TOURNAMENT INCENTIVES, CREDIT DEFAULT SWAPS TRADING, AND CORPORATE POLICIES: THE INTERPLAY OF MANAGERIAL AND CREDITOR INCENTIVES

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Abstract

This paper investigates how the interaction between managerial and creditor incentives affects corporate risk and policies. Using a sample of 16,513 firm-year observations from 2001 to 2014, we find that credit default swaps (CDS) trading leads to higher stock return volatility and leverage, yet lower cash flow volatility and capital expenditure. Meanwhile, tournament incentive is associated with higher firm risk and more aggressive corporate policies. Further, we find that the interaction between tournament incentives and CDS trading alleviates the overall effect of intra-firm tournament incentives and CDS trading on firm risk and corporate policies. Altogether, our results suggest that risk-averse managers balance risk-taking incentives and creditor incentives when making corporate decisions and, hence are less sensitive to tournament incentives due to their concerns about exacting empty creditors problems in CDS-referenced firms. This study contributes to the literature by providing initial insights into the interaction effects between managerial and creditor incentives.

Keywords: Tournament Incentives, Credit Risk, Credit Default Swaps, Firm Risk, Corporate Policies

Authors' individual contribution: Conceptualization — L.D. and J.H.; Methodology — L.D. and J.H.; Formal Analysis — L.D.; Writing — Original Draft — L.D.; Writing — Review & Editing — L.D. and J.H.

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1. INTRODUCTION

A growing literature on credit default swaps (CDS) documents that the presence of CDS trading reshapes the incentives and behaviors of creditors, which leads to changes in a firm's credit supply, borrowing costs, risk, and corporate policy choices (Bolton & Oehmke, 2011; Parlour & Winton, 2013; Li & Tang, 2016; Subrahmanyam et al., 2014, 2017). Meanwhile, studies on the effects of intra-firm rank order tournaments provide supporting evidence that the inherent optionality present in intra-firm tournaments provides managers with distinct and incremental benefits over option-based compensation incentives to work harder and pursue riskier but value-enhancing firm policies (Kale et al., 2009; Kini & Williams, 2012; Coles et al., 2018). Despite the extended literature on the economic impact of managerial tournaments and CDS, the interplay between managerial and creditor incentives remains understudied. We intend to fill the gap and shed light on the overall economic impact of CDS trading, senior manager tournament incentives (SMTI), and their interactions with firm risk and corporate policies.

First, we re-examine the stand-alone effects of tournament incentives and CDS trading on firm risk and corporate policies, respectively. Next, we investigate how the interplay of managerial and creditor incentives affects corporate risks and policies. We expect managers to be less sensitive to SMTI due to increased managerial risk aversion. For instance, compared to managers in firms without CDS traded against their debt, managers in CDS-referenced firms may become more reluctant to undertake risky projects and are less responsive to SMTI.

To test our hypotheses, we use stock return volatility and cash flow volatility as measures of firm risk and investigate firm policies on capital expenditure and leverage. Our measure for the interaction between SMTI and CDS trading (SMTI × CDS) is defined as SMTI times CDS trading, where SMTI is the difference between firm chief executive officer (CEO) compensation and median vice president (VP) compensation, and CDS trading is dummy variable takes the value of one for firm-year observations with CDS. To alleviate endogeneity concerns, we perform three sets of tests. First, we estimate firm fixed effects models using the subsample of firms that have CDS traded against their debts during our sample period. Second, we construct a matched sample using propensity score matching (PSM). To create the PSM sample, we match each firm with CDS traded on their debt with a non-CDS company with the same propensity of CDS trading. Third, we estimate regression specifications using instrumented two-stage least square regressions. Further, in all our specifications, we include control variables associated with firm risk and policies, and control for the CEO effect by including measures of CEO performance-based incentives.

Overall, our results are largely consistent with our hypotheses. First, our results suggest that the presence of CDS trading leads to higher stock volatility and leverage, but lower cash flow volatility and capital expenditure. Second, consistent with existing literature, we show that SMTI is positively associated with stock volatility, cash flow volatility, and leverage, while negatively related to capital expenditure. Third and most importantly, we find that the interaction term SMTI × CDS is negatively related to stock volatility and firm leverage, while positively related to capital expenditure. This evidence is consistent with the argument that when facing the threat of exacting empty creditors in CDS-referenced firms, managers become more risk-averse and become less responsive to SMTI. Contradict to our expectation, SMTI × CDS is positively related to cash flow volatility, which further enhances the positive effect of SMTI on cash volatility. The combined positive effects from SMTI and the interaction term seem to offset the significant negative impact of CDS trading on cash flow volatility. Taken together, our results suggest that managers balance the incentives of empty creditors and their own incentive for promotion in their decision process. Overall, managers in CDS-referenced firms react less to SMTI when making financing and investment decisions. They are, however, more likely to be motivated by SMTI in the case of cash flow management, given the higher level of cash holding (Subrahmanyam et al., 2017) and lower cash flow volatility resulting from CDS trading.

Our primary contribution is to provide insights into how managers balance their incentives and creditors' incentives when making corporate decisions. We add to both the literature on rank order tournaments and the literature on CDS by providing a more comprehensive picture of their individual effects as well as the impacts of their interaction. Specifically, we extend research on the effects of tournament incentives by showing that these effects are weakened in CDS-referenced firms. We contribute to studies on the impact of CDS by evaluating how managers respond to risk-taking incentives in the presence of CDS. Finally, we present a further explanation of the negative relation between SMTI and CDS spread documented in Du et al. (2019). In CDS referenced firms, SMTI is less effective in inducing risk-taking behavior due to concerns over exacting empty creditors, hence it is unlikely to result in excessive risky policies that are harmful to the interests of bondholders.

