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Author(s)*: Gudrun Rolle

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***Corresponding Author's Address:** E-mail address: gudrun.rolle@uni.lu

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For editorial correspondence, please contact:
sophie.lux@uni.lu

University of Luxembourg
Faculty of Law, Economics and Finance
Luxembourg School of Finance
4 Rue Albert Borschette
L-1246 Luxembourg

Executive Compensation under Debt Insurance[*]

GUDRUN ROLLE[†]

April 2016

ABSTRACT

Inside debt is designed to align managers with debt holders and to mitigate the risk-taking versus risk-avoiding conflict of interest between shareholders and bondholders. It therefore constitutes an efficient component in the equity- and debt-like compensation structure of executives. However, under debt insurance the alignment structure should shift – towards the interests of equity holders. And it does. Exploiting first-time initiations of credit default swaps (CDS) on a reference entity, I show that companies whose debt can be insured through CDS reduce their CEO's relative debt-equity and incentive ratios significantly, therefore shifting the incentive structure towards equity holders. The results are robust.

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[†] Supported by the Fonds National de la Recherche (FNR), Luxembourg; Luxembourg School of Finance, University of Luxembourg. Email: Gudrun.Rolle@uni.lu.

EXECUTIVE COMPENSATION is one instrument in corporate governance to mitigate agency costs and align managers in the interests of investors, i.e. shareholders and bondholders. By nature, the interests of these capital providers collide with each other: because of the positive relation between risk and return, equity holders – in hope of high returns – prefer managerial risk taking. Bondholders, in contrast, gain nothing from risk as their payments are fixed, but would indeed suffer in case of bankruptcy; hence they prefer risk-averse management (Jensen and Meckling 1976). By incorporating both principals' interests in the managerial compensation structure through equity- as well as debt-like instruments, i.e. inside equity and inside debt, it is possible to not only mitigate managerial slack and overcome agency costs of debt and equity, but also to alleviate the shareholder-bondholder conflict (Sundaram and Yermack 2007; Wei and Yermack 2011). Thus, in an optimal contractual setting the ratio of inside debt over inside equity, i.e. the CEO's leverage, should reflect the capital structure of the corporation, i.e. the firm's leverage (Edmans and Liu 2011).

However, if debt becomes riskless, the alignment with bondholders and the balanced relation between the CEO's and the firm's leverage needs to be revised. I empirically test this hypothesis by exploiting the financial innovation of credit default swaps (CDS), which enable debt holders to hedge their risk of investment. Therefore, they become indifferent if the firm defaults or not. Consequently, if compensation contracts are indeed designed to alleviate agency costs and align management effectively, I expect that in the presence of CDS trading the executive compensation structure should adjust accordingly, i.e. the role of inside debt should relatively diminish and the CEO's contractually constructed incentives should shift towards the interests of

equity holders. I find robust evidence for such a readjustment: in my sample of thirty U.S. companies which underwent first-time CDS initiations between 2007 and 2014, I show that the CEO's relative debt-equity ratio drops by 0.23 units and the relative incentive ratio, which captures the CEO's alignment sensitivity towards a unit change in the value of the firm, decreases by 0.21 units after controlling for further variables that have been shown to determine compensation structure. These reductions are not only statistically significant, but more so economically: given that these measures are conceptually centered around 1 – a value that indicates a perfect incentive calibration with both debt and equity holders – an impact of around 0.20 units is indeed strong. When including a control group of thirty twin-companies that are economically and statistically comparable to the thirty companies, which underwent CDS initiations, the impact of CDS trading on the CEO's relative debt-equity ratio as well as the incentive ratio reduces slightly to -0.16, but the statistical significance becomes even stronger. Finally, to ensure that the results are not due to selection bias and omitted variables, I run placebo tests with all companies in ExecuComp that report positive inside debt and never underwent any CDS trading. As expected, I do not observe any treatment-control differentials with respect to placebo-CDS trading. Hence, I find robust evidence that debt insurance has a significant impact on executive compensation structure, driving it more towards an alignment with equity holders.

The paper proceeds as follows: section I presents the economic background and develops the hypothesis, section II describes the data, section III provides the empirical setup and contains the main results, section IV tests for robustness, and section V concludes.

I. Economic Background and Hypothesis

Inside debt, which composes of defined benefit pensions and deferred compensation, has been shown to be a significant device in managerial compensation and incentive setting. Its importance is twofold: Firstly, given the unsecured and unfunded nature of inside debt obligations, they expose management to the same default risk and bankruptcy treatment as outside debt holders. Thus, they partly align management with outside creditors and help to mitigate managerial slack, i.e. a managerial inefficiency due to ineffective or even absent disciplinary devices that allow managers to pursue self-interests at the expenses of the capital providers. Secondly, inside debt also helps to alleviate the shareholder-bondholder conflict, which arises due to the colliding interests these two principals exhibit and that arises if management is purely equity-aligned (Edmans and Liu 2011, Yermack and Wei 2011). Shareholders, favouring high returns, prefer a management that invests in new, riskier projects. If the project yields a positive return, the shareholders capture most of the gains, while bondholders carry most of the costs (Fama and Miller 1972, Myers 1977). Because bondholders' payments are fixed, they do not profit from the potential upside benefits which are attached to risky projects. They are in fact exposed to the downside risk of such investments, as they carry the costs of bankruptcy. Hence, bondholders prefer conservative management (Jensen and Meckling 1976, Myers 2003). By taking into account both principals' interests in the managerial compensation structure via both equity- and debt-like instruments, i.e. inside debt and inside equity, management becomes aligned with both capital providers.

