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Essays on credit default swaps and debtor-creditor relationships

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ESSAYS ON CREDIT DEFAULT SWAPS AND DEBTOR-CREDITOR RELATIONSHIPS

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ABSTRACT

Over the last decade, markets for credit insurance have developed dramatically and credit default swaps (CDS) have become the instrument of choice when it comes to hedging credit risks. The expanded hedging opportunities CDS provide and the allied benefits of better risk-sharing notwithstanding, concerns over the economic role of CDS arise from their ability to engender "empty" creditors – joint holders of the bond and CDS, and the role such creditors play in distress situations. Financially distressed firms often restructure their debt through out-of-court renegotiations with creditors to avoid formal default. In addition to the going concern value of the firm's assets, the balance of bargaining power between the debtor and creditors plays a critical role in determining the success of these renegotiations, and therefore affects the preservation of economic value within the firm.

When creditors partially or fully hedge their economic exposure to the debtor in the CDS markets, it alters the balance of bargaining power in debtor-creditor relationships. Scholars propose that CDS may strengthen creditors' bargaining power in renegotiations and lead to frictions in debt renegotiations that may create both costs and benefits. However, the empirical evidence on the economic role of CDS in debt renegotiations is scarce and sometimes conflicting.

In this dissertation, we analyze the influence of empty creditors on debtor-creditor relationships both from an ex-ante and ex-post perspective.

CHAPTER 1: EMPTY CREDITORS AND DISTRESSED DEBT RESTRUCTURING

1.1 Introduction

Over the last decade, markets for credit insurance have developed dramatically and credit default swaps (CDS) have become the instrument of choice when it comes to hedging credit risks. The expanded hedging opportunities CDS provide and the allied benefits of better risk-sharing notwithstanding, concerns over their economic role arise from their ability to engender what Hu and Black (2008a, b) have termed "empty creditors", and the role such creditors play in distress situations. Legal scholars Lubben (2007) and Hu and Black (2008a, b) argue that insuring in the CDS market decouples a creditor's cash flow rights from the associated control rights, resulting in an empty creditor who now no longer has an interest in the efficient continuation of a distressed debtor, preferring instead that the debtor default (file for bankruptcy or liquidate) and trigger payments on their CDS contracts.[1] Consequently, these scholars argue that, in contrast to a distressed firm's typical creditors who prefer renegotiating with the debtor outside of bankruptcy rather than rely on costlier in-court proceedings, empty creditors will resist attempts by the debtor to restructure out-of-court to try and force the debtor to file for bankruptcy.[2] Bolton and Oehmke (2011) go a step further and show that even if empty creditor resistance is anticipated and reflected in CDS spreads, empty creditors will still over-insure in equilibrium and resist out-of-court restructurings.

Empirical evidence on the role of empty creditors in distress situations is mixed. On the one hand, studies like Mengle (2009) and Bedendo, Cathcart, and El-Jahel (2012) which show that firms with CDS coverage (a proxy for the presence of empty creditors) do not disproportionately

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[1] Industry analysts Yavorsky et al. (2009) express a similar view.
[2] Gilson, John and Lang (1990) argue that distressed firms have incentives to reorganize outside of bankruptcy.

file for bankruptcy suggest that empty creditors do not prevent distressed firms from restructuring out-of-court. On the other hand, studies like Subrahmanyam, Tang, and Wang (2012) who find that the inception of CDS trading increases the firm's bankruptcy risk, and Danis (2012) who finds that creditors of CDS-firms participate less in out-of-court restructurings suggest that they do. Thus, it appears that empty creditors resist out-of-court restructurings, but debtors nevertheless manage to restructure debt and avoid bankruptcy.

To the extent that renegotiating debt out-of-court is mutually beneficial to debtors and creditors in that it avoids the deadweight costs associated with default (bankruptcy or liquidation), it is reasonable to presume that debtors have an incentive to respond to empty creditor resistance. A more complete understanding of how empty creditors influence out-of-court restructurings could therefore emerge from considering the incentives faced by debtors as well as those faced by empty creditors. It is conceivable that debtors respond by structuring and executing out-of-court restructurings in a manner that addresses empty creditor resistance. Anecdotal evidence suggests such a possibility. For instance, the Financial Times (July 23, 2009) observes that with out-of-court restructurings:

> " ... the CDS market has become such a big part of the calculus that when advisers try to structure deals, their starting point is often to look at how many CDS holders there are and try to structure deals that address their concerns."

It goes on to provide the example of Unisys's restructuring:

> "… to get CDS holders to support the deal, Unisys had to offer to exchange bonds into senior secured debt at a ratio of 95 cents on the dollar and 20 per cent in cash - a deal so generous that the bonds were worth more than par. Since the most investors can get in the event of a default is 100 cents on the dollar, even holders of the credit insurance happily accepted the offer."

Our objective in this paper is to understand how debtors respond to empty creditor resistance by examining how debtors structure and execute their out-of-court restructurings. The typical

manner in which distressed firms restructure their public debt out-of-court is through exchange offers (distressed exchanges or DEs). In a DE, the firm reduces its outstanding debt through a tender offer wherein tendering bondholders receive a package of new securities (debt, equity, cash or some combination thereof) of lower cash value in exchange for their existing debt. We examine 83 such DEs conducted by 75 firms between 2004 and 2011. We use the existence of CDS coverage (CDS-firms or reference entities) to proxy for the presence of empty creditor resistance. There are 25 DEs conducted by reference entities in our sample. Our analysis involves comparing DEs conducted by reference and non-reference entities. To ensure meaningful comparisons, we control for the differences in the distress characteristics and debt structure between reference and non-reference entities. Given that CDS coverage is not random, we also conduct various tests to ensure that our findings are not subject to endogeneity concerns.

The goal of a DE is to reduce outstanding debt. The debt that is reduced through a DE depends on the outstanding debt that is restructured in the DE, and what bondholders are paid for tendering their debt in the DE. We first examine the debt that is restructured in a DE. All else equal, the reluctance of empty creditors to tender in the DE implies that reference entities restructure a smaller proportion of their outstanding debt in their DEs relative to non-reference entities. More specifically, because a CDS contract typically references senior unsecured debt, empty creditor resistance implies that, all else equal, reference entities restructure a smaller proportion of their senior unsecured debt in their DEs, relative to non-reference entities. It is conceivable that reference entities offset this limitation, partially or fully, by restructuring more junior debt in their DEs. If this were to be the case, all else equal, reference entities restructure a higher proportion of their junior debt compared to non-reference entities. We find that despite having a smaller proportion of junior debt in their capital structure, reference entities restructure

a higher proportion of their junior debt relative to non-reference entities. We also find that reference entities restructure a smaller proportion of their senior unsecured debt, but a similar proportion of their outstanding debt relative to non-reference entities. The possibility of disproportionately restructuring junior debt arises only when the firm has junior debt. Accordingly, when this possibility does not exist (when the firm has no junior debt), we find that reference entities restructure a smaller proportion of their senior unsecured debt relative to non-reference entities. When the possibility exists (the firm has both senior unsecured debt and junior debt), we find that reference entities restructure a higher proportion of their junior debt, but a similar proportion of their senior unsecured debt relative to non-reference entities. As a result, when there is junior debt, we find that there is no difference in the proportion of outstanding debt restructured by reference and non-reference entities.

Next, we examine bondholder recoveries in DEs. All else equal, empty creditor resistance implies that reference entities pay senior unsecured creditors more to tender in their DEs relative to non-reference entities. If instead, reference entities respond to empty creditor resistance by restructuring mote junior debt relative to non-reference entities, then they may pay junior bondholders more to entice them to tender disproportionately in a DE. Controlling for determinants of bond recovery rates, we find that junior bondholders recover more in reference entity DEs relative to non-reference entity DEs. We also find that when the firm does not have junior debt, senior unsecured bondholders recover more in reference entity DEs relative to non-reference entity DEs. However, when the firm has junior debt, we find that senior unsecured bondholder recovery is similar across reference and non-reference entity DEs.

Finally, we examine the debt reduction achieved through the DE. We use bondholder recoveries and the amount of debt that is restructured to compute the debt reduction achieved

through the DE. All else equal, empty creditor resistance implies that reference entities reduce their debt by a smaller proportion in a DE relative to non-reference entities. If reference entities respond to the resistance of empty creditors by disproportionately restructuring junior debt, then, all else equal, reference entities should reduce their outstanding debt to the same extent as non-reference entities. We find that the debt reduction reference entities achieve through a DE is no difference from that of non-reference entities. We also find that they are limited in their ability to reduce their debt only when they do not have junior debt. To get a further sense of the distress relief achieved through the DE beyond reducing debt, we examine the incidence of bankruptcy subsequent to the DE. We find that none of the reference entities file for bankruptcy in the first year subsequent to their DE, nor do we find reference entities to have a higher probability of filing for bankruptcy subsequent to their DEs when compared to non-reference entities.

Our results indicate that firms respond to empty creditor resistance in the manner in which they structure and execute DEs. When their capital structure permits it, they disproportionately restructure junior debt to overcome the limitation imposed by empty creditors in reducing debt. When their capital structure does not permit it (when they do not have junior debt), they pay senior unsecured bondholders more to entice them to tender in the DE but are not fully able to overcome the limitations empty creditors impose on reducing debt.

In attempting to understand how empty creditors influence distress resolution, the literature has focused on the incentives facing empty creditors and their resistance to out-of-court restructurings. Our findings show that the response by firms to empty creditor resistance in the way they structure and execute DEs is equally important in understanding the influence of empty creditors on distress resolution. In doing so, our findings help reconcile the seemingly

inconsistent evidence in the literature that despite resistance from empty creditors firms manage to restructure debt out-of-court and avoid bankruptcy.

The rest of the paper is organized as follows. The next section briefly reviews the institutional details associated with CDS, and relevant literature. Section 1.3 provides details on the data gathered for the analysis and describes the characteristics of the firms and DEs in our sample. Section 1.4 presents our analysis. Section 1.5 discusses issues related to credit events, counterparty risk, counterparty intervention, junior creditors, and endogeneity. Section 1.6 concludes with a summary of our findings.

1.2 Background

1.2.1 Credit Default Swaps (CDS)

A single-name CDS is a bilateral contract between a buyer and a seller of protection that references an entity (a firm) and an obligation (typically the senior unsecured bond). Under the contract terms, the protection buyer makes periodic payments (generally quarterly) to the seller called the fee, spread, or premium, which is a percentage of the nominal amount of the reference obligation. In exchange for these payments, the buyer receives a settlement from the seller equal to the difference between the par and recovery on the reference obligation in the event the reference entity experiences a credit event. The period over which the CDS is in effect is termed its maturity and ranges from one to ten years. While CDS contracts are privately negotiated between the counterparties, majority of them adhere to standardized protocols developed by ISDA. The contractual features associated with a CDS – the reference entity, reference obligation, effective date and scheduled termination date, are documented in a “confirmation” that references ISDA definitions.

More importantly, CDS confirmations also specify what constitutes a credit event. ISDA defined credit triggers include bankruptcy, failure to pay (after a specified grace period), obligation acceleration, obligation default, repudiation or moratorium, and restructuring.[3] When disputes arise over what constitutes a credit event, the ISDA's Credit Derivatives Determinations Committee's decisions are binding. Under the Modified Restructuring (Mod-R) clause introduced in 2003, the ISDA defined a restructuring as one where a firm in financial distress engages in one or a combination of the following actions to improve its creditworthiness - principal reduction, coupon reduction, maturity extension, or a change in subordination.

However, the restructuring would be considered a credit event only if the terms on an *existing* bond or loan (same CUSIP identifier) were changed and the changes were voluntary and binding on all holders of the obligation. Under this definition, a DE would not qualify as a credit event because it issues *new* claims to tendering bondholders even if non-tendering claims were subordinated to tendered claims. In 2009, the ISDA eliminated the Mod-R clause altogether. According to Altman and Karlin (2009), DEs have not triggered a credit event in the corporate market in recent years.

When a credit event occurs, the CDS contract is settled physically or in cash. In a physical settlement the protection buyer delivers the reference obligation in return for the agreed notional amount. With physical settlement, a sudden increase in demand for the debt obligation in the case of credit event may cause temporary shortage of the security and result in an artificial increase in its price.

[3] ISDA Credit Derivatives Definitions are available at www.isda.org/credit

Consequently, cash settlement has become the preferred method of settlement, because it reconciles the short-term demand and supply mismatch problems faced in a physical delivery. In a cash settlement, the protection buyer receives the difference between the face value and the market price of the cheapest-to-deliver reference security.[4]

1.2.2 Empty Creditors

Legal scholars Lubben (2007) and Hu and Black (2008a, b) were first to study the implications of the CDS contracts in relation to the resolution of corporate distress. They argue that CDS ownership may decouple creditors' cash flow rights from the associated control rights. Hu and Black name these creditors with CDS contracts as empty creditors. Accordingly, if empty creditors no longer have economic exposure to risk but still participate in distressed debt renegotiations, they may prefer that the debtor default (e.g., bankruptcy, liquidation) instead of restructure its debt out-of-court. This is because while restructuring debt out-of-court would require them to make concessions, a default would trigger payments on their CDS contracts and provide them with full recovery. Consequently, these scholars argue that, in contrast to a distressed firm's typical creditors, empty creditors will resist attempts by the debtor to restructure debt out-of-court to force the debtor to file for bankruptcy.

In recent theoretical work, Bolton and Oehmke (2011) interpret the influence of empty creditors on distress resolution within the broader context of debtor-creditor relationships. In their model of debt contracting, the limited ability of debtors to commit ex-ante to fulfill their payment obligations leads creditors to over-insure in the CDS market in equilibrium even if CDS spreads price in empty creditor resistance. CDS insurance strengthens the creditors' hand in ex-

[4] In a physical settlement, CDS contracts require that the buyer deliver to the seller a bond of the same seniority as that referenced in the contract. Because bonds in the same seniority class may have different prices (say because of accrued interest), the buyer has the option to deliver the cheapest bond in the class to the seller. In a cash settlement, the cheapest-to-deliver equivalent price is used to determine the market price of the reference obligation.

post renegotiations producing the inefficiencies in distress resolution envisioned by Hu and Black (2008a, b), but also generates ex-ante efficiencies because it allows the debtor to raise debt capacity by committing against strategic default.

There is evidence that distressed firms successfully restructure their debt through DEs in the presence of empty creditors. Using CDS reference entities (firms that have CDS coverage) to proxy for the presence of empty creditors, Mengle (2009), in a study conducted for the trade body, International Swaps and Derivatives Association (ISDA), finds no difference in the proportion of debt restructurings conducted in and out of bankruptcy between reference and non-reference entities. In a follow up academic study Bedendo, Cathcart, and El-Jahel (2012) control for the possibility that DEs often fail because of holdout problems associated with disparate creditors, but fail to unearth evidence that links bankruptcy filings to empty creditors.

Furthermore, empirical evidence indicates the presence of such resistance. Subrahmanyam, Tang, and Wang (2012) find that the inception of CDS trading increases the credit risk of the CDS reference entity, measured both as the propensity for a credit rating downgrade and the probability of bankruptcy, which they argue is consistent with the reluctance of empty creditors to restructure debt out-of-court. Danis (2012) investigates the issue more directly by studying creditor participation rates in DEs. Danis defines the participation rate to be the amount of bond restructured divided by the issue size of the same bond. Studying the bonds that are tendered in DEs, Danis shows that participation rates are lower in DEs conducted by reference entities compared to non-reference entities. While a lower participation rate at the bond level provides evidence for empty creditor resistance, it does not indicate that reference entities are not able to reduce their debt in DEs as much as non-reference entities. This is because firms may not tender all of their bonds in a DE as we discuss in the next section.

We contribute to the literature by investigating how firms restructure their distressed debt through DEs despite the potential resistance from empty creditors.

1.2.3 Distressed Exchanges (DE)

Financially distressed firms often restructure their public debt out-of-court in an attempt to reduce their distress and avoid default. Gilson, John, and Lang (1990) mention that in order to change the core terms of the existing bonds (e.g., interest rate, maturity), a firm needs the unanimous consent of the bondholders under the Trust Indenture Act of 1933. Given the severe holdout problems, the authors state that the restructuring of public debt out-of-court almost always takes the form of a DE.

In a DE, existing bondholders are offered to exchange their bonds for a package of newly issued securities consisting of a combination of cash, debt, or equity. Because targeted existing bonds are typically trading at a significant discount from their face amount, distressed firms are able to use the exchange offer to reduce their total outstanding indebtedness. In addition, the new debt received by participating bondholders often has a later maturity date, further relieving the company's financial pressure associated with ultimate repayment of the debt.

In a DE, firms do not always restructure all of their debt contracts. For example, Chatterjee, Dhillon, and Ramirez (1996) report the restructuring characteristics for a sample of 42 public workouts in their sample. They show that distressed firms restructured 52% of their public debt through these public workouts. Chatterjee, Dhillon, and Ramirez (1995) also report the number of bonds restructured in each creditor class for their sample of DEs. The authors show that, for example, an average exchange offer in their sample involves 21% of the senior notes outstanding. The high cost of restructuring all securities may explain the choice of securities

restructured in a DE. Chatterjee, Dhillon, and Ramirez (1996, p.13) state: "A firm may not restructure all the contracts out of court, since it is costly to bind all debt holders to the terms of the offer".

The amount of debt that a firm restructures in a DE also depends on the value of the package exchanged. The value of this package determines the willingness of the existing bondholders to tender. Gilson, John, and Lang (1990, p. 322) state: "To encourage bondholders to tender, exchange offers are structured to penalize holdouts. The new bonds are generally more senior, and mature sooner, than the old bonds." The market value of this package reflects the terms of the new securities offered.

A brief literature survey of DEs shows that the amount of debt restructured, the creditor class restructured, and the value of the package exchanged are important variables in the context of a DE. For empirical purposes, we can identify the firms for which CDS contracts are available and which creditor classes these contracts reference. Hence, we compare the differences in DEs conducted by reference and non-reference entities in those three dimensions listed above.