The rest of this paper is organized as follows. We provide a literature review and develop our hypotheses in Section 2. In Section 3, we describe our sample and research methodology. Section 4 will present the results. Section 5 discusses the results, and Section 6 summarizes the findings. Variable definitions are presented in the Appendix.

2. LITERATURE REVIEW AND HYPOTHESES DEVELOPMENT

A growing literature documents the rapid growth and influence of CDS across global financial markets in the past two decades. Studies show that CDS plays an important role in price discovery and risk-sharing processes in the secondary market (Norden & Weber, 2004; Forte & Pena, 2009; Saretto & Tookes, 2013). Meanwhile, theoretical work describes a mechanism through which the presence of CDS trading reshapes the incentives and behaviors of creditors (Morrison, 2005; Bolton & Oehmke, 2011; Parlour & Winton, 2013). Subsequently, empirical studies argue that CDS trading fundamentally changes the relationship between creditors and borrowers, which leads to changes in the firm's credit supply, borrowing costs, risk, and corporate policy choices (Li & Tang, 2016; Subrahmanyam et al., 2014, 2017).

While CDS literature concentrates on the impact of CDS on the creditor-borrower relation and consequently firm risk and corporate policies, another stream of literature has focused on the effects of intra-firm rank-order tournaments. In a typical intra-firm rank-order tournament, the best performer among senior executives wins the tournament and is promoted to the CEO position. The higher pay and prestige that comes with the promotion are expected to motivate senior managers to expend additional effort and undertake riskier projects to increase their likelihood of winning the tournament (Goel & Thakor, 2008; Kale et al., 2009). Empirical studies provide supporting evidence that the inherent optionality present in intra-firm tournaments provides managers with distinct and incremental benefits over option-based compensation incentives to work harder and pursue

riskier but value-enhancing firm policies (Kale et al., 2009; Kini & Williams, 2012; Coles et al., 2018).

Existing studies have mainly focused on the economic impact of managerial tournaments on shareholders and managers, little attention has been devoted to their corresponding impact on bondholders. Likewise, CDS literature has focused on the creditor-borrower relation, while the interplay between managerial and creditor incentives remains understudied. This study attempts to fill the gap by exploring the overall economic impact of CDS trading, SMTI, and their interactions with firm risk and corporate policies. In a related study, Du et al. (2019) investigate the impact of SMTI on firm credit risk in CDS-referenced firms and find that SMTI reduce credit risk. Their results suggest that SMTI reduces credit risk by alleviating the potential for underinvestment from risk-averse managers. This paper extends their study by further exploring the interplay between senior managerial and creditor incentives, to help determine the mechanisms through which SMTI reduces the credit risk in CDS-referenced firms. Specifically, we evaluate how managers respond to risk-taking incentives when they face exacting empty creditors and reduced lender monitoring in CDS-referenced firms.

Following the existing literature, we re-examine the stand-alone effects of tournament incentives and CDS trading on firm risk and corporate policies, respectively. First, we expect that higher tournament incentive is associated with higher firm risk and more aggressive corporate policies as documented in prior studies. Second, on the effect of CDS trading, prior studies show that reduced creditor monitoring resulting from CDS trading provides managers more flexibility to engage in risk-shifting behavior, which leads to an increase in firm risk and more aggressive financial policies (Bolton & Oehmke, 2011; Parlour & Winton, 2013; Saretto & Tookes, 2013; Subrahmanyam et al., 2014). On the other hand, CDS-insured creditors become more exacting in renegotiations, leading to the "empty creditor" problem (Stulz, 2010; Bolton & Oehmke, 2011). Subsequently, concerns over exacting empty creditors may motivate managers to adopt more conservative policies. Subrahmanyam et al. (2017) find that firms hold more cash after CDS trading. Overall, the impact of CDS trading may vary based on the measure of firm risk and the type of corporate policies.

Most importantly, we investigate how the interplay of managerial and creditor incentives affects corporate risks and policies. Drawing from the agency theory research, we focus on the link between managerial risk aversion and their risk-taking behavior (Grossman & Hart, 1982; Smith & Stulz, 1985; Coles et al., 2006). Given any level of managerial incentives, managers' willingness to take risks will decrease with their level of risk aversion. On the one hand, SMTI provides managers with incentives to engage in risk-shifting behavior preferred by shareholders. On the other hand, the availability of CDS trading reduces creditors' willingness to renegotiate. Such an "exacting empty creditor" problem then leads to an increase in managerial risk aversion to avoid renegotiation with exacting creditors. Taken together, we expect managers to be less sensitive to SMTI due to increased managerial risk aversion in CDS reference firms. For instance, compared to managers in firms without CDS traded against their debt, managers in CDS-referenced firms may become more reluctant to undertake risky projects and are less responsive to SMTI. Formally, we test the following hypotheses:

H1: SMTI is positively related to firm risk and aggressive corporate policies.

H2: CDS trading (initiations) is positively related to firm risk and aggressive corporate policies.

H3: In CDS-referenced firms, managers are less sensitive to SMTI, that is, the interaction term between SMTI and CDS trading dummy is negatively related to firm risk and aggressive policies.

3. DATA AND VARIABLE DESCRIPTION

3.1. Sample description

Our sample consists of all firms that are included in the ExecuComp, Center for Research in Security Prices (CRSP), and Compustat databases during the years 2001 to 2015. To identify the availability of CDS trading, we include all CDS contracts on United States (U.S.) entities denominated in U.S. dollars from Bloomberg.