Though widely used in practice, inside debt was a long overlooked component in the research of compensation structure: first raised by Jensen and Meckling (1976), who suggest that an optimal incentive structure should mimic the firm's capital structure in order to position the CEO according to both capital providers, it was primary Sundaram and Yermack (2007) who empirically pioneered this field. They show for a sample of 237 large capitalization firms that CEOs are compensated through a balanced mix of inside debt and inside equity, which translates into incentive setting: CEOs, whose personal inside debt-equity ratio exceeds the firm's debt-equity ratio, manage their firms more conservatively and thus act in the interests of bondholder. Furthermore, the debt incentives become more pronounced the older the CEO becomes, i.e. the closer he is to retirement. From 2007 onwards the topic received significantly more attention: when the SEC introduced disclosure requirements in 2006, which became effective in early 2007, inside debt positions became public and therefore observable and available to the research community[1]. The papers of most fundamental importance to this study are Wei and Yermack (2011) and Edmans and Liu (2011), who empirically and theoretically analyse the *relative* compensation structure with respect to the firm's capital structure. Both papers highlight the importance of incorporating all principals' interests in the managerial compensation structure

[1] Since then an ever growing stream of work has emerged, including Bolton, Mehran, and Shapiro (2011) who find that debt-based compensation for executives is effective in reducing risk in financial institutions; Cassel et al. (2012) find a negative relation between CEO's inside debt and the volatility of future firm stock returns, R&D expenditures, and financial leverage and a positive link between inside debt and the extent of diversification and asset liquidity; Halford and Qiu (2012) detect that less distressed firms use more inside debt and that firms with increased default risk during the financial crisis increase their inside debt significantly less compared to firms with decreased default risk; Van Bekkum (2014) shows that U.S. banks, whose top management holds inside debt positions, exhibit better-quality assets, more conservative balance sheet management, and a stronger tendency towards traditional banking activities; Srivastav, Armitage, and Hagendorff (2014) show that banks whose CEOs are compensated with higher inside debt relative to inside equity positions are associated with more conservative payout policies, like cutting payouts or decreasing dividends and repurchases.

and propose statistics to optimally measure the CEO's incentive alignment with both capital providers.

This paper argues that if debt becomes riskless, the CEO's contractual interest alignment with bondholders should decrease, because the agency costs of debt become less relevant. Agency costs of debt incur, when management engages in risk-shifting behavior that favors equity holders over debt holder. Agency costs of equity incur, when management's investment style is too conservative and to the detriment of shareholders. To overcome this conflict and to meet the interests of both groups of claim holders, managers are compensated through a balance of equity- and debt-like instruments. However, if corporate governance mechanisms are effective, firms with insurable debt should exhibit a shift of CEO's incentive alignment towards equity holders by diminishing the role of the existing inside debt. In order to test this hypothesis and to draw unconfounded conclusions, it is necessary to identify an exogenous and unpredictable, i.e. random, 'treatment' of insurable debt on a company that cannot self-select into being treated. Through the initiation of credit default swaps (CDS) such an environment was created: CDS provide the buyer with a fixed income made by the seller, a third party, in case of a contingent credit event on an underlying reference entity, i.e. the firm. Hence, they are similar to an insurance contract that agrees to compensate the buyer for losses arising from default (Longstaff, Mithal, and Neis 2005)[2]. Thus, bondholders are able to buy insurance against default

[2] Augustin et al. (2014) provide an excellent survey on the current credit default swap academic literature and their use in practice. Studies that investigate the link between CDS and corporate governance include Colonnello (2013) who analyses the relation between corporate governance and debt monitoring by exploiting CDS initiations: after creditors are provided with debt insurance opportunities board independence increases; Martin and Roychowdhury (2015) find that reporting conservatism is reduced after CDS trade initiations; Kitwiwattanachai and Lee (2015)

of the company, so that they should become indifferent if the firm defaults or not. Consequently, in the presence of CDS trading the executive compensation structure should adjust accordingly, i.e. the role of inside debt should diminish, and the effect should be more pronounced in corporations with high corporate governance quality. The initiation of a CDS is not a reference entity's decision and cannot be controlled by the company, neither properly predicted; they can therefore be regarded as an exogenous shock and classify as a treatment effect (Ashcraft and Santos 2009; Saretto and Tooke 2013). Hence, they provide an ideal setting to investigate the impact of debt insurance on the structure of executive compensation without being concerned about endogeneity issues and allow for causal inference. Thus, they yield an optimal setting to test the above stated hypothesis.

The study which is closets to this paper in terms of analysing the link between CDS and compensation structure is Colonnello, Curatola, and Hoang (2014). They study, both theoretically and empirically, the joint effect of inside debt and equity incentives on credit spreads and show that inside debt lowers credit spreads only when inside debt is relatively unsecured and that equity ownership reduces credit spreads only when inside debt is small or secured[3] – a relation that reverses when it is large and unsecured. To the best of my knowledge the effect of debt insurance, proxied through CDS data, *on* compensation structure has not yet

show that CDS trading causes distressed firms to engage in more risk shifting, and Kim et al. (2015) provide evidence that managers whose firms are subject to active CDS trading enhance their voluntary disclosure and are more likely to issue earnings forecasts.

[3] Secured deferred compensation is special and corresponds to the case of qualified deferred compensation plans or non-qualified deferred compensation plans that are put in a secular trust. However, secured inside debt only constitute a minority in executive compensation and the vast majority of inside debt positions are unsecured in case of bankruptcy.

been analysed so far. Hence, I exploit first-time CDS initiations on a company to empirically test the relation between compensation structure, as a means of managerial incentive setting, and debt insurance. The next chapter describes the underlying data.