1.3 Data and Sample

1.3.1 Data

To construct our sample, we start with a list of DEs obtained from Moody's Default and Recovery Database (DRD) that occurred between January 2004 and December 2011. We merge this list with the list of DEs from the database maintained by NYU's Salomon Center to obtain the largest possible set of DEs.[5] We begin in 2004, as this year marked a turning point in terms of

[5] We thank Professor Edward I. Altman for providing us this dataset of DEs conducted by high-yield bond issuers from January 2004 to March 2010. This database adds 13 firms conducting DEs and 2 additional DEs conducted by William Lyon Homes Inc. (10/23/2009) and Hovnanian Enterprises Inc. (11/24/2008) to those identified using Moody's DRD.

the availability of CDS contracts with the initiation of ISDA Credit Derivatives Definitions and the CDX and iTraxx credit indices in 2003. We identify unique DEs based on the ultimate guarantor of the restructured debt. We use Bloomberg, Moody's company searching tools, and the underlying bond indentures to identify the guarantor information. We consider DEs that occurred within 6 months of each other to represent a single DE because the precipitating factors, firm characteristics, and the nature of reorganization are unlikely to have changed within this short period. Clustering such observations, and eliminating financial and non-US companies produces an initial sample of 134 DEs conducted by 124 firms.

We compile the requisite financial data on firms conducting DEs from the first available annual report prior to the DE from COMPUSTAT, EDGAR, Bloomberg, and/or the firm's official website.[6] We obtain details on the debt structure from FactSet and firms' annual financial reports. We drop 39 DEs (37 firms) because we failed to identify an annual report within a year prior to the firm's first exchange offer.

For the remaining DEs we collect details on the exchange (the securities targeted, the amount exchanged etc.) from Moody's DRD, and when unavailable on Moody's DRD, directly from the firm's 10-K and 8-K SEC filings. We refer to company press releases and LEXIS-NEXIS news search results when further clarification and/or details are needed. Throughout the data collection

[6] There are two cases where obtaining firm level details required accounting for the mergers the firms had entered into prior to their DEs. Caesars Entertainment Corporation was involved in a merger in January 2008. It conducted a DE on 12/19/2008, which included securities from the merger that were not reported in 2007 annual report. In order to match firm characteristics with the securities restructured as closely as possible, we use balance sheet information from the second quarter of 2008 and the 12-month trailing income statement from the same quarter. We also confirmed that debt table as of the second quarter of 2008 included all of the securities restructured. Similarly, Clear Channel Communications, Inc. was involved in a merger in June 2008 and conducted a DE on 8/27/2009. The first post-merger annual report was available only in 2010. To obtain financial information on the company at the end of 2008, we sum up the pre-merger (from January 1 through July 30, 2008) and post-merger (from July31 through December 31, 2008) income statement items reported in 2009 annual report to obtain the company's 2008 annual operating performance. The company's balance sheet as of December 2008 was available in the 2009 annual report.

process, we confirm that all of the sample firms are indeed financially distressed and that their debt structure details reported in annual financial statements include the securities involved in the DEs.[7]

For each security involved in the DE, we collect its characteristics (coupon type and rate, issue amount, maturity, etc.) from either Moody's DRD or Bloomberg. For floating rate bonds, we calculate the coupon rate prior to the DE completion date using the underlying benchmark (3-month or 6-month LIBOR), spread, and coupon reset periodicity information available on Bloomberg. We obtain prices for the securities restructured one month after the DE completion date from Moody's DRD, and when unavailable on Moody's DRD, from Bloomberg or FINRA's TRACE database. We obtain stock returns, prices, and number of shares outstanding prior to the DE from the Center for Research in Security Prices (CRSP) database. Eliminating 11 DEs (11 firms) that include non-rated securities for which security characteristics and prices are unavailable results in a final sample that consists of 75 firms conducting 83 DEs involving 268 outstanding debt securities.[8]

We identify whether a sample firm is a CDS reference entity using Bloomberg data feeds.[9] To increase the probability that we capture economically significant effects associated with empty creditors at the time of the DE, we classify firms as a reference entity only if there is a CDS price (spread) available in the 6 months prior to the DE completion date. We also crosscheck if these reference entities appear in the Depository Trust & Clearing Corporation's (DTCC) Top 1,000

[7] We exclude Century Aluminum Company's DE on September 30, 2009 because the restructuring information in Moody's DRD is incomplete and we are unable to reconcile the details using the company's SEC filing.

[8] Such sample sizes are typical of studies of distressed debt restructurings. For instance, Gilson, John, and Lang (1990), Brown, James, and Mooradian (1993), Franks and Torous (1994), Chatterjee, Dhillon, and Ramirez (1995) and James (1996) examine 80, 35, 45, 46, and 68 DEs respectively.

[9] Bloomberg feeds include CBGL/LON, CBGN/NYC, CBGT/TYO, CBED/OTH, CBIL/LON, CBIN/NYC, CBIT/TYO, CMAL/OTH, and CMAN/OTH.

Reference Entities list in the same time period.[10] We identify the reference obligation for the CDS using Markit's reference obligation identifiers (RED Codes) on Bloomberg. For all our reference entities, the reference obligation is the senior unsecured bond. Our sample consists of 25 DEs conducted by reference entities and 58 DEs conducted by non-reference entities.

1.3.2 Sample Characteristics

Table 1, Panel A presents the time distribution of DEs in our sample. Majority of the DEs in the sample occur in the great recession years 2008 and 2009. Of the 83 DEs in the sample, 67 are post-2007. This time concentration is mirrored in sub-samples based on whether the firm conducting the DE is a CDS reference entity. Of the 25 DEs by reference entities, 21 are post-2007 while the corresponding figures for non-reference entities are 46 out of 58. This time distribution of DEs in our sample is consistent with Altman and Karlin's (2009) observation that the number of firms engaging in DEs has risen dramatically since 2007, both in terms of the number of DEs and the amount of debt exchanged.

According to Altman and Karlin, the number of firms that executed DEs in 2008 was twice as many as in any single year in the last 25 years, and involved dollar amounts that were twice the entire amount exchanged between 1984 and 2007. They explain that firms preferred restructuring their debt through DEs because their tax-loss credits and the lack of debtor-in-possession (DIP) loans and equity infusions during the financial crisis lowered the usual benefits of bankruptcy. Accordingly, the financial crisis may influence a firm's restructuring choice over bankruptcy vs. DE. However, we do not expect this tendency to influence a DE conducted by a reference entity different from a DE conducted by a non-reference entity.[11]

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[10] Using a one-year window or excluding firms not on the DTCC list (available at http://www.dtcc.com/products/derivserv/data_table_i.php?tbid=5) do not change any of our findings in a material way. Our sample contains two reference entities that are not on the DTCC list.

[11] Sections 1.5.2 and 1.5.5 discuss the implications of financial crisis for the resistance of empty creditors.

Table 1 Sample Distribution

Panel A: Time Distribution

Year	Reference Entity	Non-Reference Entity	Total
2004	1	6	7
2005	1	2	3
2006	1	1	2
2007	1	3	4
2008	6	7	13
2009	12	31	43
2010	2	4	6
2011	1	4	5
Total	25	58	83

Panel B: Industry Distribution (Fama-French 5-Industry Classification)

Industry	Reference Entity	Non-Reference Entity	Total
Consumer	2	19	21
Manufacturing	5	19	24
Hight-Tech	11	9	20
Health	0	1	1
Other	7	10	17
Total	25	58	83
Public	14	16	30

Panel C: Industry Characteristics

	Reference Entity		Non-reference Entity	
Variables	N	Mean (Median)	N	Mean (Median)
Industry Distress	25	0.48	58	0.38
		(0.00)		(0.00)
Industry Q	25	1.27	58	1.32
		(1.22)		(1.23)

Notes: The table reports the time and industry distribution, and industry characteristics of 83 distressed exchanges (DE) conducted by 75 firms between January 2004 and December 2011. DEs that occur within 6 months of each are considered a single event. A firm is classified as a *Reference Entity* if it has an outstanding single name CDS contract with spread quotes available in the 6-months preceding the DE completion date. *Public* variable indicates whether a firm is public at the DE announcement date. *Industry distress* is a dummy variable that takes the value one if the median firm in a 2-digit SIC industry experienced a one-year stock return prior to the DE of less than -30%, and zero otherwise. *Industry Q* is the median Tobin's Q in a 2-digit SIC industry in the year prior to the DE.

Table 1, Panel B presents the industry distribution of DEs in the sample based on the Fama-French aggregation of SIC codes into 5 representative sectors (Consumer, Manufacturing, High-tech, Health and Other). Panel B shows that DEs in the sample occur across all the representative sectors except in the Health sector and that this industry pattern is no different whether the firm conducting the DE is a reference entity or not. Panel B also shows that the majority of the firms conducting DEs are private. However, of the 30 public firms conducting DEs, about half (14) are by reference entities.

Table 1, Panel C identifies DEs in our sample based on their industry's growth prospects and financial condition (at the 2-digit SIC code level). The median industry Q in the year prior to the DE is above one irrespective of whether the firm conducting the DE is a reference entity or not indicating that DEs occur in industries with growth options. Using a median one-year industry return of less than -30% prior to the DE to classify industry distress, Panel C shows that approximately half the reference entity DEs and a third of the non-reference entity DEs occur in distressed industries.

Table 2 presents the financial characteristics of reference and non-reference entities conducting the DEs in the sample. Consistent with the fact that CDS contracts are typically written on large firms, the average sample reference entity is larger than the average sample non-reference entity. However, sample reference entities are not different from their non-reference entity counterparts in terms of their distress related characteristics. Consistent with firms experiencing financial distress, both reference and non-reference entities display, on average, negative overall profitability (ROA) but positive operating profitability (EBITDA/Sales). They are solvent on a book value basis (the leverage ratio, Total Debt/Total Assets is below 1) and

Table 2 Descriptive Statistics

Variables	Reference Entity N	Reference Entity Mean (Median)	Non-reference Entity N	Non-reference Entity Mean (Median)	Test of Differences t-value (z-value)
Firm size and profitability					
Log Assets	25	9.32	58	6.57	9.68***
		(9.23)		(6.44)	(6.57)***
ROA	25	-0.15	58	-0.11	-0.47
		(-0.07)		(-0.10)	(0.40)
Sales/Assets	25	0.57	58	1.21	-4.93***
		(0.42)		(1.20)	(-4.42)***
EBITDA/Sales	25	0.20	58	0.07	2.61**
		(0.22)		(0.07)	(3.24)***
Liquidity and solvency					
Cash/Total Debt	25	0.12	58	0.10	0.83
		(0.05)		(0.04)	(0.91)
Total Debt/Assets	25	0.75	58	0.83	-1.17
		(0.72)		(0.74)	(-0.68)
Short-term Debt/Total Debt	25	0.06	58	0.10	-1.11
		(0.02)		(0.01)	(0.30)
Interest Expense/Total Debt	25	0.08	58	0.10	-2.56**
		(0.08)		(0.09)	(-2.52)**
EBITDA/Interest Expense	25	1.05	57	1.22	-0.36
		(1.25)		(1.22)	(0.06)
Tangibility	25	0.37	58	0.39	-0.48
		(0.32)		(0.40)	(-0.42)
Market measure of credit risk					
Credit Spread - Swap Curve	25	35.69	46	51.55	-1.46
		(23.28)		(30.99)	(-1.08)
Credit Spread - Treasury Curve	25	36.21	46	52.12	-1.47
		(23.95)		(31.54)	(-1.08)

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

Notes: The table reports the mean and median characteristics for a sample of 83 distressed exchanges (DE) completed between January 2004 and December 2011. A firm is classified as a *Reference Entity* if it has an outstanding single name CDS contract with spread quotes available in the 6-months preceding the DE completion date. Financial ratios are based on the most recent annual report prior to the exchange date. *Log Assets* is the natural logarithm of total assets in millions. *ROA* is the ratio of net income to total assets. *Tangibility* is calculated as {(Cash + 0.715 x Receivables + 0.547 x Inventories + 0.535 x PP&E)/Assets}. *Cash* includes cash and cash equivalents. *Total Debt* is the sum of short-term debt and long-term debt. *Market measure of credit risk* section reports the credit spreads, expressed in percentages, for 71 DEs in our sample that have bond prices available one-month prior to the announcement of the DE. When a firm has multiple bonds outstanding, we randomly select a unique bond to represent the firm's credit risk. Credit spread is the difference between the yield-to-maturity of a bond and the maturity matched risk-free rate – linearly interpolated rates from the interest swap and treasury curves. "Test of Differences" column reports t-values from a t-test assuming unequal variances and z-values from the Wilcoxon rank-sum test.

generate sufficient earnings from their operating activities to cover interest expenses (EBITDA/Interest ratio is greater than 1). And both do not have sufficient cash to fulfill their debt obligations. The median reference entity has a Cash/Total Debt ratio of 5% while its Interest Expense/Total Debt ratio is 8%. The corresponding figures for the median non-reference entity are 4% and 9% respectively.

In general, reference entities are more likely to experience distress than non-reference entities because CDS are more likely to reference marginal credits. The greater propensity for reference entities to experience distress relative to non-reference entities by itself does not affect our analysis, because our analysis is conditioned on firms experiencing distress.

However, conditional on distress, reference entities could be closer to default than non-reference entities, which could cause them to structure their DEs differently from non-reference entities. Although the financial characteristics discussed above do not reveal any difference between reference and non-reference entities, they are based on book values, and market-based measures would be preferable. Obtaining such a market-based measure requires computing the distance-to-default based on a structural model of credit risk with the market value of equity being a key input. In the absence of the market value of equity for a number of our sample observations (64% of our sample consist of private firms), we adopt an alternate approach to determine if the market perceives the distance to default for reference entities to be different from that of non-reference entities. We randomly select a bond for every firm in our sample and calculate the credit spread as the difference between the yield-to-maturity of the bond and a benchmark risk-free rate one-month before the announcement of the DE. We calculate the benchmark risk free rate by linearly interpolating the maturity-matched interest rate swap curve. We also calculate an alternative risk-free benchmark in a similar fashion from the treasury yield

curve. Table 2 presents these credit spreads as well. The credit spreads do not differ statistically across reference and non-reference entities. Using either risk-free benchmark, the mean (median) credit spread for reference entities is about 36% (23%). It is about 52% (31%) for non-reference entities.[12]

As a final comparison of their distress characteristics, we compare their liquidation values. Following Almeida and Campello (2007), we construct a tangibility ratio to proxy for liquidation value as:

$$(\text{Cash} + 0.715 \text{ x Receivables} + 0.547 \text{ x Inventories} + 0.535 \text{ x PP\&E})/\text{Assets}. \quad (1)$$

According to Almeida and Campello, tangibility is a measure of asset pledgeability, and we use it to control for the liquidation values in default. Tangibility also contains information about the industry characteristics as it varies across industries. These tangibility ratios are also not statistically different across sample reference entities and sample non-reference entities. The mean (median) tangibility ratio for sample reference entities is 37% (32%) while it is 39% (40%) for sample non-reference entities.

Taken together, both book value and market-based measures show that the distress experienced by reference entities in the sample is no different from that experienced by non-reference entities in the sample.

Table 3 presents details on the debt structure of reference and non-reference entities conducting the DEs in the sample. We classify a firm's debt on the basis of its seniority (priority) into four classes: loan (bank debt), senior secured, senior unsecured and junior debt (which includes senior subordinated and junior subordinated debt). Almost all reference and

[12] We find no difference in the spreads even after controlling for security specific characteristics.

Table 3 Debt Structure

Variables	Reference Entity N	Reference Entity Mean (Median)	Non-Reference Entity N	Non-Reference Entity Mean (Median)	Test of Differences t-value (z-value)
Loans	24	0.34	56	0.38	-0.69
		(0.33)		(0.37)	(-0.47)
Notes/Bonds	25	0.67	57	0.64	0.55
		(0.70)		(0.65)	(0.39)
Senior Secured	11	0.16	16	0.47	-3.20***
		(0.14)		(0.44)	(-2.29)**
Senior Unsecured	25	0.54	36	0.56	-0.20
		(0.44)		(0.56)	(-0.29)
Junior	15	0.10	29	0.30	-4.13***
		(0.07)		(0.28)	(-3.47)***
Senior Subordinated	7	0.15	27	0.30	-2.31***
		(0.12)		(0.28)	(-1.70)*
Subordinated	8	0.05	2	0.31	-3.09**
		(0.03)		(0.31)	(-1.96)*
Debt Concentration	25	0.53	58	0.63	-2.17**
		(0.50)		(0.56)	(-1.87)*

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

Notes: The table reports the mean and median capital structure characteristics for a sample of 83 distressed exchanges (DE) completed between January 2004 and December 2011. A firm is classified as a *Reference Entity* if it has an outstanding single name CDS contract with spread quotes available in the 6-months preceding the DE completion date. Financial ratios are based on the most recent annual report prior to the exchange date. We categorize the capital structure into four broad debt classes (one loan class and three bond classes - Secured, Senior Unsecured, Junior). *Debt Concentration* for firm *i* is calculated as $\sum_{j=1}^{k}\left(V_j/V_i\right)^2$ where V_j is the face value of claims in debt class *j* and V_i is the sum of the face value of all debt claims. "Test of Differences" column reports t-values from a t-test assuming unequal variances and z-values from the Wilcoxon rank-sum test.

non-reference entities have loans. Furthermore, on average, they both carry similar loan amounts (about a third of their total debt) while the rest of their debt is in the form of bonds or notes.

In terms of their bonds, all reference entities have senior unsecured debt (it is the reference obligation underlying the CDS while only 36 out of the 58 non-reference entities have senior unsecured debt). However the amount of senior unsecured debt they carry (an average of 54% of total debt) is not any different from the amount carried by non-reference entities (an average of 57% of total debt when they have senior unsecured debt). Reference entities do carry a smaller

percentage of their debt in senior secured and junior bonds compared to non-reference entities. Only 11 out of the 25 reference entities have senior secured bonds, and when they do, senior unsecured debt accounts for an average of 16% of their total debt.