We obtain managerial compensation data from ExecuComp which includes U.S. firms that are in the S&P 500, S&P mid-cap 400, and S&P small-cap indices. We include all firm-years that have an identifiable CEO in ExecuComp and exclude utility and financial firms. The value of option grants in ExecuComp prior to 2005 is computed based on the Black and Scholes model while post-2005, they are based on values reported by the company. We use the same methodology as in Kini and Williams (2012) to ensure that the computation of all our ExecuComp variables is consistent throughout our entire sample period. Firm-specific financial variables are obtained from Compustat and stock return data from CRSP. All dollar-denominated variables are inflation-adjusted to 2003 dollars using the consumer price index (CPI). Lastly, all the continuous variables are winsorized at their 1% and 99% values.

After excluding observations with missing financial data, our final sample consists of 16,513 firm-year observations from the fiscal year 2001 to 2015. Specifically, we have 4,320 firm-year observations with CDS trading and 12,193 firm-year observations without CDS trading.

3.2. Baseline model and main variables

To test our hypotheses, we estimate the following model using multiple regression approaches:

$$\begin{aligned} Risk\ (or\ Policy)_{i,t} = \alpha + \beta_1 CDS\ trading\ indicator_{i,t} + \beta_2 Log(Pay\ gap)_{i,t-1} + \beta_3 Log(Pay\ gap)_{i,t-1} + \\ * CDS\ trading\ indicator_{i,t} + \gamma_1 CEO\ delta_{i,t-1} + \gamma_2 CEO\ vega_{i,t-1} + Other\ control\ variables_{i,t} + \\ + industry\ fixed\ effects + year\ fixed\ effects + \varepsilon_{i,t} \end{aligned} \quad (1)$$

The dependent variables are measures of firm risks and corporate policies. Specifically, we use stock return volatility and cash flow volatility as proxies for firm risk; and investigate determinants of corporate policies including research and development (R&D) expenditures, capital expenditures, and financial leverage.

We use the first date when CDS data became available in our sample as the initiation date of CDS contracts. The dummy variable, *CDS trading*, equals one if a firm had CDS traded against its debt in the fiscal year, and zero otherwise. Based on Kale et al. (2009) and Kini and Williams (2012), we compute SMTI by subtracting median VP compensation from firm CEO compensation. Our analysis includes controls for CEO performance-based incentives, which gauge alignment with shareholders (referred to as *CEO delta*), and risk-taking incentives (referred to as *CEO vega*). *CEO delta* is derived as the weighted average of the delta of a CEO's stock and option holdings, while *CEO vega* represents the vega of a CEO's option holdings. To value options for delta and vega calculations, we adopt the methodology outlined in Coles et al. (2006), adjusting for inflation by scaling to 2003 dollars. We include an interaction term, *CDS trading × Pay gap*, to investigate the interplay between managerial incentives and the effect of CDS trading.

Additionally, we include control variables that capture aspects such as firm characteristics and financial distress measures, including *firm size*, *profitability*, *sales growth*, *Tobin's Q*, and *credit rating*. Finally, we include industry and year fixed effects to account for any invariant industry factors and time trends. Variable description and their measurements are provided in the Appendix. Table 1 reports univariate statistics for our main variables. The variable *Pay gap* has a mean (median) value of $3.25 million ($1.94 million). Further, our sample has a mean (median) *CEO delta* of $0.56 million ($0.19 million) and a mean (median) *CEO vega* of $0.13 million ($0.05 million).

Table 1. Summary statistics

Variable	*Obs.*	*Mean*	*Median*	*Std. dev.*	*Min*	*Max*
CDS trading	16,513	0.26	0.00	0.44	0.00	1.00
Pay gap ($ thousand)	16,513	3,246.62	1,938.84	3,998.82	39.34	24,982.44
CEO delta ($ thousand)	16,513	560.77	189.16	1306.04	2.47	11,803.94
CEO vega ($ thousand)	16,513	128.16	51.14	202.45	0.00	1,118.13
Equity volatility	16,513	0.03	0.02	0.01	0.01	0.08
Cash flow volatility	8,978	0.06	0.04	0.06	0.00	1.46
R&D intensity	16,513	0.03	0.00	0.07	0.00	1.79
CAPEX intensity	16,513	0.05	0.03	0.05	-0.03	0.82
Leverage	16,513	0.51	0.50	0.26	0.02	6.81
Log (Total assets) ($M)	16,513	7.35	7.24	1.60	1.62	13.59
Return on assets (ROA) (%)	16,513	0.03	0.05	0.15	-4.75	1.63
Tobin's Q	16,513	1.98	1.60	1.29	0.37	32.47
Sales growth	16,513	0.09	0.07	0.23	-0.48	1.49
Profit margin	16,513	-0.10	0.05	5.10	-436.35	21.85
Credit rating	16,513	5.70	0.00	6.29	0.00	21.00

Note: The sample includes all public companies that are covered by ExecuComp and have CDS outstanding against their debts from 2001–2015. CDS quotes are from Bloomberg terminal, CEO compensation data are from ExecuComp, firm accounting data and S&P credit rating are obtained from Compustat North America. All variables are defined in the Appendix. All continuous variables are winsorized at 1% and 99% and all dollar-value variables are inflation-adjusted to 2003 dollars.

3.3. Control for endogeneity

Martin and Roychowdhury (2015), and Du et al. (2018), among others, document that CDS-referenced companies differ from companies without CDS. We perform three sets of analyses to alleviate the concern of endogeneity. First, we estimate firm fixed effects models using a subsample of firms that have CDS traded against their debts in our sample period. That is, we rely only on within-firm variation between CDS firms to investigate the impacts of CDS trading, tournament incentives, and their interactions.

