classification.²³ As continuous matching covariates, I employ the cash-to-stock ratio of the management team and of the CEO. In an additional matching exercise, the vector of continuous covariates includes also book leverage, tangibility, market-to-book ratio, profitability, and stock volatility. All these variables are important predictors of CDS trading. The rating indicators also help reducing concerns about differences in the debt structure (public vs. bank debt) between CDS and non-CDS firms, which could

²²In unreported tests, I find that these results are robust to using a maximum likelihood approach to estimate a treatment-effects model encompassing a first-stage latent-variable model that accounts for the binary nature of *CDS trading* ([Cameron and Trivedi, 2009](#)).

²³A finer industry definition would substantially reduce the pool of control firms. Indeed, note that the pool of non-CDS firms include only firms that are never traded (*CDS traded* = 0).

play an important role in shaping creditor governance. The lagged cash-to-stock ratio is added to help ensure treated and matched control firms are on parallel trends prior to CDS introduction.

Appendix Table A.3 reports the mean of several variable for treated and control firms before and after matching (using both sets of continuous covariates). Before matching, CDS-firms and non-CDS firms exhibit large and statistically significant differences in the reported variables. For instance, CDS-firms have substantially higher total assets and their executives' compensation structure relies more on equity incentives. Given that I match on multiple variables and I also require exact matching on several characteristics, some of the differences remain statistically significant after matching, but become economically much smaller, especially when using the entire set of continuous covariates.

Table 6 shows the estimated ATT for the cash-to-stock ratio of the management team, the CEO, and non-CEO executives. Panel A presents the results from the baseline matching. I focus on changes in the cash-to-stock ratio from year $t - 1$ to year t , where t is the year of initiation of CDS trading. I find a statistically significant decrease, except for CEOs. Also, the economic magnitude of the effect of CDS introduction is similar to the estimates in Table 2. It then is worth highlighting that the effect of CDS trading does not fade out in just one year, but remains stable and significant from year $t - 1$ to year $t + 1$. Indeed, the change in the cash-to-ratio from year t to year $t + 1$ is not significantly different across CDS-firms and matched non-CDS firms. To support the causal interpretation of these results, I also examine changes in compensation structure from year $t - 2$ to year $t - 1$. Reassuringly, I find that the difference between treated and control firms is small and insignificant, meaning that no relevant effect is at work before treatment (parallel trends assumption). These results are confirmed in Figure 2, where I plot both the mean (on the left) and median (on the right) cash-to-stock ratios for treated and control firms around CDS introduction. This figure corroborates that CDS-firms and matched non-CDS firms' compensation structures are on parallel trends and that differences in the level of cash-to-stock ratios are economically small before CDS introduction. Panel B reports the results from the matching exercise with additional continuous covariates. The previous findings remain robust, and also the CEO cash-to-stock ratio exhibits a significant decrease between year $t - 1$ and year t in this case. To sum up, the start of CDS trading displays also a short-term effect on executive compensation structure.

4.6 Additional tests

I conduct several robustness tests of my main results on the cash-to-stock ratio and CDS availability.

Table 7 presents specifications for the management team, the CEO, and non-CEO executives. First, in columns 1, 4, and 7, I include CEO characteristics (CEO age, CEO tenure, and an indicator for CEO turnover) as additional control variables. Second, in columns 2, 5, and 8, I use explanatory variables lagged by one year. Third, in columns 3, 6, and 9, I restrict the sample to the period before 2009 (prior to the implementation of the CDS Big Bang Protocol of April 2009). This sample restriction also allows me to focus on the period over which CDSs start trading for most of the firms. In line with the main analysis, I find a negative effect of CDS introduction on the cash-to-stock ratio carries in each case, except for CEOs when using lagged regressors in column 5 (p -value of 0.114).

To further mitigate concerns about selection in CDS availability, in Table 8 I focus on CDS trading firms, exploiting variation in CDS market liquidity, a proxy for creditors' ability to buy CDS protection against credit risk on a given firm. To measure CDS liquidity, I rely on (i) *CDS net protection*, namely the overall net CDS position on a firm's debt from DTCC (available from October 2008) and (ii) *CDS liquidity (pct)*, namely a price impact measure in the spirit of [Junge and Trolle \(2015\)](#). In columns 1, 2, 5, 6, 7, and 8, I observe a negative relation between the cash-to-stock ratio and both measures of CDS liquidity, although insignificant for CEOs and for non-CEO executives when using the price impact measure.²⁴ In the case of CDS liquidity measures, I can also analyze inside debt holdings, i.e., pensions and deferred compensation plans held by executives, which are akin to debt owed to executives. Inside debt incentives are admittedly a more direct measure of managerial wealth sensitivity to agency costs of debt than the cash-to-stock ratio. Unfortunately, the relative incentive ratio can only be computed starting in 2006, whereas most of CDS introductions, i.e., the source of variation in creditor governance in my baseline tests, take place between 2001 and 2005, which is why in the remainder of the paper I rely on the cash-to-stock ratio.²⁵ As a measure of inside debt incentives, I rely on the relative incentive ratio, which proxies for "the marginal change in the CEO's inside debt over the marginal change in his inside equity holdings,

²⁴In the regressions on *CDS liquidity (pct)*, I exclude *Stock volatility* from the control variables because it may give rise to collinearity problems.

²⁵The SEC's disclosure requirements about executive pension and deferred compensation plans were first enforced for 2006 fiscal year-end.

given a unit change in the overall value of the firm, scaled by the ratio of the marginal change in the firm’s external debt over the marginal change in its external equity, given the same unit change in the overall value of the firm” (Wei and Yermack, 2011). In columns 3 and 4, I look at the median relative incentive ratio within the management team and find a positive relation with CDS liquidity, which is again consistent with a substitution effect between creditor governance and internal governance. Intuitively, executives’ wealth becomes more sensitive to changes in debt value as CDS liquidity increases. The relation is statistically significant only for *CDS liquidity (pct)*. However, the insignificance of some specifications in CDS liquidity tests may just reflect a lack of statistical power because of the reduced sample size (especially for *CDS net protection*).

5 Changes in other governance mechanisms

The evidence presented so far suggests that shareholders respond to a deterioration in creditor governance by modifying executive compensation structure. The results I obtain are consistent with a substitution effect between creditor governance and the incentives provided to executives via their compensation packages. After CDS introduction, executives receive less risk-taking incentives and their wealth-performance sensitivity increases. Thus, it seems natural to investigate whether a similar response can be observed for other governance mechanisms, namely board structure and CEO turnover.

5.1 Board of directors

I now examine how board structure changes after a negative shock to creditor governance, as proxied by the initiation of CDS trading. I test if shareholders anticipate and actively respond to a deterioration in creditor governance improving board governance at after CDS introduction. More intuitively, as managerial inefficiency harms all investors, shareholders and creditors share an interest in curbing it (e.g., Jensen, 1986). Therefore, I investigate if the initiation of CDS trading for a particular firm triggers a substitution effect between creditor governance and board governance. A sensible reason to look at board scrutiny as a substitute for creditor governance is given by the evidence that both the board of directors and creditors play an important role in the effective and timely displacement of poorly-performing CEOs. Indeed, there is evidence that both higher board independence (Knyazeva, Knyazeva, and Masulis, 2013) and creditors’ interventions (Nini, Sufi, and Smith, 2012) lead to higher turnover of underperforming CEOs.

To examine this issue, I estimate equation (1) using board independence as dependent

variable. Board independence, i.e., the fraction of independent directors, is bounded zero and one, so I use its logistic transformation ($\log(y/(1-y))$) in line with [Ferreira, Ferreira, and Raposo \(2011\)](#). The variables of interest are *CDS trading* and *CDS traded*, which is equal to one if a firm has traded CDSs at any time over the sample period and is meant to control for any time-invariant differences in board structure between CDS and non-CDS firms. I control for a host of variables that have been shown to be important determinants of board structure. Such variables account for several theories of board structure, assigned to three broad groups by [Boone, Field, Karpoff, and Raheja \(2007\)](#). First, the scope of operations hypothesis, initially proposed by [Fama and Jensen \(1983\)](#) and reformulated by [Boone, Field, Karpoff, and Raheja \(2007\)](#), argues that the fraction of independent directors shall rise as a firm grows and becomes complex, to curb larger agency costs through enhanced monitoring. As customary in the literature, I control for complexity by means of book leverage, firm size as proxied by total assets, diversification as proxied by the number of business segments, and firm age. A second theory of board structure, the so called monitoring hypothesis ([Adams and Ferreira, 2007](#)), points out that, as information asymmetry about the firm rises, the cost of transferring the information needed to exert an effective monitoring activity to outsiders increases, thus lowering optimal board independence. I control for the cost of monitoring and advising through the following variables: Market-to-book ratio to proxy for growth opportunities, equity volatility to proxy for information asymmetry between the firm and the outside director, operating cash flow, and free cash flows to proxy for private benefits. Third, [Hermalin and Weisbach \(1998\)](#) contribute to the negotiation hypothesis, claiming that CEO’s bargaining power and CEO’s distance to retirement are important determinants of board structure. To account for CEO’s influence, I use CEO tenure and age. Finally, to take care of endogeneity concerns stemming from omitted variables, I include Fama-French 48-industry and year fixed effects. In the baseline specification, I do not control for firm fixed effects because board independence exhibits limited time-series variation.

