Empty Creditors and Strong Shareholders: The Real Effects of Credit Risk Trading*

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Abstract

Credit derivatives give creditors the possibility to transfer debt cash flow rights to other market participants while retaining control rights. We use the market for credit default swaps (CDSs) as a laboratory to show that the real effects of this transfer crucially hinge on the relative bargaining power of shareholders and creditors. We find that creditors buy more CDS protection when facing strong shareholders to secure themselves a valuable outside option in distressed renegotiation. After the start of CDS trading, the distance-to-default, investment, and market value of firms with powerful shareholders decline substantially relative to other firms.

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1 Introduction

Debt ownership typically conveys a package of control and cash flow rights. Yet, recent years have seen an increase of credit risk trading, which allows creditors to insure against borrower default while retaining the right to push a delinquent firm into bankruptcy.[1] This separation of rights, also called "debt unbundling" or "debt decoupling" (Hu and Black, 2008), can give rise to so-called "empty creditors," who lose interest in the efficient continuation of the debtor's operations (Bolton and Oehmke, 2011). Consistent with this prediction, credit risk trading in the market for credit default swaps (CDSs) appears to be associated with higher default risk (Subrahmanyam, Tang, and Wang, 2014) and a build-up of precautionary cash buffers by CDS firms (Subrahmanyam, Tang, and Wang, 2016).

Two natural questions arise in the context of CDS trading and the ensuing of separation of control and cash flow rights: Which firms are most prone to the empty creditor problem? What are the effects of the empty creditor problem on firm value and investment? Despite the central role of CDSs in the 2007-2009 crisis narrative,[2] the literature has remained surprisingly silent on both questions. This paper aspires to close this gap and makes three contributions. First, we build a stylized model that illustrates how the severity of the empty creditor problem hinges on the ex ante distribution of bargaining power. We predict that creditors buy more CDS protection when facing strong shareholders to secure themselves a valuable outside option in distressed renegotiations. Second, we test our predictions in a large panel of 5,843 U.S. firms with quarterly data from 2001 to 2014 explicitly allowing for differential effects of CDS trading on firms with high

[1]Credit risk trading can take place, for example, through credit risk derivatives, securitization, or short-long positions in multiple classes of debt written on the same firm. Feldhütter, Hotchkiss, and Karakaş (2016) show that market participants do not only value cash flow rights but also debt control rights, in particular around credit events.

[2]The CDS market grew to over USD 58 trillion in notional amount at its peak in 2007 (see http://www.bis.org/statistics/derstats.htm). Since the financial crisis, the use of CDSs by banks has been expanding due to the introduction of Basel III (Subrahmanyam, Tang, and Wang, 2016).

and low shareholder bargaining power. Third, we study the real effects of CDS trading on investment and firm value, thus providing insights on the costs and benefits of these instruments.

The empty creditor problem arises if insured creditors have incentives to push a delinquent firm into default even if debt renegotiation would be efficient by preserving firm operations and avoiding liquidation costs. Our model predicts that firms with relatively powerful shareholders (or, equivalently, with relatively weak creditors) are more affected by this empty creditor problem. This result follows from the observation that renegotiation outcomes crucially depend on the distribution of bargaining power among shareholders and debtholders.[3] If shareholders have relatively more bargaining power, they can extract larger concessions from creditors in distressed renegotiation under U.S. Bankruptcy Code's Chapter 11. The creditors then have incentives to buy more CDS protection to secure themselves an outside option in disadvantageous renegotiation. As a result, creditors that face powerful shareholders are more likely to refuse debt restructuring than other creditors. Our model then makes two predictions: (1) Creditors that face powerful shareholders buy more credit protection to secure themselves an outside option in distressed renegotiation. (2) Compared to other firms, companies with powerful shareholders experience adverse effects of CDS trading, which leads to an increase in their default probability and a decrease in firm value and investment.

We employ four different measures of (relative) shareholder bargaining power to test our predictions. First, we follow Alanis, Chava, and Kumar (2015) and hypothesize that institutional investors are driving a harder bargain than retail investors. Consequently, CDS trading should have particularly adverse effects on firms with high institutional

[3]Bargaining is at the core of distressed renegotiation as framed by the U.S. Bankruptcy Code's Chapter 11. Existing studies illustrate that the bargaining positions of a firm's claimholders affect the incidence of renegotiations, debt recovery rates, deviations from absolute priority, as well as credit spreads (e.g., Gilson, John, and Lang, 1990; Asquith, Gertner, and Scharfstein, 1994; Franks and Torous, 1994; Betker, 1995; Davydenko and Strebulaev, 2007; Chen and Strebulaev, 2016). Fan and Sundaresan (2000) explore the role of bargaining power in debt renegotiation theoretically.

ownership. Second, we argue that ownership concentration is likely to reduce coordination problems between shareholders, thereby strengthening their bargaining position in debt renegotiation. Third, we hypothesize that more active investors, which have invested an important part of their portfolio wealth in the firm and have more skin in the game, are tougher in debt negotiation (Fich, Harford, and Tran, 2015). Finally, we expect that shareholder bargaining power is lower in the presence of informed relationship-lenders like banks who know the situation of a distressed firm better than distant bondholders. Using these different measures of bargaining power, we make the following observations.

1. The net notional amount of credit protection written on debt is significantly higher for firms with high shareholder bargaining power, as proxied by institutional ownership. An increase of institutional ownership by 1% increases the ratio of CDS net protection over firm debt by 0.32%. This is consistent with the hypothesis that relatively powerless creditors buy more CDS insurance to create an outside option for debt renegotiation.
2. After the start of CDS trading on firm debt, the distance-to-default of firms with shareholder bargaining power in the top quartile of the distribution decreases by 0.475 relative to other firms. This treatment effect corresponds to a decrease by 7.9% relative to the median. This is consistent with the hypothesis that CDSs make debt restructurings harder for firms with high renegotiation frictions.
3. The Tobin's q of firms with high shareholder bargaining power is 0.128 lower compared to other firms and compared to the time when no CDSs were traded on their debt. This corresponds to a decrease in firm value by 8.8% relative to the sample median. It points to an adverse effect of CDS trading on firms that are more likely to suffer from an empty creditor problem.
4. After the introduction of CDS trading, firms with high shareholder bargaining power cut capital expenditures over lagged property, plant and equipment (PPE) by 0.003

compared to other firms. This effect corresponds to a decrease of investment by 7% relative to the median.

These results highlight that shareholder bargaining power importantly affects the severity of the empty creditor problem as well as the ensuing effects on firm value and investment. While our findings are derived from the CDS market, they possibly extend to other forms of debt unbundling.

The main challenge of our analysis is the possibility that firms self-select into CDS trading. We run a battery of tests to address the potential endogeneity of CDS trading. First, we follow Ashcraft and Santos (2009), Saretto and Tookes (2013), Subrahmanyam, Tang, and Wang (2014), and others and exploit differences in the timing of CDS trading initiation across firms. At the same time, we include firm fixed effects to control for unobserved time-invariant firm heterogeneity. Under the assumption that the timing of CDS introduction is exogenous, this baseline specification allows us to identify a causal effect of CDS trading on firm characteristics. In a second test, we exploit the CDS Big Bang in 2009 as a quasi-natural experiment. The Big Bang was an exogenous shock to renegotiation frictions induced by CDSs because (1) it increased the availability of CDSs through contract harmonization and (2) eliminated debt restructuring as an eligible credit event that would trigger CDS payments. Third, we devise a shock-based IV estimation, exploiting the SEC's 2004 change in the net capital rule for broker-dealers, which allowed the recognition of CDSs for regulatory purposes and exogenously increased CDS availability. Fourth, we use lagged and beginning-of-period values for institutional equity ownership to address potential endogeneity in our main proxy for shareholder bargaining power. Fifth, we restrict the sample to CDS-firms and exploit heterogeneity in CDS liquidity, which is arguably less prone to selection bias.

Our paper contributes to the literature on the effects of CDSs on firms. Previous studies have examined the role of CDSs in shaping shareholder-creditor relationships in distressed firms. For example, Danis (2016) shows that creditors of CDS firms are less likely to vote in favor of distressed exchange offers, whereas Bedendo, Cathcart, and El-Jahel (2016) do not find any evidence that distressed CDS firms are more likely to file for bankruptcy. Subrahmanyam, Tang, and Wang (2014) do not restrict their analysis to distressed firms. They show that firms tend to become riskier after the introduction of CDSs. The mixed evidence for different samples and identification strategies reported in these papers might be due to the fact that CDS trading has heterogeneous effects for different firms. We address this problem by starting with a comprehensive data set of 5,843 US firms and then explicitly allowing for variation in shareholders' bargaining power as an important determinant of the empty creditor problem.

A number of papers examine the consequences of CDS trading for firms' access to debt markets. For example, Ashcraft and Santos (2009), Kim (2016), and Narayanan and Uzmanoglu (2015) test whether CDS trading affects the cost of debt and find mixed evidence. Saretto and Tookes (2013) show that CDS availability may improve access to debt markets by increasing the maturity and quantity of debt rather than by reducing credit spreads. Several theoretical studies analyze the real effects of CDSs in a general equilibrium framework delivering a rich set of predictions (Darst and Refayet, 2014; Fostel and Geanakoplos, 2016; Danis and Gamba, 2015). Campello and Matta (2012) show theoretically that CDSs can generate risk-shifting incentives. Kitwiwattanachai and Lee (2014) and Uzmanoglu (2015) provide consistent empirical evidence. We contribute a theoretical and empirical analysis of how CDS trading affects firm value and investment. To the best of our knowledge, we are the first to show that these effects depend strongly on the distribution of bargaining power in CDS firms, which is highly consistent with the empty creditor hypothesis.[4]

The remainder of the paper is organized as follows. Section 2 presents our theoretical

[4] Augustin, Subrahmanyam, Tang, and Wang (2014) and Augustin, Subrahmanyam, Tang, and Wang (2016) survey the literature on CDSs and provide further references.

framework and derives testable predictions. Section 3 describes the data and variable definitions. Section 4 discusses our empirical results and Section 5 concludes.

2 Theory and hypotheses

In our two-date model, agents are risk neutral, the risk-free rate is zero, and markets are complete. We consider a firm whose managers act in the shareholders' best interest. The firm has one investment opportunity (assets in place are normalized to zero). The cost of investment is $I > 0$, to be paid at time $t = 0$. If exercised, the investment opportunity pays off a cash flow z at time $t = 1$. The cash flow is risky in that z is a random variable uniformly distributed over the support $[0, Z]$, with $Z > I$.

The firm can finance the initial investment with a combination of debt and equity, as in Myers (1977).[5] The proceeds of the debt issue are used to reduce the required initial equity investment (i.e., they are not held as cash). Debt matures at time $t = 1$, when it requires the contractual repayment F. Because of cash flow uncertainty, the firm may not be able to repay F at $t = 1$; i.e., debt is risky. We assume that $F < Z$, meaning that the firm can meet the contractual repayment if the $t = 1$ cash flow is sufficiently large.

If the firm fails to meet the payment F, creditors can force the firm into default. As an alternative, creditors and shareholders can renegotiate the debt contract on mutually acceptable terms. If renegotiation fails, a fraction $\alpha \in [0, 1]$ of cash flows is lost as a frictional cost. If renegotiation succeeds, the surplus is split between shareholders and creditors according to their bargaining power.[6] Absent CDSs, we assume that the relative bargaining powers are exogenously given by η for shareholders and $1 - \eta$ for creditors.

[5] As in Myers (1977), there are no taxes or agency costs of free cash flows, and the debt-equity mix is exogenous. We abstract from these aspects because our focus is on the effects of debt decoupling on corporate policies and the role of shareholder bargaining power thereof.

[6] We base this assumption on existing empirical evidence for deviations from absolute priority in debt renegotiation. See Footnote 3.