Second, in line with Du et. al. (2018), we construct a PSM sample. First, we run logistic regressions to estimate the probability of a firm having traded CDS. Second, we use the predicted probabilities from the first stage to match companies with CDS trading to companies without CDS that have a similar propensity of trading. For each observation of CDS trading, we identify three non-CDS firms with the closest propensity scores and restrict the difference in scores to one percent or less. We exclude CDS firm-year observations without any matched non-CDS firm-year observations. Table 2 presents univariate two-sample mean tests for CDS firms and firms without CDS. Consistent with our hypotheses, we find that on average, CDS firms provide higher managerial incentives, have higher risk, and more aggressive corporate policies.

Table 2. Univariate differences in pay structure and firm policies between CDS and non-CDS firms

Variable	*Non-CDS*	*CDS*	*Non-CDS*	*t-value for diff.*
Panel A: CDS firms versus non-CDS firms				
Pay gap	2410.500	6014.000	3603.500	29.80
CEO delta	552.095	943.810	391.715	20.06
CEO vega	80.118	269.246	189.128	38.87
Equity volatility	0.029	0.023	-0.007	-13.56
CAPEX intensity	0.061	0.049	-0.011	-1.87
Leverage	0.472	0.635	0.163	25.42
Log (Total assets)	6.732	9.134	2.402	81.27
Sales growth	0.136	0.068	-0.069	-3.76
Tobin's Q	2.169	1.758	-0.411	-7.18
ROA	0.032	0.049	0.017	6.59
Panel B: After propensity score matching				
Pay gap	4726.416	4740.302	13.886	*0.06*
CEO delta	558.524	578.792	20.268	*0.57*
CEO vega	322.306	335.485	13.180	*0.76*
Equity volatility	0.271	0.279	0.008	*0.86*
CAPEX intensity	0.054	0.050	-0.004	*-1.75*
Leverage	0.617	0.618	0.001	*0.12*
Log (Total assets)	8.445	8.491	0.046	*1.04*
Sales growth	0.086	0.059	-0.028	*-3.37*
Tobin's Q	0.941	0.931	-0.010	*-0.25*
ROA	0.037	0.511	0.474	*0.51*

Note: This table presents two sample mean tests between CDS firms and non-CDS firms from our full sample and one-to-one CDS trading propensity score matched (PSM) sample. Panel A reports the results from the full sample. In Panel B, each CDS trading observation is matched with one non-CDS firm-year observation by likelihood of CDS trading, where the difference in propensity score is restricted to being within 1%. All variables are defined in the Appendix. All continuous variables are winsorized at 1% and 99% and all dollar-value variables are inflation-adjusted. t-statistics adjusted for firm and year clustering are presented below.

Third, given the potential endogeneity of our measure of SMTI, denoted as *Pay gap*, we aim to pinpoint two relevant and valid instruments to over-identify the model. To identify these instruments, we draw upon the tournament-based incentives literature, seeking those that meet both relevance and validity criteria. For relevance, our chosen instruments should exhibit a correlation with the *Pay gap* even after controlling for all other second-stage regressors. Moreover, these instruments must adhere to the exclusion criterion, affecting the dependent variable solely through their influence on the *Pay gap*. Our first instrument is derived from Kini and Williams (2012), representing the number of non-CEO executives listed in ExecuComp within a firm (referred to as the *Number of vice presidents within each firm*). Kale et al. (2009) posit that a higher number of VPs decreases the likelihood of any individual VP winning the tournament. Furthermore, we anticipate that firm credit risk remains unaffected by the number of VPs within the firm. Hence, our first instrument is the *Number of vice presidents within each firm*. Aligning with Coles et al. (2018), our second instrument is grounded in the count of higher-paid CEOs within the same industry as the sample firm (referred to as the *Number of higher-paid CEOs within each industry*), anticipated to exhibit a negative association with *Pay gap*.

4. RESEARCH RESULTS

4.1. Credit default swaps trading, tournament incentives, and firm risk

In this section, we examine the individual effects and the interaction between CDS trading and tournament incentives on the level of firm risks. We use stock return volatility and cash flow volatility as measures of firm risk:

$$\begin{aligned} Stock\ return\ volaility\ (Cash\ flow\ volatility)_{i,t} = \alpha + \beta_1 CDS\ trading\ indicator_{i,t} + \beta_2 Log(Pay\ gap)_{i,t-1} \\ +\beta_3 Log(\ Pay\ gap)_{i,t-1} * CDS\ trading\ indicator_{i,t} + \gamma_1 CEO\ delta_{i,t-1} + \gamma_2 CEO\ vega_{i,t-1} \\ + Other\ control\ variables_{i,t} + \ industry\ fixed\ effects + year\ fixed\ effects + \varepsilon_{i,t} \end{aligned} \quad (2)$$

Table 3 presents the results of various specifications of Eq. (2) on the relation between CDS trading, tournament incentives, and stock return volatility. In all but PSM models, the coefficients of C*DS trading* and *Log (Pay gap)* are positive, whereas the coefficient of their interaction, *Log (Pay gap) × CDS trading,* is negative. These effects are statistically significant at a 1% level in our Model 2: firm-fixed effects model with CDS subsample and Model 4: two-stage least squares (2SLS) specification. For instance, from the second stage of our 2SLS regression, the coefficient on C*DS trading indicator* is 0.040, which implies that the availability of CDS trading results in a 0.040 (i.e., 2.97 standard deviation) increase in stock return volatility; similarly, the coefficient on *Log (Pay gap)* is 0.006, which implies that a one standard deviation increase in *Pay gap* from the mean is associated with a 0.739% (0.015 standard deviation from the mean) increase in stock return volatility. These findings are consistent with existing literature that when considered separately, CDS trading and SMTI are both associated with higher firm risk. On the contrary, the coefficient of their interaction *Log (Pay gap) × CDS trading* is –0.005, which suggests that the overall positive association between *Pay gap* and stock return volatility is weakened in CDS-referenced firms. Taken together, these results suggest that on average, stock return volatility is 0.040 higher in CDS-referenced firms than non-CDS firms. Further, a one standard deviation increase in *Pay gap* from the mean is associated with a 0.123% increase in stock return volatility in CDS-referenced firms versus a 0.739% increase in non-CDS firms.