Table 9 sheds light on the changes in board structure following CDS introduction. Column 1 illustrates that the initiation of CDS trading is followed by a significant increase in the fraction of independent directors. Based on the specification of column 1, CDS introduction is followed by an increase in board independence by roughly 2% (evaluated at mean). Given the persistence of board structure, these are substantial effects, as it emerges from a comparison with other determinants found to be relevant in the literature (e.g., [Linck, Netter, and Yang, 2008](#)). A potential alternative explanation for an increase in board independence after CDS introduction is that (i) board independence exhibits

a positive time trend, (ii) outside directors are seen as a proxy for good governance, so that large and visible firms appoint more of them, and (iii) CDS firms tend to be large and visible. To control for such explanation, in column 2 I include a vector of size and time interactions. I find that the increase in board independence is robust to the inclusion of these interactions. Column 3 explores the role of CDS credit event definitions, ending the sample in 2008 to avoid potential confounding effects of the CDS Big Bang Protocol. I find that the increase in independent directors after CDS trading initiation is driven by MR clause contracts. Column 4 illustrates that the result is robust to using coarser industry fixed effects, namely based on the Fama-French 17 industry definition. In columns 5 and 6, for robustness, I focus on the time-series variation in board independence by including firm fixed effect. In column 5, *CDS trading* still exhibits a positive coefficient but becomes insignificant. Thus, in column 6, I interact *CDS trading* with *No classified board*, an indicator variable equal to one in the absence of a classified board. Indeed, the presence of a classified board makes it impossible for shareholders to appoint a completely new team of directors in just one year. Classified boards are widespread: 54.33% of the firms in my sample have such a provision. I show that, after controlling for firm fixed effects, firms without a classified board exhibit a significantly larger adjustment of board independence following the initiation of CDS trading. Overall, these results are consistent with shareholders enhancing board governance at the time of CDS introduction in anticipation of a deterioration of creditor governance. A CDS-induced reduction in monitoring by creditors seems to be the mechanism at work, given that the increase in board independence is driven by MR contracts.

5.2 CEO turnover

Creditors are able to influence managerial turnover (Nini, Sufi, and Smith, 2012; Ozelge and Saunders, 2012; Akins, De Angelis, and Gaulin, 2016). A deterioration in creditor governance may translate in less turnover events forced by creditors. However, creditors are arguably most likely to affect turnover in bad states of the world, thus reduced monitoring by creditors is unlikely to immediately reduce the turnover rate in non-distressed firms. But shareholders may still anticipate the deterioration in creditor governance and the ensuing exacerbation of managerial opportunism, and intensify scrutiny of management. To achieve this goal, besides adjusting executive compensation structure and board structure, shareholders may make managerial turnover more sensitive to firm performance. It is thus interesting to examine the sensitivity of CEO turnover to firm per-

formance around CDS introduction. I estimate a probit model that relates CEO turnover to stock return and the presence of CDS contracts on a firm’s debt. Besides stock return and its interaction with the CDS trading indicator, the baseline specification includes various control variables in line with the literature, namely the logarithm of total assets, the market-to-book ratio, an indicator variable for CEOs of retirement age (above the age of 60), and CEO tenure. I also control for Fama-French 48-industry and year fixed effects.

Table 10 presents the results of the estimation. Panel A reports the estimated coefficients from the probit model. Column 1 considers all the CEO turnover events in my sample. Column 2 focuses on unforced CEO turnovers. Columns 3 through 6 restrict the analysis to forced CEO turnovers, i.e., the turnovers that are more likely to be due to poor performance. Column 4 reports estimates from a specification including coarser industry fixed effects, namely based on the Fama-French 17 industry definition. Column 5 distinguishes CDS contracts based on their credit event definition (MR vs. XR clause), ending the sample in 2008 because of the CDS Big Bang. Column 6 decomposes stock return into the idiosyncratic stock return and the market-adjusted industry stock return component (Peters and Wagner, 2014). I am interested in analyzing the sensitivity of CEO turnover to stock return in CDS and non-CDS firms. However, because of the nonlinearity of the probit model, one cannot simply look at the sum of coefficients of *Return* and *Return* \times *CDS trading* and draw conclusions on the sign and the statistical significance of the effect (Ai and Norton, 2003).

Panel B of Table 10 presents estimated average marginal effects (AMEs) of stock return on CEO turnover for each specification of Panel A, taking into account the nonlinearity of the probit model. Whereas CEO turnover is generally negatively related to *Return*, I do not find significant differences in turnover performance-sensitivity between CDS and non-CDS firms when looking at all turnovers and at unforced turnovers (models 1 and 2). By contrast, when focusing on forced turnovers, I find that the turnover performance-sensitivity increases significantly following the initiation of CDS trading (models 3 and 4). In line with shareholder responding to reduced monitoring by creditors, forced turnovers are significantly more sensitive to performance following the introduction of MR contracts, but not after introduction of XR contracts (model 5). Interestingly, the higher performance-sensitivity of CEO turnover is driven by idiosyncratic return (model 6). All in all, these findings are consistent with a substitution effect between creditor governance and internal governance. Intuitively, I argue that shareholders anticipate a deterioration in creditor governance following CDS introduction and choose to monitor management

more closely.

6 Conclusion

This paper studies the interaction between internal governance mechanisms and creditor governance. I build on the intuition that shareholders have an interest in enhancing internal governance after a worsening of the creditor-borrower relationship. Consistently, I find evidence of a substitution effect between internal governance and creditor governance.

In particular, I exploit the start of CDS trading on a firm's debt to proxy for a negative shock to creditor governance. Creditors that hedge with CDSs de facto relinquish cash flow rights while retaining control rights on the extended loans. As a result, they might become so-called empty creditors. First, empty creditors might be tougher in renegotiations and lead to inefficient liquidations because they have more bargaining power. Second, CDS-hedged creditors are insulated from borrowers' distress, which may decrease their incentive to monitor. Consistently, previous work shows that CDS introduction is indeed linked to a deterioration in creditor governance.

The internal governance mechanisms that I investigate include executive compensation structure, board structure, and managerial turnover performance-sensitivity. I show that firms provide executives with lower risk-taking incentives after the initiation of CDS trading. At the same time, firms increase managerial wealth-performance sensitivity. Following the CDS introduction, firms also increase board independence and managerial turnover performance-sensitivity. These results are consistent with shareholders anticipating the deterioration in creditor governance after CDS introduction and trying to limit both agency costs of debt and agency costs of managerial discretion. My findings are robust to concerns about endogeneity and selection in CDS availability.

This paper contributes to the debate on the repercussions of CDS trading. My results suggest that shareholders rationally seek to offset the negative shock to creditor governance brought about by CDSs through an ex ante improvement of internal governance. However, such a response may not fully offset the negative ex post consequences of the empty creditor problem shown in prior studies. Assessing the net welfare effect of these opposing forces is an area for future research.