A benchmark without CDSs. We start by assuming that there are no CDSs written on firm debt. In default, creditors receive $(1-\alpha)z$ and shareholders receive nothing. In renegotiation, the optimal sharing rule θ_N^* solves

$$\theta_N^* = \arg\max[\theta z]^\eta[(1-\theta)z - (1-\alpha)z]^{1-\eta},$$

where the term θz (respectively, $(1-\theta)z-(1-\alpha)z$) is the incremental value to shareholders (creditors) from renegotiation as opposed to liquidation. Solving the maximization problem gives

$$\theta_N^* = \eta\alpha \tag{1}$$

for shareholders and $1-\theta_N^* = 1-\eta\alpha$ for creditors. Creditors strictly prefer renegotiation to liquidation for any realization of the cash flow shock z when $1-\theta_N^* > 1-\alpha$ and thus $\eta < 1$. An increase in shareholders' bargaining power weakens creditors' preference for renegotiation over default. In the limit case with $\eta = 1$, creditors are indifferent between default and renegotiation.

Absent CDSs, the value of equity is given by the following expression

$$E[\text{equity}] = \int_0^F \frac{\eta\alpha z}{Z}dz + \int_F^Z \frac{z-F}{Z}dz = \frac{\eta\alpha F^2 + (Z-F)^2}{2Z}. \tag{2}$$

The first integral represents the payoff to shareholders if the realized cash flow is low ($z < F$), which triggers renegotiation. The second integral is the residual payoff to shareholders after debt repayment (whenever $z \geq F$). Absent CDSs, shareholders' bargaining power has an unambiguous positive effect on the value of equity because it increases the shareholders' surplus share in renegotiation. Likewise, the value of debt at time zero solves

$$E[\text{debt}] = \int_0^F \frac{(1-\eta\alpha)z}{Z}dz + \int_F^Z \frac{F}{Z}dz = F - \frac{F^2}{2Z}(1+\eta\alpha). \tag{3}$$

Absent CDSs, shareholders' bargaining power has an unambiguous negative effect on the value of debt because it erodes the creditor's surplus share in renegotiation. The sum of equity and debt gives firm value at $t = 0$:

$$E[\text{firm}] = \frac{Z}{2}. \tag{4}$$

Firm value depends neither on shareholders' bargaining power η nor on default costs α as bargaining in debt renegotiation does not affect the total continuation value of the firm.

Shareholders are willing to invest at $t = 0$ if the following inequality holds:

$$E[\text{equity}] > I - E[\text{debt}].$$

The value of equity needs to exceed investment cost net of the proceeds of debt issuance. In other words, firm value in (4) needs to exceed investment cost I. When no CDSs are traded on corporate debt, the investment decision is thus unrelated to shareholders' bargaining power.

CDS credit protection. We next allow creditors to insure against non-payment of the contractual obligation F by purchasing CDSs. Following the literature, we assume that the CDS market is competitive and CDS contracts are fairly priced. CDSs provide creditors with the promise of a gross payment π (equivalently, net payment $\pi - (1-\alpha)z$) if a credit event occurs at $t = 1$, against a fair premium $p(\pi)$ that creditors (protection buyers) pay to the protection seller. A credit event is verified if the firm misses the contractual payment F and creditors and shareholders fail to renegotiate the debt contract to mutually acceptable terms. That is, if F goes unpaid, two outcomes are possible: Either creditors force the firm into bankruptcy and collect π, or creditors and shareholders renegotiate the debt contract.

CDS protection provides creditors with an outside option. When CDSs on the firm's debt are available, the optimal sharing rule θ^* solves

$$\theta^* = \arg\max[\theta z]^{\eta}[(1-\theta)z - \pi]^{1-\eta}.$$

The last term in this expression illustrates that CDS protection affects the incremental value to creditors from renegotiation. Solving this maximization problem gives

$$\theta^* = \eta\frac{z-\pi}{z} = \eta\left(1 - \frac{\pi}{z}\right) \tag{5}$$

for shareholders and $1 - \theta^* = 1 - \eta + \eta\frac{\pi}{z}$ for creditors. Thus, renegotiation occurs only if $z > \pi$, i.e., if the realized cash flow is sufficiently high. By contrast, for low cash flow realizations, the creditors exercise their outside option, push the firm into inefficient default, and collect the insurance premium.

Next, we allow creditors to choose their optimal level of credit protection. The fair price of CDS insurance (paid by creditors at $t = 0$) is equal to the expected payment $t = 1$ by the protection seller. Thus, the fair price and the expected CDS payment offset each other in the creditors' expected payoff. The creditors' maximization problem is

$$\max_{\pi}\left\{\int_0^{\pi}(1-\alpha)\frac{z}{Z}dz + \int_{\pi}^{F}\left[1 - \eta\left(1 - \frac{\pi}{z}\right)\right]\frac{z}{Z}dz + \int_F^Z \frac{F}{Z}dz\right\}.$$

Solving this problem delivers the optimal π^*

$$\pi^* = \frac{F\eta}{\alpha+\eta}, \tag{6}$$

which is monotonically increasing (and concave) in η. The value of debt associated with (6) is given by

$$E[\text{debt} \mid \pi = \pi^*] = F - \frac{F^2}{2Z}\left(1 + \frac{\eta\alpha}{\alpha + \eta}\right). \tag{7}$$

Comparing (7) to (3) shows that buying the amount of CDS protection in (6) is only optimal if $\eta + \alpha > 1$; that is whenever shareholders' bargaining power and/or liquidation costs are sufficiently large.[7] This condition is intuitive considering that the cash flow share $\theta_N^* = \eta\alpha$ that shareholders capture in renegotiation is increasing in η and α if creditors do not insure (see (1)). In other words, for high shareholder bargaining power η and liquidation cost α, shareholders can extract very high concessions from creditors in renegotiation and creditors, therefore, find it optimal to buy credit protection.[8]

The level of credit protection affects the likelihood of renegotiation and default. Default occurs if $z < \pi^*$, i.e., if the cash flow at $t = 1$ falls short of the level of credit protection. The probability of default can thus be calculated as follows:

$$P\left[\text{default}|\pi = \pi^*\right] = \int_0^{\pi^*} \frac{dz}{Z} = \frac{\pi^*}{Z} = \frac{F}{Z}\frac{\eta}{\alpha + \eta}, \tag{8}$$

which is monotonically increasing (and concave) in η. This means that the stronger the shareholders are, the larger the level of credit protection bought by creditors, and the higher the probability of default.

Figure 1 shows the amount of credit protection π^* bought by creditors and the three possible outcomes at $t = 1$ (repayment, renegotiation, and default) for different combinations of shareholder bargaining power η, liquidation cost α, and cash flow realizations z. The figure summarizes the results discussed above.

[7] The empirical literature shows that liquidation costs α are on average large and also vary substantially across firms. For example, Glover (2016) estimates average liquidation costs of 45%. This estimate is shown to vary between 19% and 57% depending on the credit rating of the company and between 35% and 53% depending on the industry.

[8] Equivalently, for $\eta + \alpha > 1$, buying the amount of CDS protection in (6) increases the cash flow share $1 - \theta$ that creditors can secure for themselves in renegotiation.

1. Creditors buy less than perfect coverage ($\pi^* < F$) for any positive liquidation cost α and shareholder bargaining power η.[9]
2. Default occurs for $z \in [0, \pi^*)$, renegotiation occurs for $z \in [\pi^*, F)$, and contractual repayment occurs for $z \in [F, Z]$. In other words, CDS protection π^* provides creditors with an outside option to default, which makes them refuse renegotiation when cash flow realizations are sufficiently low ($z < \pi^*$).
3. Ceteris paribus, credit protection π^* is increasing in shareholder bargaining power η. As a consequence, creditors that face stronger shareholders push the firm into default more often.
4. Liquidation costs have two opposite effects on the incidence of default. A greater α lowers π^* for any η, which implies that creditors avoid costly liquidation for a larger interval of cash flow realizations. Yet, an increase of α also extends the default area to the left, i.e., into the population of firms with relatively weaker shareholders.[10]

Finally, we study the effects of CDS trading on the valuation and the investment decision of the firm and how these effects depend on the distribution of bargaining power among creditors and shareholders. Given the optimal level of credit protection π^*, the value of equity is given by

$$\begin{aligned} E\left[\text{equity} \mid \pi = \pi^*\right] &= \int_{\pi^*}^{F} \frac{\eta(z - \pi^*)}{Z} dz + \int_{F}^{Z} \frac{z - F}{Z} dz \\ &= \frac{\eta F^2}{2Z} \frac{\alpha^2}{(\alpha + \eta)^2} + \frac{(Z - F)^2}{2Z}. \end{aligned} \tag{9}$$

This expression implies that, when CDSs are traded on the firm's debt, shareholders' bargaining power η has two offsetting effects on the value of equity: (1) An increase in

[9]As the CDS premium is fairly set, (7) is strictly larger than $E[\text{debt} \mid \pi = F]$. Furthermore, the case $\pi > F$ never arises because it is suboptimal to pay the CDS premium for states of the world that do not trigger the CDS payment.

[10]Yet, from (8) it is clear that the combined effect of an increase in α on the probability of default is unambiguous, i.e., it leads to a decrease in the probability of default.

η increases the shareholders' surplus share in renegotiation, which increases the value of equity; (2) Yet, an increase in η also increases the optimal level of credit protection bought by creditors, i.e., the value of the creditors' outside option. This second effect increases the probability of default and, therefore, decreases the value of equity. Both effects compound at the firm level, which is given as the sum of debt and equity:

$$E\left[\text{firm}|\pi = \pi^*\right] = \frac{Z}{2} - \frac{F^2}{2Z}\frac{\eta^2\alpha}{(\eta+\alpha)^2}. \tag{10}$$

Comparing (10) with (4) illustrates that CDSs lead to a decrease in firm value. The decrease is more severe when shareholders' bargaining power is large (as (10) is decreasing in η). Firm value is only unaffected by CDS trading if η is zero (and debtholders are willing to renegotiate for any z) or if the cost of default α is zero.

Finally, as in the case without CDSs, shareholders are willing to invest at $t = 0$ only if the value of equity exceeds investment cost net of the proceeds of debt issuance:

$$E[\text{equity} \mid \pi = \pi^*] > I - E[\text{debt} \mid \pi = \pi^*].$$

Equivalently, firm value in (10) needs to satisfy:

$$\frac{Z}{2} - \frac{F^2}{2Z}\frac{\eta^2\alpha}{(\eta+\alpha)^2} > I. \tag{11}$$

In this expression, the left-hand side is decreasing in η, whereas the right-hand side is constant. This implies that it is optimal to invest only if $\eta < \eta^*$, where η^* denotes the critical bargaining power such that (11) holds as an equality. If shareholder bargaining power is too high and $\eta > \eta^*$, the firm does not invest because the project has negative NPV.[11] In conclusion, the model delivers two testable hypotheses.

[11] If there is no η^* such that (11) holds as an equality, the project has a negative NPV for all $\eta \in [0, 1]$.

Hypothesis 1:

The level of CDS protection written on firm debt increases in shareholder bargaining power.

Hypothesis 2:

CDS protection has adverse effects on default risk, firm value, and investment. The effects are larger for firms whose shareholders have large bargaining power.

3 Data

3.1 Data sources

We use quarterly accounting data and daily stock return data for a sample of U.S. public firms from the CRSP-Compustat merged database over the period from 2001 through 2014, excluding financial institutions and utilities. We restrict the analysis to this period, because our CDS data start in 2001. We include firm-years with non-missing sales, total assets, common shares outstanding, share price, and calendar date. We exclude firms with zero financial debt and firms with market or book leverage outside of the unit interval. In addition, we require firms to report total assets and property, plant and equipment (PPE) in excess of $10 million and of $1 million in 2010 dollars, respectively.

We match this dataset with CDS pricing data from Markit (starting in January 2001) and CDS volume data from the Depository Trust & Clearing Corporation DTCC (starting in the fourth quarter of 2008). We retrieve institutional holdings data from the Thomson 13f filings database and debt structure data from Capital IQ (starting in 2002).

Finally, to identify firms' relationships with financial institutions, we rely on loan data from the Loan Pricing Corporation's Dealscan database, and non-convertible debt issuance data from the Thomson Financial's SDC Platinum Global New Issues (SDC) database.[12]

[12] We match Dealscan data with Compustat data using the link file made available by Michael Roberts

3.2 Variable construction

To test our predictions, we construct the following variables.