Table 3. CDS trading, senior manager tournament incentives, and stock return volatility

Specification	*Ordinary least squares*	*CDS firm fixed effect*	*PSM*	*2SLS (2nd stage)*
Stock return volatility	***(1)***	***(2)***	***(3)***	***(4)***
CDS trading	0.001	0.012***	0.000	0.040***
	(0.54)	(5.44)	(0.01)	(2.60)
Log (Pay gap)	0.000***	0.001***	-0.000	0.006***
	(3.99)	(5.76)	(-0.08)	(3.17)
*CDS trading * Log (Pay gap)*	-0.000	-0.002***	-0.000	-0.005**
	(-0.23)	(-5.75)	(-0.25)	(-2.46)
CEO delta	0.000***	0.000***	0.000***	0.000***
	(6.82)	(4.66)	(3.29)	(5.57)
CEO vega	-0.000***	-0.000***	-0.000***	-0.000
	(-4.47)	(-5.38)	(-4.93)	(-1.63)
CEO tenure	-0.000***	-0.000	0.000	-0.000***
	(-2.60)	(-0.70)	(0.83)	(-4.76)
Log (Total assets)	-0.003***	-0.002***	-0.002***	-0.007***
	(-36.10)	(-13.75)	(-14.56)	(-5.72)
Tobin's Q	-0.001***	0.000	-0.001***	-0.003***
	(-11.34)	(0.41)	(-5.91)	(-5.53)
Sales growth	0.003***	0.002***	0.002***	0.003***
	(7.38)	(2.88)	(2.68)	(3.30)
Leverage	0.004***	0.004***	0.006***	0.007***
	(11.29)	(7.56)	(12.47)	(5.14)
ROA	-0.024***	-0.044***	-0.040***	-0.023***
	(-43.21)	(-28.72)	(-29.31)	(-20.04)
Year fixed effects	Yes	Yes	Yes	Yes
Industry fixed effects	Yes	Yes	Yes	Yes
Std. dev. cluster on years	Yes	Yes	Yes	Yes
Std. dev. cluster on firms	Yes	Yes	Yes	Yes
Number of observations	14768	4960	6186	14658
R^2	0.559	0.599	0.601	0.198
Model	$Stock\ return\ volatility_{i,t} = \alpha + \beta_1 CDS\ trading\ indicator_{i,t} + \beta_2 Log(Pay\ gap)_{i,t-1} + \beta_3 Log(\ Pay\ gap)_{i,t-1} * CDS\ trading\ indicator_{i,t} + \gamma_1 CEO\ delta_{i,t-1} + \gamma_2 CEO\ vega_{i,t-1} + Other\ control\ variables_{i,t}$			

*Note: All variables are defined in the Appendix. All continuous variables are winsorized at 1% and 99% and all dollar-value variables are inflation-adjusted. T-statistics adjusted for firm and year clustering are presented below. ***, **, and * denote significance at the 1%, 5%, and 10% levels, respectively.*

Table 4. CDS trading, senior manager tournament incentives, and cash flow volatility

Specification	*Ordinary least squares*	*CDS firm fixed effect*	*PSM*	*2SLS (2nd stage)*
Cash flow volatility	***(1)***	***(2)***	***(3)***	***(4)***
CDS trading	-0.029***	-0.018**	-0.015	-0.365***
	(-2.92)	(-2.05)	(-1.36)	(-2.72)
Log (Pay gap)	0.001	0.000	0.001	0.040***
	(1.50)	(0.05)	(1.05)	(2.58)
*CDS trading * Log (Pay gap)*	0.004***	0.003***	0.002	0.046***
	(3.28)	(2.92)	(1.36)	(2.75)
CEO delta	-0.000	-0.000**	0.000	0.000
	(-0.19)	(-2.49)	(0.49)	(0.04)
CEO vega	0.000	-0.000***	-0.000	-0.000*
	(1.25)	(-2.61)	(-1.53)	(-1.80)
CEO tenure	0.000*	-0.000**	0.000**	0.000
	(1.74)	(-2.07)	(2.41)	(0.17)
Log (Total assets)	-0.009***	-0.001*	-0.004***	0.016
	(-14.30)	(-1.66)	(-4.66)	(1.38)
Tobin's Q	0.014***	0.004***	0.007***	0.022***
	(29.56)	(8.38)	(6.93)	(4.81)
Sales growth	0.002	-0.011***	0.006	-0.006
	(0.93)	(-5.72)	(1.64)	(-1.30)
Leverage	0.022***	0.013***	0.013***	0.007
	(8.61)	(4.23)	(3.99)	(0.51)
ROA	-0.118***	-0.026***	-0.023***	-0.129***
	(-27.57)	(-6.48)	(-2.71)	(-16.39)
Year fixed effects	Yes	Yes	Yes	Yes
Industry fixed effects	Yes	Yes	Yes	Yes
Std. dev. cluster on years	Yes	Yes	Yes	Yes
Std. dev. cluster on firms	Yes	Yes	Yes	Yes
Number of observations	7836	2921	3367	7754
R^2	0.294	0.226	0.196	0.225
Model	$Cash\ flow\ volatility_{i,t} = \alpha + \beta_1 CDS\ trading\ indicator_{i,t} + \beta_2 Log(Pay\ gap)_{i,t-1} + \beta_3 Log(\ Pay\ gap)_{i,t-1} * CDS\ trading\ indicator_{i,t} + \gamma_1 CEO\ delta_{i,t-1} + \gamma_2 CEO\ vega_{i,t-1} + Other\ control\ variables_{i,t}$			