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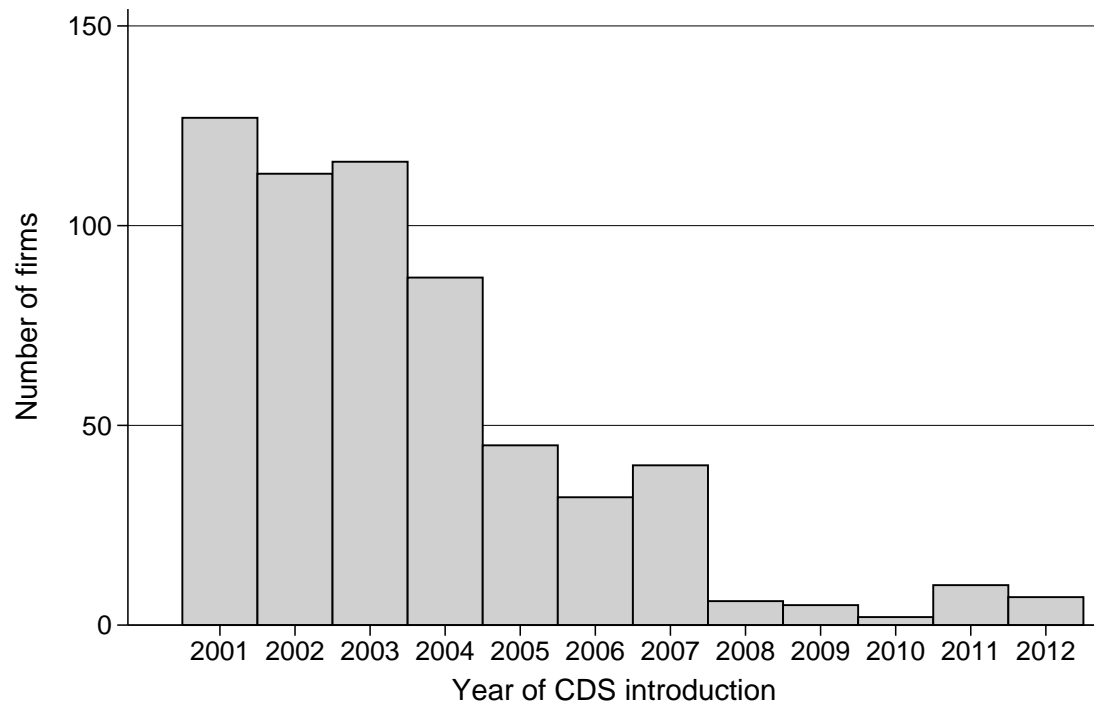


Figure 1. Timing of CDS introduction
This figure groups CDS firms by the year of initiation of CDS trading based on Markit data (2001-2012).

Cash-to-stock ratio around CDS introduction

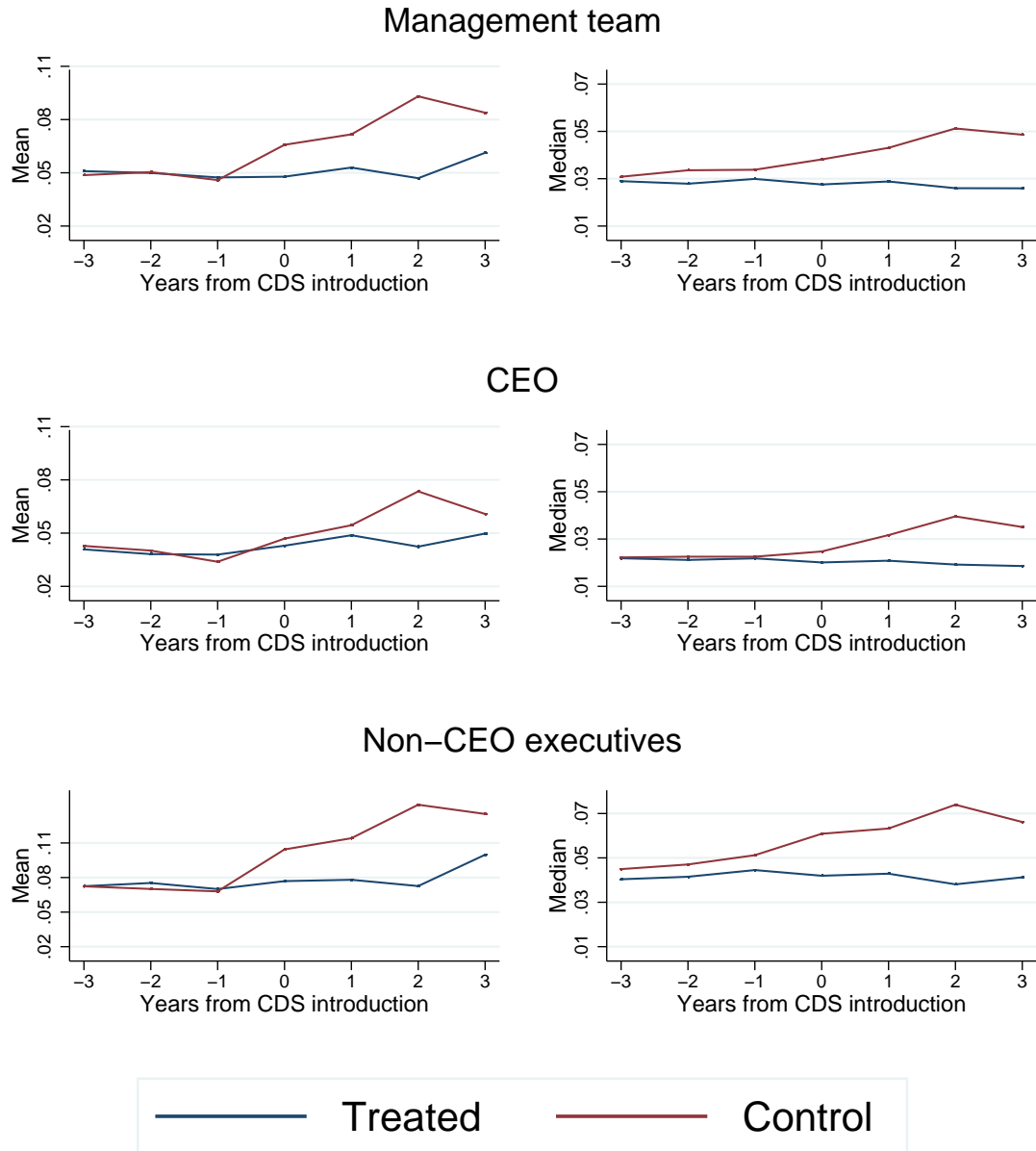


Figure 2. Cash-to-stock ratio around CDS introduction

This figure shows the effect of CDS trading on managerial risk-taking incentives, as proxied by the cash-to-stock ratio proposed by [Carlson and Lazrak \(2010\)](#), relative to a matched sample of non-CDS firms. More details on the baseline matching procedure are given in Table 6. The horizontal axis shows years in event-time. At time zero CDSs are introduced on firms' debt. The vertical axis shows the mean (on the left) and the median (on the right) of the cash-to-stock ratio. The sample contains firm-year observations for the period 2000-2012.

Table 1. Summary statistics

This table reports summary statistics of the variables employed in the paper. The sample includes 2,274 U.S. firms for the period 2000-2012, excluding financial institutions and utilities. I obtain CDS data from Markit and DTCC, accounting and stock market data from the CRSP-Compustat merged database, top executive data from Execucomp, and board of directors' data from IRRC and Riskmetrics. Panel A presents the descriptive statistics of the variables over the entire sample. Panel B presents the descriptive statistics conditioning on firms' CDS trading status. All dollar amounts are in millions of 2012 dollars. Refer to Appendix Table A.1 for variable definitions.