CDS trading activity. Following Ashcraft and Santos (2009), Saretto and Tookes (2013), Subrahmanyam, Tang, and Wang (2014), and others, we start by checking whether a given firm is traded in the CDS market. The binary variable *CDS traded* equals one for firms that have an outstanding CDS in at least one quarter over the sample period and zero for firms that are never traded in the CDS market. The binary variable *CDS trading* captures the timing of CDS introduction. It equals one only in firm-quarters in which a CDS is traded on the firm and zero before the onset of CDS trading. In a second step we analyze the amount and liquidity of CDS trading at the firm-quarter level. DTCC data reports the notional value of CDS protection written on a given firm. In line with Campello and Matta (2016), we measure the amount of CDS protection written on a firm name as the ratio of outstanding CDS net (gross) notional amount to total firm debt at quarter end. Finally, we capture the liquidity of a firm's CDS contract using the negative of the illiquidity measure proposed by Junge and Trolle (2015).[13]

Bargaining power proxies. We use several measures of shareholder bargaining power. In our baseline analysis, we focus on institutional ownership (relative to common shares outstanding). Institutional investors tend to be more sophisticated than retail investors and are, therefore, likely to have more bargaining power in renegotiation (see, e.g., Alanis, Chava, and Kumar, 2015). Second, we look at ownership concentration among the top five institutional investors. More concentrated ownership is likely to reduce potential coordination problems among investors thereby increasing their bargaining power. Third, we hypothesize that an institutional investor will be more active and tougher in debt

(Chava and Roberts, 2008).

[13]This illiquidity measure is given by the quarterly average of absolute 5-year CDS spread changes divided by the number of quotes available on a given contract.

renegotiation if he has more skin in the bargaining outcome. Following Fich, Harford, and Tran (2015), we check for each investor-firm relationship whether the firm represents a significant position in the investor's portfolio. For each firm we compute the fraction of equity held by institutions that each have allocated more than 2% of their portfolio wealth to the firm.[14] Fourth, we use the ratio of bank debt to total assets as a proxy for *creditor* bargaining power. Due to their monitoring function in relationship lending, banks are presumably better informed about debtors than distant bondholders. The presence of high bank debt should, therefore, limit the relative bargaining position of shareholders.

Dependent variables. Our main measure of default risk is the naïve distance-to-default by Bharath and Shumway (2008). Such a measure hinges on the functional form by Merton (1974) but does not require to solve the model numerically. Bharath and Shumway (2008) provide evidence that it predicts default better than the actual Merton (1974) distance-to-default. As a supplementary proxy for default risk, we use the Altman's Z-score as modified by MacKie-Mason (1990). A low Z-score indicates high default risk. Our main measure of firm value is Tobin's q. As an additional measure, we use the return on assets (ROA), which captures operational performance. Finally, we use the ratio of capital expenditures to PPE and PPE growth to measure investment.

We winsorize variables at the 1st and 99th percentile to reduce the influence of outliers. All dollar amounts are expressed in 2010 dollars. Detailed definitions of the variables are given in Table A.1.

[14] Other studies have looked at the Herfindahl Hirschman Index (HHI) as a measure of general portfolio concentration (e.g., Geng, Hau, and Lai, 2015). The approach by Fich, Harford, and Tran (2015) has the additional advantage to capture the importance of the individual firm to the investor.

3.3 Summary statistics

Panel A of Table 1 reports summary statistics for the 5,843 firms in our final sample. The binary variable *CDS traded* equals one for 23% of the firm-quarter observations, i.e., 742 firms are referenced in a CDS contract at least once between 2001 and 2014. The variable *CDS trading* equals one for 18% of the firm-quarters. Conditional on CDS trading, we report *CDS gross (net) protection*. As DTCC reports outstanding notional amounts of CDS protection only for the top 1,000 reference firms and only from the fourth quarter of 2008 onwards, CDS volume data is available only for 5,593 firm-quarters. In this sub-sample, average *CDS gross protection* equals 4.4. After netting, CDS protection over total firm debt decreases to, on average, 0.325.

Average institutional ownership equals 0.53. For roughly 25% of the observations institutional investors hold more than 80% of firm equity which suggests that ownership of these firms is sophisticated and associated with high bargaining power. Average ownership concentration among the top five investors equals 0.25 and exceeds 0.34 in the top quartile of the distribution. Average active ownership, measured as the fraction of firm equity held by investors with significant skin in the game, equals a modest 0.06. Average bank debt over total assets equals 0.11, which is considerable given that average book leverage equals only 0.25.

Panel B of Table 1 reports summary statistics for firms with institutional ownership in the lower three quartiles of the distribution. Column 2 reports variable means for firm-quarters without an outstanding CDS contract (*CDS trading* = 0) whereas column 4 reports variable means for firm-quarters with CDS trading. Columns 5 and 6 of Panel B show that, conditional on low institutional ownership, CDS firms have a significantly higher average distance-to-default, Z-score, and ROA than non-CDS firms. Panel C shows the corresponding variable means in the sample of firms with institutional ownership in the top quartile of the distribution. For these firms with presumably high shareholder bargaining power, CDS trading appears to be associated with a lower distance-to-default and lower Tobin's q, investment, and PPE growth.

The two-sample t-tests reported in Panels B and C provide suggestive evidence that CDS trading has adverse effects on firms with high shareholder bargaining power compared to other firms. While this is consistent with our theoretical predictions, these results are possibly confounded by a potential self-selection of firms into CDS trading. We will address this problem in Section 4.2.

4 Results

4.1 CDS protection

In debt renegotiation, creditors of firms with high shareholder bargaining power receive a relatively smaller fraction of the continuation value of the firm.[15] Hypothesis 1 predicts that creditors who must negotiate with powerful shareholders try to improve their bargaining position by buying more credit insurance. Figure 2 is consistent with this hypothesis. The positive slope of the fitted line suggests that the ratio of CDS net notional amount to total debt increases in shareholder bargaining power measured by institutional ownership. Next, we will verify this observation in a formal regression framework:

$$CDS\ net\ protection_{i,t} = \beta_1 \cdot Inst.\ own._{i,t} + \theta \cdot Controls_{i,t} + \upsilon_i + \nu_t + FQ_{i,t} + \epsilon_{i,t}, \quad (12)$$

where the subscripts i and t indicate firm and calendar quarter, respectively. $CDS\ net\ protection_{i,t}$ is the ratio of CDS net notional amount to total debt of firm i at the end of quarter t. $Inst.\ own._{i,t}$ denotes institutional ownership and measures shareholder bargaining power. We control for Tobin's q, internal cash flow, firm size, and an indicator

[15] See Footnote 3 for empirical evidence.

variable for the investment grade rating status.[16] We include firm fixed effects υ_i to absorb time-invariant firm heterogeneity. Furthermore, we include calendar quarter fixed effects ν_t and fiscal quarter fixed effects $FQ_{i,t}$ where the latter are included to control for seasonal patterns. Standard errors are clustered at the firm-level.

Table 2 examines the relation between CDS protection bought and shareholder bargaining power. As our measure of CDS protection relies on CDS volume data, we restrict the analysis to the subsample of firms with data available in DTCC. The sample period starts in the fourth quarter of 2008. In column 1, we estimate equation (12) without the control variables to ensure that our results are not driven by "bad controls", i.e., control variables that are potentially outcome variable themselves and may induce selection bias (Angrist and Pischke, 2009). The coefficient estimate $\hat{\beta}_1$ of institutional ownership equals 0.149 and is statistically significant at the 5% level consistent with Hypothesis 1. When we include the control variables in column 2, the regression coefficient drops only slightly to 0.133 and remains significant. In column 3, we lag institutional ownership by one quarter to address concerns that reverse causality might drive our results. The change in the regression coefficient is negligible.

The elasticity of CDS protection to an increase of institutional ownership is economically large. In column 2, a 1% increase in institutional ownership is associated with a 0.32% increase in CDS protection (at the sample mean of the regressors). These findings suggest that especially the creditors of firms with powerful shareholders buy more CDS protection to improve their outside option in debt renegotiation.

4.2 Real effects of CDS trading

The goal of our analysis is to identify real effects of CDS. The main challenge is potential endogeneity and that firms self-select into CDS trading. We follow four different

[16] We do not include an indicator for the presence of a rating in this case, because all the firms with available CDS volume data in our sample are rated.

identification strategies to establish a causal link between CDSs and default risk, firm value, and investment. First, we follow Ashcraft and Santos (2009) and exploit differences in the timing of the onset of CDS trading across firms. Second, we exploit the CDS Big Bang Protocol in April 2009 as a quasi-natural experiment (see, e.g., Danis, 2016; Uzmanoglu, 2015). Third, we devise a shock-based IV estimation, exploiting the SEC's 2004 change in the net capital rule for broker dealers as a source of exogenous variation in CDS availability. Fourth, we restrict the sample to CDS firms and analyze variation in CDS liquidity, which is arguably less affected by firm selection bias.

In the baseline specification, we exploit differences in the timing of CDS introduction and define the binary variable *CDS trading* that equals one after the inception of CDS trading for the firm, and zero before that. We estimate the baseline specification:

$$y_{i,t} = \beta_1 \cdot CDS\ trading_{i,t} + \theta \cdot Controls_{i,t} + \upsilon_i + \nu_t + FQ_{i,t} + \epsilon_{i,t}. \tag{13}$$

As in equation (12), unobservable time-invariant differences between CDS and non-CDS firms are absorbed by firm fixed effects υ_i and we also control for time fixed effects ν_t and fiscal quarter fixed effects $FQ_{i,t}$. The coefficient β_1 of the variable $CDS\ trading_{i,t}$ tells us whether the dependent variable $y_{i,t}$ changes after the CDS of the firm starts to trade. Hence, identification is based on the assumption that the timing of the onset of CDS trading is exogenous.

In Table 3 we estimate equation (13) for various measures of default risk, firm value, and investment. In columns 1 and 2 of Table 3 we use the distance-to-default and the Z-score to measure the risk of firm default. For both variables high values indicate lower default risk. In columns 3 and 4 we use Tobin's q and the return on assets ROA to measure firm value. In columns 5 and 6 we use investment (capital expenditures over lagged PPE) and PPE growth as dependent variables. Consistent with Bennett, Güntay, and Unal (2015) and Bhagat, Bolton, and Lu (2015), we control for book leverage, asset tangibility, and firm size in the default risk and firm value regressions.[17] In investment regressions, we control for lagged Tobin's q and internal cash flow as is standard in the literature. To capture CDS availability we also control for the credit ratings of firms and firm reliance on the commercial paper market. Following Ashcraft and Santos (2009), we exclude firms that are already trading in the first quarter of the regression sample because it is not clear when the CDSs of those firms actually began trading.[18]

Except for column 2, the regression coefficient of $\textit{CDS trading}_{i,t}$ is negative in all specifications of Table 3, suggesting that CDS trading activity makes firms riskier and decreases firm value and investment activity. However, these effects are not statistically significant. In our large sample of 5,843 US firms, the unconditional real effects of CDS trading appear to be very weak over the years 2001 to 2014. In the following sections we will refine the analysis and check whether the real effects of CDS trading are stronger for firms with high shareholder bargaining power.

4.3 Shareholder bargaining power

We have established above that creditors of firms with powerful shareholders have a higher propensity to hedge against firm default. For sufficiently high levels of CDS protection these "empty creditors" may be unwilling to renegotiate and force firms into inefficient liquidation. According to Hypothesis 2, CDS trading has, therefore, particularly adverse effects on firms with high shareholder bargaining power.

Figure 3 provides first evidence for Hypothesis 2. The horizontal axes show year-quarters in event time. CDS trading starts at time zero. The vertical axes show the (median) distance-to-default, z-score, firm value measured by Tobin's q, return on assets,

[17] In the firm value (default risk) regressions we also control for stock volatility (lagged Tobin's q). As stock volatility can be seen as a measure of credit risk itself, we do not include it as a control variable in the default risk regressions. Similarly, we do not include lagged Tobin's q in firm value regressions. However, in unreported tests, we find that our results about firm value are robust to including lagged Tobin's q among control variables.