*Note: All variables are defined in the Appendix. All continuous variables are winsorized at 1% and 99% and all dollar-value variables are inflation-adjusted. T-statistics adjusted for firm and year clustering are presented below. ***, **, and * denote significance at the 1%, 5%, and 10% levels, respectively.*

We report regression results on the relation between CDS trading, tournament incentives, and cash flow volatility in Table 4. The coefficients of *CDS trading* are negative, while the coefficients of *Log (Pay gap)* and their interaction term *Log (Pay gap) × CDS trading* are positive. The coefficients on *CDS trading* and *Log (Pay gap) × CDS trading* are statistically significant in all but PSM specification, however, the coefficient on *Log (Pay gap)* is only statistically significant in the 2SLS specification. Specifically, the coefficient on *CDS trading* is –0.365 from our 2SLS regression, which suggests that CDS trading leads to a 0.365 (i.e., 6.32 standard deviation) decrease in cash flow volatility. On the other hand, the coefficient on *Log (Pay gap)* is 0.040 and the coefficient of their interaction *Log (Pay gap) × CDS trading* is 0.046. Collectively, these results suggest that the overall positive association between *Pay gap* and cash flow volatility is strengthened in CDS-referenced firms, potentially offsetting the strong negative effect of CDS trading.

4.2. Credit default swaps trading, tournament incentives, and corporate policies

Next, we investigate the channels through which tournament incentives and CDS trading can affect firm risk. We examine the individual and combined effects of CDS trading and tournament incentives on corporate policies including capital expenditure (CAPEX) intensity and firm leverage. If tournament incentives and CDS trading lead to more aggressive corporate policies, we expect a *CDS trading* and *Pay gap* to be negatively associated with *CAPEX intensity* while positively associated with *Leverag*e.

$$CAPEX\ intensity\ (Leverage)_{i,t} = \alpha + \beta_1 CDS\ trading\ indicator_{i,t} + \beta_2 Log(Pay\ gap)_{i,t-1} + \beta_3 Log(Pay\ gap)_{i,t-1} * CDS\ trading\ indicator_{i,t} + \gamma_1 CEO\ delta_{i,t-1} + \gamma_2 CEO\ vega_{i,t-1} + Other\ control\ variables_{i,t} \quad (3)$$

Table 5 reports results from our regression analyses on the relation between CDS trading, tournament incentives, and capital expenditure intensity. Overall, there is weak support for our *H3*. The coefficients on our main variables, *CDS trading, Log (Pay gap)*, and *Log (Pay gap) × CDS trading* are statistically significant in the firm-fixed effect model with a subsample of firms that had CDS traded against their debts during our sample period. That is, relying only on within-firm variation between firms that had CDS traded against their debts, the coefficient of –0.034 on *CDS trading* suggests that CDS trading leads to a 0.034 (i.e., 0.628 standard deviation) decrease in capital expenditure intensity; similarly, the coefficient of –0.003 on *Log (Pay gap)* implies that a one standard deviation increase in *Pay gap* from the mean is associated with a 0.370% (0.0034 standard deviation from the mean) decrease in capital expenditure intensity; whereas the coefficient of 0.004 on their interaction *Log (Pay gap) × CDS trading* indicates that the negative impact of *Pay gap* on capital expenditure intensity is reduced in CDS-referenced firms. In sum, these results suggest that on average, capital expenditure intensity is 0.034 lower in CDS-referenced firms than non-CDS firms. In addition, a one standard deviation increase in *Pay gap* from the mean is associated with a 0.123% increase in capital expenditure intensity in CDS-referenced firms, as compared to a 0.370% decrease in non-CDS firms.

Table 5. CDS trading, senior manager tournament incentives, and capital expenditure intensity