II. Data

The beginning of the sample period is determined by the SEC disclosure reform in early 2007, according to which companies had to initially report their CEO's inside debt positions. Hence, I collect all firms that report positive inside debt in ExecuComp since the fiscal year 2007. The end of the sample period is determined by the fiscal year 2013; therefore, the respective calendar time horizon is from June 30, 2006 to April 30, 2014. Next, I narrow down the dataset to only those companies, which underwent first-time CDS trading during this time span since the invention of CDS contracts in 2001. CDS data is drawn from Markit. Following conventions, I define a first-time CDS initiation as the first occurrence of a five-year maturity CDS contract on the firm. Each company receives an indicator variable (*CDS TRADED)* equal to one ninety days after the CDS initiation date and zero otherwise. Furthermore, I require that each company has at least one year of fundamental pre- and post-treatment data to ensure the existence of a pre- and post-treatment period. This filtering leads to a dataset of thirty U.S. companies, which underwent initial CDS initiations and that report positive inside debt holdings for their CEOs since July 2006. For these companies I construct the following dependent variables: *inside debt, CEO inside debt-equity ratio, CEO relative debt-equity ratio,* as well as *CEO relative incentive ratio*. *Inside debt* is defined as the sum of defined benefit pensions and

deferred compensation as stated in ExecuComp and reported in millions. The *CEO inside debt-equity ratio*, also denoted as CEO leverage, is the ratio of inside debt over inside equity, which composes of the value of shares, stock units, and restricted stock, as well as vested and unvested options, and is reported in millions. The values of shares, stock units, and restricted stock are directly taken from ExecuComp. Option values are calculated via the Black-Scholes formula; I estimate the stock volatility over a five-year history of rolling monthly stock returns taken from CRSP. The dividend yield, exercise price, and the year-end close price of the company's primary stock are drawn from ExecuComp; the respective risk-free rates are pulled from the Federal Reserve, and following conventional standards, the remaining life of each firm's option is assumed to be four years. The *CEO relative debt-equity ratio*, which is also referred to as *k*, is a statistic proposed by Edmans and Liu (2011) and captures the relation between the CEO's personal leverage ratio and the firm's leverage ratio, which is defined as total liabilities over market capitalization as reported in Compustat. According to Jensen and Meckling (1976), if the relative debt-equity ratio equals 1, the agency costs of debt and equity should vanish, because the CEO's compensation structure mimics the company's capital structure and would thus perfectly align him with both principals. Hence, there should be no incentives to engage in risk-shifting strategies which transfer values between equity and debt. Deviations above or below 1 can be interpreted as the percentage of which the CEO's leverage exceeds or falls short of the firm's capital structure. However, according to Edmans and Liu (2011), the theoretical optimal ratio should be a little less than 1[4], but it remains that a relative debt-equity ratio *above* the optimal

[4] For trade-off reasons between improving project selection and reducing output (cf. Edmans and Qui 2011, p. 88).

value implies a debt bias in the compensation structure, leading to excessive conservatism in project selection at the expenses of equity holders, and a value significantly below 1 aligns the CEO more in favor of equity holders, possibly leading to excessive risk-taking, with potentially detrimental effects on debt holders. Under debt insurance I expect this value to drop relatively to its pre-insurance value. Finally, I compute the *CEO relative incentive ratio*, also denoted as k^*, which according to Edmans and Lui (2011) and Wei and Yermack (2011), is the most appropriate variable in measuring the alignment of the CEO's incentives with respect to both claim holders. In fact, k^* "captures the marginal change in the CEO's inside debt over the marginal change in his inside equity holdings, 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, p. 14). I estimate the relative incentive ratio through equation (1):

$$k^* \approx \left(\frac{D_{CEO}}{D_{FIRM}}\right) \div \left(\frac{\Delta E_{CEO}}{\Delta E_{FIRM}}\right) \tag{1}$$

D_{CEO} and D_{FIRM} are the CEO's inside debt and the companies' debt, respectively. ΔE_{CEO} and ΔE_{FIRM} are the "total delta" of the manager and the company and capture the marginal change of equity holdings given a \$1.00 change in stock price. They are calculated using the number of shares and options held by the CEO (ΔE_{CEO}) and the firm (ΔE_{FIRM}), whereas the number of options is weighted by their respective option delta, which is extracted from the Black-Scholes formula, i.e. the slope with respect to the stock price. The number of shares and options held by the CEO are available in ExecuComp. The firm's number of shares and options outstanding is

taken from Compustat[5]. Similar to the relative debt-equity ratio, high values of k^* indicate a value transfer from equity to debt, implying a bias towards debt holders.

Further variables used in this paper include CEO characteristics, firm characteristics, and corporate governance measures. CEO characteristics are constructed using ExecuComp and include an indicator variable if the CEO was hired from outside (*CEO outside*), the CEO's age (*CEO age*), as well as years of tenure (*CEO tenure*). Firm characteristics are drawn from CRSP and Compustat: *firm size* is the log of total assets; *firm age* is the log of days since the company went public; *leverage* is total liabilities over market capitalization, and *growth opportunities* are expressed through the ratio of R&D expenditures over sales. Governance controls include the percentage of *institutional ownership*, which is constructed using Thompson Reuters Institutional Holdings (13F) database, the *board size*, which is the log of members of the board of directors, and the percentage of independent directors on the board of directors (*outside directors*). The latter two variables are calculated using data from the Investor Responsibility Research Center (IRRC). Panel A of table 1 provides summary statistics for all dependent and independent variables for the time span 2006 to 2014.

[Insert table 1 here]

The average inside debt value is 12.19 million USD, with a standard deviation of around 18 million USD. The average inside equity position is naturally significantly larger and more volatile, with a mean of 56 million USD and a standard deviation of around 84 million USD. The

[5] Given that the total number of outstanding options tranches issued by the company is not observable, I approximate this number through the total number of employee options outstanding.