Panel A: Whole sample						
	Mean	Std. dev.	Q1	Med.	Q3	Obs.
<i>CDS trading activity</i>						
CDS net protection	0.338	0.380	0.090	0.187	0.435	1147
CDS gross protection	4.414	5.407	0.997	2.281	5.854	1147
5-year CDS spread (bps)	213.858	440.273	43.578	92.239	231.034	4246
CDS liquidity (percentile)	0.504	0.283	0.260	0.510	0.750	4517
CDS traded	0.361	0.480	0.000	0.000	1.000	18813
CDS trading	0.271	0.444	0.000	0.000	1.000	18813
CDS trading (MR)	0.187	0.390	0.000	0.000	0.000	18813
CDS trading (XR)	0.084	0.277	0.000	0.000	0.000	18813
<i>Managerial incentives</i>						
Cash-to-stock (management team)	0.100	0.177	0.019	0.044	0.099	18003
Cash-to-stock (CEO)	0.080	0.166	0.013	0.030	0.072	17867
Cash-to-stock (non-CEO exec.)	0.168	0.322	0.032	0.072	0.160	17985
Median cash-to-stock (management team)	0.184	0.353	0.038	0.078	0.171	18003
Median relative incentive (management team)	1.587	4.846	0.000	0.139	0.878	7332
Wealth-performance sens. (management team)	5.976	7.917	1.644	3.258	6.499	18012
Wealth-performance sens. (CEO)	3.388	5.708	0.659	1.447	3.196	18012
Wealth-performance sens. (non-CEO exec.)	2.496	3.822	0.675	1.360	2.580	18007
Vega (management team)	238.722	381.115	33.644	99.051	258.745	18012
Vega (CEO)	107.591	181.483	11.256	40.754	115.612	18012
Vega (non-CEO exec.)	128.065	207.257	18.002	52.197	136.749	18007
<i>Firm characteristics</i>						
Total assets	6448.373	21513.295	518.114	1338.233	4026.426	18813
Book leverage	0.213	0.194	0.028	0.190	0.325	18813
Tangibility	0.258	0.214	0.093	0.192	0.364	18801
Rated	0.470	0.499	0.000	0.000	1.000	18813
Investment grade	0.240	0.427	0.000	0.000	0.000	18813
Market-to-book	2.006	1.375	1.204	1.580	2.278	18812
Profitability	0.128	0.123	0.085	0.131	0.185	18788
Stock volatility	0.484	0.309	0.285	0.400	0.580	18813
Institutional ownership (HHI)	0.063	0.075	0.035	0.047	0.065	18751
Block ownership	0.229	0.127	0.130	0.209	0.309	16926
Free cash flow	0.076	0.125	0.040	0.085	0.133	18714
Firm age	21.379	13.953	10.000	17.000	35.000	18656
Number business segments	5.520	3.598	3.000	5.000	7.000	18813
Return	0.144	0.568	-0.189	0.077	0.353	18503
Idiosyncratic return	-0.005	0.500	-0.278	-0.041	0.205	18406
Market-adjusted industry return	0.019	0.222	-0.104	-0.003	0.092	18673
<i>Board and CEO characteristics</i>						
Board independence	0.717	0.158	0.625	0.750	0.857	14418
Board size	8.943	2.249	7.000	9.000	10.000	14418
Classified board	0.543	0.498	0.000	1.000	1.000	16773
CEO age	55.183	7.488	50.000	55.000	60.000	18012
CEO tenure	7.180	7.232	2.000	5.000	10.000	18012
CEO turnover	0.114	0.318	0.000	0.000	0.000	18012
CEO turnover (forced)	0.032	0.177	0.000	0.000	0.000	13073

(Continued)

Table 1. – *Continued*

Panel B: CDS firms vs. non-CDS firms						
	CDS-firms			Non-CDS firms		
	Mean	Med.	Obs.	Mean	Med.	Obs.
<i>Managerial incentives</i>						
Cash-to-stock (management team)	0.069	0.033	5011	0.112	0.050	12992
Cash-to-stock (CEO)	0.057	0.023	4992	0.088	0.034	12875
Cash-to-stock (non-CEO exec.)	0.111	0.049	5007	0.190	0.083	12978
Median cash-to-stock (management team)	0.120	0.053	5011	0.209	0.090	12992
Median relative incentive (management team)	1.398	0.390	2962	1.715	0.000	4370
Wealth-performance sens. (management team)	3.264	1.548	5015	7.022	4.116	12997
Wealth-performance sens. (CEO)	1.814	0.697	5015	3.995	1.892	12997
Wealth-performance sens. (non-CEO exec.)	1.382	0.664	5015	2.926	1.712	12992
Vega (management team)	456.269	269.274	5015	154.780	72.570	12997
Vega (CEO)	209.002	119.226	5015	68.461	29.190	12997
Vega (non-CEO exec.)	240.522	135.185	5015	84.656	38.672	12992
<i>Firm characteristics</i>						
Total assets	18578.929	7448.172	5092	1946.603	827.061	13721
Book leverage	0.298	0.270	5092	0.181	0.139	13721
Tangibility	0.303	0.244	5083	0.241	0.176	13718
Rated	0.955	1.000	5092	0.289	0.000	13721
Investment grade	0.626	1.000	5092	0.097	0.000	13721
Market-to-book	1.735	1.479	5092	2.106	1.632	13720
Profitability	0.140	0.135	5089	0.124	0.130	13699
Stock volatility	0.388	0.307	5092	0.520	0.435	13721
Institutional ownership (HHI)	0.050	0.039	5086	0.068	0.050	13665
Block ownership	0.208	0.185	4418	0.237	0.219	12508
Free cash flow	0.090	0.088	5078	0.071	0.084	13636
Firm age	30.169	35.000	5078	18.092	15.000	13578
Number business segments	7.005	6.000	5092	4.970	4.000	13721
Return	0.126	0.090	5028	0.151	0.070	13475
Idiosyncratic return	-0.034	-0.033	5028	0.006	-0.044	13378
Market-adjusted industry return	0.020	-0.002	5077	0.019	-0.004	13596
<i>Board and CEO characteristics</i>						
Board independence	0.773	0.800	4417	0.692	0.714	10001
Board size	10.406	10.000	4417	8.297	8.000	10001
Classified board	0.496	0.000	5016	0.564	1.000	11757
CEO age	55.931	56.000	5015	54.895	55.000	12997
CEO tenure	6.238	5.000	5015	7.544	5.000	12997
CEO turnover	0.122	0.000	5015	0.111	0.000	12997
CEO turnover (forced)	0.032	0.000	3538	0.032	0.000	9535

Table 2. Managerial risk-taking incentives and CDS trading

This table reports panel regressions of managerial risk-taking incentives on the indicator variable *CDS trading*, which is equal to one in the years in which CDSs are available for the firm and zero before the start of CDS trading. The measure of managerial risk-taking incentives is the cash-to-stock ratio proposed by [Carlson and Lazrak \(2010\)](#). Columns 1 and 2 analyze the cash-to-stock ratio of the entire management team. Columns 3 and 4 analyze the cash-to-stock ratio of the CEO. Columns 5 and 6 analyze the cash-to-stock ratio of non-CEO executives. Odd-numbered columns do not include control variables. Even-numbered columns control for selected firm characteristics (market-to-book ratio, profitability, tangibility, size, book leverage, stock volatility, debt-equity ratio, profitability, and indicator variables for the presence of a rating and for the investment grade rating status). All specifications include firm fixed effects and year fixed effects. The sample contains firm-year observations for the period 2000-2012. The *t*-statistics (in parentheses) are calculated with robust standard errors clustered by firm. Significance at the 10%, 5%, and 1% level is indicated by *, **, ***, respectively. Refer to Appendix Table A.1 for variable definitions.

	Management team		CEO		Non-CEO executives	
	(1)	(2)	(3)	(4)	(5)	(6)
CDS trading	-0.031*** (-4.46)	-0.033*** (-5.06)	-0.017** (-2.52)	-0.020*** (-3.10)	-0.050*** (-4.31)	-0.053*** (-4.96)
Market-to-book		-0.021*** (-11.64)		-0.016*** (-10.37)		-0.033*** (-10.56)
Profitability		-0.168*** (-5.08)		-0.135*** (-4.75)		-0.280*** (-4.68)
Tangibility		0.053 (1.63)		0.036 (1.14)		0.097* (1.70)
Size		-0.076*** (-12.20)		-0.054*** (-9.71)		-0.128*** (-11.40)
Book leverage		0.122*** (4.55)		0.087*** (3.83)		0.210*** (4.84)
Stock volatility		0.162*** (13.97)		0.141*** (12.01)		0.266*** (12.53)
Rated		-0.021** (-2.22)		-0.017* (-1.93)		-0.018 (-1.06)
Investment grade		0.007 (0.93)		0.002 (0.22)		0.010 (0.74)
Firm F.E.	Yes	Yes	Yes	Yes	Yes	Yes
Year F.E.	Yes	Yes	Yes	Yes	Yes	Yes
Observations	17174	17148	17040	17014	17157	17131
Adjusted R^2	0.08	0.23	0.05	0.15	0.07	0.20