In contrast, 16 out of the 58 non-reference entities have senior secured bonds, and when they do, it accounts for an average of 47% of their total debt. Similarly, 15 out the 25 reference entities have junior bonds that on average represent 10% of their total debt, while 29 out of 58 non-reference entities have junior bonds that represent an average of 30% of their total debt.

To obtain a summary measure of the debt structure of reference entities, we construct a Hefindahl index of debt concentration across debt classes along the lines of Betker (1995). We calculate a debt concentration measure for firm i as:

$$\sum_{j=1}^{k}\left(V_j/V_i\right)^2, \quad (2)$$

where V_j is the face value of long-term claims held by debt class j and V_i is the sum of the face value of all long-term debt claims. Based on this measure, reference entities have a less concentrated debt structure than non-reference entities. This is because, relative to non-reference entities, reference entity debt is held across more classes and across more securities in each class.[13]

1.4 Analysis

To understand how reference entities execute their DEs when confronted with empty creditors we first examine the debt they target and restructure in the DE. We then examine what they pay bondholders to tender in the DE (equivalently, what tendering bondholders recover in

[13] The median reference entity's debt is held across three classes (about 6 securities per class) while the median non-reference entity's debt is held in two creditor classes (with about 2 securities per class).

the DE). Finally, we examine the distress relief they achieve through the DE in terms of the amount of debt they reduce through the DE and how successfully they avoid having to file for bankruptcy subsequent to the DE.

1.4.1 Debt Restructured in the DE

We study the restructuring characteristics by analyzing the amount of debt restructured in in a debt class divided by the amount of debt outstanding in the same debt class. Table 4 presents details on the debt restructured in the DEs conducted by reference and non-reference entities. Panel A of the table presents these details for all DEs in the sample. This panel shows that reference entities restructure a much smaller percentage of their debt relative to non-reference entities. On average reference entities have $18.65 billion in debt, but restructure only 18% of it.

In contrast, non-reference entities have $0.84 billion in debt, but restructure 37% of it. This difference in the amount of debt restructured arises from reference entities restructuring a smaller proportion of their bonds relative to non-reference entities despite having a similar amount of bonds proportional to their total debt. Both reference and non-reference entities rarely restructure their loans with their banks along with the DE. Furthermore, this difference traces to the restructuring of senior unsecured bonds. Despite having a similar proportion of their debt in senior unsecured bonds, reference entities restructure a smaller proportion of it compared to non-reference entities. The average reference entity has 54% of its debt in senior unsecured bonds and restructures only 26% of it. In contrast, the average non-reference entity among the 36 non-reference entities that have senior unsecured bonds has 56% of its debt in senior unsecured bonds but restructures 48% of it.

Table 4 Restructuring Characteristics

Variables	Reference Entity					Non-Reference Entity					Test of Diff.
	N	Amount ($ Bln)	Amount /Total Debt	Restructured ($ Bln)	Restructured /Total Class (A)	N	Amount ($ Bln)	Amount /Total Debt	Restructured ($ Bln)	Restructured /Total Class (B)	(A - B) t-value
Panel A: All Firms											
Total Debt	25	18.65	1.00	1.70	0.18	58	0.84	1.00	0.17	0.37	-3.31***
Loans	24	6.53	0.34	0.11	0.01	56	0.42	0.38	0.01	0.04	-1.13
Notes/Bonds	25	11.65	0.67	1.60	0.27	57	0.43	0.64	0.16	0.51	-3.32***
Senior Secured	11	7.05	0.16	0.05	0.09	16	0.38	0.47	0.09	0.33	-1.65
Senior Unsecured	25	8.15	0.54	1.47	0.26	36	0.34	0.56	0.15	0.48	-2.79***
Junior	15	0.46	0.10	0.17	0.25	29	0.20	0.30	0.08	0.39	-1.26
Panel B: Firms with Cushion - Have Senior Unsecured and Junior Debt											
Total Debt	15	15.03	1.00	1.45	0.18	15	0.98	1.00	0.20	0.26	-1.07
Loans	15	7.79	0.34	0.03	0.00	15	0.38	0.32	0.01	0.07	-1.06
Notes/Bonds	15	7.31	0.66	1.42	0.26	15	0.59	0.66	0.19	0.36	-0.90
Senior Secured	7	2.40	0.15	0.09	0.14	3	0.11	0.18	0.07	0.33	-0.52
Senior Unsecured	15	5.73	0.49	1.21	0.23	15	0.38	0.43	0.13	0.30	-0.60
Junior	15	0.46	0.10	0.17	0.25	15	0.18	0.19	0.04	0.23	0.12
Panel C: Firms without Cushion - Have Senior Unsecured but No Junior Debt											
Total Debt	10	24.08	1.00	2.09	0.19	21	0.77	1.00	0.18	0.44	-2.53**
Loans	9	4.43	0.34	0.24	0.03	19	0.45	0.38	0.00	0.01	0.69
Notes/Bonds	10	18.17	0.69	1.87	0.28	21	0.36	0.66	0.18	0.62	-2.75**
Senior Secured	4	15.19	0.16	0.00	0.00	1	0.86	0.22	0.17	0.20	.
Senior Unsecured	10	11.78	0.62	1.87	0.30	21	0.32	0.65	0.17	0.62	-2.64**

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

Notes: The table reports the restructuring characteristics for a sample of 83 distressed exchanges (DE) completed between January 2004 and December 2011. A firm is classified as a *Reference Entity* if it has an outstanding single name CDS contract with spread quotes available in the 6-months preceding the DE completion date. Panel A reports the average debt outstanding and average restructured in dollars while Panel B and C reports these for firms with and without cushion. Firms *with cushion* have both senior unsecured and junior debt. Conversely, firms *without cushion* have senior unsecured but no junior debt. "Test of Differences" column reports t-values from a t-test assuming unequal variances.

Panels B and C isolate the DEs by firms that have a junior debt cushion under their senior unsecured debt and those that do not. These panels indicate that the difference in the amount of debt restructured by reference entities arises from those DEs where reference entities do not have junior debt that they can restructure. In such situations, reference entities restructure a smaller proportion of their debt compared to non-reference entities, and this is because they restructure a smaller proportion of their senior unsecured debt relative to non-reference entities. The average reference entity without junior debt has 62% of its debt in senior unsecured bonds and restructures only 30%, as a result of which it only restructures 19% of its total debt, while the average non-reference entity without junior debt has a similar amount of its debt in senior unsecured bonds (65%) but restructures 62% of it that enables it to restructure 44% of its total debt. In contrast, when reference entities have both senior unsecured debt and junior debt, the amount of debt they restructure is no different from similar non-reference entities. The proportion of each debt classes (including the senior unsecured class) such reference entities restructure is similar to the proportion of each debt class restructured by non-reference entities with both senior unsecured and junior debt.

Table 4 provides preliminary evidence that reference entities are able to restructure their debt in a similar manner to non-reference entities when they have a junior debt cushion under their senior unsecured debt. To further understand how reference entities restructure their debt when faced with empty creditors, we utilize a regression framework that accounts for firm level differences in distress and debt structure. We run OLS regressions employing White's (1980) correction to account for possible heteroskedasticity that examine whether reference entities restructure their debt differently from non-reference entities. The results from this analysis are presented in Table 5.

Table 5 Debt Restructured Regressions – All Firms

	All Firms		
Explanatory Variables	Total Rest./ Total Debt I	Junior Rest./ Junior Debt II	Sen. Unsec. Rest./ Sen. Unsec. Debt III
Intercept	-0.09	-0.03	0.51**
	(-0.83)	(-0.16)	(2.32)
EBITDA/Sales	-0.35***	-1.02**	-0.19
	(-3.11)	(-2.64)	(-1.18)
Total Debt/Assets	0.05	0.17	-0.15
	(0.54)	(1.33)	(-1.06)
Interest Exp./Total Debt	4.28***	2.59	0.84
	(4.28)	(1.57)	(0.42)
Cash/Total Debt	0.23	-0.96	0.05
	(0.69)	(-1.28)	(0.14)
CDS Dummy	-0.08	0.28**	-0.22**
	(-1.38)	(2.37)	(-2.51)
Sen. Unsec. Debt/Tot. Debt		-0.32	0.18
		(-1.31)	(0.87)
Junior Debt/Total Debt		0.86***	-0.95**
		(3.04)	(-2.68)
Number of Observations	83	44	61
R^2	0.35	0.53	0.33

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

Notes: The table reports the restructuring regression results for all firms. The sample comprises of 83 distressed exchanges (DE) completed between January 2004 and December 2011. A firm is classified as a *Reference Entity* if it has an outstanding single name CDS contract with spread quotes available in the 6-months preceding the DE completion date. *CDS Dummy* equals 1 if the firm is a reference entity, and 0 otherwise. All other variable definitions are provided in Table 2. The t-statistics in parenthesis reflect White (1980) robust standard errors.

In regression I, which is run on the entire sample of DEs, the dependent variable is the dollar amount of debt restructured as a proportion of total debt. The regression controls for firm level differences in leverage (Total Debt/Assets), profitability (EBITDA/Sales), and liquidity (Interest Expense/Total Debt and Cash/Total Debt). The coefficient of interest in the regression is the one on the dummy variable (CDS Dummy) that indicates whether there is a difference in the amount of debt restructured by reference and non-reference entities. Statistically significant coefficients

in the regression confirm that more profitable firms restructure less debt while firms with higher interest burdens restructure more debt. The insignificant coefficient on the CDS Dummy indicates that the percentage of outstanding debt restructured by reference entities is no different from that restructured by non-reference entities.

Regressions II and III analyze subsamples of DEs where junior debt and senior unsecured debt are restructured respectively. In regression II, the dependent variable is the dollar amount of junior debt restructured as a proportion of outstanding junior debt. The independent variables in this regression include controls for the amount of junior and senior debt (as a percentage of outstanding debt) in addition to the independent variables in regression I. Not surprisingly, this regression shows that firms with more junior debt restructure a larger proportion of their junior debt. The coefficient on Junior Debt/Total Debt is 0.86 at statistically significant at conventional levels. More importantly, the coefficient on the CDS dummy is 0.28 and statistically significant indicating that reference entities restructure a larger proportion of their junior debt relative to non-reference entities. Regression III examines the restructuring of senior unsecured debt by reference entities in a manner that is similar to regression II. In regression III, the dependent variable is the proportion of senior unsecured debt restructured, while all the independent variables are identical to that of regression II. Again, not surprisingly, this regression indicates that firms with more junior debt restructure less senior unsecured debt. This regression also indicates that reference entities restructure a smaller proportion of their senior unsecured debt. The coefficient on the CDS dummy is -0.22 and statistically significant.

Regressions I, II and III indicate that although reference entities restructure a similar proportion of their outstanding debt when compared to non-reference entities, there are differences in the restructuring of junior and senior unsecured debt. To better understand this

difference, we run regressions using firms with comparable debt structures. Table 6 reports the results from this analysis.

Table 6 Debt Restructured Regressions – Comparable Firms

	Firms with Cushion		Firms without Cushion
Explanatory Variables	Junior Rest./ Junior Debt I	Sen. Unsec. Rest./ Sen. Unsec. Debt II	Sen. Unsec. Rest./ Sen. Unsec. Debt III
Intercept	0.31	0.60	0.39
	(0.96)	(1.34)	(1.26)
EBITDA/Sales	-1.10**	-0.14	-0.21
	(-2.24)	(-0.28)	(-0.94)
Total Debt/Assets	-0.16	-0.26	0.08
	(-0.81)	(-1.44)	(0.36)
Interest Exp./Total Debt	0.35	0.49	-0.41
	(0.18)	(0.15)	(-0.15)
Cash/Total Debt	-1.56	0.16	0.46
	(-1.63)	(0.16)	(0.86)
CDS Dummy	0.27**	-0.17	-0.28*
	(2.15)	(-1.44)	(-1.78)
Sen. Unsec. Debt/Tot. Debt	0.01	0.07	0.27
	(0.04)	(0.29)	(0.95)
Junior Debt/Total Debt	1.33**	-0.78*	
	(2.73)	(-1.88)	
Number of Observations	30	30	31
R^2	0.44	0.25	0.28

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

Notes: The table reports the restructuring regression results for firms with comparable debt structure. The sample comprises of 83 distressed exchanges (DE) completed between January 2004 and December 2011. A firm is classified as a *Reference Entity* if it has an outstanding single name CDS contract with spread quotes available in the 6-months preceding the DE completion date. *CDS Dummy* equals 1 if the firm is a reference entity, and 0 otherwise. All other variable definitions are provided in Table 2. Firms *with cushion* have both senior unsecured and junior debt. Conversely, firms *without cushion* have senior unsecured but no junior debt. The t-statistics in parenthesis reflect White (1980) robust standard errors.

Regressions I and II analyze DEs by firms that have both senior unsecured and junior debt (firms with cushion), while regression III analyzes DEs by firms with senior unsecured debt but no junior debt (firms without cushion). In regression I, which is identical to regression II of Table

5 in its specification, the coefficient on the CDS dummy is 0.27 and statistically significant indicating that reference entities restructure a larger proportion of their junior debt compared to non-reference entities when they have senior unsecured debt.

In contrast, in regression II, which is identical to regression III of Table 5 in its specification, the coefficient on the CDS dummy is insignificant, indicating that reference entities restructure a similar proportion of their senior unsecured debt compared to non-reference entities when they have junior debt. In regression III, which examines the senior unsecured debt restructured by firms that do not have any junior debt, the coefficient on the CDS dummy is -0.28 and statistically significant, indicating that reference entities restructure a smaller proportion of their senior unsecured debt compared to non-reference entities only when they do not have junior debt.

Our analysis of the debt restructured in DEs indicates that reference entities respond to the potential for empty creditors to limit their restructuring by disproportionately restructuring junior debt. When junior debt is not available, and thus circumventing restructuring empty creditor debt (senior unsecured debt) is not possible, reference entities restructure a smaller proportion of their senior unsecured debt.[14]

1.4.2 Bondholder Recoveries in the DE

In a DE, tendering bondholders receive a package of cash and securities of lower value. We use the price of the bond targeted in the exchange subsequent to the completion of the DE as an estimate the value of the cash and securities that bondholders receive in exchange for tendering their bonds.[15] Our estimate of the bondholder's recovery rate is this price as a percentage of face

[14] Appendix A shows that the results in this section are identical if an alternative dependent variable is used.

[15] The preference for using market prices subsequent to the completion of the DE as opposed to those at or just after the announcement of the DE is motivated by the fact that market prices just subsequent to the announcement also

value of the tendered bond. Following Moody's convention, we use the bond price one month from the DE's completion to infer the recovery rate for a bond. For DEs in the sample that are not from Moody's DRD, we obtain the first price available one month from the completion of the DE from Bloomberg or FINRA's TRACE database.

Table 7 presents descriptive statistics associated with these recovery rates. Panel A of the Table reports mean and median recovery rates for securities restructured in our DE sample. Panel B of the Table reports these values for DEs conducted by firms with a junior debt cushion under their senior unsecured debt, and panel C for DEs by firms with no junior debt cushion.

Panel A shows that while reference entities restructure a larger number of bonds, the recovery rates for reference entity bondholders are similar to those of non-reference entity bondholders. Panel B shows that when firms have a junior cushion below the senior unsecured debt, the senior unsecured bondholders recover 47% while the corresponding figure for non-reference entity is 68%, and the difference is statistically significant. The recovery rates for the junior bondholders are not statistically different across reference and non-reference entities. However, Panel C shows that when firms do not have a junior cushion – making the senior unsecured debt the lowest in ranking – the senior unsecured bondholders significantly recover more in reference entities (59%) relative to the non-reference entities (47%).

Recovery rates, however, depend on industry, firm and security characteristics. We control for differences in the DEs along these dimensions in a regression framework where the

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incorporate the probability that the exchange offer may fail (succeed) while those just subsequent to exchange completion do not.

Table 7 Security Level Recovery Rates

	Reference Entity			Non-Reference Entity			Test of Differences	
Variables	N	Mean	Median	N	Mean	Median	t-test	Wilcoxon
Panel A: All firms								
All Securities	174	52.72	52.00	77	56.58	60.00	-1.10	-1.13
Loans	1	47.00	47.00	7	55.21	55.11	.	0.00
Notes/Bonds	173	52.76	53.00	70	56.71	61.38	-1.08	-1.13
Senior Secured	1	105.00	105.00	10	71.29	71.38	.	1.42
Senior Unsecured	155	52.20	53.00	41	53.84	60.00	0.37	-0.38
Junior	17	54.78	45.00	19	55.24	62.75	0.05	0.00
Panel B: Firms with cushion - Have senior unsecured and junior bonds								
All Securities	108	48.78	46.13	26	61.10	64.38	-2.25**	-2.23**
Loans	.	.	.	3	45.67	37.00	.	.
Notes/Bonds	108	48.78	46.13	23	63.12	66.00	-2.48**	-2.45**
Senior Secured	1	105.00	105.00	1	99.50	99.50	.	.
Senior Unsecured	90	47.02	46.13	14	67.57	73.00	-3.30***	-3.00***
Junior	17	54.78	45.00	8	50.77	53.94	0.33	-0.18
Panel C: Firm Firms without cushion - Have senior unsecured but no junior bonds								
All Securities	66	59.18	58.50	29	46.58	41.00	2.39**	2.46**
Loans	1	47.00	47.00	.	.	.	.	.
Notes/Bonds	65	59.37	59.75	29	46.58	41.00	2.41**	2.49**
Senior Secured	.	.	.	2	44.63	44.63	.	.
Senior Unsecured	65	59.37	59.75	27	46.72	38.50	2.27**	2.44**

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

Notes: The table reports the percentage recovery rate details for the securities in a sample of 83 distressed exchanges (DE) completed between January 2004 and December 2011. A firm is classified as a *Reference Entity* if it has an outstanding single name CDS contract with spread quotes available in the 6-months preceding the DE completion date. Firms *with cushion* have both senior unsecured and junior debt. Conversely, firms *without cushion* have senior unsecured but no junior debt. "Test of Differences" column reports t-values from a t-test assuming unequal variances and z-values from the Wilcoxon rank-sum test.

dependent variable is the bond level recovery rate. In all our regressions, we follow Acharya, Bharath, and Srinivasan (2007), and control for firm specific characteristics: firm size (Log Assets), asset tangibility (Tangibility), profitability (EBITDA/Sales), leverage (Total Debt/Total Assets), and debt concentration (Debt Concentration) in all our regressions. We also control for industry characteristics: industry growth options (Industry Q) and industry distress (a dummy variable that takes the value one if the median firm in the firm's 2-digit SIC industry had a stock

return of less than -30% in the year prior to the DE, and zero otherwise). Finally, we also control for security specific characteristics: time to maturity in years (Time to Maturity), coupon rate (Coupon Rate), Issue size (Log Issue Size), and seniority (Junior), security (Secured), and optionality (Convertible) status using dummy variables. The coefficient of interest in our regressions is the one on the CDS dummy that captures any difference in the recovery rates between reference entity and non-reference entity bondholders. We run OLS regressions with White's (1980) correction applied to errors clustered at the firm level to account for possible heteroskedasticity and correlation across recovery rates within the same firm. Table 8 presents the regression results.