[18] In unreported tests, we find that our results are robust to the inclusion of these firms.

investment, and PPE growth of treated firms with high shareholder bargaining power (solid lines) and of control firms with low shareholder bargaining power (dashed lines). High shareholder bargaining power is proxied by institutional ownership in the top quartile of the distribution. Before CDS introduction at time zero, the solid lines of the treatment group co-move with the dashed lines of the control group (except in the case of PPE growth). After the start of CDS trading, the solid and dashed lines diverge. Firms with high shareholder bargaining power seem to become riskier, lose firm value, and reduce investment compared to other firms in the control group. While this visual analysis provides evidence consistent with Hypothesis 2, it controls neither for general time trends nor for firm heterogeneity. Next, we use a regression framework to address these shortcomings and adjust equation (13) in the following way:

$$
\begin{aligned}
y_{i,t} = \beta_1 \cdot CDS\ trading_{i,t} \times Inst.\ own._{i,t} + \beta_2 \cdot Inst.\ own._{i,t} + \beta_3 \cdot CDS\ trading_{i,t} \\
+ \theta \cdot Controls_{i,t} + \upsilon_i + \nu_t + FQ_{i,t} + \epsilon_{i,t} \qquad (14)
\end{aligned}
$$

The regression coefficient β_1 of the interaction term $CDS\ trading_{i,t} \times Inst.\ own._{i,t}$ measures the treatment effect of CDS trading on firms that have high institutional ownership and presumably high shareholder bargaining power.[19] As $Inst.\ own._{i,t}$ is non-negative and interacted with another non-negative variable ($CDS\ trading_{i,t}$), we demean institutional ownership to avoid potential multicollinearity problems.[20]

Table 4 reports the coefficient estimates of equation (14) for the dependent variables distance-to-default, firm value measured by Tobin's q, and firm investment.[21] The same control variables as in Table 3 are included but not reported for brevity.[22] In column 1

[19]Section 4.6 shows the robustness of our results to the use of alternative measures of shareholder bargaining power.

[20]All results are robust if we do not demean institutional ownership.

[21]Specifications with the dependent variables Z-score, return on assets, and PPE growth can be found in Appendix Table A.2.

[22]Specifications without controls can be found in Appendix Table A.3.

the distance-to-default is used as dependent variable. The coefficient estimate of -1.546 for the interaction effect $CDS\ trading_{i,t} \times Inst.\ own._{i,t}$ is negative and statistically significant. Compared to other firms, firms with high institutional ownership and thus high shareholder bargaining power become riskier after CDS contracts on their debt start to trade. In column 2 we replace the continuous variable $Inst.\ own._{i,t}$ with a dummy variable that equals one if institutional ownership is in the top-quartile of the distribution and zero otherwise. The coefficient of the interaction $CDS\ trading_{i,t} \times Inst.\ own.\ Top25\%_{i,t}$ is interpreted as the treatment effect on the top 25% firms with the highest shareholder bargaining power. After the onset of CDS trading, their distance-to-default drops by an additional 0.475 compared to firms with low shareholder power. This treatment effect corresponds to a reduction of -7.9% relative to the median distance-to-default (=6.032) and is economically large.

Columns 3 and 4 of Table 4 report regression estimates for Tobin's q as dependent variable. The coefficients of the interaction terms $CDS\ trading_{i,t} \times Inst.\ own._{i,t}$ in column 3 and $CDS\ trading_{i,t} \times Inst.\ own.\ Top25\%_{i,t}$ in column 4 are both negative and highly significant. The effect of CDS trading on the Tobin's q of treated firms with institutional ownership in the top-quartile is 0.128 lower compared to firms with low institutional ownership. This corresponds to a large drop of -8.8% relative to median Tobin's q (=1.449). In columns 5 and 6 investment is used as dependent variable. Again the treatment effect of CDS trading on firms with high shareholder bargaining power is negative and highly significant. Firms with institutional ownership in the top-quartile of the distribution cut capital expenditures over lagged PPE by 0.003 compared to other firms and compared to the time when no CDSs were traded on their debt. The treatment effect is again economically large and corresponds a decrease of -7% relative to median investment (=0.043).

Overall the baseline regressions in Table 4 suggest that CDS trading has statistically and economically large adverse effects on default risk, firm value, and investment. The fact that these real effects are concentrated in the sample of firms with high shareholder bargaining power is consistent with the hypothesis that CDS trading creates an empty creditor problem.

4.4 The 2009 CDS Big Bang: A quasi-natural experiment

In the previous analysis we assume that differences in the timing of CDS introduction across firms are exogenous. In this section we conduct a quasi-natural experiment in which an exogenous shock increases the renegotiation frictions induced by CDSs. The event is the implementation of the CDS Big Bang Protocol on April 4, 2009. This regulatory change had two effects. First, it increased the liquidity of the CDS market by harmonizing CDS contracts and setting new market conventions.[23] Second, the Big Bang removed debt restructuring as an eligible credit event for North American CDS. Before the CDS Big Bang, single-name CDSs with a "Modified Restructuring (MR)" clause would pay buyers of CDS protection also after a debt restructuring. After the CDS Big Bang, all CDSs had "No restructuring (XR)" clauses, which confine CDS protection to firm default.

The contract and convention changes in the CDS Big Bang increased the renegotiation frictions induced by CDSs as it became easier for creditors to hedge against firm default and as debt renegotiation was officially eliminated as an eligible credit event that would trigger CDS payments (Danis, 2016; Subrahmanyam, Tang, and Wang, 2014). We exploit this exogenous shock employing a differences-in-differences estimation. We define treated firms as those that had CDSs traded on their debt as of 2008Q3, namely two quarters before the introduction of the CDS Big Bang, and that have high institutional ownership.

[23]Among others, the contract and convention changes included auction hardwiring following credit events, the formation of official committees that would determine credit events, and the harmonization of contractual features that would allow trade compression. See Markit (2009).

We argue that the creditors of these firms became tougher in renegotiation after the CDS Big Bang. To establish a sounder causal link, we restrict the sample to the period from 2008Q1 through 2010Q4.

Table 5 reports the results from the quasi-natural experiment for distance-to-default, Tobin's q as a measure of firm value, and investment. The same control variables as in Table 3 are included in the estimation but not reported for brevity. The coefficient of the triple interaction *Post 2009Q1* × *CDS trading 2008Q3* × *Inst. own.* measures the treatment effect.[24] Column 1 shows a negative and highly significant coefficient estimate of -4.682 for the triple interaction. The increased renegotiation frictions induced by the CDS Big Bang triggered a drop in the distance-to-default of treated firms with trading CDS contracts and high institutional ownership. Columns 4 and 7 show similar adverse effects on firm value (Tobin's q) and investment of treated firms.

A potential concern might be that institutional ownership, our proxy for shareholder bargaining power, is endogenous. To address this concern we lag institutional ownership by one quarter in columns 2, 5, and 8. The treatment effects measured by the coefficients of the triple interaction barely change. Finally, we use the beginning-of-period values of institutional ownership as measured in the quarter when a firm enters the complete sample for the first time (i.e., 2001Q1 for most firms). Again the effects of the 2009 CDS Big Bang remain qualitatively unchanged and statistically significant (columns 3, 6, and 9). Overall, the evidence from this quasi-natural experiment is consistent with Hypothesis 2 which predicts adverse real effects of CDS trading due to renegotiation frictions in firms with high shareholder bargaining power.

[24]The stand-alone indicators for *Post 2009Q1* and *CDS trading 2008Q3* are absorbed by time and firm fixed effects.

4.5 The 2004 net capital rule exemption: Instrumental variable estimation

In the previous section we relied on the 2009 CDS Big Bang as an exogenous shock to CDS-induced renegotiation frictions. In this section we exploit another regulatory event which took place several years before the financial crisis. On August 20, 2004 the SEC exempted a group of broker-dealers from the net capital rule, which had been effective since 1975. The regulatory event allowed the exempted broker-dealers to use their own internal risk models to calculate haircuts and capital levels for securities holdings.

The 2004 net capital rule exemption has three interesting aspects. First, the exemption allowed the recognition of credit risk transfers (CRTs) that would result in lower regulatory capital requirements: "the deductions for [derivatives-related] credit risk would recognize appropriate offsets as a result of hedging strategies for CRT instruments (Bank for International Settlements, 2004)."[25] Among the CRTs recognized for regulatory capital requirements were CDSs.[26] We argue that this increased the incentives of creditors to buy CDS protection and thereby exacerbated CDS-induced renegotiation frictions.

Second, the exemption only applied to broker-dealers that were part of so-called consolidated supervised entities (CSEs), back then Bear Sterns, Goldman Sachs, Lehman Brothers, Merrill Lynch, and Morgan Stanley. Broker-dealers that were not part of CSEs "would not get relief for using credit derivatives as hedges for credit risk (Bank for International Settlements, 2004)." We conjecture that especially firms with public debt or loans that were underwritten or extended by a CSE were affected by the 2004 net capital rule exemption.[27]

[25]The exemption extended the approach for market risk and credit risk derivatives under the Basel Accord to investment banks, thus recognizing a wide range of CRTs.

[26]Another recognized CRT was securitization. Nadault and Sherlund (2013) argue that the exemption possibly contributed to the dramatic increase in securitization activity by investment banks between 2003 and 2005. Milcheva (2013) provides evidence of cross-border regulatory arbitrage through securitization related to the 2004 exemption.

[27]Note that the CSE holding companies themselves had never been subject to the net capital rule. Nevertheless, their capital requirements were reduced thanks to the net capital rule exemption of their affiliated broker-dealers (Levine, 2010).

Third, even though the net capital rule exemption became effective on August 20, 2014,[28] it did not allow exempted broker-dealers to use internal models and to recognize CDSs for regulatory purposes immediately. Instead, the internal models of CSE-affiliated broker-dealers were authorized at different dates.[29] Treatment of firms with relationships to different CSEs is thus staggered across time.

We use the staggered recognition of CDSs for regulatory purposes to instrument CDS trading. More specifically, we define the dummy variable *CSE relationship* equal to one in a given firm-quarter (i) if the firm has had public debt underwritten or loans extended by a CSE in the previous five years, and (ii) if the CSE has already been authorized to use its internal risk models and hence to recognize CDSs for regulatory purposes.[30] The first condition (i) exploits heterogeneity in firm-bank relationships whereas the second condition (ii) exploits differences in the timing of the regulatory shock to firm-bank relationships. According to, for example, Atanasov and Black (2016), such a shock-based IV technique is more likely to satisfy the exclusion restriction than conventional IV estimation that only exploits cross-sectional variation.

In columns 1 and 2 of Table 6 we report the first stages for *CDS trading* and the interaction *CDS trading* $\times$ *Inst. own.*[31] We control for the same set of controls and fixed effects as in previous regressions. The instruments are *CSE relationship* and the interaction *CSE relationship* $\times$ *Inst. own.* The model is, hence, exactly identified. As expected, the instruments have statistically significant positive coefficient estimates suggesting that incentives to trade CDS protection are higher if the bank of the firm can recognize the

[28] See Federal Register, Volume 69, Number 118, p. 34428.

[29] Merrill Lynch (January 2005), Goldman Sachs (May 2005), Bear Sterns, Lehman Brothers, and Morgan Stanley (December 2005).

[30] We match subsidiaries reported as lead lenders and underwriters in Dealscan and SDC to their ultimate parent company. To identify the correct ultimate parent company, we keep track of the mergers and acquisitions involving the subsidiary. The relationships of target institutions are assumed to be inherited by acquiring institutions after mergers.

[31] We report the first-stage estimates for distance-to-default, but our results remain qualitatively unchanged for the other measures of default risk and firm value.

CDS for regulatory purposes.[32] The Angrist-Pischke F-statistic of excluded instruments exceeds the conventional threshold of 10, reducing concerns about weak instruments.

Columns 3, 4, and 5 of Table 6 show the second stages for the dependent variables distance-to-default, Tobin's q, and investment. The coefficients of the (instrumented) interaction term *CDS trading* × *Inst. own.* are always negative and highly significant. Columns 6, 7, and 8 show the second stages of specifications that use lagged values of institutional ownership. The coefficient estimates of the (instrumented) interaction term decrease in absolute terms but remain statistically significant for the dependent variables distance-to-default and investment. Overall, our shock-based IV estimation suggests that CDS trading has an adverse *causal* effect on the default risk, value, and investment activity of firms with high shareholder bargaining power.[33]

4.6 Robustness

We begin by establishing the robustness of our results to alternative measures of bargaining power. In columns 1, 4, and 7 of Table 7 we replace the variable *Inst. ownership* by equity ownership of the top five institutional investors. We hypothesize that higher ownership concentration among the top five investors reduces coordination problems between shareholders and that this strengthens their bargaining power in debt renegotiation. We find that the treatment effect of CDS trading as measured by the coefficient of the interaction term *CDS trading* × *Inst. own. (top 5 inv.)* is negative and highly significant for the dependent variables distance-to-default, Tobin's q, and investment.