Table 3. Managerial compensation structure and CDS trading: Economic mechanism

This table examines the economic mechanism behind the relation between managerial compensation structure and CDS availability on the firm's debt. Panel A reports panel regressions of managerial risk-taking incentives, as proxied by the cash-to-stock ratio proposed by [Carlson and Lazrak \(2010\)](#), on *CDS trading (MR)* and *CDS trading (XR)*. *CDS trading (MR)* is an indicator variable equal to one in the years in which CDSs are available for a given firm if the "Modified restructuring" contract (MR clause, i.e., restructuring is a credit event) is the most frequently traded at the time CDS trading starts. *CDS trading (XR)* is defined analogously for "No restructuring" contracts (XR clause, i.e., a debt restructuring does not trigger CDS settlement). The sample contains firm-year observations for the period 2000-2008. Panel B reports panel regressions of the cash-to-stock ratio on the indicator variable *CDS trading*, which is equal to one in the years in which CDSs are available for the firm and zero before the start of CDS trading, and its interactions with two different measures of shareholder bargaining power. Odd-numbered columns interact *CDS trading* with *Institutional ownership (HHI)*, i.e., the concentration of institutional ownership computed as its Herfindahl index. Even-numbered columns interact *CDS trading* with *Block ownership*, i.e., the fraction of equity owned by blockholders. The sample contains firm-year observations for the period 2000-2012. Panel C reports panel regressions of several managerial incentive measures on the indicator variable *CDS trading*. In columns 1, 5, and 7, the dependent variable is wealth-performance sensitivity (*WPS*), as proxied by effective ownership. In columns 2, 6, and 8, the dependent variable is the vega of the option portfolio (*Vega*). In columns 3 and 4, the dependent variable is the median and mean cash-to-stock ratio within the management team. For brevity, following [Carlson and Lazrak \(2010\)](#), the cash-to-stock ratio is denoted as A/pS , where A is the salary, p is the effective ownership (accounting for stock and option holdings), and S is the end-of-year firm's market capitalization. The sample contains firm-year observations for the period 2000-2012. All tests are conducted for the management team, the CEO, and non-CEO executives. All specifications include the same control variables as in Table 2 (market-to-book ratio, profitability, tangibility, size, book leverage, stock volatility, debt-equity ratio, profitability, and indicator variables for the presence of a rating and for the investment grade rating status). All specifications include firm fixed effects and year fixed effects. The t -statistics (in parentheses) are calculated with robust standard errors clustered by firm. Significance at the 10%, 5%, and 1% level is indicated by *, **, ***, respectively. Refer to Table A.1 for variable definitions.

Panel A: Credit event definition			
	Management team	CEO	Non-CEO executives
	(1)	(2)	(3)
	Year \leq 2008	Year \leq 2008	Year \leq 2008
CDS trading (MR)	-0.032*** (-4.97)	-0.027*** (-4.60)	-0.044*** (-3.93)
CDS trading (XR)	-0.008 (-0.77)	0.004 (0.36)	-0.028 (-1.64)
Control variables	Yes	Yes	Yes
Firm F.E.	Yes	Yes	Yes
Year F.E.	Yes	Yes	Yes
Observations	11876	11791	11864
Adjusted R^2	0.22	0.15	0.20

(Continued)

Table 3. – *Continued*

Panel B: Shareholder bargaining power						
	Management team		CEO		Non-CEO executives	
	(1)	(2)	(3)	(4)	(5)	(6)
CDS trading	-0.010 (-0.84)	-0.009 (-1.04)	0.001 (0.09)	-0.001 (-0.11)	-0.029* (-1.94)	-0.006 (-0.43)
CDS trading \times Inst. own. (HHI)	-0.521** (-2.29)		-0.471* (-1.72)		-0.583** (-2.21)	
Inst. own. (HHI)	0.346*** (5.72)		0.317*** (5.28)		0.651*** (5.60)	
CDS trading \times Block own.		-0.101*** (-3.23)		-0.080** (-2.50)		-0.195*** (-3.81)
Block own.		0.032* (1.90)		0.006 (0.35)		0.073** (2.24)
Control variables	Yes	Yes	Yes	Yes	Yes	Yes
Firm F.E.	Yes	Yes	Yes	Yes	Yes	Yes
Year F.E.	Yes	Yes	Yes	Yes	Yes	Yes
Observations	17091	15579	16957	15452	17074	15567
Adjusted R^2	0.24	0.24	0.16	0.15	0.21	0.20

(Continued)

Table 3. – *Continued*

Panel C: Other managerial incentive measures								
	Management team				CEO		Non-CEO executives	
	(1) WPS	(2) Vega	(3) Med. A/pS	(4) Mean A/pS	(5) WPS	(6) Vega	(7) WPS	(8) Vega
CDS trading	1.037*** (3.95)	-28.435** (-2.13)	-0.052*** (-4.42)	-0.071*** (-2.81)	0.684*** (3.60)	-11.866* (-1.82)	0.334** (2.21)	-13.761* (-1.86)
Control variables	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firm F.E.	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year F.E.	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	17155	17155	17148	17148	17155	17155	17150	17150
Adjusted R^2	0.09	0.07	0.19	0.08	0.06	0.05	0.04	0.07

Table 4. Managerial risk-taking incentives and CDS trading: A quasi-natural experiment

This table reports panel regressions of managerial risk-taking incentives that exploit the introduction of the CDS Big Bang Protocol in 2009 as a quasi-natural experiment. The measure of managerial risk-taking incentives is the cash-to-stock ratio proposed by [Carlson and Lazrak \(2010\)](#). In odd-numbered columns, the differences-in-differences design is based on the interaction of the treatment variable, i.e., an indicator for CDS availability as of 2008 (*CDS trading 2008*), and an indicator for the post-event period (*Post 2009*). Even-numbered columns classify treated firms by the credit event definition of their CDS contracts as of 2008. *CDS trading 2008 (MR)* is an indicator variable equal to one if the “Modified restructuring” contract (MR clause, i.e., restructuring is a credit event) is the most frequently traded as of 2008. *CDS trading 2008 (XR)* is defined analogously for “No restructuring” contracts (XR clause, i.e., a debt restructuring does not trigger CDS settlement). Columns 1 and 2 analyze the cash-to-stock ratio of the entire management team. Columns 3 and 4 analyze the cash-to-stock ratio of the CEO. Columns 5 and 6 analyze the cash-to-stock ratio of non-CEO executives. All specifications include the same control variables as in Table 2 (market-to-book ratio, profitability, tangibility, size, book leverage, stock volatility, debt-equity ratio, profitability, and indicator variables for the presence of a rating and for the investment grade rating status). All specifications include firm fixed effects and year fixed effects. The sample contains firm-year observations for the period 2008-2010. The *t*-statistics (in parentheses) are calculated with robust standard errors clustered by firm. Significance at the 10%, 5%, and 1% level is indicated by *, **, ***, respectively. Refer to Appendix Table A.1 for variable definitions.

	Management team		CEO		Non-CEO executives	
	(1)	(2)	(3)	(4)	(5)	(6)
CDS trading 2008 \times Post 2009	0.011 (1.54)		0.019** (2.41)		0.021 (1.44)	
CDS trading 2008 (MR) \times Post 2009		0.016** (2.19)		0.024*** (3.09)		0.024* (1.65)
CDS trading 2008 (XR) \times Post 2009		-0.000 (-0.01)		0.010 (0.63)		0.014 (0.53)
Control variables	Yes	Yes	Yes	Yes	Yes	Yes
Firm F.E.	Yes	Yes	Yes	Yes	Yes	Yes
Year F.E.	Yes	Yes	Yes	Yes	Yes	Yes
Observations	4276	4276	4241	4241	4272	4272
Adjusted R^2	0.25	0.25	0.19	0.19	0.19	0.19

Table 5. Managerial risk-taking incentives and CDS trading: IV estimation

This table presents results from an IV estimation for managerial risk-taking incentives based on the SEC's 2004 exemption from the net capital rule for broker-dealers. The measure of managerial risk-taking incentives is the cash-to-stock ratio proposed by [Carlson and Lazrak \(2010\)](#). After the SEC's 2004 exemption, broker-dealers were allowed to rely on internal models to estimate risk and compute capital requirements. This regulatory change applied only to broker-dealers that were part of so-called CSEs, i.e., the five major U.S. investment banks as of 2004: Bear Sterns, Goldman Sachs, Lehman Brothers, Merrill Lynch, and Morgan Stanley. CSE-affiliated broker-dealers were given the possibility to lower capital requirements against derivatives-related credit risk by means of credit derivatives. *CDS trading IV* is the instrumented indicator *CDS trading*. *CDS trading*, which is equal to one in the years in which CDSs are available for the firm and zero before the start of CDS trading, is instrumented with the fitted probability of CDS trading from a probit model. The estimated probit model for CDS trading is reported in Appendix Table [A.2](#), where the instrument is *CSE relationship*. *CSE relationship* is an indicator variable equal to one in a given firm-year if (i) a CSE has underwritten public debt or extended loans to the firm in the previous five years, and (ii) the CSE has already obtained the SEC's authorization to use internal models. Second-stage regression estimates are reported. Odd-numbered columns include Fama-French 48-industry fixed effects. Even-numbered columns include firm fixed effects. All specifications include the same control variables as in Table [2](#) (market-to-book ratio, profitability, tangibility, size, book leverage, stock volatility, debt-equity ratio, profitability, and indicator variables for the presence of a rating and for the investment grade rating status). All specifications include year fixed effects. The sample contains firm-year observations for the period 2000-2012. The *t*-statistics (in parentheses) are calculated with robust standard errors clustered by firm. Significance at the 10%, 5%, and 1% level is indicated by *, **, ***, respectively. Refer to Appendix Table [A.1](#) for variable definitions.