Regression I analyzes bondholder recoveries for the entire sample of DEs. Regression I indicates that recovery rates are higher if the firm's debt structure is more concentrated. It also indicates that recovery rates are higher in growth industries and lower in distressed industries. Furthermore, it confirms that recovery rates are higher when creditors have security and convertibility.[16] The coefficient on the CDS dummy in this regression is 13.31 and statistically significant, indicating that the average reference entity bondholder recovers more in the DE relative to a non-reference entity bondholder.

Regressions II and III analyze junior and senior unsecured bondholder recoveries respectively, for all DEs in the sample. The coefficient on the CDS dummy is positive and significant in both regressions indicating that in reference entity DEs, junior and senior unsecured bondholders recover more relative to their counterparts in non-reference entity DEs.

[16] In regression I we also include 2-digit SIC industry dummies and following Stromberg, Hotchkiss, and Smith (2011), a LBO&MBO dummy to control for private equity involvement. None of the dummies are significant.

Table 8 Bond Recovery Regressions

	All Firms			Firms w/ Cushion		Firms w/o Cushion
	All Bonds	Junior	Sen. Unsec.	Junior	Sen. Unsec.	Sen. Unsec.
Explanatory Variables	I	II	III	IV	V	VI
Intercept	2.46	96.25	-5.22	123.05	29.37	5.80
	(0.09)	(1.67)	(-0.20)	(1.11)	(0.63)	(0.13)
Time to Maturity	-0.62	-6.24***	-0.40	-5.70*	-1.17*	-0.29
	(-1.60)	(-2.99)	(-1.59)	(-2.16)	(-2.12)	(-1.59)
Coupon Rate	0.33	1.88	0.26	-3.63*	0.73	0.78**
	(0.94)	(0.86)	(0.84)	(-2.08)	(0.71)	(2.23)
Log Issue Size	0.13	-9.96	0.44	5.57	-4.58	9.06**
	(0.05)	(-1.52)	(0.17)	(0.27)	(-1.43)	(2.38)
Log Assets	0.18	-3.92	-0.03	-6.13	3.32	-8.82**
	(0.07)	(-0.66)	(-0.01)	(-1.30)	(0.75)	(-2.54)
Tangibility	10.54	24.88	9.80	-10.49	87.02**	44.11
	(0.51)	(0.77)	(0.42)	(-0.34)	(2.34)	(1.69)
EBITDA/Sales	6.13	51.62	-6.60	19.08	24.91	1.33
	(0.33)	(1.36)	(-0.35)	(0.27)	(0.59)	(0.07)
Total Debt/Assets	1.36	10.87	12.08	-13.53	-37.93***	43.88**
	(0.13)	(0.69)	(1.07)	(-0.39)	(-3.77)	(2.21)
Debt Concentration	30.14*	-71.32*	38.28**	-46.58	49.74***	24.62
	(1.94)	(-1.76)	(2.39)	(-0.24)	(3.78)	(0.86)
Industry Q	26.64***	41.05***	19.54	31.63**	11.61	-10.38
	(2.69)	(2.98)	(1.53)	(2.53)	(1.08)	(-0.50)
Industry Distress	-18.42***	-14.87	-20.29***	-34.07*	-25.84**	-16.77**
	(-3.27)	(-1.33)	(-3.13)	(-2.03)	(-2.57)	(-2.23)
CDS Dummy	13.31*	27.10*	11.29*	29.39*	-16.95	37.61***
	(1.80)	(1.88)	(1.78)	(2.05)	(-1.54)	(2.96)
Convertible Dummy	18.29***	40.07***	11.08	9.95	9.60	5.13
	(3.05)	(3.10)	(1.63)	(0.60)	(0.84)	(0.62)
Secured Dummy	20.46**					
	(2.28)					
Junior Dummy	7.54					
	(1.51)					
Number of Obs.	241	36	194	25	102	92
R^2	0.45	0.76	0.42	0.84	0.54	0.58

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

Notes: The table reports the OLS regression results for the bond level recovery rates for all, senior unsecured, and junior bonds. The sample consists of all bonds restructured in 83 distressed exchanges (DE) completed between January 2004 and December 2011. A firm is classified as a *Reference Entity* if it has an outstanding single name CDS contract with spread quotes available in the 6-months preceding the DE completion date. *CDS Dummy* equals 1 if the firm is a reference entity, and 0 otherwise. *Time to Maturity*, *Coupon Rate*, *Log Issue Size*, *Convertible Dummy, Secured Dummy, and Junior Dummy* variables control for the bond features. All other variable definitions are provided in Table 2. Regression I include industry dummies based on 1-digit SIC codes. None of the industry dummies are significant. Industry dummies are excluded from the senior unsecured and junior debt regressions in order to gain degrees of freedom. Firms *with cushion* have both senior unsecured and junior debt. Conversely, firms *without cushion* have senior unsecured but no junior debt. The t-statistics in parenthesis reflect White (1980) robust standard errors clustered at the firm level.

Regressions IV and V restrict the sample to DEs conducted by firms that have a junior debt cushion under their senior unsecured bonds. Regression IV analyzes the junior bond recoveries while regression V analyzes the senior unsecured recoveries in this subsample of DEs. The coefficient on the CDS dummy in regression IV is 29.39 and statistically significant while it is statistically insignificant in regression V. These two regressions indicate that when the firm has a junior debt cushion, it is the junior bondholders and not the senior unsecured bondholders who recover more in reference entity DEs than in non-reference entity DEs. Regression VI restricts the sample to DEs conducted by firms that have no junior debt cushion. The coefficient on the CDS dummy in this regression is 37.61 and statistically significant, indicating that senior unsecured bondholders in reference entity DEs recover more relative to their counterparts in non-reference entity DEs only when the firm has no junior debt.

The results from the analysis of bondholder recoveries, taken together with those from the previous section on the debt restructured indicate that reference entities execute DEs not by restructuring their senior unsecured debt any differently from similar non-reference entities. Instead, they respond to empty creditor resistance by restructuring more junior debt. In the end, junior bondholders in reference entities recover more relative to those in non-reference entities. When junior debt is not available, senior unsecured creditors recover more in the DE. However, firms still target and restructure a lower proportion of their senior unsecured debt when compared to similar non-reference entities.

1.4.3 Distress Relief from the DE

The goal of a DE is to remedy distress and avoid default. Critical to these objectives is the reduction of outstanding debt. The amount of debt reduction is a function of both recovery rates and the amount of debt tendered. The previous sections analyze the amount of debt restructured

and recovery rates independently. This section investigates the aggregate outcome of the restructuring, which is the reduction of outstanding debt.

To analyze how effectively reference entities remedy distress, we compute the debt reduced through the DE as:

$$\sum_i \textit{Amount Restructured}_i \ x \ (1\text{-}\textit{Recovery}_i), \qquad (3)$$

where i references the bond restructured in the DE. When a particular bond's recovery rate is not available, we use the average recovery rate for the corresponding bond class as an estimate of that particular bond's recovery rate.

We investigate the amount of debt reduced through the DE in a regression framework that controls for firm profitability (EBITDA/Sales), leverage (Total Debt/Assets), liquidity (Cash/Total Debt), asset tangibility (Tangibility), and debt concentration (Debt Concentration), along with added controls for industry growth options (Industry Q) and distress (Industry Distress). The dependent variable in all regressions is the amount of debt reduced in the DE as a proportion of total debt outstanding prior to the DE. The variable of interest in all regressions is the CDS dummy. We run OLS regressions that use White (1980) robust standard errors. The results of this analysis are presented in Table 9.

Regression I is run using the full sample of DEs. Although the coefficients on EBITDA/Sales, Total Debt/Assets and Cash/Total Debt and Tangibility are not statistically significant in regression I, their signs are broadly consistent with the need for debt reduction. The signs on these variables indicate that more profitable firms with tangible and liquid assets reduce their debt less while those with more leverage reduce their debt more. The coefficient on the debt concentration variable is positive and significant at conventional levels indicating that firms find

Table 9 Debt Reduction Regressions

Explanatory Variables	All Firms I	Firms with Cushion II	Firms without Cushion III
Intercept	0.05	0.08	0.29**
	(0.69)	(0.99)	(2.35)
EBITDA/Sales	-0.06	-0.15	0.05
	(-0.95)	(-1.50)	(0.60)
Total Debt/Assets	0.03	0.01	-0.09
	(0.79)	(0.28)	(-1.15)
Cash/Total Debt	-0.04	-0.16	0.40
	(-0.22)	(-0.71)	(1.51)
Debt Concentration	0.16*	-0.06	-0.07
	(1.67)	(-0.58)	(-0.63)
Tangibility	0.00	0.02	-0.11
	(-0.05)	(0.17)	(-0.82)
Industry Q	-0.04	0.00	0.01
	(-1.06)	(0.02)	(0.13)
Industry Distress	0.00	0.04	-0.04
	(0.05)	(1.54)	(-0.99)
CDS Dummy	-0.02	0.03	-0.14***
	(-0.86)	(0.79)	(-3.00)
Number of Observations	77	30	27
R^2	0.11	0.23	0.40

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

Notes: The table reports the OLS regression results for the percentage debt reduction in distressed exchanges (DE). The sample consists of all bonds restructured in 83 DEs completed between January 2004 and December 2011. A firm is classified as a *Reference Entity* if it has an outstanding single name CDS contract with spread quotes available in the 6-months preceding the DE completion date. The dependent variable is the percentage reduction in debt at the firm level calculated as $\sum_i \text{Amount Restructured}_i \text{x}(1\text{-Recovery}_i)/\text{Total Debt}$ where i denotes the security restructured. When a particular recovery rate is not available, we use the average recovery rate for the corresponding debt class. We drop a DE if average recovery rate for the creditor class is not available. All variable definitions are provided in Table 2. Firms *with cushion* have both senior unsecured and junior debt. Conversely, firms *without cushion* have senior unsecured but no junior debt. The t-statistics in parenthesis reflect White (1980) robust standard errors.

it easier to reduce their debt when they have to deal with concentrated as opposed to dispersed creditors. Similarly, the signs on the industry variables indicate that firms in industries with growth options reduce their debt less, but industry distress has no noticeable effect on debt reduction. In regression I, the coefficient on the CDS dummy is statistically insignificant

indicating that the amount of debt reduction achieved by reference entities is no different from that achieved by non-reference entities.

In regression II we restrict the sample to DEs by firms with a junior debt cushion, and in regression III to firms with no junior debt. The coefficient on the CDS dummy is statistically insignificant in regression II, but attains statistical significance in regression III, indicating that reference abilities are limited in their ability to reduce their debt only when they do not have junior debt. These results indicate that reference entities are not limited in their ability to reduce their debt when they are able to restructure more junior debt.

To further examine whether reference entities are limited in their ability to remedy distress, we examine the incidence of bankruptcy in the two years following the DE. We obtain bankruptcy filings for our sample firms from Moody's DRD database and LEXIS-NEXIS news search results. We tabulate the findings in Table 10. Table 10 shows that 5 out of 78 DEs (6.41%) conducted between 2004 and 2010 are followed by a bankruptcy filing within a year of the DE. However, none of these are by the 24 reference entities in the sample. Extending the post DE period to two years, we find that 11 out of 74 DEs (14.87%) conducted between 2004 and 2009 are followed by a bankruptcy. Only 2 of these bankruptcies are by reference entities while 11 of these are by non-reference entities. The difference in the proportion of firms filing for bankruptcy is significantly smaller for reference entities for the one-year post-period and insignificant for the two-year post-period. These results show that reference entities do not experience higher bankruptcy rates subsequent to DEs.[17]

[17] In unreported results, we find that a logistic regression that controls for firm characteristics shows no difference across reference and non-reference entities in the probability of filing for bankruptcy subsequent to the DE.

Table 10 Post-Restructuring Bankruptcy Trends

Variable	Reference Entity	Non-Reference Entity	Test of Differences
Bankruptcy in 1-year	0	5	
Total Observations	24	54	
Percentage	0.00%	9.26%	-2.33**
Bankruptcy in 2-years	2	9	
Total Observations	22	52	
Percentage	9.09%	17.31%	1.00

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

Notes: The sample consists of 83 distressed exchanges (DE) completed between January 2004 and December 2011. A firm is classified as a *Reference Entity* if it has an outstanding single name CDS contract with spread quotes available in the 6-months preceding the DE completion date. The table reports the number of firms filed for bankruptcy during one-year and two-year post DE periods. Bankruptcy in one-year and two-year sub-samples include DEs conducted during 2004 - 2010 and 2004 - 2009 periods, respectively. "Test of Differences" column reports t-values from a t-test assuming unequal variances.

In sum, the results of this section reveal that empty creditors do not limit the ability of firms to remedy their distress when firms' debt structure allows them to restructure more junior debt.

1.5 Discussion

Several issues arise in the context of our analysis. All but one of these issues relates to the likelihood of empty creditor resistance. The remaining issue relates to endogeneity. In this section, we discuss these issues and how they relate to our analysis.

1.5.1 Credit Event Trigger

The incentive for empty creditors to resist DEs arises because resistance increases the probability that the debtor would experience a credit event triggering payoffs on their CDS contracts. If the DE itself were to trigger a credit event, there would be no need for empty creditors to resist it. Whether DEs constitute a credit event is therefore critical to identifying empty creditor resistance. As mentioned earlier in section 1.2.1, under ISDA's 2003 Modified Restructuring (Mod-R) clause, a debt restructuring is defined as one where a firm in financial

distress engages in one or a combination of the following actions to improve its creditworthiness - principal reduction, coupon reduction, maturity extension, or a change in subordination. Furthermore, the restructuring is considered a credit event only if the terms on an *existing* bond or loan (same CUSIP identifier) are changed and the changes are voluntary and binding on all holders of the obligation. Under Mod-R, DEs would not qualify as a credit event because the firm issues *new* claims to tendering bondholders even if non-tendering claims were subordinated to the tendered claims. In 2009, ISDA eliminated the Mod-R clause altogether as part of its Big Bang Protocol and formally recognized formally that DEs do not constitute a credit event. Altman and Karlin (2009) confirm that DEs have not triggered a credit event in the corporate market in the last decade. Thus, over our entire sample period, DEs would not have triggered a credit event and empty creditors would have faced incentives to resist the DE to try and push the firm to experience a credit event.[18]

1.5.2 Counterparty Risk

The majority of the DEs in our sample – 72% of DEs by reference entities and 66% of DEs by the non-reference entities – were conducted during the 2008-09 period. This period coincides with the financial crisis of 2008 where concerns over the ability of major financial institutions to fulfill their contractual obligations increased counterparty risk. It is conceivable therefore that empty creditors, worried about the ability of their counterparties to pay out on their CDS contracts in the event the debtor defaults, would be more likely to participate in, and less likely to resist DEs. If increased counterparty risk caused empty creditors to lower their resistance to DEs, then we should not find a difference in the way reference and non-reference entities execute their DEs. Moreover, we should not expect firms with a junior cushion to respond differently to

[18] Section 1.5.5 investigates the influence of the Big Bang Protocol on the restructuring of distressed debt by the reference entities.

empty creditors when compared to firms without a junior cushion. Our finding that reference entities disproportionately restructure junior debt suggests that concerns over counterparty risk were not adequate enough to cause them to ignore the potential for empty creditors to resist their DEs, perhaps because debtors could not ascertain for sure whether empty creditors will or will not resist the DE.[19]

1.5.3 Counterparty Intervention

It is also conceivable that counterparties (CDS protection sellers) purchase debt claims from empty creditors to preempt having to pay out on the CDS contract. Such a scenario would arise if the purchase price were to be lower than the CDS payout in the event of default. If protection sellers were to purchase empty creditor debt, reference entity DEs would not be associated with empty creditor resistance. Although this is a theoretical possibility, there is no evidence that protection sellers settle in this manner (see Bolton and Oehmke, 2011 pp. 33). Furthermore, it is unclear whether under the current disclosure regime, debtors would know of such a settlement between the creditor and the CDS protection seller. Our analysis is predicated on the possibility of empty creditor resistance. Given the uncertainty over whether empty creditors have settled with their counterparties or not, this possibility still exists, and our analysis indicates that debtors respond to this possibility.

1.5.4 Junior Creditors

In our analysis, we identify empty creditor resistance as being associated with the senior unsecured class because the CDS in our sample reference senior unsecured debt. It is possible that empty creditor resistance is also associated with the junior class (in an admittedly derivative manner) if junior creditors purchase CDS protection (that references senior unsecured debt). If

[19] Section 1.5.5 investigates the influence of the financial crisis of 2008 on the restructuring of distressed debt by the reference entities

this were to be the case, then the analysis effectively reduces to the one we conducted on firms without junior debt.