[32] *CSE relationship* is strongly related to *CDS trading* whereas its correlation with *CDS trading* × *Inst. own.* is economically small. By contrast, *CSE relationship* × *Inst. own.* is strongly related to *CDS trading* × *Inst. own.* but not to *CDS trading*. Hence, the instruments allow us to separately identify the endogenous variables (see, e.g., Butler, Fauver, and Mortal, 2009).

[33] We estimate another two IV specifications (untabulated). First, our results are robust to including two commercial banks whose broker-dealers were also authorized to use internal models (Citigroup in August 2006 and JP Morgan Chase in December 2007). We ignore both commercial banks in our baseline IV estimation because they were regulated under the Basel Accord and had already been allowed to recognize CDSs for capital requirements before 2004. Second, our results are robust to restricting the analysis to firms that have loans and bond issues reported in Dealscan and SDC over the past-five years.

In columns 2, 5, and 8 of Table 7 we interact the dummy variable *CDS trading* with *Active ownership*. The new variable measures the fraction of firm equity held by institutional investors that each have allocated at least two percent of their portfolio wealth to the firm in question. We hypothesize that these investors have strong incentives to influence firm policies and are more active in negotiations with creditors as they have significant skin in the game. Indeed, we find that CDS trading has a significant negative treatment effect on firm value (Tobin's q) and investment for firms with active shareholders. Yet, the coefficient of *CDS trading* $\times$ *Active ownership* is not significantly different from zero for the distance-to-default.[34]

In columns 3, 6, and 9 of Table 7 we use the ratio of bank debt to total assets as a proxy for the bargaining power of *creditors*. Under the assumption that bank creditors are better informed about the situation of a distressed firm than bondholders, firms with more bank debt should have higher *creditor* bargaining power. For these firms we predict *lower* renegotiation frictions induced by CDSs. Indeed, regression coefficients of the interaction *CDS trading* $\times$ *Bank debt* are positive and significant in all columns.

Next, we establish the robustness of our baseline results to the use of different regression samples (see Appendix Table A.4). First, we drop all firms that never have an outstanding CDS traded on their names between 2001 and 2014. Again we find that CDS trading has a significant negative treatment effect on firm value and investment for firms with high shareholder bargaining power. In another test, we restrict the sample to firm-quarter observations for which the dummy *CDS trading* equals one. Consistent with Hypothesis 2, we find that firms with very liquid CDS contracts and high shareholder bargaining power are significantly riskier and invest less than firms with illiquid CDS contracts and low shareholder bargaining power.[35]

[34]The results of the event study and the instrumental variable regressions described in the two previous subsections remain qualitatively unchanged when we replace *Inst. ownership* by *Active ownership*.

[35]We proxy for CDS liquidity with a price impact measure in the spirit of Junge and Trolle (2015).

5 Conclusion

When creditors buy CDS protection, they transfer credit risk and cash flow rights to protection sellers but, at the same time, retain control rights. Such debt unbundling can give rise to empty creditors, who are less willing to renegotiate and may push the firm into bankruptcy even if the continuation of the firm would be efficient. We study how the severity of this empty creditor problem depends on the bargaining power of shareholders and creditors in the firm.

We show both theoretically and empirically that creditors buy more CDS protection in the presence of powerful shareholders in the attempt to avoid disadvantageous debt renegotiations. Next, we provide evidence that firms with powerful shareholders, which are prone to suffer from an empty creditor problem, suffer large adverse effects from debt unbundling. Compared to other firms, firms with powerful shareholders have higher default risk, lose market value, and invest less after the start of CDS trading. Our findings remain unchanged in a battery of robustness checks that address the potential endogeneity of CDS trading.

Our results highlight the potentially harmful consequences of CDS trading and extend to other credit transfer techniques such as debt securitization, long-short positions in multiple classes of debt written on the same firm, and other credit risk derivatives besides CDSs.

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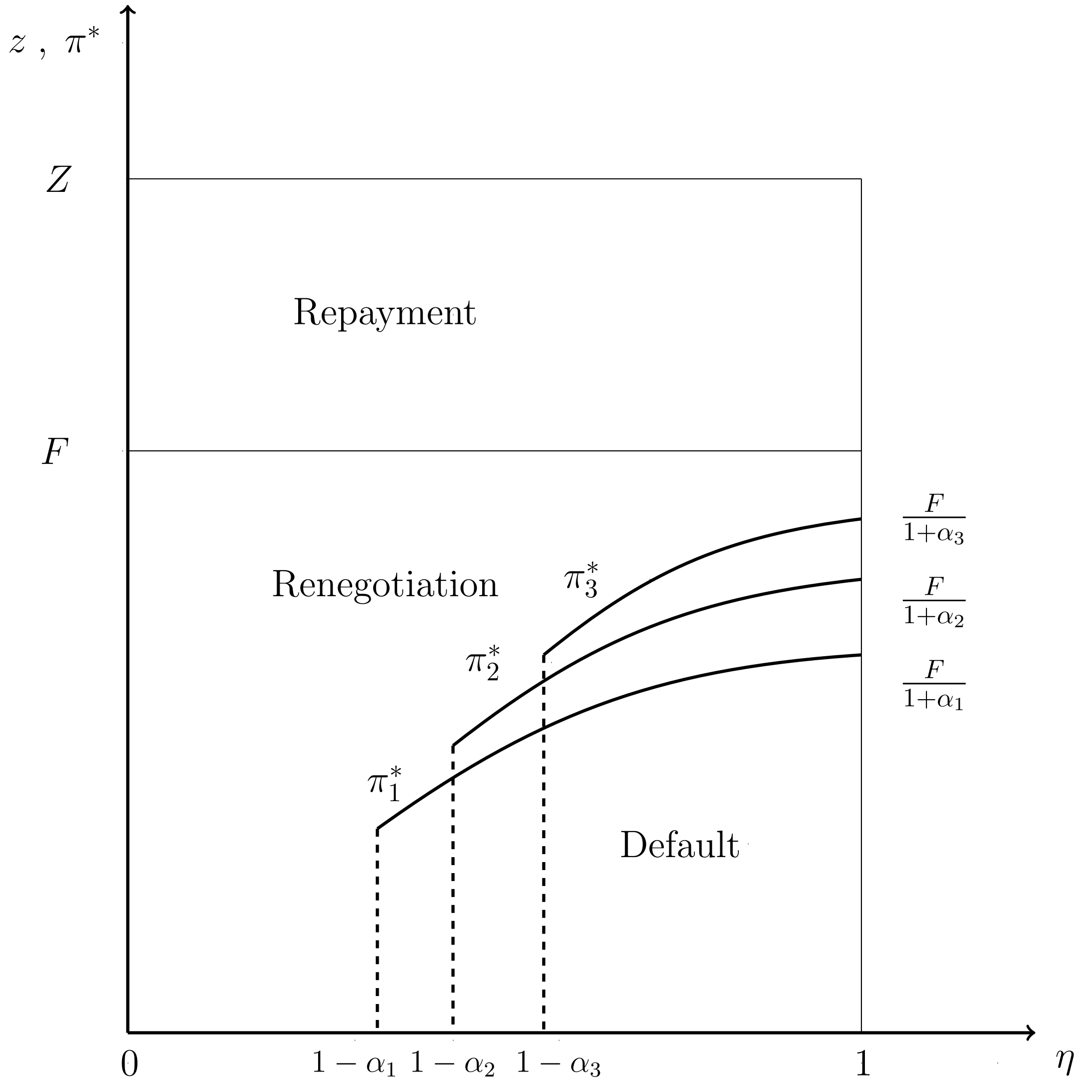

Figure 1: The figure shows how different combinations of shareholder bargaining power η and liquidation costs α translate into different renegotiation outcomes when creditors choose the optimal level of CDS protection ($\pi^* = F\eta/(\alpha + \eta)$).

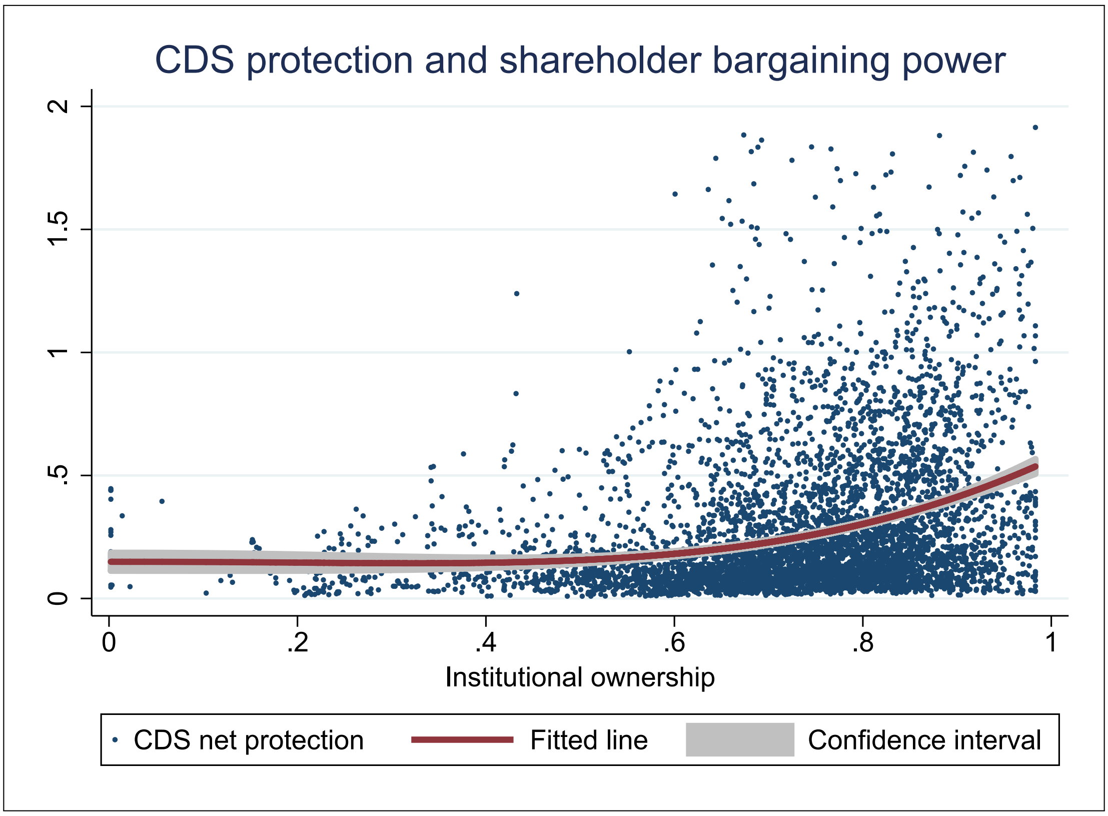

Figure 2: The figure shows the amount of CDS protection traded on firm debt for firms with different shareholder bargaining power. Shareholder bargaining power is proxied by institutional ownership (horizontal axis). The vertical axis shows the ratio of CDS net notional amount to total firm debt. The fitted line is estimated using a fractional polynomial of institutional ownership. The sample contains firm-quarter observations for the period 2008Q4-2014Q4. Outliers with CDS protection to debt above a value of two are omitted. The confidence interval is drawn for the 5% level.