	Management team		CEO		Non-CEO executives	
	(1)	(2)	(3)	(4)	(5)	(6)
CDS trading (IV)	-0.021* (-1.81)	-0.057*** (-5.10)	-0.028** (-2.54)	-0.047*** (-4.23)	-0.038* (-1.76)	-0.082*** (-4.40)
Control variables	Yes	Yes	Yes	Yes	Yes	Yes
Fama-French 48 industry F.E.	Yes	No	Yes	No	Yes	No
Firm F.E.	No	Yes	No	Yes	No	Yes
Year F.E.	Yes	Yes	Yes	Yes	Yes	Yes
Observations	12500	12368	12423	12291	12489	12357

Table 6. Managerial risk-taking incentives and CDS trading: Matching estimation

This table examines the impact of CDS availability on managerial risk-taking incentives through a difference-in-differences analysis relative to a matched sample of non-CDS firms with a similar probability of becoming reference entities. The matched sample is created following the [Abadie and Imbens \(2011\)](#) technique. The measure of managerial risk-taking incentives is the cash-to-stock ratio proposed by [Carlson and Lazrak \(2010\)](#). The estimated bias-adjusted ATTs of CDS introduction on the cash-to-stock ratio at different time horizons are reported (year t is the year of CDS introduction). Each CDS-firm is matched to the closest non-CDS firm, allowing for replacement. The matching procedure in Panel A requires exact matching on the size quartile, an indicator equal to one if the firm has a rating, an indicator equal to one if the firm has an investment-grade rating, and Fama-French 10-industry classification. The cash-to-stock ratio of the management team and the cash-to-stock ratio of the CEO are used as continuous matching covariates. In the matching procedure in Panel B, the vector of continuous covariates includes also book leverage, tangibility, market-to-book ratio, profitability, and stock volatility. All the matching variables are lagged by one year relative to CDS introduction. Matching diagnostics are provided in Appendix Table [A.3](#). All tests are conducted for the management team, the CEO, and non-CEO executives. The significance of ATTs is computed using heteroskedasticity-consistent standard errors. Significance at the 10%, 5%, and 1% level is indicated by *, **, ***, respectively. Refer to Appendix Table [A.1](#) for variable definitions.

Panel A: Baseline matching									
	Management team			CEO			Non-CEO executives		
	ATT	p -value	No. matched	ATT	p -value	No. matched	ATT	p -value	No. matched
$t - 2$ to $t - 1$	0.001	0.896	421	0.000	0.959	420	0.001	0.895	420
$t - 1$ to t	-0.019**	0.020	429	-0.013	0.123	429	-0.034**	0.019	428
t to $t + 1$	-0.002	0.850	411	-0.002	0.799	411	-0.011	0.469	411
$t - 1$ to $t + 1$	-0.020**	0.034	412	-0.007	0.421	412	-0.041**	0.012	411

Panel B: Additional covariates									
	Management team			CEO			Non-CEO executives		
	ATT	p -value	No. matched	ATT	p -value	No. matched	ATT	p -value	No. matched
$t - 2$ to $t - 1$	-0.000	0.996	419	-0.000	0.920	418	-0.002	0.743	418
$t - 1$ to t	-0.044**	0.011	427	-0.048**	0.010	427	-0.073**	0.018	426
t to $t + 1$	0.004	0.680	409	-0.002	0.821	409	-0.016	0.464	409
$t - 1$ to $t + 1$	-0.038*	0.051	410	-0.038*	0.051	410	-0.080**	0.041	409

Table 7. Managerial risk-taking incentives and CDS trading: Other tests

This table reports panel regressions of managerial risk-taking incentives on the indicator variable *CDS trading*, which is equal to one in the years in which CDSs are available for the firm and zero before the start of CDS trading. The measure of managerial risk-taking incentives is the cash-to-stock ratio proposed by [Carlson and Lazrak \(2010\)](#). Columns 1, 4, and 7 include selected CEO characteristics (CEO age, CEO tenure, and an indicator for CEO turnover) as additional control variables. Columns 2, 5, and 8 use explanatory variables lagged by one year. Columns 3, 6, and 9 restrict the sample to the period before 2009. Columns 1 through 3 analyze the cash-to-stock ratio of the entire management team. Columns 4 through 6 analyze the cash-to-stock ratio of the CEO. Columns 7 through 9 analyze the cash-to-stock ratio of non-CEO executives. All specifications include the same control variables as in Table 2 (market-to-book ratio, profitability, tangibility, size, book leverage, stock volatility, debt-equity ratio, profitability, and indicator variables for the presence of a rating and for the investment grade rating status). All specifications include firm fixed effects and year fixed effects. The sample contains firm-year observations for the period 2000-2012, except in columns 3, 6, and 9. The *t*-statistics (in parentheses) are calculated with robust standard errors clustered by firm. Significance at the 10%, 5%, and 1% level is indicated by *, **, ***, respectively. Refer to Appendix Table A.1 for variable definitions.

	Management team			CEO			Non-CEO executives		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
		Lagged	Year \leq 2008		Lagged	Year \leq 2008		Lagged	Year \leq 2008
CDS trading	-0.033*** (-5.18)	-0.024*** (-3.60)	-0.023*** (-3.73)	-0.021*** (-3.41)	-0.010 (-1.58)	-0.015** (-2.38)	-0.052*** (-4.92)	-0.042*** (-3.98)	-0.038*** (-3.76)
CEO tenure	-0.003*** (-5.11)			-0.005*** (-7.80)			-0.001 (-1.20)		
CEO age	0.000 (0.62)			0.000 (0.15)			0.001 (0.98)		
CEO turnover	0.016*** (4.26)			0.038*** (7.71)			-0.003 (-0.48)		
Control variables	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firm F.E.	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year F.E.	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	17148	16302	11876	17014	16183	11791	17131	16286	11864
Adjusted R^2	0.24	0.12	0.21	0.17	0.07	0.14	0.20	0.10	0.19

Table 8. Managerial compensation structure and CDS trading: The role of CDS liquidity

This table examines the relation between managerial compensation structure and CDS liquidity. Columns 1, 2, and 5 through 8 report panel regressions using the cash-to-stock ratio proposed by [Carlson and Lazrak \(2010\)](#) as dependent variable. For brevity, following [Carlson and Lazrak \(2010\)](#), the cash-to-stock ratio is denoted as A/pS , where A is the salary, p is the effective ownership (accounting for stock and option holdings), and S is the end-of-year firm's market capitalization. Columns 3 and 4 report panel regressions using the median relative incentive ratio within the management team (*Med. rel. inc.*) as dependent variable. The measure of CDS liquidity in odd-numbered columns is *CDS net protection*, i.e., the ratio of the overall net CDS position on the firm's debt to the firm's debt. The measure of CDS liquidity in even-numbered columns is *CDS liquidity (pct)*, i.e., the firm's percentile of the negative of the [Junge and Trolle \(2015\)](#) CDS illiquidity measure. Odd-numbered columns use the sample period 2008-2012 and include the same control variables as in Table 2 (market-to-book ratio, profitability, tangibility, size, book leverage, stock volatility, debt-equity ratio, profitability, and indicator variables for the presence of a rating and for the investment grade rating status). Even-numbered columns use the sample period 2000-2012 (except in column 4, where the sample period is 2006-2012) and include the same control variables as in Table 2 (except stock volatility). All tests are conducted for the management team, the CEO, and non-CEO executives. All specifications include firm fixed effects and year fixed effects. The t -statistics (in parentheses) are calculated with robust standard errors clustered by firm. Significance at the 10%, 5%, and 1% level is indicated by *, **, ***, respectively. Refer to Table A.1 for variable definitions.