1.5.5 Endogeneity

Our analysis involves a sample of reference entities. Reference entities may be more likely to experience distress than non-reference entities because CDS are more likely to reference marginal credits. The greater propensity for reference entities to experience distress relative to non-reference entities by itself does not affect our analysis, because our analysis is conditioned on firms experiencing distress. However, the possibility that conditional on distress, reference entities could be closer to default than non-reference entities raises endogeneity concerns with our analysis if the distance to default also influences how firms structure their DEs. To control for the distance to default, our analysis relies on book values of financial statement items given that 64% of our sample consists of private firms. A market-based measure of distance-to default would be preferable, but computing such a measure using a structural model of credit risk requires the market value of equity as a key input. In the absence of the market value of equity for a number of our sample observations, we examine the credit spreads observed on reference entities just prior to the DE to determine if the market perceives their distance to default to be different from that of non-reference entities.

Table 2 reports that the mean and median credit spreads for the entire sample of reference and non-reference entities are not statically different. Some of our tests, however, rely on the subsamples of reference and non-reference entities. In this section, we test whether credit spreads are different for reference and non-reference entities within our subsamples. Panel A of Table 11 presents univariate tests of credit spreads differences between reference and non-reference

Table 11 Credit Spreads

Panel A: Univariate Tests

Credit Spreads	Reference N	Reference Mean (Median)	Non-Reference N	Non-Reference Mean (Median)	Test of Differences t-value (z-value)
Firms with Cushion	15	25.71	13	55.39	-1.36
		(21.16)		(31.07)	(-1.11)
Firms without Cushion	10	50.65	16	38.87	0.80
		(41.44)		(30.72)	(0.34)

Panel B: Regression

Explanatory Variables	All Firms I	Firms with Cushion II	Firms without Cushion III
Intercept	-40.10	92.61	-160.18*
	(-0.60)	(1.25)	(-1.94)
Time to Maturity	-3.82*	-1.45	4.03
	(-1.78)	(-0.78)	(1.31)
12-Month Swap Rate	-7.69	-5.95	-24.87***
	(-1.43)	(-1.26)	(-3.27)
Log Assets	12.93	-5.62	0.72
	(1.66)	(-0.67)	(0.06)
Tangibility	70.55	100.46**	98.56
	(1.58)	(2.34)	(1.61)
Industry Q	27.01	-29.64	158.8***
	(1.11)	(-1.10)	(4.48)
CDS Dummy	-30.09	38.78	-7.68
	(-1.34)	(1.54)	(-0.27)
Convertible Dummy	-31.61	-16.42	6.20
	(-1.33)	(-0.52)	(0.22)
Senior Unsecured Dummy	-39.41**	.	-36.31
	(-2.55)	.	(-1.80)
Secured Dummy	-37.77	.	.
	(-1.43)	.	.
Number of Observations	71	26	22
R^2	0.22	0.53	0.72

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

Notes: The table reports the OLS regression results for credit spreads for 71 distressed exchanges (DE) in our sample that have bond prices available one-month prior to the announcement of the DE. When a firm has multiple bonds outstanding, we randomly select a unique bond to represent the firm's credit risk. Credit spread is the difference between the yield-to-maturity of a bond and the maturity matched risk-free rate from the interest rate swap curve. Panel A reports the mean and median credit spreads for firms with cushion (firms with senior unsecured and junior debt) and without cushion (firms with senior unsecured debt but no junior debt). "Test of Differences" column reports t-values from a t-test assuming unequal variances and z-values from the Wilcoxon rank-sum test. Panel B reports the regression results for the credit spreads. *Time to Maturity* is the maturity of the bond in years. *12-Month Swap Rate* is the yearly interest rate swap rate. *Secured, Senior Unsecured, and Convertible Dummies* control for bonds' seniority. See Table 2 for a definition of *Log Assets and Tangibility* variables. The t-statistics in parenthesis reflect White (1980) robust standard errors.

entities both for firms with and without a junior debt cushion. Using the risk-free benchmark derived from interpolating the interest rate swap curve, the mean (median) credit spread is about 26% (21%) for reference entities and about 55% (31%) for non-reference entities with cushion.

Among firms without cushion, the mean (median) credit spread is about 51% (41%) for reference entities and about 39% (31%) for non-reference entities. The credit spreads are not statistically different in either subsample, indicating that the level of distress is no different for reference and non-reference entities[20].

To control for the effects of bond, firm, and industry characteristics on credit spreads, we run OLS regressions of credit spreads based on the swap curve with White (1980) robust standard errors using the full sample and subsamples of firms with and without a junior debt cushion. [21] Panel B of Table 11 presents these results. The CDS Dummy is insignificant in all specifications, indicating that the market's estimate of the distance to default as proxied by credit risk is not statistically different between reference and non-reference entities. These results from the market price of credit risk indicate that endogeneity issues due to greater expected probability of distress for the reference entities are unlikely to detract from our analysis.

The concerns over endogeneity may also arise due to unobservable firm characteristics other than credit quality. An instrumental variable regression methodology could account for possible endogeneity issues, but the small sample size and/or the distressed status of our sample firms make this approach difficult to implement[22]. In order to explore whether the restructuring

[20] Appendix B reports the differences in credit spreads for reference and non-reference entities by randomly selecting only senior unsecured bonds. Appendix B also reports the comparison of weighted average spreads where the weights are the bonds' issue size weights. The results show that the market measure of risk is not significantly different across the reference and non-reference entities.

[21] The results are not sensitive to the choice of risk-free benchmark rate used to calculate the credit spreads.

[22] Appendix C shows that a strong instrumental variable used in the CDS literature is insignificant in determining the probability of a distressed firm having CDS.

behavior indeed depends on the empty creditor resistance, we use the Big Bang Protocol and the financial crisis of 2008 as natural experiments.

We first use the initiation of the Big Bang Protocol by the International Swaps and Derivatives Association (ISDA) on April 8, 2009 as a natural experiment. As we discuss in section 1.2.1, an out-of-court restructuring was formally excluded from the ISDA protocols as a credit event after the initiation of the Big Bang Protocol. Therefore, if CDS can influence the restructuring of distressed debt, reference entities should be able to restructure even a smaller portion of their debt after the initiation of the Big Bang Protocol[23].

Table 12 reports the regression results where the dependent variable is total debt restructured divided by total debt outstanding. We control for the same independent variables used in Table 5. The Big Bang Dummy variable equals 1 if the DE is conducted after April 8, 2009, and 0 otherwise. The variable of interest is the interaction of CDS Dummy and the Big Bang Dummy. If empty creditors resist more after the initiation of the Big Bang Protocol, we would expect to see a negative and significant interaction term.

Regression I shows that the coefficient on the interaction term is -0.17 and close to being significant (t-value = -1.62; p-value = 0.106). While its sign is consistent with the prediction of empty creditor resistance, it lacks significance. This may be because the initiation of the Big Bang Protocol coincides with the end of the financial crisis of 2008 – a period of high counterparty risk. We discuss the relevance of the counterparty risk in section 1.5.2.

Briefly, the financial health of the counterparty is an important determinant of the empty creditors' incentives to hold out in a DE since the counterparty promises to cover for the empty creditors' losses in case of a credit event. Therefore, as counterparty risk increases, empty

[23] Several authors, including Danis (2012), also use the initiation of the Big Bang Protocol as an experiment in the context of CDS research.

Table 12 Natural Experiments

	Big Bang Protocol		Financial Crisis	
Explanatory Variables	I	II	III	IV
Intercept	-0.14	-0.03	0.08	0.12
	(-1.29)	(-0.16)	(0.78)	(0.78)
EBITDA/Sales	-0.34***	-0.34***	-0.28**	-0.29**
	(-2.88)	(-2.77)	(-2.42)	(-2.45)
Total Debt/Assets	0.08	0.05	0.04	0.03
	(0.74)	(0.46)	(0.45)	(0.31)
Interest Expense/Total Debt	4.27***	3.83***	3.46***	3.40***
	(4.30)	(3.75)	(3.36)	(3.23)
Cash/Total Debt	0.27	0.29	0.26	0.25
	(0.76)	(0.81)	(0.80)	(0.77)
CDS Dummy	-0.01	(0.00)	-0.26***	-0.26***
	(-0.10)	(-0.06)	(-3.15)	(-3.19)
Big Bang Dummy	0.07	0.04		-0.02
	(0.94)	(0.39)		(-0.29)
CDS Dummy x Big Bang Dummy	-0.17	-0.18*		
	(-1.62)	(-1.72)		
LIBOR-OIS spread		-0.06	-0.16**	-0.17**
		(-0.96)	(-2.46)	(-2.14)
CDS Dummy x LIBOR-OIS spread			0.26***	0.26***
			(2.94)	(2.92)
Number of Observations	83	83	83	83
R^2	0.37	0.38	0.41	0.42

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

Notes: The table reports the restructuring regression results for a sample of 83 distressed exchanges (DE) completed between January 2004 and December 2011. The dependent variable is the amount of debt restructured divided by total debt. A firm is classified as a *Reference Entity* if it has an outstanding single name CDS contract with spread quotes available in the 6-months preceding the DE completion date. *CDS Dummy* equals 1 if the firm is a reference entity, and 0 otherwise. *Big Bang Dummy* equals 1 if the DE is conducted after April 8, 2009, and 0 otherwise. *LIBOR-OIS spread* is the spread in percentages. All other variable definitions are provided in Table 2. The t-statistics in parenthesis reflect White (1980) robust standard errors.

creditor resistance should decline and reference entities should be able to restructure more of their debt. Given that high counterparty risk and the initiation of the Big Bang Protocol have opposite effect on empty creditor resistance, we control for the counterparty risk and investigate the sign and significance of the interaction term between the CDS and Big Bang dummies.

We use LIBOR-OIS spread to proxy for the financial health of the banking system. Figure 1 reports the historical LIBOR-OIS spreads downloaded from Bloomberg. A higher spread indicates that the health of the banking system is lower.

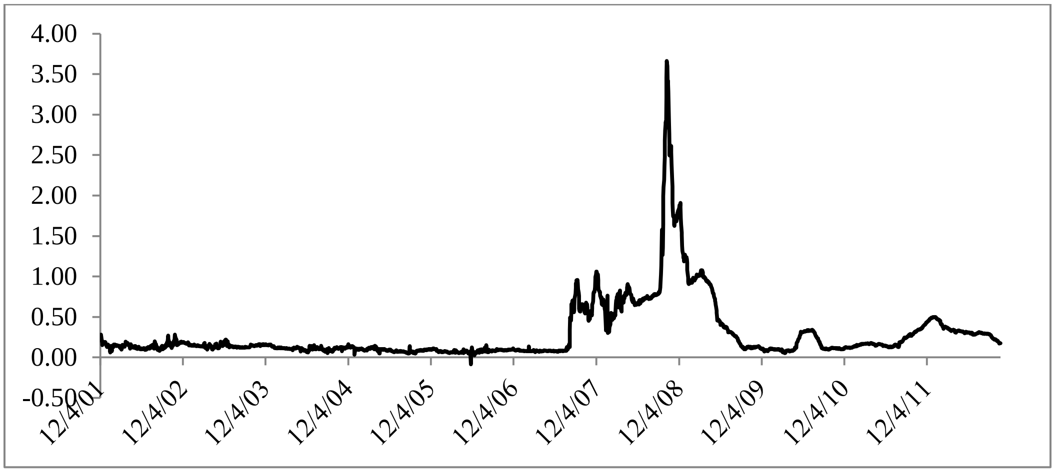

Figure 1 LIBOR-OIS Spread

Notes: This figure shows the historical LIBOR-OIS spreads. The horizontal axis reports the dates and the vertical axis reports the spreads in percentages. The spread data is from Bloomberg.

Regression II of Table 12 reports that, controlling for the counterparty risk, the coefficient on the interaction term is -0.18 and it attains significance. The analysis of the Big Bang Protocol provides support for the influence of CDS on debt restructuring.

We also use the financial crisis of 2008 as a natural experiment. As explained earlier, the influence of empty creditors might be lower when the counterparty risk is high – when LIBOR-OIS spread is high. Hence, in a regression of total debt restructured divided by total debt, the interaction term between the CDS Dummy and LIBOR-OIS is expected to be positive and significant.

Regression III of Table 12 reports the findings. The variable of interest is the interaction of CDS dummy with LIBOR-OIS spread variable. The interaction term is 0.26 and significant.

Regression IV of Table 12 shows that the results are robust to the control of the initiation of the Big Bang Protocol. This provides evidence that reference entities might be able to restructure relatively more of their debt when the counterparty risk is high, providing support for the influence of CDS on debt restructuring.

1.6 Summary

Empty creditors – joint holders of a firm's bonds and CDS – prefer that a distressed firm default rather than restructure its debt out-of-court. This is because a default would trigger payments on their CDS contracts and make them whole while an out-of-court restructuring would write down the value of their debt. This preference for default incentivizes them to resist out-of-court restructurings. In this paper, we present evidence that, when their debt structure permits, debtors respond to the potential for empty creditors to resist in a DE and successfully restructure their debt.

We show that reference entities disproportionately restructure debt that is junior to the empty creditor debt, and that they pay such junior bondholders more to tender in the DE, relative to non-reference entities. Executing DEs in this manner allows reference entities to reduce their debt and achieve the same level of distress relief as non-reference entities. When they do not have debt junior to the empty creditor debt, reference entities restructure empty creditor debt to a smaller extent by paying them more to tender in the DE, relative to non-reference entities. While restructuring debt in this fashion allows reference entities to successfully restructure debt out-of-court, it does limit their ability to reduce their debt. Our findings imply that accounting for debtors' response to empty creditor incentives is critical to understanding the influence of CDS on distress resolution.

CHAPTER 2: CDS EXPOSURE AND CREDIT SPREADS

2.1 Introduction

Financially distressed debtors often renegotiate with their creditors to restructure debt and avoid default (e.g., bankruptcy, liquidation)[24]. In a frictionless world, such ex-post renegotiations are costless and do not entail a loss in value, and hence, do not influence ex-ante debt values. As Hart and Moore (1994, 1998) show, strategic actions by debtors and creditors introduce frictions in debt renegotiations and affect debt values. Furthermore, Anderson and Sundaresan (1996) and Fan and Sundaresan (2000) show that the influence of such frictions in debt values depends on the stakeholders' relative bargaining power. The rapid development of the credit default swaps (CDS) market over the last decade has allowed creditors to hedge their economic exposure to the firm through CDS contracts. Bolton and Oehmke (2011) theoretically show that when creditors hedge with CDS, their bargaining power in debt renegotiations increases as CDS contracts provide insurance against default while allowing creditors to maintain their control rights[25]. In this paper, we analyze bonds' credit spreads – the default risk component of bond yields – to investigate whether creditors' CDS exposure creates renegotiation frictions, and if so when these frictions are more pronounced.

Davydenko and Strebuleav (2007) show that credit spreads reflect the strategic actions of debtors and creditors through a bargaining in renegotiation effect on expected recovery rates, and a strategic default effect associated with the debtor's endogenous default decision. CDS contracts may influence both of these channels by making creditors with CDS – as Bolton and Oehmke (2011, p. 2648) state – "…a tougher counterparty in [debt] renegotiations…"

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[24] Economically viable but financially distressed firms restructure their claims through private renegotiations as default imposes greater resolution costs (e.g., Bris, Welch, and Zhu, 2006).

[25] See section 2.2.1 for a discussion of events (types of default) that may trigger payment on CDS contracts.

CDS may influence bargaining in renegotiations because tougher creditors may be reluctant to renegotiate their debt, making default more likely. Creditors hedged with CDS, however, would be reluctant to make concessions in renegotiations since CDS contracts promise them full recovery in default. Lubben (2007) and Hu and Black (2008 a,b) argue that creditors hedged with CDS may be indifferent to a distressed firm's survival and raise the probability of default. Bolton and Oehmke (2011) theoretically show that empty creditors may create inefficiencies in debt renegotiations since creditors will over-insure in equilibrium and resist out-of-court restructurings even if their resistance is priced in CDS spreads. Hence, creditors' CDS exposure may increase credit spreads by raising the costs of inefficient renegotiation.

Bolton and Oehmke (2011) also argue that tougher creditors may deter strategic default, reducing credit spreads. In a strategic default, the prospects of debt reduction through renegotiations give the debtor incentive to behave opportunistically and demand concessions from creditors even though the debtor possesses the resources to make payment on its obligations (e.g., Hart and Moore, 1994, 1998; Anderson and Sundaresan, 1996; Fan and Sundaresan, 2000; Favara, Schroth, and Valta, 2012). Given that only the debtor observes the true realized returns and the liquidity of the firm, creditors with lower bargaining power would agree to concessions through renegotiations knowing that the pay-off would be even lower had the claims been restructured in default. In this situation, creditors' CDS exposure may strengthen creditors hand in renegotiations by ensuring full recovery in default, and allow creditors to deter strategic default.

We follow the empirical framework of Davydenko and Strebuleav (2007) and analyze bond credit spreads to investigate the net effect of creditors' CDS exposure on debt renegotiations: whether the costs of inefficient renegotiations or the benefits of deterring strategic default

dominate in equilibrium. Creditors may influence the restructuring choice *only* if a substantial portion of their economic exposure to risk is hedged with CDS contracts. Therefore, having a CDS contract is necessary but not sufficient to affect the bargaining dynamics. We use the amount of CDS contracts outstanding (net notional) per dollar of total debt as a proxy for creditors' CDS exposure[26]. The analysis period is from October 2008 to December 2010 as the net notional is available weekly since October 2008. The sample consists of plain vanilla senior unsecured bonds issued by investment grade industrial U.S. firms with outstanding CDS contracts. Senior unsecured bonds are the most common CDS reference obligations and a sample of investment grade firms allows for extracting small variations in credit spreads due to the strategic actions of stakeholders.[27]

We find that CDS exposure is positively related with credit spreads after controlling for credit risk. This finding implies that the costs of inefficient renegotiations outweigh the benefits of deterring strategic default. Since the average CDS exposure of creditors in our sample is 22.35% with a standard deviation of 27.58%, a one standard deviation increase in CDS exposure is associated with a 20.83 bps increase in the credit spreads. While this impact seems to be small as Schultz (2001) reports that the round trip transaction cost in the corporate bond markets is around 27 bps, our results show that CDS may impose significant economic costs if creditors over-insure (i.e., CDS exposure greater than 100%), as Bolton and Oehmke (2011) suggest. The results are robust to the inclusion of other strategic behavior proxies, implying that CDS create

[26] Net notional is the net amount of CDS written on a firm. We also use net notional divided by the CDS reference debt as a proxy for CDS exposure. See section 2.3.2.3 for the details.
[27] See section 2.3.1 for the details.

additional renegotiation frictions. We also control for bond liquidity, simultaneity between credit spreads and CDS exposure, measurement error in our CDS exposure proxy, and endogeneity issues, and replicate our analysis using alternative dependent and independent variables, but the results do not change.