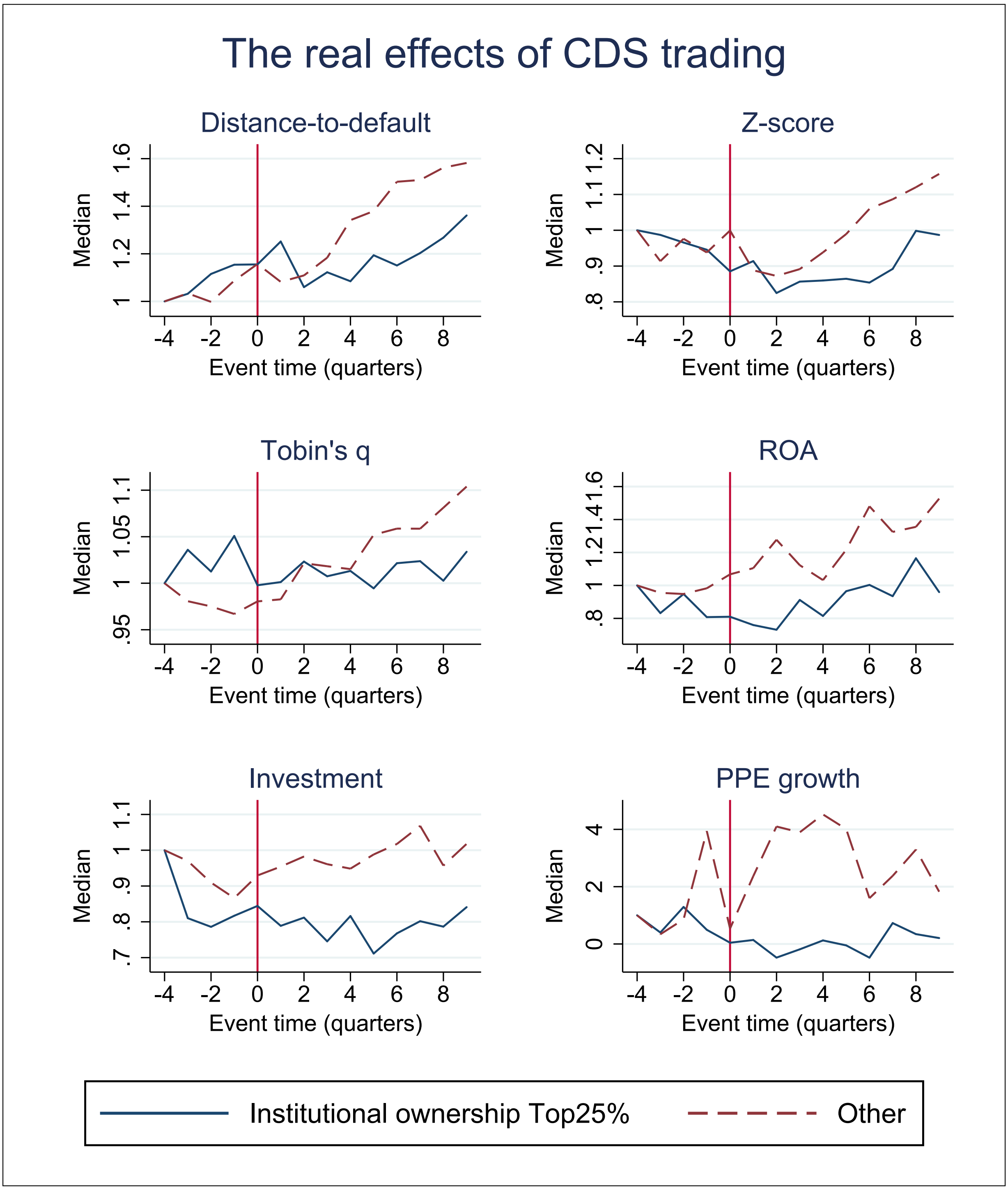

Figure 3: The figure shows the real effects of CDS trading on firms with high and low shareholder bargaining power. The horizontal axes show year-quarters in event-time. At time zero a CDS contract is written on the debt of firms for the first time. The vertical axes show the sample medians of the distance-to-default, Z-score, Tobin's q, return on assets, investment, and PPE growth. They are standardized by their respective values one year before CDS introduction. The solid lines represent the treated firms with shareholder bargaining power (as measured by institutional ownership) in the top quartile of the distribution. The dashed lines represent the control firms with shareholder bargaining power in the lower three quarters of the distribution. The sample contains firm-quarter observations for the period 2001Q1-2014Q4.

Table 1: Summary statistics
This table reports summary statistics of the main variables employed in the paper. The sample includes 5,843 U.S. firms for the period 2001Q1-2014Q4, excluding financial institutions and utilities. Data on CDSs are from DTCC and Markit. We obtain accounting and stock market data from the CRSP-Compustat merged database, institutional holdings data from Thomson 13f filings, debt structure data from Capital IQ, loan data from Dealscan, and bond issuance data from SDC. Panel A shows the descriptive statistics of the variables in the full sample. Panel B reports variable means only for firms with shareholder bargaining power (as proxied by institutional ownership) in the lower three quartiles of the distribution. Panel C shows variable means for firms with high shareholder bargaining power in the top quartile of the distribution. The samples in Panels B and C are split into sub-samples conditional on firms' CDS trading status. Column 5 in Panels B and C shows the differences in means between firms with and without CDSs. Column 6 reports the standardized test statistic for a two-sample t-test. All dollar amounts are in millions of 2010 dollars. Refer to Table A.1 for variable definitions.

Panel A: Full sample

	Obs. (1)	Mean (2)	Std. Dev. (3)	P25 (4)	Median (5)	P75 (6)
CDS trading activity:						
CDS traded	132827	0.226	0.419	0.000	0.000	0.000
CDS trading	132827	0.182	0.386	0.000	0.000	0.000
CDS gross protection	5593	4.364	9.709	0.988	2.043	5.018
CDS net protection	5593	0.325	0.691	0.085	0.164	0.375
CDS liquidity (percentile)	21618	0.498	0.278	0.300	0.510	0.720
5-year CDS spread (%)	17890	2.233	5.053	0.464	0.972	2.426
Bargaining power proxies:						
Institutional ownership	124834	0.532	0.297	0.268	0.586	0.794
Institutional ownership (top 5 investors)	130757	0.252	0.128	0.166	0.254	0.335
Active ownership	131083	0.059	0.087	0.000	0.023	0.086
Bank debt	46067	0.106	0.147	0.000	0.040	0.161
Dependent variables:						
Distance-to-default	123368	7.320	7.177	2.838	6.032	10.129
Z-score	127021	0.062	2.210	-0.059	0.645	1.165
Tobin's q	132827	1.811	1.163	1.105	1.449	2.076
ROA	132808	-0.007	0.058	-0.009	0.008	0.019
Investment	130555	0.063	0.067	0.023	0.043	0.078
PPE growth	131184	0.007	0.099	-0.029	-0.005	0.028
Control variables:						
Cash flow	125717	0.001	0.687	0.013	0.071	0.179
Investment grade	132827	0.141	0.348	0.000	0.000	0.000
Rated	132827	0.338	0.473	0.000	0.000	1.000
Stock volatility	132827	0.547	0.360	0.311	0.455	0.656
Book leverage	132827	0.252	0.198	0.089	0.222	0.369
Tangibility	132827	0.280	0.233	0.097	0.204	0.403
Size	132827	6.283	1.908	4.834	6.251	7.595
Commercial paper issuer	132827	0.083	0.275	0.000	0.000	0.000

(Continued)

Table 1: – *Continued*

Panel B: Firms with low shareholder bargaining power	Non-CDS firms		CDS firms			
	Obs. (1)	Mean (2)	Obs. (3)	Mean (4)	Difference (5)	*t*-stat (6)
Dependent variables:						
Distance-to-default	73018	6.325	10258	9.589	-3.265	-46.33
Z-score	77002	-0.324	9922	0.707	-1.032	-39.01
Tobin's q	80297	1.793	10912	1.798	-0.005	-0.38
ROA	80285	-0.017	10910	0.012	-0.029	-44.23
Investment	78533	0.065	10838	0.045	0.020	27.69
PPE growth	79029	0.005	10851	0.003	0.001	1.24
Control variables:						
Cash flow	75255	-0.086	10502	0.123	-0.209	-27.26
Investment grade	80297	0.031	10912	0.624	-0.594	-249.67
Rated	80297	0.154	10912	0.950	-0.796	-224.73
Stock volatility	80297	0.635	10912	0.372	0.263	68.29
Book leverage	80297	0.236	10912	0.318	-0.082	-40.05
Tangibility	80297	0.279	10912	0.326	-0.046	-19.43
Size	80297	5.347	10912	8.912	-3.565	-238.39
Commercial paper issuer	80297	0.013	10912	0.434	-0.421	-203.91

Panel C: Firms with high shareholder bargaining power	Non-CDS firms		CDS firms			
	Obs. (1)	Mean (2)	Obs. (3)	Mean (4)	Difference (5)	*t*-stat (6)
Dependent variables:						
Distance-to-default	21010	9.160	8692	7.968	1.192	11.24
Z-score	21022	0.684	8349	0.691	-0.007	-0.48
Tobin's q	21575	1.962	8828	1.618	0.344	25.73
ROA	21571	0.008	8828	0.010	-0.002	-5.56
Investment	21421	0.070	8785	0.050	0.020	28.46
PPE growth	21477	0.017	8796	0.005	0.012	11.67
Control variables:						
Cash flow	20830	0.141	8523	0.132	0.009	1.24
Investment grade	21575	0.073	8828	0.506	-0.433	-98.57
Rated	21575	0.349	8828	0.943	-0.594	-111.79
Stock volatility	21575	0.435	8828	0.376	0.059	20.39
Book leverage	21575	0.234	8828	0.316	-0.082	-36.11
Tangibility	21575	0.253	8828	0.302	-0.049	-17.01
Size	21575	6.854	8828	8.563	-1.708	-143.93
Commercial paper issuer	21575	0.013	8828	0.243	-0.230	-73.05

Table 2: Shareholder bargaining power and net notional amount of CDS protection
Shown are estimates from panel regressions that use the ratio of CDS net notional amount to total firm debt at quarter-end as dependent variable. In columns 1 and 2 institutional ownership is used to proxy for shareholder bargaining power. In column 3 institutional ownership is lagged by one quarter. All specifications include calendar quarter, fiscal quarter, and firm fixed effects. The sample contains firm-quarter observations for the period 2008Q4-2014Q4. The t-statistics (in parentheses) are calculated with robust standard errors clustered by firm. Significance at the 10%, 5%, and 1% level is indicated by *, **, ***, respectively. Refer to Table A.1 for variable definitions.

	CDS net protection		
	(1)	(2)	(3)
Inst. ownership	0.149**	0.133**	
	(2.33)	(2.01)	
Inst. own. (lagged)			0.129**
			(2.07)
Tobin's q (lagged)		-0.085**	-0.087***
		(-2.52)	(-2.63)
Cash flow		0.011	0.016
		(0.81)	(1.17)
Size		-0.308***	-0.307***
		(-6.72)	(-6.73)
Investment grade		0.044	0.046
		(1.12)	(1.19)
Firm F.E.	Yes	Yes	Yes
Time F.E.	Yes	Yes	Yes
Fiscal quarter F.E.	Yes	Yes	Yes
Observations	5449	5351	5312
Adjusted R^2	0.20	0.30	0.30

Table 3: The real effects of CDS trading
Shown are estimates from panel regressions that regress measures of default risk, firm value, and investment on the dummy variable *CDS trading*, which equals one if the firm has quoted CDS contracts on its debt. Columns 1 and 2 analyze the risk of firm default as measured by the distance-to-default and the Z-score, respectively. Columns 3 and 4 analyze firm value as measured by Tobin's q and return on assets, respectively. Columns 5 and 6 analyze investment (capital expenditures scaled by lagged PPE) and the log-change in PPE. All specifications include firm, calendar quarter, and fiscal quarter fixed effects. The sample contains firm-quarter observations for the period 2001Q1-2014Q4. The t-statistics (in parentheses) are calculated with robust standard errors clustered by firm. Significance at the 10%, 5%, and 1% level is indicated by *, **, ***, respectively. Refer to Table A.1 for variable definitions.