Specification	*Ordinary least squares*	*CDS firm fixed effect*	*PSM*	*2SLS (2nd stage)*
CAPEX intensity =	*(1)*	*(2)*	*(3)*	*(4)*
CDS trading	0.003	-0.034***	-0.005	0.070
	(0.41)	(-2.94)	(-0.52)	(1.02)
Log (Pay gap)	0.000	-0.003***	-0.001	-0.003
	(0.07)	(-2.75)	(-1.13)	(-0.34)
*CDS trading * Log (Pay gap)*	-0.000	0.004**	0.001	-0.008
	(-0.54)	(2.50)	(0.61)	(-0.96)
CEO delta	0.000**	0.000	0.000	0.000***
	(2.28)	(0.03)	(1.53)	(5.45)
CEO vega	-0.000**	-0.000	-0.000**	-0.000
	(-2.36)	(-1.58)	(-2.17)	(-0.09)
CEO tenure	0.000***	0.000***	0.000***	-0.002***
	(3.58)	(3.33)	(2.65)	(-4.62)
Log (Total assets)	-0.001***	-0.001**	-0.001**	-0.013**
	(-3.24)	(-2.05)	(-2.03)	(-2.41)
Tobin's Q	0.003***	0.005***	0.006***	-0.006**
	(9.91)	(6.86)	(7.96)	(-2.36)
Sales growth	0.008***	0.004	0.004	0.008**
	(4.75)	(1.20)	(1.51)	(2.22)
Leverage	-0.004***	-0.003	-0.003	0.017***
	(-2.77)	(-1.19)	(-1.51)	(2.73)
ROA	0.001	-0.001	-0.022***	0.011**
	(0.28)	(-0.19)	(-3.21)	(2.06)
Year fixed effects	Yes	Yes	Yes	Yes
Industry fixed effects	Yes	Yes	Yes	Yes
Std. dev. cluster on years	Yes	Yes	Yes	Yes
Std. dev. cluster on firms	Yes	Yes	Yes	Yes
Number of observations	14768	4960	6186	14658
R^2	0.559	0.599	0.601	0.198
Model	$CAPEX\ intensity_{i,t} = \alpha + \beta_1 CDS\ trading\ indicator_{i,t} + \beta_2 Log(Pay\ gap)_{i,t-1} + \beta_3 Log(Pay\ gap)_{i,t-1} * CDS\ trading\ indicator_{i,t} + \gamma_1 CEO\ delta_{i,t-1} + \gamma_2 CEO\ vega_{i,t-1} + Other\ control\ variables_{i,t}$			

*Note: All variables are defined in the Appendix. All continuous variables are winsorized at 1% and 99% and all dollar-value variables are expressed in 2003 dollars. T-statistics adjusted for firm and year clustering are presented below. ***, **, and * denote significance at the 1%, 5%, and 10% levels, respectively.*

Finally, we explore the complete effects of CDS trading and tournament incentives on firm leverage and report results from various specifications in Table 6. Our results are mostly consistent with the existing literature that when considered individually, CDS trading and tournament incentives lead to higher firm leverage, as indicated by the positive coefficients on the *CDS trading* and *Log (Pay gap)*. The coefficients on their interaction, *Log (Pay gap) × CDS trading*, are negative and statistically significant in all but one specification. For example, in our fixed-effect model with CDS subsample, the coefficient on *Log (Pay gap) × CDS trading* is –0.014, which implies that the positive effect of the *Pay gap* on *Leverage* is reduced substantially in CDS-referenced firms. Explicitly, a one standard deviation increase in the *Pay gap* from the mean is associated with a 0.862% increase in leverage in non-CDS firms on average, but a 0.862% decrease in leverage in CDS-referenced firms.

Table 6. CDS trading, senior manager tournament incentives, and firm leverage

Specification	*Ordinary least squares*	*CDS firm fixed effect*	*PSM*	*2SLS (2nd stage)*
Leverage	*(1)*	*(2)*	*(3)*	*(4)*
CDS trading	0.210***	-0.077	-0.058	0.498
	(5.71)	(-1.19)	(-1.16)	(1.42)
Log (Pay gap)	0.005**	0.007	0.006	0.104***
	(2.12)	(1.01)	(1.18)	(2.65)
*CDS trading * Log (Pay gap)*	-0.017***	-0.014*	-0.012*	-0.056
	(-3.75)	(-1.76)	(-1.95)	(-1.27)
CEO delta	-0.000***	-0.000***	-0.000***	-0.000***
	(-7.02)	(-4.01)	(-3.25)	(-5.51)
CEO vega	-0.000***	-0.000***	-0.000***	-0.000
	(-14.76)	(-7.42)	(-9.40)	(-0.47)
CEO tenure	-0.001***	0.000	-0.000	0.009***
	(-4.47)	(0.13)	(-0.93)	(4.40)
Log (Total assets)	0.059***	0.001	0.005	0.066**
	(28.53)	(0.16)	(1.43)	(2.49)
Tobin's Q	0.035***	0.040***	0.074***	0.061***
	(20.70)	(9.94)	(17.77)	(5.78)
Sales growth	-0.039***	-0.105***	-0.078***	-0.028
	(-4.27)	(-5.82)	(-4.91)	(-1.61)
ROA	-0.510***	-0.490***	-0.679***	-0.501***
	(-36.52)	(-10.87)	(-18.29)	(-24.86)
Year fixed effects	Yes	Yes	Yes	Yes
Industry fixed effects	Yes	Yes	Yes	Yes
Std. dev. cluster on years	Yes	Yes	Yes	Yes
Std. dev. cluster on firms	Yes	Yes	Yes	Yes
Number of observations	14773	4962	6186	14663
R^2	0.231	0.136	0.156	0.527
Model	$Leverage_{i,t} = +\beta_1 CDS\ trading\ indicator_{i,t} + \beta_2 Log(Pay\ gap)_{i,t-1} + \beta_3 Log(Pay\ gap)_{i,t-1}$ $* CDS\ trading\ indicator_{i,t} + \gamma_1 CEO\ delta_{i,t-1} + \gamma_2 CEO\ vega_{i,t-1} + Other\ control\ variables_{i,t}$			

*Note: All variables are defined in the Appendix. All continuous variables are winsorized at 1% and 99% and all dollar-value variables are inflation-adjusted. T-statistics adjusted for firm and year clustering are presented below. ***, **, and * denote significance at the 1%, 5%, and 10% levels, respectively.*