CEO's average leverage, or inside debt-equity ratio, is 0.37, with a smaller median of 0.18. These values are slightly higher compared to what Wei and Yermack (2011) report, but their sample period is prior to the subprime crisis, whereas my study completely includes theses turmoil years. The relative debt-equity ratio (k) has a mean of 0.46 and a median of 0.21, and the average relative incentive ratio (k^*) is 0.38, with a median of 0.17. Hence, the CEOs in my sample – on average – do not exhibit excessive bondholder alignment, as the distribution of k and k^* is not centered around or exceeds 1. These below-one values are in line with what other empirical inside debt-equity studies report. Further CEO characteristics are that roughly 20% entered the firms as CEOs from outside; they are in their late fifties and have been CEO for around six to seven years. The average firm in the sample reports a firm size of 9.4 (in logs) and a firm age of 9.14 (days since IPO, in logs, which translates to approximately 26 years). The leverage ratio has a mean of 1.58 and a median of 0.87. In light of the fact that the sample period includes the subprime crisis years, where companies' stocks underwent extreme declines, the relatively high mean is not surprising. The growth opportunities for the sample are relatively modest, with 0.03 in the mean and zero in the median – values, which are similar to Wei and Yermack (2011). The summary statistics for the governance variables are an average institutional ownership of 64.5% and a board size of 2.35 (in logs, i.e. ten to eleven members), of which 81% are independent directors. Panel B of table 1 provides the correlation matrix between all variables and the explanatory variable of interest, i.e. *CDS TRADED*, which is an indicator variable that codes the post-treatment period as one and the pre-treatment period as zero. Surprisingly, the correlation between *CDS TRADED* and the compensation structure variables is

very low, ranging from -0.01 for the inside debt-equity ratio, to 0.15 for inside debt. However, these correlations do not allow for any claims yet, since causality and controlling for further effects still needs to be established. Furthermore, the statistics do not exhibit any correlation link between CDS trading and the leverage ratio, which is odd and contrary to the findings in Saretto and Tookes (2013) and Subrahmanyam, Tang, and Wang (2014), who confirm that firm leverage and CDS trading are positively correlated. It is also worth noting that though – as per Edmans and Liu (2011) and Wei and Yermack (2011) – *k** is preferred to *k* in appropriately capturing the CEO's incentives, the correlation between the two is almost perfect, i.e. 0.99. Hence, I do not expect to find a significant difference in the impact of CDS trading between *k* and *k**. If CDS trading matters, it should be relevant for both variables.

III. Empirical Setup

In order to test the effect of debt insurance on the CEO's compensation structure (*CS*) I estimate the following panel regression:

$$CS_{it} = \alpha + \beta CDS\ TRADED_{it} + \boldsymbol{\gamma}' \boldsymbol{X}_{it} + \alpha_t + \alpha_i + \varepsilon_{it} \quad (2)$$

CS_{it} either represents *inside debt*, *CEO inside debt-equity ratio*, *CEO relative debt-equity ratio* (*k*), or *CEO relative incentive ratio* (*k**). *CDS TRADED*$_{it}$ is an indicator variable which equals one ninety days after the CDS initiation date and zero prior to this time. I require at least three months for the CDS effect to get incorporated into the data. The coefficient of interest is β as it captures the effect of debt insurance, proxied through CDS trading, on compensation structure.

$\mathbf{X}_{it}$ is a vector of control variables which have been shown to play a role in explaining CEO compensation structure in the literature. It captures CEO, firm, and corporate governance characteristics. The CEO variables are a dummy variable if the CEO was hired from outside, the CEO's age as well as his tenure years. The firm variables include firm size, company age, leverage ratio and growth opportunities. The governance variables are institutional ownership, board size and the percentage of independent directors on the board of directors. All variables are defined as in section II and table I. Furthermore, I control for firm and year fixed effects, α_i and α_t, respectively. Table II reports the estimated coefficients of equation (2).

[Insert table II here]

For inside debt (model 1) I do not find any significant effect of CDS initiation. In fact the estimated effect is positive (0.48), though insignificant. For the CEO's leverage ratio (model 2), I estimate the predicted negative effect (-0.17), though slightly insignificant. In line with the theoretical expectations, firm leverage has a stark, highly significant and positive effect on CEO's inside debt-equity ratio. Moving to the firm-relative compensation structure variables – the CEO's relative debt-equity ratio, k (model 3), and the CEO's relative incentive ratio, k^* (model 4) – I find negative impacts of CDS initiations of around 0.2, which are significant at the 5% level. Hence, the compensation structure shifts towards the interest of equity holders. Furthermore, in all models the CEO's age plays a significant role, which is not surprising: the closer the CEO is to retirement, i.e. the older he is, the more important inside debt becomes, because it composes of components that become valuable once he retires. Like Sundaram and

Yermack (2007), I find that larger firms have lower relative compensation ratios. Moreover, the percentage of outside directors has a significant positive effect on compensation structure.

Because equation (2) represents a difference analysis which merely analyses the CDS treated sample and captures the effect of CDS trading only by contrasting the before and after initiation period, the results could be driven by a sample selection bias. In order to overcome this issue of potential endogeneity, I use propensity score matching (PSC) to find the nearest neighbor among all companies in the ExecuComp database with respect to all independent and dependent variables, which report positive inside debt values and that never underwent any CDS trading. Each CDS treated company receives a non-CDS treated 'twin'-company that is selected in terms of all variables the year prior to treatment. Ideally, PSC selects a control group so that treatment and control group do not differ concerning both the dependent as well as the independent variables the year before treatment. Table III reports the mean values of these variables for the control group (column 1), the treatment group (column 2), and the t-values of their statistical difference (column 3).

[Insert table III here]

Control and treatment group are statistically comparable, as none of the variables is significantly different, except the percentage of outside directors, which differs by 4% at a 10% significance level.[6] Hence, proceeding with the statistical inference is justified. Due to the creation of a control group, equation (2) expands to a difference-in-difference analysis, where *CDS TRADED* now also captures the control group, i.e. assigns a value of zero for control

[6] However, this difference is not economically relevant.

companies. For the treated companies, *CDS TRADED* remains one ninety days after the CDS initiation and zero otherwise. Table IV reports the estimated coefficients of the difference-in-difference analysis between the control and treated group. Again, like in the difference analysis in table II, I do not find any significant effect of CDS trading neither on inside debt nor the CEO's inside debt-equity ratio[7]. However, the effect is indeed validated for the relative debt-equity ratio (k) and the relative incentive ratio (k^*).