We also investigate when these renegotiation frictions are more pronounced. Davydenko and Strebuleav (2007) show that firms with higher liquidation costs would face greater losses in default as the recovery rates for these firms would be lower. Moreover, because creditors face a threat of lower recovery in default, higher liquidation costs would also increase the debtors' incentives to strategically default. When liquidation costs are higher, creditors' CDS exposure affects these two channels in opposite directions. CDS exposure may deter strategic default, and therefore, creditors' CDS exposure should decrease credit spreads as liquidation costs increase. On the other hand, if tougher creditors make default more likely and higher liquidation costs result in lower recovery rates in default, then creditors' CDS exposure should decrease the underlying bonds' expected recovery and increase the credit spreads. We find that CDS exposure increases credit spreads as liquidation costs rise. Hence, the costs of inefficient renegotiations are more pronounced when liquidation costs are higher.

Davydenko and Strebuleav (2007) also show that strategic default becomes more likely if debtors have greater bargaining power. If creditors' CDS exposure help deter strategic default by making them a tougher counterparty in renegotiations, we would expect to see the benefit of CDS exposure to be more pronounced as the debtor bargaining power is higher. In addition, debtors with higher bargaining power may extract more from creditors in renegotiations and

reduce creditor recoveries. If CDS make creditors a tougher counterparty in renegotiations and increase their recoveries, creditors' CDS exposure should reduce credit spreads more so when debtor bargaining power is higher. We find that CDS exposure indeed reduces credit spreads as debtor bargaining power increases.

This paper contributes to the literature in various ways. First, it shows that CDS contracts may create renegotiation frictions in addition to the existing ones reported by Davydenko and Strebuleav (2007). Second, this paper adds to a growing body of literature that examines the impact of CDS on the underlying corporations. While Peristiani and Sarino (2011), Danis (2012), and Subrahmanyam, Tang, and Wang (2012) provide evidence supporting that CDS may create inefficiencies in renegotiations, Mengle (2009) and Bedendo, Catchcart, and Jahel (2012) find that CDS do not influence renegotiations. We show that ex-ante credit spreads reflect the costs of inefficient renegotiations. Finally, our paper has implications for the influence of CDS on the cost of debt financing. Ashcraft and Santos (2009) fail to find evidence that CDS trading lowers the cost of debt financing. Their findings suggest that CDS activity has adversely affected the financing costs of riskier and informationally opaque firms. This study provides some evidence that CDS may increase a firm's cost of debt as we show that creditors' CDS exposure increases bond credit spreads.

The remainder of the paper is organized as follows. Section 2.2 gives a tour of the CDS literature pertaining to corporate distress and develops the hypotheses. Section 2.3 explains the data, sample selection, and empirical design. Section 4 discusses the results. Section 2.5 reports the robustness tests. Finally, section 2.6 summarizes the results.

2.2 CDS, Literature Review, and Hypothesis Development

2.2.1 CDS Contracts

CDS is an innovative instrument that allows transferring credit risk from one party to another. A single name CDS contract promises the protection buyer full recovery on the reference obligation if a credit event occurs. In return for protection, the CDS buyer makes fixed payments to the protection seller generally in quarterly installments. The annual fee for the protection is called the CDS spread. The protection seller (counterparty) receives the spread and pays out the losses of insured creditors only if a credit event occurs. CDS can be settled physically or in cash. In a physical settlement, the buyers of protection deliver one of the qualified obligations and receive the par value of the bond. In a cash settlement, on the other hand, the protection buyer receives the difference between the par and the market value of the underlying obligation[28]. Given that the secondary market for distressed bonds is relatively illiquid, higher demand for the underlying bonds following a credit event may distort bond prices in a physical delivery. Hence, cash settlement has been the preferred method of delivery in the recent years. CDS contracts primarily follow the International Swaps and Derivatives Association (ISDA) protocols.

When a credit event occurs, either the protection buyer or seller notifies the ISDA Determination Committee for evaluating the event. The 2003 ISDA Credit Derivatives Definitions define six broad credit events: bankruptcy, failure to pay, obligation acceleration, obligation default, repudiation/moratorium, and restructuring. Among these events, the restructuring clause has received considerable attention as it pertains to the preservation of

[28] Because bonds in the same seniority class may have different prices, in a physical settlement the CDS buyer has the option to deliver the cheapest bond in the class to the seller. In a cash settlement, the cheapest-to-deliver equivalent price is used to determine the market price of the reference obligation.

economic value. The definition of a restructuring event is rather ambiguous. In a restructuring event, the reference entity renegotiates some or all of its debt with its creditors, and it is often not clear whether a voluntary debt restructuring constitutes a credit event. In a voluntary restructuring, renegotiations may involve exchanging and altering the terms of multiple securities and, in some cases, may benefit the creditors. ISDA reduced this ambiguity in the spring of 2009 as the new protocol does not recognize restructuring as a credit event. According to Altman and Karlin (2009), none of the distressed restructurings constituted a credit event prior to 2009 and in the recent years. Bolton and Oehmke (2011) also state that the standard practice in the CDS market does not consider out-of-court restructuring (e.g., exchange offer, distressed exchanges) as a credit event. Hence, reference entities may restructure the underlying obligations, or alternatively failure to meet the contractual obligations triggers a CDS payment.

2.2.2 Literature Review

Legal scholars Henry Hu and Bernard Black were the first to identify the possible conflict between hedged creditors and the debtor. In a series of papers (Hu and Black, 2006a, 2006b, 2007, 2008a, 2008b) the authors propose that CDS contracts unbundle the ownership and cash flow rights, and this separation alters hedged creditor's incentives in debt contracting. Hedging with CDS contracts lowers creditor's economic exposure to the firm while still maintaining the right to participate in distressed debt renegotiations that affect the going concern value of the firm. In this case, creditors who hold both the underlying obligation and the CDS contract – empty creditors as named by Hu and Black – may be indifferent to the firm's survival and reluctant to engage in value-enhancing behavior if a firm is in distress. This is a result of empty creditors' resistance to participate in out-of-court renegotiations. While out-of-court renegotiations would require empty creditors to make concessions, they would receive full

recovery in default (e.g., bankruptcy, liquidation) from their CDS contracts. Therefore, while an economically viable but financially distressed firm would be better off by restructuring the distressed debt through out-of-court renegotiations, empty creditors may resist such renegotiations in order to benefit from their CDS contracts. The empty creditor hypothesis suggests that in the extreme case, over-insured creditors may even push economically feasible firms into costly bankruptcy by making renegotiations harder, and eliminate efficient restructuring.

A research note published by ISDA (Mengle, 2009) questions the validity of empty creditor hypothesis. Mengle (2009) reports no difference in the proportion of firms conducting out-of-court restructurings relative to filing for bankruptcy across firms with and without CDS. Bedendo, Cathcart, and El-Jahel (2012) support Mengle's findings. Contrary to the empty creditor hypothesis, the authors find no evidence for increased probability of filing for bankruptcy in the presence of CDS. They show that other precipitating factors such as leverage and short-term debt ratios determine the choice of restructuring method.

Given severe holdout problems in restructuring public debt, out-of-court restructuring of public debt take the form of a distressed exchange (Gilson, John, and Lang, 1990). Narayanan and Uzmanoglu (2012) study how firms design distressed exchanges so that they avoid possible resistance posed by empty creditors. They show that firms with CDS contract around hedged creditors by restructuring debt held by other creditors. Danis (2012) analyzes distressed exchange participation rates and shows that creditors in firms with CDS participate less in restructurings – also providing support for the economic role of CDS in distressed debt workouts. Subrahmanyam, Tang, and Wang (2012) study the propensity of credit rating downgrade and the probability of bankruptcy at CDS inception. They find that firms' credit risk

increases after the inception of CDS trading. They argue that the increased credit risk is due to the reluctance of empty creditors to restructure debt. Peristiani and Sarino (2011) report a significant correlation between corporate distress and CDS in the recent years. They use a linear probability model as a proxy for CDS exposure to explain implied default rates. Utilizing a hazard model and Merton's contingent claims method, the authors find that firms with CDS had a greater probability of default during 2008.

On the other hand, CDS may provide benefits to creditors. Hedged creditors have stronger bargaining power in negotiations that may enhance their ability to extract greater concessions in renegotiations. Greater creditor control may also deter debtors from behaving opportunistically. In their theoretical framework, Bolton and Oehmke (2011) show that stronger creditors may reduce the probability of strategic default by tilting bargaining power from debtors to creditors.

In this paper, we analyze whether CDS may create renegotiation frictions by altering the balance of bargaining power between debtors and creditors. By analyzing credit risk component of bond yields, we provide evidence on the economic role of CDS in debt renegotiations. Our findings join the literature that conjectures both the costs and benefits associated with CDS contracts.

2.2.3 Hypothesis Development

Creditors' ability to influence debt renegotiations depends on their relative bargaining power. In order for CDS to present renegotiation frictions, creditors should hedge a significant portion of their economic exposure to default risk in the CDS market. Therefore, the variable of interest is not simply a dummy variable indicating whether hedged creditors exist; it is rather a CDS exposure measure that proxies the proportion of creditors that also hold CDS contracts.

Davydenko and Strebuleav (2007) show that the strategic actions may affect credit spreads. If greater CDS exposure alters the balance of bargaining power between the debtor and creditors, the credit spreads should react in predictable ways. The following sections discuss these predictions.

2.2.3.1 The net effect: costs vs. benefits

Davydenko and Strebuleav (2007) identify two channels through which strategic behavior may influence credit spreads: bargaining in renegotiations and strategic default decision. As explained earlier, out-of-court renegotiations in the presence of creditors with CDS become harder – making costly default more likely.[29] In this case, higher CDS exposure should increase credit spreads because renegotiation frictions increase the probability of default and reduce the expected recoveries.

On the other hand, Davydenko and Strebuleav (2007) show that the prospects of a strategic default increase credit spreads. In a strategic default, the debtor behaves opportunistically and demand concessions from creditors even though the debtor possesses the resources to make payment on its obligations. This is because the prospects of debt reduction through renegotiations give debtors incentives to threaten creditors with default (e.g., Hart and Moore, 1994, 1998; Anderson and Sundaresan, 1996; Fan and Sundaresan, 2000; Favara, Schroth, and Valta, 2012). Creditors with lower bargaining power would agree to make concessions knowing that the pay-off would be even lower had the claims been restructured through default (e.g., bankruptcy, liquidation). In this case, CDS exposure may strengthen creditors' hand in renegotiations by ensuring full recovery in default, and benefit creditors by allowing them to

[29] Because default triggers payment on the CDS contracts, creditors with CDS become ordinary creditors after a firm is in default.

deter strategic default. Hence, credit spreads should decrease as creditors' CDS exposure increases.

This section shows that the net effect of CDS exposure on credit spreads is an empirical question. The following two sections develop a framework to study when the effects of CDS exposure on credit spreads are more pronounced.

2.2.3.2 Liquidation cost

In this section, we discuss the influence of CDS exposure on credit spreads when liquidation costs are higher. According to Davydenko and Strebuleav (2007), liquidation costs may affect credit spreads in two opposing ways.

First, creditors of firms with higher liquidation costs face greater losses in default since the recovery rates in default would be lower for these firms. If creditors' CDS exposure creates renegotiation frictions and increases the probability of default, then the expected bond recoveries should decline. Hence, creditors' CDS exposure should increase credit spreads more so as liquidation costs increase.

Second, because creditors face a threat of lower recovery in default, higher liquidation costs also increase the debtors' incentives to strategically default. Expecting a lower recovery in default (due to high liquidation costs), creditors would be less likely to call debtors' bluff for strategic default. In this case, creditors' CDS exposure should strengthen creditors' bargaining power, decrease the probability of strategic default, and therefore decrease credit spreads as liquidation costs increase.

Therefore, the net effect of creditors' CDS exposure on credit spreads when liquidation costs are higher is an empirical question.

2.2.3.3 Debtor bargaining power

In this section, we discuss how creditors' CDS exposure may influence credit spreads when debtor bargaining power is higher. Davydenko and Strebuleav (2007) explain how debtor bargaining power may affect credit spreads.

First, strategic default becomes more likely if debtors have greater bargaining power. In this case, if creditors' CDS exposure increases creditors' bargaining power, higher CDS exposure should lower the incidence of strategic default, and this effect should be more pronounced when debtors have greater bargaining power. Hence, we expect that creditor's CDS exposure reduce credit spreads more so as debtor bargaining power increases.

Second, creditors gain less from renegotiations when debtors are stronger. Hence, credit spreads increase when debtor bargaining power is higher. If CDS increase creditors' bargaining power, then creditors' CDS exposure should benefit them more when debtor bargaining power is higher – lowering credit spreads.

Therefore, we expect that creditors' CDS exposure will decrease credit spreads more so when debtor bargaining power is higher.

2.3 Data, Sample Selection, and Empirical Design

2.3.1 Data and Sample Selection

CDS exposure is the key variable of interest in this study. We use the amount of net notional outstanding divided by total debt as a proxy for CDS exposure[30]. The net notional data is available in weekly periodicity since October 2008, marking the start of the study period. The study period ends in December 2010 due to the availability of financial data.

[30] See section 2.3.2.3 for a detailed definition and source of the net notional data.

The majority of CDS contracts reference to a senior unsecured bond class[31]. We also confirm the reference class by taking a sample of 100 randomly selected CDS reference obligations from the Markit's Reference Entity Database (RED) Codes and identifying their seniority[32]. Therefore, the bond universe of interest is the senior unsecured bonds[33]. We download the bond data from Bloomberg.

We screen the senior unsecured bond universe to include only fixed and zero coupon bonds with no embedded options (plain vanilla bonds), keep only USD denominated bonds issued in the U.S., and exclude bonds issued by financial firms[34]. This filter results in 1,787 unique bonds and 343 unique firms by the ultimate parent. Focusing on plain vanilla bonds reduces the complications in spread estimations due to embedded options and/or variable coupon securities. We remove the financial firms since their capital structure and method of debt renegotiations are relatively different from those of industrial firms.

We are able to match CRSP identification number (PERMNO) and COMPUSTAT identification number (GVKEY) for 296 firms out of 343 unique firms in the bond sample. The financial information and S&P long-term issuer ratings come from COMPUSTAT, the historical stock prices are downloaded from CRSP, and bond details are from Bloomberg.

We use weekly historical z-spreads from Bloomberg as a measure of credit spreads to match the periodicity of the net notional data. We use z-spreads because Davydenko and Strebuleav (2007) show that z-spreads take into account the term structure of benchmark interest rates and

[31] According to Bloomberg and Credit Market Analysis (CMA) data sources.
[32] We confirm the reference obligation class via Bloomberg that uses the RED Pair Codes for identification. RED Codes can also be viewed on Bloomberg.
[33] Bloomberg collateral criteria used for senior unsecured class is "Sr Unsecured" or "Company Guaranteed".
[34] Financial industry is excluded from the search results using Global Industry Classification Standard (GICS).

hence they are more appropriate in measuring credit risk than the nominal spreads. We only use TRACE as the pricing source to ensure that the price used in spread calculations is from an actual transaction[35].

We identify the firms with outstanding CDS contracts using the CDS ticker symbols from Bloomberg. Bloomberg reports the universe of RED Code matched reference firms under *CDSD* function. RED codes link the underlying CDS reference obligations with the CDS contracts and they are widely used as a standard identifier among traders to electronically match and confirm CDS transactions. We confirm that all of the U.S. reference entities from the Depository Trust and Clearing Corporation (DTCC)'s most actively traded 1,000 reference entities list are available in the Bloomberg CDS reference entity ticker database. We match the bond issuers and the CDS reference entities at the ultimate parent level. A firm's bonds are aggregated under the ultimate parent *only* if the two firms are associated prior to October 2008 and the ultimate parent is also the guarantor[36]. This procedure ensures that bonds' credit spreads reflect the default risk and strategic behavior associated with the underlying firm characteristics.

The senior unsecured bond sample consists of 296 unique firms that contribute 42,269 weekly spread quotes during the period from October 2008 to December 2010. We further filter the senior unsecured bond sample to obtain a cleaner and unified data set.

We include a firm in the sample if it has a CDS contract outstanding. This study focuses on firms with CDS because our hypotheses depend on CDS exposure, which is conditional on a firm having an outstanding CDS. In addition, around 95% of the firms in our senior unsecured bond sample have CDS contracts. The heavy representation of the CDS firms in our sample does not allow for a comparison between CDS and non-CDS firms.

[35] Other pricing sources that we have access to (e.g., BGN, BFV, and BVAL) are matrix prices that may bias the spreads calculations.
[36] We confirm the guarantor information by using the bond and CDS tickers of the parent and the subsidiary.

We drop bonds with remaining maturities less than 1 or more than 30 years as of the trade date to reduce the noise in credit spread calculations. As Davydenko and Strebuleav (2007) mention, small price measurement errors may result in large credit spread deviations for bonds with very short maturities. The spread estimates for bond maturities greater than 30-years is also problematic because of the difficulty with finding a benchmark risk-free rate with an identical maturity.

We eliminate the financial firms using their SIC codes since the bond screening criterion in Bloomberg is based on GICS industry classification. We also require firms to have stock prices available at least 1 year preceding the trade date. This eliminates any performance bias due to recent IPO firms and allows for calculating asset volatility using equity returns in the past year, which we discuss in section 2.3.2.1.