	Distance-to-default	Z-score	Tobin's q	ROA	Investment	PPE growth
	(1)	(2)	(3)	(4)	(5)	(6)
CDS trading	-0.177	0.097**	-0.054	-0.001	-0.001	-0.004*
	(-1.14)	(2.13)	(-1.49)	(-0.52)	(-0.55)	(-1.90)
Book leverage	-14.305***	-2.329***	-0.360***	-0.047***		
	(-46.53)	(-22.83)	(-5.81)	(-18.16)		
Tangibility	-2.231***	-1.262***	-0.669***	-0.056***		
	(-5.10)	(-7.70)	(-5.86)	(-13.02)		
Size	0.295***	1.190***	-0.353***	0.009***		
	(3.68)	(23.85)	(-16.88)	(10.14)		
Rated	-0.438**	-0.289***	0.005	-0.005***		
	(-2.50)	(-6.16)	(0.17)	(-4.75)		
Investment grade	0.764***	-0.185***	0.140***	0.001		
	(3.75)	(-3.36)	(2.94)	(0.92)		
Comm. paper issuer	0.248	-0.191***	-0.144**	-0.003**		
	(0.86)	(-3.06)	(-2.09)	(-2.17)		
Tobin's q (lagged)	1.243***	0.055***			0.015***	0.022***
	(24.53)	(3.86)			(25.99)	(29.32)
Stock volatility			-0.144***	-0.022***		
			(-7.83)	(-20.86)		
Cash flow					0.000	0.003***
					(0.00)	(2.89)
Firm F.E.	Yes	Yes	Yes	Yes	Yes	Yes
Time F.E.	Yes	Yes	Yes	Yes	Yes	Yes
Fiscal quarter F.E.	Yes	Yes	Yes	Yes	Yes	Yes
Observations	119816	122331	129472	129454	121965	122450
Adjusted R^2	0.27	0.31	0.12	0.08	0.06	0.04

Table 4: Shareholder bargaining power and the real effects of CDS trading
Shown are estimates from panel regressions that use measures of default risk, firm value, and investment as dependent variables. Columns 1 and 2 analyze the risk of firm default as measured by the distance-to-default. Columns 3 and 4 analyze firm value as measured by Tobin's q. Columns 5 and 6 analyze investment (capital expenditures scaled by lagged PPE). In columns 1, 3, and 5, the dependent variables are regressed on institutional ownership *Inst. ownership* as a proxy of shareholder bargaining power, the dummy variable *CDS trading*, which equals one if the firm has quoted CDS contracts on its debt, and the interaction *Inst. own.* × *CDS trading*. In columns 2, 4, and 6, the continuous variable *Inst. own.* is replaced by the dummy variable *Inst. own. Top25%*, which equals one if institutional ownership is in the top 25% quartile of the regression sample. All specifications include the same firm controls as in Table 3 as well as firm, calendar quarter, and fiscal quarter fixed effects. The sample contains firm-quarter observations for the period 2001Q1-2014Q4. The t-statistics (in parentheses) are calculated with robust standard errors clustered by firm. Significance at the 10%, 5%, and 1% level is indicated by *, **, ***, respectively. Refer to Table A.1 for variable definitions.

	Distance-to-default		Tobin's q		Investment	
	(1)	(2)	(3)	(4)	(5)	(6)
CDS trading × Inst. ownership	-1.546***		-0.776***		-0.013***	
	(-3.20)		(-8.42)		(-3.26)	
Inst. ownership	1.413***		0.933***		0.026***	
	(4.98)		(16.66)		(9.58)	
CDS trading × Inst. own. Top25%		-0.475***		-0.128***		-0.003**
		(-3.07)		(-4.75)		(-2.23)
Inst. own. Top25%		0.180*		0.149***		0.004***
		(1.79)		(8.51)		(3.86)
CDS trading	0.269	0.088	0.138***	-0.001	0.003**	0.001
	(1.34)	(0.49)	(3.34)	(-0.02)	(2.00)	(0.68)
Controls	Yes	Yes	Yes	Yes	Yes	Yes
Firm F.E.	Yes	Yes	Yes	Yes	Yes	Yes
Time F.E.	Yes	Yes	Yes	Yes	Yes	Yes
Fiscal quarter F.E.	Yes	Yes	Yes	Yes	Yes	Yes
Observations	112766	112766	121612	121612	114582	114582
Adjusted R^2	0.26	0.26	0.14	0.13	0.06	0.06

Table 5: The CDS Big Bang: A quasi-natural experiment

Shown are estimates from panel regressions that exploit the introduction of the CDS Big Bang Protocol in 2009Q2 as a quasi-natural experiment. The sample contains firm-quarter observations for the time window 2008Q1-2010Q4 around the CDS Big Bang event. The dependent variables are regressed on institutional ownership as a proxy of shareholder bargaining power, the dummy variable *CDS trading 2008Q3*, which equals one if the firm has quoted CDS contracts on its debt as of 2008Q3, the indicator *Post 2009Q1* for the post-event period, and interactions between these three variables. In columns 1, 4, and 7, the variable *Inst. own.* is the demeaned institutional ownership variable used in previous tables. In columns 2, 5, and 8, institutional ownership is lagged by one quarter (*Inst. own. (lagged)*). In columns 3, 6, and 9, institutional ownership is computed as the beginning-of-period value measured in the first quarter a firm enters the sample (*Inst. own. (initial)*). The dependent variables are distance-to-default, Tobin's q, and investment (capital expenditures scaled by lagged PPE). All specifications include the same firm controls as in Table 3 as well as firm, calendar quarter, and fiscal quarter fixed effects. The t-statistics (in parentheses) are calculated with robust standard errors clustered by firm. Significance at the 10%, 5%, and 1% level is indicated by *, **, ***, respectively. Refer to Table A.1 for variable definitions.

	Distance-to-default			Tobin's q			Investment		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Post 2009Q1 × CDS trading 2008Q3 × Inst. own.	-4.682***			-0.224**			-0.014**		
	(-6.86)			(-2.33)			(-2.14)		
CDS trading 2008Q3 × Inst. own.	1.131			-0.855***			-0.020**		
	(1.25)			(-6.58)			(-2.22)		
Post 2009Q1 × Inst. own.	2.543***			0.110**			0.006*		
	(7.40)			(2.46)			(1.67)		
Inst. own.	-0.034			0.783***			0.026***		
	(-0.07)			(7.44)			(3.50)		
Post 2009Q1 × CDS trading 2008Q3 × Inst. own. (lagged)		-4.813***			-0.204**			-0.012*	
		(-6.70)			(-2.10)			(-1.91)	
CDS trading 2008Q3 × Inst. own. (lagged)		3.873***			-0.236*			-0.017**	
		(4.69)			(-1.91)			(-2.07)	
Post 2009Q1 × Inst. own. (lagged)		2.627***			0.058			0.005	
		(7.26)			(1.29)			(1.29)	
Inst. own. (lagged)		-1.015*			0.278***			0.025***	
		(-1.84)			(3.00)			(3.66)	
Post 2009Q1 × CDS trading 2008Q3 × Inst. own. (initial)			-1.806***			-0.292***			-0.011*
			(-2.76)			(-3.33)			(-1.93)
Post 2009Q1 × Inst. own. (initial)			1.619***			0.105**			0.007*
			(3.66)			(2.35)			(1.90)
CDS trading 2008Q3 × Post 2009Q1	0.835***	0.994***	-0.008	-0.024	-0.009	-0.025	0.005***	0.004**	0.003**
	(4.02)	(4.73)	(-0.04)	(-0.86)	(-0.30)	(-1.30)	(2.86)	(2.40)	(2.15)
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firm F.E.	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Time F.E.	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Fiscal quarter F.E.	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	23719	22841	24943	25416	24225	26674	24533	23648	25755
Adjusted R^2	0.40	0.39	0.39	0.21	0.20	0.20	0.08	0.08	0.08

Table 6: The 2004 net capital rule exemption: Instrumental variable estimation
Shown are instrumental variable estimates from two-stage least squares panel regressions. The IV relies on the SEC 2004 exemption of broker-dealers from the net capital rule. This regulatory change allowed broker-dealers to use their own internal models to assess risk and calculate adequate capital levels. It applied to broker-dealers that were part of so-called consolidated supervised entities (CSEs), i.e., the five major U.S. investment banks as of 2004: Bear Sterns, Goldman Sachs, Lehman Brothers, Merrill Lynch, and Morgan Stanley. After the 2004 exemption, U.S. CSE-affiliated broker-dealers were allowed to reduce their capital requirements for derivatives-related credit risk through hedging with credit derivatives. The CDS availability indicator *Trading* and its interaction with institutional ownership are instrumented with *CSE relationship* and its interaction with institutional ownership. *CSE relationship* is an indicator variable equal to one in a given firm-quarter if (i) the firm has had public debt underwritten or loans extended by a CSE in the previous five years and (ii) the CSE has already obtained the authorization to use internal models. *CSE relationship* is based on all the lead lenders from Dealscan and underwriters of non-convertible debt from SDC that have had a relationship with a given firm in the previous five years. Columns 1 and 2 report first-stage estimates when the outcome variable in the second-stage is distance-to-default. Columns 3 through 8 report second-stage estimates. In columns 6 through 8, institutional ownership is lagged by one quarter (*Inst. own. (lagged)*). The dependent variables are distance-to-default, Tobin's q, and investment (capital expenditures scaled by lagged PPE). All specifications include the same firm controls as in Table 3 as well as firm, calendar quarter, and fiscal quarter fixed effects. The sample contains firm-quarter observations for the period 2001Q1-2014Q4. The t-statistics (in parentheses) are calculated with robust standard errors clustered by firm. Significance at the 10%, 5%, and 1% level is indicated by *, **, ***, respectively. Refer to Table A.1 for variable definitions.

	1st stage		2nd stage			2nd stage: Lagged regressor		
	(1) CDS trading	(2) CDS trading × Inst. own.	(3) Dist.-to-def.	(4) Tobin's q	(5) Investment	(6) Dist.-to-def.	(7) Tobin's q	(8) Investment
CSE relationship	0.168***	-0.046***						
	(8.19)	(-5.33)						
CSE relationship × Inst. own.	0.073	0.445***						
	(1.32)	(12.59)						
Inst. own.	-0.055***	0.089***	1.863***	0.911***	0.031***			
	(-3.57)	(9.71)	(5.23)	(12.65)	(9.16)			
CDS trading (pred.) × Inst. own.			-5.758***	-0.679**	-0.039***			
			(-3.95)	(-2.09)	(-2.96)			
Inst. own. (lagged)						1.102***	0.589***	0.024***
						(3.22)	(8.07)	(7.46)
CDS trading (pred.) × Inst. own. (lagged)						-4.638***	-0.414	-0.026**
						(-3.12)	(-1.27)	(-2.00)
CDS trading (pred.)			0.257	-0.048	0.038***	-0.024	-0.265	0.032***
			(0.26)	(-0.20)	(4.35)	(-0.02)	(-1.03)	(3.46)
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firm F.E.	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Time F.E.	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Fiscal quarter F.E.	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	112443	112443	112443	121305	114285	106320	113192	108264
F-stat A-P test of excl. instr.	104.79	144.98						

Table 7: Alternative measures of shareholder bargaining power

Shown are estimates from panel regressions that use measures of default risk, firm value, and investment as dependent variables. Columns 1 through 3 analyze the risk of firm default as measured by the distance-to-default. Columns 4 through 6 analyze firm value as measured by Tobin's q. Columns 7 through 9 analyze investment (capital expenditures scaled by lagged PPE). In columns 1, 4, and 7, the dependent variables are regressed on equity ownership by the top five institutional investors as a measure of shareholder bargaining power, the dummy variable *CDS trading*, which equals one if the firm has quoted CDS contracts on its debt, and the interaction *Inst. own. (top5 inv.)* × *CDS trading*. In columns 2, 5, and 8 *Inst. own. (top5 inv.)* is replaced by *Active ownership*, defined as the fraction of firm equity held by active investors. In columns 3, 6, and 9, *Inst. own. (top5 inv.)* is replaced by the ratio of bank debt over total assets as a measure of creditor bargaining power. All specifications include the same firm controls as in Table 3 as well as firm, calendar quarter, and fiscal quarter fixed effects. The sample contains firm-quarter observations for the period 2001Q1-2014Q4. The t-statistics (in parentheses) are calculated with robust standard errors clustered by firm. Significance at the 10%, 5%, and 1% level is indicated by *, **, ***, respectively. Refer to Table A.1 for variable definitions.