[Insert table IV here]

With an estimated effect of -0.17 and -0.16 on k and k^* the magnitude of CDS trading in the difference-in-difference analysis is economically slightly smaller than in the difference analysis, where the coefficients of k and k^* are -0.23 and -0.21, respectively. However, statistically, the effect is stronger in the treatment-control group analysis, receiving 1% significance for the relative incentive ratio k^*. Again, the CEO's age plays a major role in explaining the compensation structure, as well as firm size and percentage of outside directors, the latter effect again remaining positive. Hence, the impact of debt insurance on compensation structure is validated. To finally rule out that the selection of observables is driving the results in table II and IV I run falsification tests in the next section.

[7] In unreported tests, where I expand the control group to the two nearest neighbors, i.e. sixty control companies, which are statistically comparable to the treated group, I do find a 5% significant effect of *CDS TRADED* on CEO's leverage.

IV. Robustness Tests

In this section I run placebo tests to mitigate the odds that omitted variables are driving the results in section III. The assumption is that in a placebo test we should not observe treatment-control differentials when there was in fact no true treatment. I start the analysis by selecting all companies in ExecuComp that report positive inside debt values as of the fiscal year 2007. I then remove those thirty companies that underwent CDS initiations. Next, the remaining companies are split into a placebo treated and dummy control group; each company has an equal probability of being assigned into either group. Within the false treated group I randomly assign CDS initiation dates, ensuring at least one year of pre- and post-'treatment' data. I am thus able to run a placebo difference analysis with just the placebo treated group and a placebo difference-in-difference analysis with the fake treated and control group. Table V reports the estimated coefficients for the difference analysis (model 1, 3, 5, and 7), and the difference-in-difference analysis (model 2, 4, 6, 8). Overall, the difference analyses comprise around 470 companies (depending on the availability of all variables) and the difference-in-differences analyses cover between 913 and 921 companies. In table V I estimate the placebo-CDS effect by running equation (2), but replacing *CDS TRADED* with the placebo variable *PLACEBO CDS*, which is zero for the control group and one post the randomly assigned treatment date and zero otherwise for the fake treatment group.

[Insert table V here]

The placebo variable *PLACEBO CDS* is never significant in any of the models. Furthermore, its estimated insignificant impact randomly switches between being positive and negative, further confirming that the observed significant effect for the truly treated companies in table II and IV is indeed not due self-selection based on unobservables. Moreover, the impact of CEO age, firm size, leverage, and corporate governance on determining compensation structure is reassured. Given the placebo test results it can be confidently claimed that debt insurance does play a significant role in compensation structure and that firms that exogenously undergo CDS initiations, which allow debt holders to insure themselves against the risk of debt, adjust their CEO's compensation contracts so that they reasonably favor equity holders. This incentives alignment is a sign that corporate governance mechanisms do work adequately.

V. Conclusion

In this paper I empirically test the relation between CEO's compensation structure and debt insurance. It is generally accepted that managerial compensation should be set to align management with share- and bondholders, not only to mitigate managerial slack but also to overcome the conflict of interest between these two claim holders and to reduce the resulting agency costs: equity holders seek potential return maximization by favoring managerial risk-taking which goes at the expenses of debt holders, who do not benefit from the upside potential of risky investment since their claims are fixed. Therefore, they only bear the downside risk in case of default. Debt holders, in contrast, prefer conservative investment decisions, which in the extreme lead to underinvestment and the passing on of potentially beneficial but risky projects.

Agency costs of debt incur, when management engages in risk-shifting behavior that favors equity holders over debt holder. Agency costs of equity incur, when management's investment style is too conservative and at the detriment of shareholders. To overcome this conflict and to meet the interests of both groups of capital providers, managers are compensated through a balance of equity- and debt-like instruments. However, if debt holders have the option to insure themselves against the risks of debt, i.e. default, and if governance structures are effective, the compensation committee should update the CEO's alignment more towards equity holders, since the agency costs of debt, relative to the agency costs of equity, become less of a concern and should diminish under debt insurance. Thus, under debt insurance the compensation contract should be restructured so that inside debt positions, relative to the CEO's inside equity, and especially comparative to the company's capital structure, are reduced. Exploiting first-time credit default swap (CDS) initiations as a positive and exogenous shock on debt insurance, I find robust evidence that CDS trading on a given company shifts the CEO's alignment values, the relative debt-equity and the relative incentive ratio towards equity holders, implying a significant reduction in both statistics of around 0.2 units. The results hold in a difference analysis, a difference-in-difference analysis with nearest neighbor matching, and withstand placebo tests and are therefore robust.