	Management team				CEO		Non-CEO executives	
	(1) A/pS	(2) A/pS	(3) Med. rel. inc.	(4) Med. rel. inc.	(5) A/pS	(6) A/pS	(7) A/pS	(8) A/pS
CDS net protection	-0.084* (-1.77)		0.982 (1.28)		-0.045 (-1.24)		-0.127* (-1.93)	
CDS liquidity (pct)		-0.014* (-1.70)		0.641* (1.69)		-0.015 (-1.16)		-0.024 (-1.52)
Control variables	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firm F.E.	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year F.E.	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	1143	4433	1074	2526	1135	4419	1143	4431
Adjusted R^2	0.28	0.13	0.04	0.08	0.14	0.07	0.23	0.10

Table 9. Board independence and CDS trading

This table reports panel regressions of board independence on measures of CDS trading activity. Board independence is measured as the logistic transformation of the fraction of independent directors serving on the board. Column 1 presents estimates from a regression of board independence on the indicator variable *CDS trading*, which is equal to one in the years in which CDSs are available for the firm and zero before the start of CDS trading. Column 2 controls also for a vector of size and year interactions. Column 3 presents estimates from a regression of board independence on the indicator variable *CDS trading (MR)* and *CDS trading (XR)*. *CDS trading (MR)* is an indicator variable equal to one in the years in which CDSs are available for a given firm if the “Modified restructuring” contract (MR clause, i.e., restructuring is a credit event) is the most frequently traded at the time CDS trading starts. *CDS trading (XR)* is defined analogously for “No restructuring” contracts (XR clause, i.e., a debt restructuring does not trigger CDS settlement). Whereas columns 1 through 3 include Fama-French 48-industry fixed effects, column 4 presents estimates from a regression of board independence on *CDS trading* including Fama-French 17-industry fixed effects. Column 5 includes firm fixed effects. Column 6 interacts *CDS trading* with the indicator *No classified board*, which is equal to one if the firm does not have a classified board. All specifications include the following control variables: Size, profitability, free cash flow, stock volatility, the logarithm of firm age, the logarithm of the number of segments the firm operates in, the logarithm of CEO tenure, and the logarithm of CEO age. All specifications include year fixed effects. The sample contains firm-year observations for the period 2000-2012 (except in column 3, where the sample period is 2000-2008). The *t*-statistics (in parentheses) are calculated with robust standard errors clustered by firm. Significance at the 10%, 5%, and 1% level is indicated by *, **, ***, respectively. Refer to Appendix Table A.1 for variable definitions.

	(1)	(2)	(3) Year ≤ 2008	(4)	(5)	(6)
CDS trading	0.103** (2.44)	0.099** (2.11)		0.111** (2.57)	0.014 (0.41)	-0.039 (-0.93)
CDS traded	0.037 (0.68)	0.042 (0.77)	0.042 (0.74)	0.007 (0.13)		
CDS trading \times No classified board						0.116** (2.14)
No classified board						-0.015 (-0.30)
CDS trading (MR)			0.125** (2.53)			
CDS trading (XR)			-0.003 (-0.05)			
Control variables	Yes	Yes	Yes	Yes	Yes	Yes
Size \times Year F.E.	No	Yes	No	No	No	No
Fama-French 48 industry F.E.	Yes	Yes	Yes	No	No	No
Fama-French 17 industry F.E.	No	No	No	Yes	No	No
Firm F.E.	No	No	No	No	Yes	Yes
Year F.E.	Yes	Yes	Yes	Yes	Yes	Yes
Observations	12486	12486	8562	12370	12545	12124
Adjusted R^2	0.25	0.25	0.20	0.22	0.34	0.34

Table 10. CEO turnover performance-sensitivity CDS trading

This table examines the relation between CEO turnover performance-sensitivity and CDS availability on the firm's debt. Panel A reports coefficient estimates from probit models. The dependent variable is an indicator variable equal to one in the years in which the firm's CEO is replaced. Column 1 considers all the CEO turnover events. Column 2 focuses on unforced CEO turnover events. Columns 3 through 6 focus on forced CEO turnover events. Columns 1 through 4 interact *Return*, which is the stock return over the year, with the indicator *CDS trading*, which is equal to one in the years in which CDSs are available for the firm and zero before the start of CDS trading. Column 5 interact *Return* with *CDS trading (MR)* and *CDS trading (XR)*. *CDS trading (MR)* is an indicator variable equal to one in the years in which CDSs are available for a given firm if the "Modified restructuring" contract (MR clause, i.e., restructuring is a credit event) is the most frequently traded at the time CDS trading starts. *CDS trading (XR)* is defined analogously for "No restructuring" contracts (XR clause, i.e., a debt restructuring does not trigger CDS settlement). Column 6 interacts *CDS trading* with *Idiosyncratic return* and *Market-adjusted industry return*. All specifications include the following control variables: Size, the market-to-book ratio, an indicator variable for CEOs of retirement age (above the age of 60), and CEO tenure. All specifications include Fama-French 48-industry fixed effects (except column 4, which includes Fama-French 17-industry fixed effects) and year fixed effects. The sample contains firm-year observations for the period 2000-2010, except in columns 1 (2000-2012) and 5 (2000-2008). The *t*-statistics (in parentheses) are calculated with robust standard errors clustered by firm. Panel B reports estimated AMEs of stock return on CEO turnover for each specification of Panel A, taking into account the nonlinearity of the probit model. The *p*-values for Chi-square tests are reported in parentheses. Significance at the 10%, 5%, and 1% level is indicated by *, **, ***, respectively. Refer to Appendix Table A.1 for variable definitions.

Panel A: Probit models						
	Any	Unforced	Forced			
	(1)	(2)	(3)	(4)	(5)	(6)
					Year \leq 2008	
Return	-0.110*** (-3.40)	-0.072* (-1.80)	-0.087 (-1.38)	-0.104 (-1.59)	-0.139** (-2.01)	
Ret. \times CDS trading	-0.085 (-1.19)	0.027 (0.34)	-0.395** (-2.22)	-0.409** (-2.00)		
Ret. \times CDS trading (MR)					-0.916*** (-4.09)	
Ret. \times CDS trading (XR)					-0.293 (-1.58)	
Idio. return						-0.105 (-1.56)
Idio. ret. \times CDS trading						-0.539*** (-2.64)
Market-adj. ind. return						0.083 (0.62)
Market-adj. ind. ret. \times CDS trading						-0.601 (-1.58)
CDS trading	0.051 (0.92)	0.026 (0.39)	0.122 (1.15)	0.117 (1.13)		0.045 (0.41)
CDS trading (MR)					-0.032 (-0.27)	
CDS trading (XR)					0.221* (1.78)	
Traded	0.033 (0.64)	0.074 (1.25)	-0.056 (-0.57)	-0.089 (-0.93)	-0.081 (-0.82)	-0.049 (-0.50)

(Continued)

Table 10. – *Continued*

Control variables	Yes	Yes	Yes	Yes	Yes	Yes
Fama-French 48 industry F.E.	Yes	Yes	Yes	No	Yes	Yes
Fama-French 17 industry F.E.	No	No	No	Yes	No	No
Year F.E.	Yes	Yes	Yes	Yes	Yes	Yes
Observations	15964	10550	9509	9843	8512	9509
Pseudo R^2	0.03	0.06	0.05	0.04	0.06	0.06

Panel B: AMEs							
	AME (Ret.)					AME (Idio. ret.)	AME (Market-adj. ind. ret.)
	Mod. (1)	Mod. (2)	Mod. (3)	Mod. (4)	Mod. (5)	Mod. (6)	Mod. (6)
[a] CDS trading = 0	-0.020*** (0.001)	-0.011* (0.071)	-0.006 (0.165)	-0.008 (0.111)		-0.008 (0.117)	0.006 (0.534)
[b] CDS trading = 1	-0.037*** (0.004)	-0.008 (0.529)	-0.035*** (0.006)	-0.035** (0.011)		-0.046*** (0.001)	-0.037 (0.143)
[b] – [a] = 0 (p -value)	0.212	0.829	0.029**	0.050*		0.011**	0.114
[c] CDS trading (MR) = 0					-0.013** (0.011)		
[d] CDS trading (MR) = 1					-0.062*** (0.000)		
[d] – [c] = 0 (p -value)					0.002***		
[e] CDS trading (XR) = 0					-0.019*** (0.000)		
[f] CDS trading (XR) = 1					-0.044** (0.020)		
[f] – [e] = 0 (p -value)					0.183		

Appendix for
“Internal Governance and Creditor Governance:
Evidence from Credit Default Swaps”