5. DISCUSSION OF THE RESULTS

Overall, the results on firm risks presented in Tables 3 and 4 provide supporting evidence for *H1* to indicate a positive relation between SMTI and firm risk. On the other hand, we find mixed results on *H2* regarding the relation between CDS trading and firm risk. While CDS trading is positively associated with stock return volatility, it is negatively related to cash flow volatility. A related study by Subrahmanyam et al. (2017) shows that firms hold more cash after CDS trading, especially for firms with higher levels of cash flow volatility. However, they did not explore the impact of CDS on firm cash flow volatility. We add to their findings by documenting that the level of cash flow volatility decreases after CDS trading. Further, our evidence indicates the positive effect of SMTI on stock return volatility is weakened in CDS-referenced firms, but such a positive effect on cash flow volatility is strengthened in CDS firms. Taken together, our findings indicate that the interaction between SMTI and CDS trading depends on the combined individual effects of SMTI and CDS trading. When both SMTI and CDS trading lead to increases in stock volatility, the overall positive effect is reduced in CDS-referenced firms, indicated by the negative coefficient on the interaction term. In contrast, when the negative effect of CDS trading on cash flow volatility dominates the positive effect of SMTI, the interaction term is positive and hence enhances the positive effect of SMTI in CDS-referenced firms.

Altogether, the results on corporate policies presented in Tables 5 and 6 provide support for our hypotheses. Consistent with *H1*, we document a negative relation between SMTI and capital expenditure intensity and a positive relation between SMTI and firm leverage. Similarly, CDS trading is negatively associated with capital expenditure intensity but positively associated with leverage, providing supporting evidence for *H2*. Finally, *H3* is supported by the findings that the interaction between SMTI and CDS trading offset the positive effect of SMTI on aggressive corporate policies. Our results are consistent with the argument that risk-averse managers balance their own incentives and creditor incentives in their decision process. They are less sensitive to tournament incentives when making capital expenditure and leverage decisions due to their concerns about exacting empty creditors in CDS-referenced firms.

6. CONCLUSION

This study attempts to fill the gap in the CDS and SMTI literature by examining the overall economic impacts of CDS trading, SMTI, and their interactions on firm risk and corporate policies. We investigate managers' responses to SMTI when they face exacting empty creditors and reduced lender monitoring, to help determine the mechanisms through which SMTI reduces the credit risk in CDS-referenced firms as documented in Du et al. (2019).

First, we find that CDS trading leads to higher stock volatility and leverage, but lower cash flow volatility and capital expenditure. Second, we show that SMTI is positively associated with stock volatility, cash flow volatility, and leverage, while negatively related to capital expenditure. Third, we find that their interaction term, SMTI × CDS, is negatively related to stock volatility and firm leverage, while positively related to cash flow volatility and capital expenditure. Collectively, we show that managers in CDS-referenced firms react less to SMTI when making financing and investment decisions except in cash flow management.

We make several contributions to the literature on rank order tournaments and the literature on CDS. First, we provide evidence that managers balance their incentives and creditors' incentives when making corporate decisions. We extend studies on tournament incentives by showing that the effects of these risk-taking incentives are weakened in CDS-referenced firms. In other words, we contribute to the understanding of CDS by demonstrating that managers respond to risk-taking incentives differently with the presence of CDS. Finally, we present a further explanation of the negative relation between SMTI and CDS spread documented in Du et al. (2019). Our findings indicate that SMTI is less effective in inducing risk-taking behavior due to concerns over exacting empty creditors in CDS referenced firms, hence it is unlikely to result in excessive risky policies that are harmful to the interests of bondholders.

This study has several limitations. First, we use only U.S. firms due the limited data availability, hence the results may not apply to the rest of the world. Second, due to data availability, our measures of firm risk and corporate policy are not comprehensive. Future research can extend our coverage to provide a more comprehensive picture of the effects of SMTI and CDS on corporate governance.

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APPENDIX

Table A.1. Variable definition

Variables	*Definition*
Dependent variables	
Equity volatility	The standard deviation of stock returns during year *t*.
Cash flow volatility	The standard deviation of quarterly earnings before interest, taxes, depreciation, and amortization (EBITDA) divided by total assets from year *t* through year *t* + 4.
CAPEX intensity	CAPEX divided by total assets in year *t*.
Leverage	Total liabilities divided by total assets in year *t*.
Independent variables	
CDS trading	1 if the CDS of the underlying company is traded in year *t*, and 0 otherwise.
Pay gap	The difference between the CEO's total compensation and the median VP's total compensation in year t.
CEO vega	A CEO's total portfolio vega, or his/her increase in option-wealth for a 0.01 standard deviation increase in stock volatility in year *t*.
CEO delta	A CEO's total portfolio delta, and is computed as his/her dollar increase in wealth for a 1% increase in stock price in year *t*.
Accounting and market-based firm characteristics	
Log (Total assets)	The natural logarithm of total assets in year *t*.
Return on assets (ROA)	Income before extraordinary items divided by total assets in year *t*.
Credit rating	Numerical scores of the S&P ratings, ranging from 1 to 21. A higher numerical score reflects a higher rating. The entire spectrum of ratings is as follows: AAA = 21, AA+ = 20, AA = 19, AA− = 18, A+ = 17, A = 16, A− = 15, BBB+ = 14, BBB = 13, BBB− = 12, BB+ = 11, BB = 10, BB− = 9, B+ = 8, B = 7, B− = 6, CCC+ = 5, CCC = 4, CCC− = 3, CC = 2, D = 1.
Tobin's Q	Market value of the firm divided by total book value of the firm in year *t*.
Profit margin	Net income divided by revenue.
Sales growth	Changes in sales in year *t* divided by sales in year *t* - 1.
CEO tenure	The number of years that the current CEO has served as the CEO.
Instrumental variables	
Number of vice presidents within each firm	The number of non-CEO executives that a firm lists in ExecuComp.
Number of higher-paid CEOs within each industry	The total number of CEOs with higher total compensation in each industry.