Finally, we only keep the investment grade firms (credit rating above or equal to BBB-). Analyzing the investment grade firms is motivated by several reasons. First, we would like to focus our analysis on the default component of bond yields and minimize the influence of other frictions, such as liquidity. Chen, Lesmond, and Wei (2007) show that liquidity can explain a lower variation in bond yields for investment grade bonds compared to the speculative grade bonds. Second, Blume, Keim, and Patel (1991) show that high-yield bonds behave like both bonds and stocks. The primary purpose of this study is to capture the influence of CDS from the creditors' perspective as the creditors price the strategic actions of the debtor. A sample of investment grade firms better allows for capturing this sensitive information. Third, because we control for the probability of financial distress by calculating an implied asset volatility measure using Merton's (1974) structural model, our distress measure better fits the investment grade firms. Teixeira (2007) shows that Merton's model performs better in investment grade bonds.

Therefore, analyzing investment grade firms allows us to control for the default component of bond yields more accurately and, as a result, identify the renegotiation frictions associated with CDS exposure.

Table 13 reports that the final sample consists of 26,995 weekly credit spreads provided by 115 firms (123 firm and credit rating combinations). Panel A in Table 13 shows the average credit spreads by each credit rating. Panel A reports that AAA rated bonds have the lowest average credit spread of 90.16 bps. The spreads increase monotonically as ratings get lower with a maximum of 343.41 bps for the BBB rated bonds. The variation in spreads also increases as the ratings decline. The standard deviation of ratings is around 88 bps for AAA and AA rated bonds, whereas BBB rated bonds' credit spreads have a standard deviation of 241 bps. A higher variation in credit spreads for lower rated firms is expected since the heterogeneity among firms' quality increases as the credit ratings decline. Panel B in Table 13 reports the spreads averaged at each firm and credit rating level and shows that the average spreads by firm and credit ratings are higher than those in Panel A.

Consistent with Davydenko and Strebuleav (2007), A and BBB rated firms dominate the sample. Of the 123 firm and credit rating combinations, (115 firms), 4 are AAA, 11 are AA, 41 are A, and 67 are BBB rated. The time-to-maturity for the entire sample is around 11 years, slightly higher than 9.43 years reported by Davydenko and Strebuleav (2007). The credit spreads in our sample are considerably higher than the spreads reported in Davydenko and Strebuleav (2007) that study a period from 1994 to 1999. This is because our sample period from 2008 to 2010 coincides with the end of the financial crisis of 2008. The credit spreads were higher during this period as the industrial firms became riskier while the benchmark risk-free interest rates were close to zero.

Table 13 Credit Spread Distributions

Rating	N	Mean	25%	50%	75%	St. Dev.	Time-to-Maturity
Panel A: Averaged over ratings							
AAA	579	90.16	23.40	73.42	124.29	88.06	11.34
AA	3597	94.49	22.95	85.34	142.19	87.22	10.78
A	10196	194.78	107.57	177.31	262.61	125.11	11.50
BBB	12623	343.41	196.52	284.62	425.19	241.45	11.03
All	26995	248.67	121.47	208.65	322.25	208.21	11.18
Panel B: Averaged over firms and ratings							
AAA	4	139.13	76.25	119.95	202.01	99.08	10.12
AA	11	123.11	80.63	121.44	175.20	68.48	12.35
A	41	210.69	141.51	189.36	237.06	124.70	11.38
BBB	67	398.02	278.99	334.35	403.02	279.64	11.12
All	123	302.57	175.13	257.01	361.69	244.23	11.29

Notes: This table reports the credit spread (z-spread, weekly) distributions by S&P long-term issuer credit ratings for a sample of Bloomberg and CRSP matched U.S. senior unsecured plain vanilla bond universe between October 31, 2008 and December 31, 2010. A bond is included in the sample if it has a maturity of 1- to 30-years as of the trade date, and its issuer is an investment grade non-financial firm with CDS contract outstanding that has stock price available at least within 1-year preceding the trade date. *Time-to-Maturity* is in years. Panels A reports the average credit spreads by each credit rating class. Panels B reports the credit spreads averaged at firm and credit rating level.

2.3.2 Variables

2.3.2.1 Credit risk variables

We mainly use the credit risk variables discussed in Davydenko and Strebuleav (2007). Research in recovery rates also provide guidance on variables that may also influence credit spreads. For instance, Cangemi, Mason, and Pagano (2012) show that asset volatility and discount rate are critical for understanding the dynamics of recovery in default. We closely follow the methodology of Davydenko and Strebuleav (2007) to conduct our empirical tests, and hence, we primarily use their variables.

We use leverage, time-to-maturity, natural log of assets, and asset volatility as the fundamental credit risk variables[37]. Following Davydenko and Strebuleav, we calculate leverage as the ratio of total debt to the market value of assets. Total debt is from COMPUSTAT (*dlc* +

[37] We do not control for the risk-free rate, because our methodology for analyzing credit spreads implicitly accounts for it. As we will discuss in section 2.3.3, we run weekly cross-sectional regressions of credit spreads. Hence, the risk-free rate is the same for all firms in each weekly regression and does not vary across firms.

dltt) and the market value of assets is the sum of market value of equity from CRSP (*prc x shrout*) on the trade date and total debt. Table 14 shows that the mean leverage is 29.13% with a median of 26.42%. Leverage shows considerable variation across firms. Time-to-maturity is in years as of the trade date and the maturity date is from Bloomberg. Table 14 shows that the average maturity of a firm's bonds is 11.29 years and the sample's standard deviation of bond maturity is 5.99 years. Total assets are from COMPUSTAT (*at*). The average firm size is $43.64 billion, almost twice as large as in Davydenko and Strebuleav's sample, confirming that CDS contracts are available for larger firms.

Asset volatility controls for the default risk of a firm. Since asset volatility is not observable, we estimate it using Merton's (1974) structural model following the methodology presented by Bharath and Shumway (2008).

Briefly, Merton (1974) assumes that a firm's value follows a geometric Brownian motion:

$$\frac{dV}{V} = \mu dt + \sigma_V dW \tag{6}$$

where V is the value of firm's assets, μ is the drift term for the entire firm, σ_V is the asset volatility, and dW is a Wiener process. Accordingly, the value of equity can be presented as a call option on the firm:

$$E = VN(d_1) - \exp(-rT)FN(d_2)$$

$$d_1 = \frac{\ln\left(V/F\right) + \left(r + 0.5\sigma_V^2\right)T}{\sigma_V \sqrt{T}} \tag{7}$$

$$d_2 = d_1 - \sigma_V \sqrt{T}$$

Table 14 Variables

	Averaged over Firms and Variables					
Variables	N	Mean	25%	50%	75%	St. Dev.
Distress variables and firm characteristics						
Assets ($ Billions)	115	43.64	9.99	22.93	42.14	84.59
Market value of equity ($ Billions)	115	33.49	6.68	17.65	33.56	50.14
Total debt ($ Billions)	115	13.47	2.56	5.72	10.08	48.56
Leverage (%)	115	29.13	16.58	26.42	40.78	16.91
Asset volatility (%)	115	35.29	27.17	34.73	41.58	11.03
Time-to-maturity (Years)	115	11.29	6.97	10.35	15.49	5.99
Proxies for strategic variables						
Non-fixed assets (%)	115	63.44	44.13	68.32	84.14	23.25
Intangibility (%)	114	59.06	49.72	59.27	67.53	11.16
CEO shareholding (%)	112	0.32	0.04	0.09	0.20	0.95
Managerial shareholding (%)	112	0.51	0.09	0.20	0.40	1.04
CDS Exposure variables						
Net notional ($ Billions)	96	1.36	0.68	1.13	1.85	0.98
Normalized net notional (%)	115	22.35	5.50	12.46	30.31	27.58
Normalized net notional-SU (%)	115	35.37	7.62	18.32	37.46	64.25
Industry distribution						
SIC 1 dummy (%)	115	8.70	0.00	0.00	0.00	28.30
SIC 2 dummy (%)	115	36.52	0.00	0.00	100.00	48.36
SIC 3 dummy (%)	115	20.87	0.00	0.00	0.00	40.82
SIC 4 dummy (%)	115	20.87	0.00	0.00	0.00	40.82
SIC 5 dummy (%)	115	9.57	0.00	0.00	0.00	29.54
SIC 6 dummy (%)	115	0.00	0.00	0.00	0.00	0.00
SIC 7 dummy (%)	115	3.48	0.00	0.00	0.00	18.40
SIC 8 dummy (%)	115	0.00	0.00	0.00	0.00	0.00
SIC 9 dummy (%)	115	0.00	0.00	0.00	0.00	0.00

Notes: This table reports firm characteristics for the sample firms explained in Table 1. *Total debt* is the sum of short- and long-term. *Leverage* is the ratio of total debt to the market value of assets on the trade date. *Asset volatility* is the estimated volatility of a firm inferred from the market value of equity and iteratively solving the structural model of Merton (1974) (see Bharath and Shumway, 2008). *Time-to-Maturity* is the bonds' time-to-maturity in years. *Non-fixed assets* is equal to (1 – Fixed assets/Assets). *Intangibility* is equal to {1 - (Cash and Equivalents + 0.715 x Receivables + 0.547 x Inventories + 0.535 x PP&E)/Assets}. *CEO shareholding* and *Managerial shareholding* are calculated as the number of shares held by the CEO and the aggregate number of shares held by the five highest paid managers divided by the total number of shares outstanding, respectively. *Normalized net notional* is the ratio of net notional divided by total debt. *Normalized net notional-SU* is equal to net notional divided by the total amount of senior unsecured debt. *Normalized net notional* and *Normalized net notional –SU* take a value of 0 if a firm is not included in the Top 1,000 actively traded reference entity list of DTCC (Represents around 11% of the credit spreads). *SIC dummies* are based on the first digit of SIC codes.

where E is the market value of equity, r is the risk-free rate, F is the value of debt, and T is the maturity of debt issue. In this model, all of the variables except for V and σ_V are observed, which renders the application of an iterative approach that simultaneously solves Equation 7 for the missing variables using a starting value of σ_V.

Daily market value of equity (E) is from CRSP (*prc x shrout*), time-to-maturity (T) is one-year and risk-free rate (r) is T-bill rate from Kenneth R. French's web site[38]. The value of debt (F) is an important input to the model as it determines the default point. A firm will default if its asset value goes below this debt level. Crosbie and Bohn (2002) explain that the default point lies between the total debt and short-term debt. This approach gives short-term debt greater importance in the model. Eom, Helwege, and Huang (2004) discuss that this is logical since shorter-term debt is more likely to cause a default. They compare various structural models of default risk and run a sensitivity analysis on the leverage assumptions used in their models. They show that, compared to using total debt as the default point, giving greater weight to short-term debt reduces the estimated spreads, but better fits their data. Vassalou and Xing (2004) also use the same approach in estimating the default point. They argue that long-term debt should have a lower weight in determining the default point because it reduces a firm's default risk by increasing its ability to roll over its short-term debt. Therefore, we also assume that the default point is the sum of short-term debt (COMPUSTAT *dlcq*) and one half of long-term debt (COMPUSTAT 0.5 x *dlttq*). Accordingly, firm value (V) is the sum of E and F.

Following Bharath and Shumway (2008), we take an initial starting value of $\sigma_V = \sigma_E[E/(E + F)]$ where σ_E is the annualized standard deviation of equity returns and solve for V in Equation 7 for every day during the year prior to the trade date. Then, we calculate the asset volatility using the estimated asset values and solve for V in Equation 7 using the asset volatility estimated in the

[38] http://mba.tuck.dartmouth.edu/pages/faculty/ken.french/index.html

second stage. This process is repeated until the asset volatility converges at 0.001 level[39]. Table 14 reports that the average asset volatility for our sample is 35.29% with a median of 34.73%. Asset volatility for our sample is smaller than 56.00% mean and 46.32% median values reported by Bharath and Shumway (2008). This is not surprising as the average market value of equity for their sample is $1.07 billion that is much smaller than $33.49 billion for our sample. Larger firms are likely to have lower asset volatility.

2.3.2.2 Liquidation cost and debtor bargaining power variables

A proxy for the liquidation cost is important for estimating the recovery in default. If liquidation costs are higher, then creditors would expect to have lower recoveries in default. Following Davydenko and Strebuleav (2007), we use non-fixed assets as a proxy for liquidation costs. We calculate non-fixed assets as one minus the ratio of net PP&E (COMPUSTAT *ppent*) to the book value of assets (COMPUSTAT *at*). PP&E represents the tangible assets that tend to have a greater liquidation value. Hence, as PP&E divided by the book value of assets declines, non-fixed assets variable increases, and accordingly liquidation costs rise. Table 14 reports that the average non-fixed assets for our sample firms is 63.44%. In addition, we use a broader proxy for liquidation costs using the tangibility measure developed by Almeida and Campello (2007). Accordingly, we define intangibility as {1 – [Cash and Equivalents (COMPUSTAT *che*) + Receivables (COMPUSTAT *rect*) + 0.547 x Inventories (COMPUSTAT *invt*) + 0.535 x PP&E (COMPUSTAT *ppent*)]/Assets (COMPUSTAT *at*)}. Intangibility measures the proportion of assets that cannot be pledged. As asset pledgeability declines, recovery rates decline, and liquidation costs rise[40]. Table 14 shows that average intangibility is 59.06% with a median value of 59.27%.

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[39] Stop the iteration if $(\sigma_{V(j)} - \sigma_{V(j-1)}) \leq 0.001$ where j is the number of iterations.

[40] Hahn and Lee (2009) also use this intangibility measure in a different context.

Following Davydenko and Strebuleav (2007), we use CEO and managerial shareholding as a proxy for debtor bargaining power. As the managers have greater ownership in the form of stocks, their incentives would be more in line with the shareholders'. The executive compensation data comes from ExecuComp database. Managerial shareholding is the ratio of the aggregate number of shares held by the highest paid five executives to the total number of shares outstanding. Table 14 reports that the average CEO shareholding is 0.32% and the average managerial shareholding is 0.51% for our sample firms. Davydenko and Strebuleav report that the average CEO ownership and managerial ownership for their sample are 0.93% and 1.73%, respectively. Larger size of the firms with CDS contracts may explain the relatively smaller managerial equity ownership reported for our sample. Average book value of assets is $7.81 billion in Davydenko and Strebulaev's sample whereas it is $43.64 billion in our sample.

2.3.2.3 CDS exposure variable

We use net notional as a proxy for the total amount of outstanding CDS contracts for a given firm. Net notional is the net amount of CDS contracts bought by protection buyers on a single name reference entity (firm). This is the aggregate protection bought from all counterparties and hence represents the outstanding dollar amount of credit protection. Net notional data is provided with the courtesy of DTCC and available weekly since October 2008 for the most actively traded 1,000 reference entities. Table 14 reports that the average net notional for our sample firms is $1.36 billion and it is available for 96 out of 115 firms in our sample.

In order to construct a CDS exposure variable, for each firm, we calculate a *Normalized Net Notional* variable as the dollar amount of net notional outstanding for a firm divided by the same firm's total debt outstanding. Normalized net notional variable assumes that all creditors of a firm may have an interest in purchasing a CDS contract. As an alternative CDS exposure

measure, we construct a variable based on the CDS reference debt. Since senior unsecured debt is the most widely used reference obligation as discussed in section 2.3.1, we use the amount of net notional divided by total senior unsecured debt as an alternative CDS exposure variable. We download the debt structure for firms from FactSet. We name this variable *Normalized Net Notional-SU* and replicate the results using this variable as robustness in section 2.5.2.

Given that some firms in our sample does not make into the DTCC's most actively traded 1,000 reference entities list, we assume that normalized net notional is equal to zero when net notional is unavailable. This assumption implies that these firms with missing net notional do not have sufficiently large number of hedged creditors to influence their debtor-creditor relationships. We find that firms with missing net notional are larger and have more leverage than the smallest firm in the DTCC's list. This indicates that normalized net notional for firms with missing net notional is likely to be lower than that of firms with net notional data. For robustness purposes, in section 2.5.4 we replicate the analysis by dropping the observations with missing net notional data and replacing the missing observations with a predicted the net notional.

Table 14 shows that the average normalized net notional is 22.35% with a standard deviation of 27.58%. This indicates that over-insurance at the total debt level is unlikely as three-standard deviation increase in normalized net notional results in 94.63% CDS exposure, still not over 100%. Table 14 shows that the average normalized net notional-SU for our sample is 35.37% with a standard deviation of 64.25%. If senior unsecured creditors are the only creditors purchasing CDS contract, even one standard deviation increase in net notional-SU implies that 99.62% of the amount of outstanding senior unsecured debt may be protected by CDS contracts. Since investors other than the creditors of a firm also purchase CDS contracts and net notional

includes their CDS positions, over insurance at the total debt level seems unlikely, yet senior unsecured creditor class may possibly be over insured in some circumstances.

Table 15 reports a correlation matrix of the variables of interest. CEO shareholding and managerial shareholding show a strong correlation (0.90). Non-fixed assets and intangibility are also strongly correlated with a correlation coefficient of 0.48. Hence, each variable within the liquidation cost and debtor bargaining power categories can be used as a substitute for one another while controlling for slightly different aspects of the economic behavior they measure.

Table 15 Correlation Matrix

	Assets	Asset vol.	Lev.	TTM	Non-fixed assets	Int.	CEO share.	MNGR share.	Norm. net not.
Assets	1								
Asset volatility	-0.17	1							
Leverage	0.22	-0.04	1						
TTM	-0.07	0.03	0.07	1					
Non-fixed assets	0.10	-0.06	-0.01	-0.17	1				
Intangibility	0.03	-0.10	0.23	-0.10	0.48	1			
CEO share.	-0.06	0.01	0.01	0.01	-0.05	-0.09	1		
MNGR share.	-0.11	0.09	0.10	0.03	0.00	-0.08	0.90	1	
Norm. net not.	-0.24	0.22	0.09	0.06	0.08	-0.04	0.00	0.17	1

Notes: This table reports the correlation coefficients between the variables reported in Table 14. *Asset vol., Lev., TTM, Int., CEO share., MNGR share., and Norm. net not.* represent asset volatility, leverage, time-to-maturity, intangibility, CEO shareholding, managerial shareholding, and normalized net notional, respectively. See Table 14 for the variable definitions.