Table A.1. Definition of variables

Variable	Definition
<i>CDS trading activity</i>	
CDS net protection	Ratio of CDS net notional amount from DTCC at year-end to total debt. Total debt is <code>dltt+dlc</code> in Compustat.
CDS gross protection	Ratio of CDS gross notional amount from DTCC at year-end to total debt. Total debt is <code>dltt+dlc</code> in Compustat.
5-year CDS spread	Average of daily five-year U.S. dollar denominated CDS spreads over the last quarter of the year from Markit. I consider only CDS on unsecured debt (<code>tier=snrfor</code>).
CDS liquidity (percentile)	Percentile of CDS illiquidity measure (based on the last quarter of the year) from Markit computed following Junge and Trolle (2015) and multiplied by (-1).
CDS traded	Indicator variable equal to one if the firm has CDSs traded over the period 2001-2012 based on Markit data.
CDS trading	Indicator variable equal to one in the period after initiation of CDS trading based on Markit data.
CDS trading (MR)	Indicator variable equal to one in the years in which CDSs are available for a given firm if the “Modified restructuring” contract (MR clause, i.e., restructuring is a credit event) is the most frequently traded at the time CDS trading starts.
CDS trading (XR)	Indicator variable equal to one in the years in which CDSs are available for a given firm if the “No restructuring” contract (XR clause, i.e., a debt restructuring does not trigger CDS settlement) is the most frequently traded at the time CDS trading starts.
<i>Managerial incentives</i>	
Cash-to-stock	Cash-to-stock ratio defined as the ratio of salary to equity incentives (stock and option holdings) defined as in Carlson and Lazrak (2010) . I compute this measure for the management team, the CEO, and non-CEO executives (i.e., the management team excluding the CEO).
Relative incentive	Relative incentive ratio defined as in Wei and Yermack (2011) . Inside debt holdings are given by the sum of <code>defer.balance</code> and <code>pension.value</code> from Execucomp (setting missing values to zero). This ratio is winsorized at 2nd and 98th percentile, because it is characterized by many outliers. I compute the median relative incentive ratio within the management team.
II Wealth-performance sensitivity	Wealth-performance sensitivity defined as dollar change in executive’s wealth given a \$1 change in firm value (effective ownership, i.e., based on stock and option holdings) from Execucomp, computed following Core and Guay (2002) . I compute this measure for the management team, the CEO, and non-CEO executives (i.e., the management team excluding the CEO).
Vega	Vega of option holdings from Execucomp computed following the definition of Coles, Daniel, and Naveen (2006) . I compute this measure for the management team, the CEO, and non-CEO executives (i.e., the management team excluding the CEO).
<i>Firm characteristics</i>	
Size	Natural logarithm of total assets defined as <code>at</code> in Compustat.
Book leverage	Book leverage defined as $(dltt+dlc)/at$ in Compustat.
Tangibility	PPE to total assets defined as <code>ppent/at</code> in Compustat.
Rated	Indicator variable equal to one a firm has a long-term issuer rating, <code>splticrm</code> , from Compustat.
Investment grade	Indicator variable equal to one if a firm has investment grade rating (<code>splticrm</code> at least BBB) from Compustat.
Market-to-book	Market-to-book ratio defined as $(at-ceq+prccfxcshe)/at$ in Compustat.
Profitability	Profitability defined as <code>ebitda/at</code> from Compustat.
Stock volatility	Annualized stock volatility based CRSP daily returns over the last quarter of the year.
Institutional ownership (HHI)	Herfindahl index of institutional investors’ equity holding from Thomson’s 13f.
Block ownership	Fraction of shares outstanding held by blockholders from Thomson’s 13f.
CSE relationship	Indicator variable equal to one in a given firm-year if (i) a CSE has underwritten public debt or extended loans to the firm in the previous five years, and (ii) the CSE has already obtained the SEC’s authorization to use internal models.
Free cash flow	Free cash flow defined as $(ebitda-capx)/at$ from Compustat.
Firm age	Firm age defined as the number of years since the firm entered the CRSP sample.
Number business segments	Number of business segments defined as the number of different <code>sid</code> in Compustat (excluding <code>sid 99</code>).
Return	Stock return over the year from CRSP.

(Continued)

Table A.1. – *Continued*

Idiosyncratic return	<i>Return</i> minus equally weighted industry return based on Fama-French 48 industry classification.
Market-adjusted industry return	Equally weighted industry return based on Fama-French 48 industry classification minus equally weighted market return.
<i>Board and CEO characteristics</i>	
Board independence	Fraction of independent directors serving on the board of directors from IRRC and Riskmetrics.
Board size	Number of board members from IRRC and Riskmetrics.
Classified board	Indicator variable equal to one if the firm’s board of directors is staggered (classified) from IRRC and Riskmetrics.
CEO tenure	Number of years since the executive was appointed as CEO based on <code>becameceo</code> from Execucomp.
CEO age	CEO’s age defined as <code>age</code> from Execucomp. If missing, I replace it with <code>page-(Current year - year)</code> . If missing, I replace it with the CEOs’ median age.
CEO turnover	Indicator equal to one if the CEO changes in the current year.
CEO turnover (forced)	Indicator equal to one if the CEO changes in the current year in a forced turnover event based on data from Jenter and Kanaan (2015) and Peters and Wagner (2014) .

Table A.2. Probability of CDS trading

This table presents results from a probit model for CDS trading. The dependent variable is the indicator *CDS trading*, which is equal to one in the years in which CDSs are available for the firm and zero before the start of CDS trading. Explanatory variables include the same control variables as in Table 2 (market-to-book ratio, profitability, tangibility, size, book leverage, stock volatility, debt-equity ratio, profitability, and indicator variables for the presence of a rating and for the investment grade rating status) and *CSE relationship*. *CSE relationship* is an indicator variable equal to one in a given firm-year if (i) a CSE has underwritten public debt or extended loans to the firm in the previous five years, and (ii) the CSE has already obtained the SEC's authorization to use internal models. In line with the method proposed by Wooldridge (2010), the fitted probability of CDS trading is then used as an instrument for *CDS trading* in Table 5. The LR test assesses the null hypothesis that the inclusion of *CSE relationship* does not improve model fit. Fama-French 48-industry fixed effects and year fixed effects are included. The sample contains firm-year observations for the period 2000-2012. The *t*-statistics (in parentheses) are calculated with robust standard errors clustered by firm. Significance at the 10%, 5%, and 1% level is indicated by *, **, ***, respectively. Refer to Appendix Table A.1 for variable definitions.

	(1)
CSE relationship	0.256*** (2.72)
Market-to-book	-0.017 (-0.34)
Profitability	0.313 (0.68)
Tangibility	0.173 (0.59)
Size	1.002*** (17.36)
Book leverage	1.765*** (6.70)
Stock volatility	0.108 (1.03)
Rated	0.970*** (7.72)
Investment grade	0.765*** (8.27)
Year F.E.	Yes
Fama-French 48 industry F.E.	Yes
Observations	13812
Pseudo R^2	0.66
Incremental LR test	17.27
Pseudo incremental LR test (<i>p</i> -value)	0.00

Table A.3. Managerial risk-taking incentives and CDS trading: Matching diagnostics

This table reports matching diagnostics for the matching exercises presented in Table 6. Means of selected variables of treated and control firms before matching, after the baseline matching (Panel A of Table 6), and after the matching on additional continuous covariates (Panel B of Table 6) are presented. Differences in means are assessed using *t*-tests. Significance at the 10%, 5%, and 1% level is indicated by *, **, ***, respectively. Refer to Appendix Table A.1 for variable definitions.

	Pre-match			Post-match (baseline)			Post-match (additional covariates)		
	Treated	Control	<i>t</i> -stat	Treated	Control	<i>t</i> -stat	Treated	Control	<i>t</i> -stat
Cash-to-stock (management team)	0.053	0.110	-6.73***	0.047	0.046	0.32	0.048	0.048	-0.01
Cash-to-stock (CEO)	0.039	0.087	-5.95***	0.038	0.034	0.95	0.038	0.035	0.79
Cash-to-stock (non-CEO exec.)	0.079	0.189	-6.97***	0.070	0.068	0.31	0.070	0.073	-0.47
Size	8.535	6.488	41.84***	8.635	8.139	7.74***	8.637	7.986	11.14***
Book leverage	0.302	0.159	16.97***	0.300	0.236	5.64***	0.300	0.282	1.62
Tangibility	0.326	0.234	9.42***	0.326	0.283	2.73***	0.326	0.301	1.59
Market-to-book	2.001	2.205	-2.65***	1.999	1.944	0.60	2.003	1.852	1.71*
Profitability	0.151	0.128	3.65***	0.149	0.140	1.73*	0.150	0.142	1.47
Stock volatility	0.431	0.533	-7.26***	0.429	0.422	0.39	0.428	0.396	2.37**
Rated	0.934	0.208	38.51***	0.964	0.964	0.00	0.963	0.963	0.00
Investment grade	0.609	0.047	51.63***	0.638	0.638	0.00	0.639	0.639	0.00

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