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Table I

Summary Statistics

This table provides summary statistics of the thirty U.S. companies which underwent first-time credit default swap (CDS) initiations during the time span 2007 to 2014. CDS data is pulled from Markit, executive compensation data is provided by ExecuComp, market data is drawn from CRSP, fundamental data is gathered from Compustat, corporate governance data is taken from the Investor Responsibility Research Center (IRRC), and institutional ownership data is pulled from Thomson Reuters. *Inside debt* is the sum of defined benefit pensions and deferred compensation. *Inside equity* is the sum of the values of shares, stock units, and restricted stock, as well as vested and unvested options. Option values are calculated using the Black-Scholes formula, employing the respective, historical risk-free rates from the Federal Reserve; stock volatility is estimated using a five-year historical time horizon of monthly rolling returns. Following conventional standards, the remaining life of each firm's option is assumed to be four years. Inside debt and inside equity are measured in millions. The *CEO inside debt-equity ratio*, also denoted as the CEO leverage ratio, is the ratio between inside debt over inside equity. The *CEO relative debt-equity ratio*, interchangeably called CEO relative leverage ratio, is the CEO's inside debt-equity ratio over the firm's debt equity ratio, i.e. firm leverage, which is defined as the firm's total liabilities over market capitalization. The *CEO relative incentive ratio* is based upon the CEO's and firm's changes in debt and equity value for a unit change in the value of the firm. The computation follows Wei and Yermack (2011). *CEO outside* is a dummy variable that equals one if the CEO was hired from outside and zero otherwise. *CEO age* is the age of the CEO at any given time of measurement, *CEO tenure* is the years since becoming CEO, *firm size* is the log of total assets, *firm age* is the log of days since going public, *leverage* is defined as described previously, *growth opportunities* is the ratio of R&D expenditures over sales, *institutional ownership* is the percentage of institutional investor ownership, *board size* is the log of members of the board of directors, and *outside directors* is the percentage of independent directors on the board of directors. Panel A provides summary statistics and Panel B reports the correlation matrix between the variables, as well as the correlation with *CDS TRADED*, which is an indicator variable that codes one ninety days after the CDS initiation and zero otherwise. The time horizon for measuring the variables is between 2006 and 2014.

Panel A: Summary Statistics

	N	Mean	Std. Dev.	25th %tile	Median	75th %tile
Inside debt	224	12.19	18.60	1.82	5.30	14.06
Inside equity	225	56.33	83.91	13.6	27.74	62.5
CEO inside debt-equity ratio	223	0.37	0.62	0.05	0.18	0.47
CEO relative debt-equity ratio (k)	223	0.46	0.69	0.05	0.21	0.5
CEO relative incentive ratio (k)*	223	0.38	0.56	0.05	0.17	0.45
CEO outside	225	0.2	0.4	0	0	0
CEO age	225	58.9	6.57	54	60	63
CEO tenure	225	6.78	5.35	2.66	5.42	9.76
Firm size	225	9.4	1.05	8.68	9.22	10.15
Firm age	225	9.14	0.95	8.71	9.2	9.81
Leverage	225	1.58	1.77	0.48	0.87	1.86
Growth opportunities	225	0.03	0.07	0	0	0.01
Institutional ownership (%)	225	0.645	0.331	0.647	0.77	0.854
Board size	225	2.35	0.21	2.2	2.4	2.48
Outside directors (%)	225	0.81	0.09	0.75	0.82	0.9

Panel B: Correlation Matrix

	CDS TRADED	*Inside debt*	*Inside equity*	*CEO lev.*	*k*	*k**	*CEO out.*	*CEO age*	*CEO tenure*	*Firm size*	*Firm age*	*Lev. ratio*	*Growth opps.*	*Inst. Own.*	*Board size*	*Out. Dir.*
CDS TRADED	1.00															
Inside debt	0.15	1.00														
Inside equity	-0.07	0.28	1.00													
CEO lev.	-0.01	0.29	-0.16	1.00												
k	0.01	0.56	-0.07	0.55	1.00											
*k**	0.02	0.56	-0.06	0.49	0.99	1.00										
CEO outside	-0.08	-0.19	0.06	-0.07	-0.17	-0.18	1.00									
CEO age	-0.19	0.25	0.29	0.27	0.30	0.29	0.22	1.00								
CEO tenure	0.12	0.18	0.36	0.06	0.01	-0.01	0.22	0.45	1.00							
Firm size	-0.09	0.37	0.01	0.11	0.17	0.16	-0.08	0.03	-0.04	1.00						
Firm age	0.05	0.38	0.28	0.15	0.31	0.28	-0.08	0.08	0.22	0.05	1.00					
Lev. ratio	0.00	-0.22	-0.24	0.09	-0.30	-0.31	-0.08	-0.15	-0.06	0.37	-0.33	1.00				
Growth opps.	0.05	-0.04	-0.06	0.00	0.23	0.23	0.17	-0.08	-0.18	0.02	0.18	-0.22	1.00			
Inst. Own.	0.29	0.18	0.05	0.04	0.14	0.16	-0.35	0.03	0.15	0.01	0.12	0.10	-0.09	1.00		
Board size	-0.15	0.31	0.19	0.17	0.21	0.20	0.01	0.22	0.15	0.35	0.37	-0.07	0.03	-0.13	1.00	
Out. Dir.	0.10	0.15	-0.11	0.11	0.20	0.19	-0.15	-0.06	-0.12	0.31	0.30	0.07	0.03	-0.01	0.04	1.00

Table II

Main Results – Difference Analysis

This table provides results of panel regressions of the effect of CDS initiations on various measures of compensation structure. In column (1) the dependent variable is *inside debt*, in column (2) the explained variable is *CEO inside debt-equity ratio*, in column (3) *CEO relative debt-equity ratio*, and in column (4) *CEO relative incentive ratio*. *CDS TRADED* is an indicator variable that equals one ninety days after the CDS initiation and zero otherwise. The control variables fall into three categories: CEO-related and firmspecific controls, as well as measures of corporate governance. The CEO-specific controls are a dummy variable if the CEO was hired from outside (*CEO outside*), the current age of the CEO (*CEO age*), and the years of CEO tenure (*CEO tenure*). The firmspecific controls are *firm size*, which is the log of total assets, *firm age*, which is the log of days since the company went public, the *leverage* ratio, which is total liabilities over the market value, and the *growth opportunities* of the firm, which are captured through the ratio of R&D expenditures over sales. The governance controls are the percentage of *institutional ownership*, the log of *board size*, as well as the percentage of independent directors (*outside directors*). All variables are constructed as described in table 1. Year fixed effects as well as firm fixed effects are employed. The sample of CDS treated companies composes of thirty firms. The time span covers the years 2006 to 2014; t-statistics are in parentheses. *, **, and *** denote significance at the 10%, 5%, and 1% level.