	Distance-to-default			Tobin's q			Investment		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
CDS trading × Inst. own. (top 5 inv.)	-3.705***			-0.386**			-0.020***		
	(-4.32)			(-2.50)			(-2.81)		
Inst. own. (top 5 inv.)	-0.426			-0.306***			0.011**		
	(-0.96)			(-3.59)			(2.31)		
CDS trading × Active ownership		0.840			-0.721***			-0.024***	
		(0.68)			(-4.57)			(-3.16)	
Active ownership		4.526***			1.089***			0.024***	
		(6.93)			(10.44)			(4.50)	
CDS trading × Bank debt			2.509***			0.262*			0.017**
			(2.58)			(1.68)			(2.15)
Bank debt			-1.583**			0.043			-0.022***
			(-2.47)			(0.36)			(-3.53)
CDS trading	0.880***	-0.278*	-0.653*	0.046	0.019	0.007	0.005**	0.002	-0.010***
	(2.82)	(-1.70)	(-1.73)	(0.79)	(0.50)	(0.07)	(2.13)	(1.04)	(-2.60)
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firm F.E.	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Time F.E.	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Fiscal quarter F.E.	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	118449	119183	40156	127428	127745	43786	120153	120424	42081
Adjusted R^2	0.27	0.27	0.20	0.13	0.13	0.14	0.06	0.06	0.05

Appendix for

"Empty Creditors and Strong Shareholders: The Real Effects of Credit Risk Trading"

Table A.1: Definition of variables

Variable	Definition
CDS trading activity:	
CDS traded	Indicator variable equal to one if the firm has CDSs traded over the period 2001-2014 based on Markit data.
CDS trading	Indicator variable equal to one in the period after initiation of CDS trading based on Markit data.
CDS gross protection	Ratio of CDS gross notional amount from DTCC at quarter-end to total debt. Total debt is `dlttq+dlcq` in Compustat.
CDS net protection	Ratio of CDS net notional amount from DTCC at quarter-end to total debt. Total debt is `dlttq+dlcq` in Compustat.
CDS liquidity (percentile)	Percentile of CDS illiquidity measure from Markit computed following Junge and Trolle (2015) and multiplied by (-1). The illiquidity measure $ILLIQ_{i,t}$ is computed at quarterly frequency for each firm i with an available 5-year senior unsecured (*tier=snrfor*) CDS contract: $$ILLIQ_{i,t} = \frac{1}{n_{i,t}} \sum_{d=1}^{n_{i,t}} \frac{\lvert C_{i,d} - C_{i,d-1} \rvert}{Depth_{i,d}},$$ where $n_{i,t}$ is number of consecutive spread changes over the quarter t, $Depth_{i,d}$ is the number of quotes available on trading date d, and $\lvert C_{i,d} - C_{i,d-1} \rvert$ is the absolute spread change on trading date d.
5-year CDS spread	Average of daily five-year U.S. dollar denominated CDS spreads over the last quarter from Markit. We consider only CDS on unsecured debt (*tier=snrfor*).
Bargaining power proxies:	
Institutional ownership	Fraction of shares outstanding held by institutional investors from Thomson 13f. *Institutional ownership* is generally demeaned for default risk, firm value, and investment regressions.
Institutional ownership (top 5 investors)	Fraction of shares outstanding held by the top five institutional investors from Thomson 13f.
Active ownership	Fraction of firm equity held by investors that each have allocated at least 2% of their portfolio wealth to the firm.
Bank debt	Ratio of bank debt relative to total assets, where bank debt is defined as the sum of term loans and revolving credit in Capital IQ.
Dependent variables:	
Distance-to-default	Naïve distance-to-default measure computed following Bharath and Shumway (2008).
Z-score	Altman's Z-score as modified by MacKie-Mason (1990). We define it as `−3.3 × (piq/atq) − (saleq/atq) − 1.4 × (req/atq) − 1.2×(actq−lctq)/atq)` in Compustat.
Tobin's q	Tobin's q defined as `(prccq×cshoq+atq−ceqq)/atq` in Compustat.
ROA	Return on assets defined as `ibq/atq` in Compustat.
Investment	Capital expenditures to PPE defined as `capxy/ppentq(t−1)` in Compustat. As `capxy` are reported on a year-to-date basis by Compustat, in the second, third, and fourth quarter we use the change relative to the previous quarter.
PPE growth	Log-change in PPE, defined as `ppentq` in Compustat.
Control variables:	
Cash flow	Internal cash flow defined as `(ibq+dpq)/ppentq(t−1)` in Compustat.
Investment grade	Indicator variable equal to one if a firm has investment grade rating (`splticrm` at least BBB) in Compustat.
Rated	Indicator variable equal to one a firm has a long-term issuer rating, `splticrm`, in Compustat.
Stock volatility	Annualized stock volatility based CRSP daily returns over the last quarter.
Book leverage	Book leverage defined as `(dlcq+dlttq)/atq` in Compustat.
Tangibility	PPE to total assets defined as `ppentq/atq` in Compustat.
Size	Natural logarithm of total assets defined as `atq` in Compustat.

(Continued)

Table A.1: – *Continued*

Commercial paper issuer	Indicator variable equal to if the has issued commercial paper based on information in Capital IQ.
CSE relationship	Indicator variable equal to one in a given firm-quarter if (i) the firm has had public debt underwritten or loans extended by a CSE in the previous five years, and (ii) the CSE has already obtained the authorization to use internal models.

Table A.2: Shareholder bargaining power and the effects of CDS trading on Z-score, ROA, and PPE growth
Shown are estimates from panel regressions that use measures of default risk, firm value, and investment as dependent variables. Columns 1 and 2 analyze the risk of firm default as measured by the Z-score. Columns 3 and 4 analyze firm value as measured by return on assets *ROA*. Columns 5 and 6 analyze investment as measured by PPE growth. In columns 1, 3, and 5, the dependent variables are regressed on institutional ownership *Inst. own.* as a proxy of shareholder bargaining power, the dummy variable *CDS trading*, which equals one if the firm has quoted CDS contracts on its debt, and the interaction *Inst. own.* × *CDS trading*. In columns 2, 4, and 6, the continuous variable *Inst. own.* is replaced by the dummy variable *Inst. own. Top25%*, which equals one if institutional ownership is in the top 25% quartile of the regression sample. All specifications include the same firm controls as in Table 3 as well as firm, calendar quarter, and fiscal quarter fixed effects. The sample contains firm-quarter observations for the period 2001Q1-2014Q4. The t-statistics (in parentheses) are calculated with robust standard errors clustered by firm. Significance at the 10%, 5%, and 1% level is indicated by *, **, ***, respectively. Refer to Table A.1 for variable definitions.

	Z-score		ROA		PPE growth	
	(1)	(2)	(3)	(4)	(5)	(6)
CDS trading × Inst. own.	-0.245*		-0.007**		-0.016**	
	(-1.84)		(-2.09)		(-2.32)	
Inst. own.	0.304***		0.010***		0.047***	
	(3.58)		(4.86)		(11.93)	
CDS trading × Inst. own. Top25%		-0.034		-0.002*		-0.004**
		(-1.08)		(-1.86)		(-2.22)
Inst. own. Top25%		0.030		0.002***		0.008***
		(1.47)		(2.83)		(6.11)
CDS trading	0.168***	0.117**	0.001	0.000	0.002	-0.001
	(3.16)	(2.51)	(1.00)	(0.21)	(0.78)	(-0.39)
Controls	Yes	Yes	Yes	Yes	Yes	Yes
Firm F.E.	Yes	Yes	Yes	Yes	Yes	Yes
Time F.E.	Yes	Yes	Yes	Yes	Yes	Yes
Fiscal quarter F.E.	Yes	Yes	Yes	Yes	Yes	Yes
Observations	114911	114911	121594	121594	115041	115041
Adjusted R^2	0.31	0.31	0.08	0.08	0.05	0.05

Table A.3: Baseline regressions without control variables

Shown are estimates from panel regressions that use measures of default risk, firm value, and investment as dependent variables. Columns 1 and 2 analyze the risk of firm default as measured by the distance-to-default and the Z-score, respectively. Columns 3 and 4 analyze firm value as measured by Tobin's q and return on assets, respectively. Columns 5 and 6 analyze investment (capital expenditures scaled by lagged PPE) and the log-change in PPE. The dependent variables are regressed on institutional ownership *Inst. own.* as a proxy for shareholder bargaining power, the dummy variable *CDS trading*, which equals one if the firm has quoted CDS contracts on its debt, and the interaction *Inst. own.* $\times$ *CDS trading*. There are no control variables besides firm, calendar quarter, and fiscal quarter fixed effects. The sample contains firm-quarter observations for the period 2001Q1-2014Q4. The t-statistics (in parentheses) are calculated with robust standard errors clustered by firm. Significance at the 10%, 5%, and 1% level is indicated by *, **, ***, respectively. Refer to Table A.1 for variable definitions.

	Distance-to-default	Z-score	Tobin's q	ROA	Investment	PPE growth
	(1)	(2)	(3)	(4)	(5)	(6)
CDS trading $\times$ Inst. own.	-2.448***	-0.934***	-0.541***	-0.014***	-0.024***	-0.034***
	(-4.47)	(-7.77)	(-6.04)	(-4.50)	(-5.95)	(-5.00)
CDS trading	0.202	0.459***	0.029	0.003**	0.005***	0.004
	(0.87)	(9.17)	(0.70)	(2.43)	(2.78)	(1.63)
Inst. own.	4.063***	1.725***	0.560***	0.029***	0.039***	0.066***
	(13.66)	(17.24)	(10.89)	(13.71)	(13.75)	(16.37)
Controls	No	No	No	No	No	No
Firm F.E.	Yes	Yes	Yes	Yes	Yes	Yes
Time F.E.	Yes	Yes	Yes	Yes	Yes	Yes
Fiscal quarter F.E.	Yes	Yes	Yes	Yes	Yes	Yes
Observations	112978	116295	121612	121594	119577	120153
Adjusted R^2	0.18	0.07	0.09	0.04	0.03	0.02

Table A.4: Regression samples restricted to traded and trading firms

Shown are estimates from panel regressions that use measures of default risk, firm value, and investment as dependent variables. Columns 1 and 2 analyze the risk of firm default as measured by the distance-to-default. Columns 3 and 4 analyze firm value as measured by Tobin's q. Columns 5 and 6 analyze investment as measured by capital expenditures scaled by lagged PPE. In columns 1, 3, and 5, the regression samples are restricted to firms that have a quoted CDS contract on its debt for at least one quarter in period 2001Q1-2014Q4 (firms are *CDS-traded*). The dependent variables in columns 1, 3, and 5 are regressed on institutional ownership *Inst. own.* as a proxy of shareholder bargaining power, the dummy variable *CDS trading*, which equals one if the firm has quoted CDS contracts on its debt, and the interaction *Inst. own.* × *CDS trading*. In columns 2, 4, and 6, the regression samples only comprise observations with a quoted CDS contract in each firm-quarter (firms are *CDS-trading*). In these columns, the variable *CDS trading* is replaced by *CDS liqu. (pct)*, which equals the firm's percentile of the negative of the Junge and Trolle (2015) CDS illiquidity measure (averaged over a given quarter). All specifications include the same firm controls used in Table 3 as well as firm, calendar quarter, and fiscal quarter fixed effects. The sample contains firm-quarter observations for the period 2001Q1-2014Q4. The t-statistics (in parentheses) are calculated with robust standard errors clustered by firm. Significance at the 10%, 5%, and 1% level is indicated by *, **, ***, respectively. Refer to Table A.1 for variable definitions.

	Distance-to-default		Tobin's q		Investment	
	(1)	(2)	(3)	(4)	(5)	(6)
CDS contract of sample firms	Traded	Trading	Traded	Trading	Traded	Trading
CDS trading × Inst. own.	0.652		-0.440***		-0.012**	
	(0.95)		(-3.39)		(-2.10)	
CDS trading	-0.716***		0.131***		-0.004**	
	(-3.33)		(2.84)		(-2.30)	
CDS liqu. (pct) × Inst. own.		-3.644***		0.097		-0.018*
		(-3.47)		(0.57)		(-1.80)
CDS liqu. (pct)		2.329***		0.095*		0.010***
		(6.81)		(1.70)		(3.15)
Inst. own.	-1.105	0.780	0.443***	-0.132	0.022***	0.006
	(-1.57)	(1.17)	(3.39)	(-1.41)	(3.53)	(1.31)
Controls	Yes	Yes	Yes	Yes	Yes	Yes
Firm F.E.	Yes	Yes	Yes	Yes	Yes	Yes
Time F.E.	Yes	Yes	Yes	Yes	Yes	Yes
Fiscal quarter F.E.	Yes	Yes	Yes	Yes	Yes	Yes
Observations	24023	19903	25338	20550	24219	19690
Adjusted R^2	0.36	0.38	0.18	0.21	0.11	0.13