	(1) *Inside debt*	(2) *CEO inside debt-equity ratio*	(3) *CEO relative debt-equity ratio*	(4) *CEO relative incentive ratio*
CDS TRADED	0.48	-0.17	-0.23**	-0.21**
	(0.26)	(-1.34)	(-2.37)	(-2.59)
CEO outside	-4.54*	0.11	-0.05	0.00
	(-1.72)	(0.60)	(-0.33)	(0.00)
CEO age	0.50**	0.06***	0.05***	0.04***
	(2.60)	(4.11)	(4.45)	(4.48)
CEO tenure	1.04***	0.02	0.00	-0.00
	(4.97)	(1.37)	(0.22)	(-0.34)
Firm size	2.06	-0.25*	-0.29***	-0.20**
	(1.09)	(-1.91)	(-2.83)	(-2.51)
Firm age	-3.91	-0.35*	-0.21	-0.20*
	(-1.50)	(-1.95)	(-1.52)	(-1.73)
Leverage	0.10	0.19***		
	(0.13)	(3.38)		
Growth opportunities	-3.61	0.21	0.60	0.54
	(-0.27)	(0.22)	(0.82)	(0.93)
Institutional ownership (%)	-1.23	0.03	0.02	0.13
	(-0.47)	(0.16)	(0.17)	(1.15)
Board size	-0.87	0.02	-0.01	-0.02
	(-0.23)	(0.09)	(-0.05)	(-0.10)
Outside directors (%)	-6.54	0.35	1.19**	0.99**
	(-0.71)	(0.55)	(2.36)	(2.45)
Constant	-3.34	1.52	1.14	0.83
	(-0.11)	(0.73)	(0.70)	(0.63)
Observations	224	223	223	223
R-squared	0.34	0.30	0.21	0.21
Number of firms	30	30	30	30
Firm FE	yes	yes	yes	yes

Table III

Test of Differences in Control and Treated Group

This table provides the mean and standard errors of t-tests of the independent and dependent variables the year before the CDS treatment occurs to the treated sample. The control group for each treatment year is formed annually based on propensity score matching, where the nearest neighbor to the company that will receive treatment during the next year is identified. The propensity score is calculated by mapping on the variables below. The time span covers the years 2006 to 2012, meaning that CDS initiations occur the following year on the treated sample. Column (1) reports the mean of the control group; column (2) the mean of the treated group, and column (3) reports the t-value of the differences in means. Variables are defined as in table xx; *, **, and *** denote significance at the 10%, 5%, and 1% level.

	(1) Control group	(2) Treatment group	(3) Difference (t-value)
Inside debt	7.62	8.86	0.37
	2.11	2.63	
CEO inside debt-equity ratio	0.19	0.23	0.64
	0.04	0.05	
CEO relative debt-equity ratio (k)	0.25	0.33	0.68
	0.07	0.10	
CEO incentive ratio (k)*	0.19	0.29	1.03
	0.05	0.08	
CEO age	58.43	59.27	0.51
	1.11	1.19	
CEO tenure	6.97	6.58	-0.26
	1.16	1.02	
CEO outside	0.23	0.27	0.29
	0.08	0.08	
Firm size	9.62	9.36	-0.65
	0.36	0.19	
Firm age	9.04	9.00	-0.14
	0.18	0.18	
Growth opportunities	0.03	0.03	0.07
	0.02	0.01	
Leverage	1.87	1.52	-0.68
	0.39	0.33	
Institutional Ownership (%)	0.69	0.62	-0.84
	0.05	0.07	
Board size	2.42	2.38	-0.60
	0.07	0.04	
Outside director	0.82	0.78	-1.49*
	0.02	0.02	
Number of firms	30	30	

Table IV

Difference-in-Difference Analysis – Control and Treated Group

This table provides coefficient estimates of panel regressions of the effect of CDS initiations on various measures of compensation structure on the treated and a control group that never was subject to CDS trading; both groups compose of thirty companies. The control group is determined through propensity score matching as explained in table III. In column (1) I estimate the effect of CDS trading (*CDS TRADED*) on *inside debt*, in column (2) on the *CEO inside debt-equity ratio*, in column (3) on the *CEO relative debt-equity ratio*, and in column (4) on the *CEO relative incentive ratio*. The control variables are defined as in the previous tables and compose of CEO-related, firmspecific, and corporate governance controls. The CEO-specific controls are a dummy variable if the CEO was hired from outside (*CEO outside*), the current *CEO age*, and the years of CEO tenure (*CEO tenure*). The firmspecific controls are *firm size* (log of total assets), *firm age* (log of days since the company went public), *leverage* (total liabilities over market capitalization), and *growth opportunities* of the firm (R&D expenses over sales). The governance controls are the percentage of *institutional ownership*, *board size* (in logs), as well as the percentage of independent directors (*outside directors*). Year fixed effects as well as firm fixed effects are employed. The time span covers the years 2006 to 2014; t-statistics are in parentheses. *, **, and *** denote significance at the 10%, 5%, and 1% level.

	(1) *Inside debt*	(2) *CEO inside debt-equity ratio*	(3) *CEO relative debt-equity ratio*	(4) *CEO relative incentive ratio*
CDS TRADED	2.30	-0.13	-0.17**	-0.16***
	(1.59)	(-1.43)	(-2.37)	(-2.79)
CEO outside	-6.18***	0.12	-0.03	0.02
	(-2.93)	(0.91)	(-0.24)	(0.19)
CEO age	0.55***	0.05***	0.04***	0.03***
	(3.89)	(5.10)	(4.98)	(5.16)
CEO tenure	0.99***	0.01	0.00	-0.00
	(6.47)	(0.95)	(0.09)	(-0.59)
Firm size	1.35	-0.22**	-0.22***	-0.15***
	(0.91)	(-2.34)	(-2.95)	(-2.62)
Firm age	-2.74	-0.24*	-0.10	-0.09
	(-1.33)	(-1.91)	(-0.90)	(-1.08)
Leverage	-0.23	0.12***		
	(-0.45)	(3.80)		
Growth Opportunities	-7.19	-0.03	-0.04	0.09
	(-0.64)	(-0.04)	(-0.07)	(0.20)
Institutional Ownership (%)	-1.33	-0.03	0.00	0.10
	(-0.63)	(-0.21)	(0.03)	(1.18)
Board size	-0.36	-0.06	-0.09	-0.07
	(-0.12)	(-0.32)	(-0.63)	(-0.59)
Outside Director (%)	-6.59	0.19	0.67**	0.56**
	(-1.00)	(0.46)	(2.00)	(2.12)
Constant	-12.57	1.29	0.69	0.36
	(-0.55)	(0.90)	(0.59)	(0.39)
Observations	404	403	402	402
R-squared	0.29	0.24	0.14	0.14
Number of firms	60	60	60	60
Firm FE	yes	yes	yes	yes
Year FE	yes	yes	yes	yes

Table V

Placebo Tests

This table provides results of panel regressions of placebo tests on the effect of placebo-CDS initiations on various measures of compensation structure. Models 1, 3, 5, and 7 report coefficients of a pre/post difference analysis of a randomly chosen placebo group with randomly assigned CDS-treatment dates. Model 2, 4, 6 and 8 include a control group and thus reports coefficients of difference-in-difference analyses. The dependent variables are *inside debt* (model 1 and 2), *CEO inside debt-equity ratio* (model 3 and 4), *CEO relative debt-equity ratio* (model 5 and 6) and *CEO relative incentive ratio* (model 7 and 8). *PLACEBO CDS* is an indicator variable that is zero for the control group and one for the fake treated group after the placebo CDS initiation is randomly assigned and zero prior to the 'treatment'. All other variables are defined as stated in table 1. The sample consists of all companies that report positive inside debt in ExecuComp during the time span 2006 to 2014 and never underwent CDS trading. The companies are randomly divided into a placebo group and a control group, with an equal probability of being either in the falsified or control group. The date when the placebo treatment occurs is randomly assigned as well. I require at least a one year period of pre-treatment data; t-statistics are in parentheses. *, **, and *** denote significance at the 10%, 5%, and 1% level.

	(1) *Inside debt*	(2) *Inside debt*	(3) *CEO inside debt-equity ratio*	(4) *CEO inside debt-equity ratio*	(5) *CEO relative debt-equity ratio*	(6) *CEO relative debt-equity ratio*	(7) *CEO relative incentive ratio*	(8) *CEO relative incentive ratio*
PLACEBO CDS	-0.28	-0.07	0.25	0.30	-0.08	1.11	-0.05	1.14
	(-0.54)	(-0.16)	(1.05)	(1.31)	(-1.04)	(0.89)	(-0.78)	(0.89)
CEO outside	0.69	-0.07	-5.04***	-2.58***	0.28	-0.34	0.40*	-0.35
	(0.43)	(-0.07)	(-6.45)	(-3.94)	(1.19)	(-0.09)	(1.92)	(-0.10)
CEO age	0.28***	0.42***	-0.01	0.00	0.02***	0.00	0.04***	-0.00
	(5.22)	(10.20)	(-0.21)	(0.20)	(2.86)	(0.00)	(5.50)	(-0.01)
CEO tenure	0.57***	0.49***	-0.06*	-0.03	0.01	-0.09	-0.01	-0.09
	(9.86)	(11.94)	(-1.95)	(-1.03)	(1.31)	(-0.64)	(-0.79)	(-0.67)
Firm size	-0.81	1.02	-0.21	0.79**	-0.43***	7.22***	-0.36***	7.51***
	(-0.92)	(1.63)	(-0.52)	(2.21)	(-3.53)	(3.69)	(-3.21)	(3.72)
Firm age	-1.10	0.06	0.41	-0.20	0.42*	-2.01	0.35	-2.19
	(-0.63)	(0.05)	(0.50)	(-0.30)	(1.74)	(-0.55)	(1.54)	(-0.58)
Leverage	0.04	0.02	0.59***	0.45***				
	(0.61)	(0.37)	(19.70)	(14.62)				
Growth opportunities	-0.82	-3.29	0.47	0.44	1.00	4.23	1.05	4.10
	(-0.09)	(-0.55)	(0.11)	(0.13)	(0.76)	(0.23)	(0.86)	(0.21)
Inst. Ownership (%)	0.57	-0.12	-0.44	0.24	0.07	8.05**	0.17	8.48**
	(0.29)	(-0.10)	(-0.49)	(0.32)	(0.27)	(1.98)	(0.68)	(2.03)
Board size	1.09	-0.04	0.09	0.72	0.12	6.83*	0.01	7.19*
	(0.59)	(-0.03)	(0.10)	(1.02)	(0.46)	(1.76)	(0.06)	(1.80)
Outside director	2.26	2.18	-0.52	0.92	0.24	11.59*	0.07	11.76*
	(0.73)	(1.02)	(-0.36)	(0.75)	(0.55)	(1.72)	(0.18)	(1.70)
Constant	-1.51	-31.79***	-0.74	-7.42	-1.70	-70.37*	-2.25	-72.08*

	(-0.09)	(-2.72)	(-0.09)	(-1.11)	(-0.70)	(-1.92)	(-1.00)	(-1.90)
Observations	2,617	5,134	2,570	5,048	2,570	5,048	2,610	5,122
R-squared	0.13	0.15	0.19	0.06	0.02	0.01	0.03	0.01
Number of firms	472	921	468	913	468	913	472	921
Firm FE	yes	yes	yes	yes	yes	yes	yes	yes
Year FE	yes	yes	yes	yes	yes	yes	yes	yes