2.3.3 Empirical Methodology

We follow Davydenko and Strebuleav (2007)'s sample selection and empirical methodologies to eliminate the influence of large firms with multiple bonds to the sample and capture the firm level characteristics that contribute to credit spreads in a regression framework.

We construct a regression sample by randomly selecting only one credit spread from each firm in each week during the entire period from October 2008 to December 2010. This approach helps with capturing the firm level effects and reduces the impact of unbalanced nature of the data structure. Table 16 reports the distribution of credit spreads for the randomly selected regression sample.

Panel A in Table 16 shows that there are 9,042 unique spreads in the regression sample. Panel B in Table 16 reports the average spreads at the firm and credit rating levels. The monotonic relationship between the credit ratings and the spreads persists in the regression sample. Table 16 shows that net notional data is available for the majority of the sample: 88.78% of the total number of credit spreads and 82.82% of the firms in the regression sample have net notional data. While the random selection method reduces the influence of firms with multiple bonds outstanding, it creates a noise in credit spread estimations. In addition, it does not allow for making inferences about the cost of funding, as randomly selected bonds may not represent the cost of the entire class of debt. Therefore, we also use a weighted average credit spreads as an alternative dependent variable where the weights represent the issue size of each bond issued by the same firm.[41]

[41] See Section 2.5.1 for the details.

Table 16 Credit Spread Distributions for the Regression Sample

Rating	N	Mean	25%	50%	75%	St. Dev.	Time-to-Maturity	Has Net Notional
Panel A: Averaged over ratings								
AAA	259	106.01	40.01	87.91	140.76	92.03	10.67	58.30%
AA	1038	118.79	50.84	115.47	162.57	95.95	11.30	79.38%
A	3331	181.49	98.30	163.78	240.84	123.31	11.05	93.25%
BBB	4414	364.18	216.17	308.23	441.03	247.71	11.63	89.40%
All	9042	261.31	127.61	217.69	336.19	217.69	11.35	88.78%
Panel B: Averaged over firms and ratings								
AAA	4	138.09	71.76	118.12	204.42	103.42	9.69	50.00%
AA	11	123.84	74.86	116.87	175.20	66.06	12.33	72.73%
A	41	214.35	146.33	194.32	242.71	129.53	11.51	87.49%
BBB	67	400.88	282.72	334.58	403.02	283.04	11.14	83.58%
All	123	305.38	176.16	263.71	366.71	247.27	11.32	82.82%

Notes: This table reports credit spread (z-spread, weekly) distributions by S&P long-term issuer credit ratings for the regression samples. Table 1 provides the details of sample selection. The regression sample is a randomly selected subset of the sample where a firm contributes only one credit spread in each week. *Time-to-Maturity* is in years and *Has Net Notional* is a dummy variable equals to 1 if the firm has net notional data, 0 otherwise. Panel A reports the average credit spreads by credit rating class. Panels B reports the same statistics for credit spreads averaged at firm level and rating level.

Following Davydenko and Strebuleav (2007), we run weekly cross-sectional regressions as in Fama and MacBeth (1973), and report the time series averages of the coefficient estimates with Newey-West adjusted standard errors. This regression approach controls for the time series variation in the coefficient estimates. Alternatively, methods such as random and fixed effects panel regression models, and pooled regression with cluster corrected standard errors and time dummies do not reasonably fit our data structure. Fixed effects model is not appropriate as the majority of firm characteristics of interest are fixed and some explanatory variables have small variation through weeks given the short analysis period. Random effects model would suffer from possible correlation between the explanatory variables and the random part. Finally, the pooled regression approach with time and firm fixed effects is not appropriate because time and firm dummies would reduce the degrees of freedom given the relatively small sample size. Alternatively, using cluster corrected standard errors in a pooled OLS would result in significant efficiency losses due to the long panel data structure (Number of observations in clusters is greater than the number of clusters).

2.3.4 Hypotheses Testing

The hypotheses outlined in section 2.2.3 show that credit spreads reflect both the costs and benefits associated with CDS contracts. Since these effects have inverse signs, the significance and sign of the coefficient estimate on CDS exposure when explaining credit spreads would represent the net effect of CDS exposure on credit spreads. This regression should control for the fundamental credit risk variables, credit ratings, and industry fixed effects to extract the marginal contribution of CDS exposure on the credit spreads. Following cross sectional regression equation is the base model for testing the net effect of CDS on credit spreads:

$$Spread_i = \alpha + x_i^{'}\beta^{Credit} + CDS_i\beta^{CDS} + \varepsilon_i \quad (4)$$

where $Spread_i$ is credit spread on firm i, x_i' is a row vector of credit risk variables including credit rating and industry dummies, β^{Credit} is a column vector of coefficient estimates on the credit risk variables, CDS_i is CDS exposure of firm i, β^{CDS} is the coefficient on CDS exposure, and ε_i is the error term. We report and interpret the time series averages of the individual coefficients from weekly cross sectional regressions with Newey-West adjusted standard errors.

The coefficient estimate on CDS exposure (β^{CDS}) should reflect two counter effects: (1) the costs of inefficient renegotiations – Positive, and (2) the benefits of deterring strategic default – Negative. If the coefficient estimate is significant, then the sign should reveal which effect dominates in practice. On the other hand, an insignificant beta coefficient would mean that CDS exposure is empirically irrelevant.

We use the interaction of CDS exposure with liquidation cost and debtor bargaining power variables to test the liquidation cost and debtor bargaining power predictions. This interaction term captures the influence of CDS exposure as the corresponding interacting variable rises. Using a multiplication of variables (e.g., A x B) as an interaction term and the underlying variables themselves in the same model; however, causes a multi-collinearity problem. Davydenko and Strebuleav (2007) deal with this issue by using one set of variables in the base model and including the interaction of an alternative pair of variables in the same regression. This way the multi-collinearity declines while reserving the multiplicative effect in the model. In our case, however, there is only one measure of CDS exposure[42].

To address this issue, we first run a regression where the interaction term (e.g., A x B) is the dependent variable and components of the interaction term (e.g., A and B) are the explanatory variables, and then use the residual from this model as the interaction term. The residuals are, by

[42] While we use normalized net notional-SU as an alternative proxy for CDS exposure, it primarily varies by the weekly variations in net notional. Hence, normalized net notional and normalized net notional-SU are highly correlated. Using these alternative CDS exposure proxies do not cure the multi-collinearity problem.

definition, orthogonal to the explanatory variables and expected to reduce the multi-collinearity problem in the base regression. Accordingly, the following cross sectional regression summarizes the regression model for testing the liquidation cost and bargaining power hypotheses:

$$Spread_i = \alpha + x_i^{'}\beta^{Credit} + CDS_i\beta^{CDS} + LQ_i\beta^{LQ} + BP_i\beta^{BP} + INT_i\beta^{INT} + \varepsilon_i \qquad (5)$$

where LQ_i is the liquidation cost variable for firm i and β^{LQ} is its coefficient estimate, BP_i is the debtor bargaining power variable for firm i and β^{BP} is its coefficient estimate, INT_i is the residual from the interaction regression of interest and β^{INT} is its coefficient estimate, and ε_i is the error term. We interpret the sign and significance of β^{INT} to test the liquidation cost and debtor bargaining power hypotheses.

2.4 Results

2.4.1 The Net Effect: Costs vs. Benefits

Regression I in Table 17 reports the coefficients for the credit risk variables. This base model controls for the default component of credit spreads.

Consistent with the literature, leverage, asset volatility, and time-to-maturity are all positively, whereas log(assets) is negatively significantly related with credit spreads. The base model fits credit spreads data well as it explains 63.4% of the variability in the credit spreads. Davydenko and Strebuleav (2007) report an R^2 of 32.4% for a similar model explaining credit spreads. We are able to achieve a higher R^2 because, different from Davydenko and Strebuleav (2007), we also control for industry and rating fixed effects that have significant explanatory power.

Table 17 Credit Spread Regressions – Base Model

	Credit Risk Model	The Net Effect			
Variables	I	II	III	IV	V
Intercept	341.182***	133.597***	157.849***	307.219***	130.193**
	(5.85)	(2.83)	(3.08)	(5.33)	(2.36)
Leverage	3.136***	3.115***	3.164***	3.171***	3.185***
	(6.57)	(6.60)	(6.55)	(6.77)	(6.65)
Asset volatility	2.192***	2.138***	2.125***	2.230***	2.122***
	(13.1)	(11.52)	(11.49)	(13.5)	(11.7)
Log(Assets)	-11.639***	-3.779**	-5.540***	-15.102***	-8.702***
	(-5.41)	(-2.26)	(-2.77)	(-5.25)	(-3.10)
Time-to-maturity	4.193***	4.101***	4.274***	4.336***	4.410***
	(8.34)	(7.95)	(8.53)	(8.37)	(8.63)
Net notional dummy			18.657***		15.343**
			(3.05)		(2.28)
Normalized net notional		0.755***	0.671***		0.677***
		(10.51)	(9.21)		(11.49)
Intangibility				1.450***	1.337***
				(4.44)	(4.25)
Managerial shareholding				4.627***	4.147***
				(2.80)	(2.88)
Rating dummies	Yes	Yes	Yes	Yes	Yes
Industry dummies	Yes	Yes	Yes	Yes	Yes
$\overline{R}^2$	0.634	0.648	0.653	0.651	0.669
Number of obs.	9042	9042	9042	8918	8918

***,**,* indicate significance at the 1%, 5%, and 10% levels, respectively.

Notes: This table reports the average coefficient estimates from 114 weekly cross-sectional regressions, as in Fama and MacBeth (1973). See Table 16 for a definition of the regression sample. *Leverage* is the ratio of total debt to the market value of the assets on the trade date. *Asset volatility* is the estimated volatility of a firm inferred from the market value of equity and iteratively solving the structural model of Merton (1974) (see Bharath and Shumway, 2008). *Log(Assets)* is the natural logarithm of the assets. *Time-to-maturity* is bond level time-to-maturity in years calculated on trade date. *Net notional dummy* is equal to 1 if net notional data is available, 0 otherwise. *Normalized net notional* is the ratio of net notional divided by total debt. *Normalized net notional* is assumed to be 0 if a firm is not included in the Top 1,000 actively traded reference entity list of DTCC. *Intangibility* is equal to {1 - (Cash and equivalents + 0.715 x Receivables + 0.547 x Inventories + 0.535 x PP&E)/Assets}. *Managerial shareholding* is calculated as the ratio of aggregate number of shares held by the five highest paid managers to the total number of shares outstanding. *Rating dummies* are based on S&P long-term issuer credit ratings (AAA, AA, etc.) and *Industry dummies* are based on the first digit of SIC codes. Reported in parenthesis are *t-values* calculated using Newey-West adjusted standard errors.

Regression II in Table 17 formally tests the net effect of CDS on credit spreads by adding normalized net notional variable in the base regression as a proxy for CDS exposure. The coefficient estimate on normalized net notional is 0.755 and it is statistically significant. Hence, there is evidence that CDS related costs of inefficient restructuring outweigh its benefits of deterring strategic default. One standard deviation increase in the firm level CDS exposure (27.58 bps) results in a 20.83 bps increase in credit spreads. The impact of CDS exposure is not economically significant after accounting for transaction costs since Schultz (2001) reports that the transaction cost in the corporate bond markets is about 27 bps. Hence, CDS exposure may impose significant economic costs only in the extreme case where creditors are over insured. This finding is consistent with Bolton and Oehmke (2011) as the authors propose that over insurance may give rise to high incidence of a default.

Regression III in Table 17 controls for the unobservable effects of having net notional data. Firms with net notional information – firms reported in the 1,000 most actively traded reference entity list – have, on average, higher credit spreads than those that are inactive in the CDS market by 18.657 bps. The coefficient estimate on normalized net notional is 0.671 – a positive and significant coefficient also confirms that the costs dominate the benefits. The difference between the coefficient estimates on CDS exposure in regressions II and III is not economically significant.

Regression IV in Table 17 adds intangibility and managerial shareholding in order to control for liquidation costs and debtor bargaining power, respectively. Consistent with the literature, liquidation costs and debtor bargaining power are both positively and significantly related to credit spreads. Regression V in Table 17 shows that the inefficiencies associated with CDS exposure are robust to the control of liquidation costs and debtor bargaining power as the

coefficient estimate on CDS exposure is 0.677 and significant. This result indicates that CDS exposure creates additional renegotiation frictions even after controlling for the frictions reported in Davydenko and Strebuleav (2007).

2.4.2 Liquidation Cost

Regression models I through IV in Table 18 formally test the liquidation cost hypothesis. All of the regression models include credit risk variables from regression I in Table 17, net notional dummy, rating and industry dummies, but do not report them for brevity. Regression I uses intangibility and managerial shareholding, regression II uses intangibility and CEO shareholding, regression III uses non-fixed assets and managerial shareholding, and regression IV uses non-fixed assets and CEO shareholding pairs to proxy for liquidation costs and debtor bargaining power, respectively. These models also have the corresponding interaction terms as explained in section 2.3.4. The coefficient estimate on CDS exposure and liquidation cost interaction term is positive and significant in all of the regressions. Coefficient estimate on the interaction term is around 0.07 when intangibility proxy represents liquidation costs, and 0.01 when non-fixed assets proxy represents the liquidation costs. Hence, these results show that the frictions (costs) associated with CDS exposure tend to have greater impact on credit spreads as liquidation costs increase.

2.4.3 Debtor Bargaining Power

Regressions V through VIII in Table 18 analyze the debtor bargaining power hypothesis for all combinations of liquidation cost and debtor bargaining power variables. All of the regression models include credit risk variables from regression I in Table 17, net notional dummy, rating and industry dummies, but do not report them for brevity. The coefficient estimate on the

Table 18 Credit Spread Regressions – Interaction Model

	Liquidation Cost				Debtor Bargaining Power			
Variables	I	II	III	IV	V	VI	VII	VIII
CDS exposure								
Normalized net notional	0.619***	0.678***	0.679***	0.706***	0.677***	0.707***	0.660***	0.685***
	(11.48)	(11.79)	(10.97)	(10.71)	(11.22)	(10.94)	(10.23)	(10.06)
Liquidation cost								
Intangibility	1.366***	1.397***			1.313***	1.303***		
	(4.37)	(4.42)			(4.13)	(4.07)		
Non-fixed assets			0.137*	0.177**			0.321***	0.371***
			(1.94)	(2.52)			(4.18)	(4.86)
Debtor bargaining power								
Managerial shareholding	8.749***		3.872**		4.864***		3.951***	
	(4.31)		(2.61)		(3.29)		(2.81)	
CEO shareholding		7.321***		3.168**		4.704***		3.405**
		(3.16)		(2.07)		(2.65)		(2.28)
Interaction								
CDS exposure & Liquidation cost	0.069***	0.065***	0.009***	0.011***				
	(8.77)	(8.66)	(2.81)	(3.43)				
CDS exposure & Bargaining power					-0.156***	-0.385***	-0.183***	-0.454***
					(-3.26)	(-6.21)	(-3.66)	(-6.84)
$\overline{R}^2$	0.685	0.683	0.672	0.672	0.674	0.673	0.671	0.671
Number of obs.	8918	8918	8950	8950	8918	8918	8950	8950

***,**,* indicate significance at the 1%, 5%, and 10% levels, respectively.

Notes: This table reports the average coefficient estimates from 114 weekly cross-sectional regressions, as in Fama and MacBeth (1973). See Table 16 for a definition of the regression sample. All of the regression models include *Credit risk variables, Net notional dummy, Rating dummies, and Industry dummies* as control variables, but do not reported them for brevity. *Normalized net notional* is the ratio of net notional divided by total debt. *Normalized net notional* is assumed to be 0 if a firm is not included in the Top 1,000 actively traded reference entity list of DTCC (Represents about 11% of the observations). *Intangibility* is equal to {1 - (Cash and equivalents + 0.715 x Receivables + 0.547 x Inventories + 0.535 x PP&E)/Assets}. *Non-fixed assets* is equal to (1 – Fixed assets/Assets). *CEO shareholding* and *Managerial shareholding* are calculated as the number of shares held by the CEO and the aggregate number of shares held by the five highest paid managers divided by the total number of shares outstanding, respectively. The *Interaction* term is the residual from the weekly cross-sectional regression of interaction variable (e.g., AxB) on the components of the interaction term ($\bar{\varepsilon}_{i,t}=A_{i,t}\ x\ B_{i,t} - \bar{\alpha}_t - \bar{\beta}_{A,t}A_{i,t} - \bar{\beta}_{B,t}B_{i,t}$). Reported in parenthesis are *t-values* calculated using Newey-West adjusted standard errors.

interaction term between CDS exposure and bargaining power proxies varies from -0.156 to -0.454, and it is significant in all of the alternative specifications. Hence, there is evidence that the benefits associated with CDS exposure become greater when debtor bargaining power is higher. We empirically show that CDS exposure may create benefits in debt renegotiations as conjectured in the theoretical predictions of Bolton and Oehmke (2011).

2.5 Robustness Tests

2.5.1 Weighted Average Credit Spreads

As discussed in section 2.3.3, randomly selecting credit spreads when a firm has multiple bonds outstanding may create noise in estimating the firm level credit spreads. Hence, we replicate the baseline results reported in Tables 17 and 18 using weighted average credit spreads as the dependent variable. For each firm and each week, we calculate a firm level weighted average credit spreads measure where the weights represent the issue size of each bond for which credit spread is available. We also calculate a weighted average time-to-maturity using the same weighting approach. Table 19 reports the results. Regression I shows that CDS exposure is 0.650 and significant. This indicates that one standard deviation increase in CDS exposure (27.58 bps) results in a 17.93 bps increase in funding costs. A coefficient estimate of 0.650 is identical to the coefficient estimate of 0.671 when the same regression model uses randomly selected credit spreads as the dependent variable. The interaction terms also maintain their sign and significance. The interaction of CDS exposure and liquidation cost is 0.063, and the interaction of CDS exposure and bargaining power is -0.141. Both of the interaction terms are significant. Hence, the results are robust to the selection method of credit spreads.

Table 19 Weighted Average Credit Spreads

	Regression Models		
Variables	I	II	III
Intercept	175.494***	82.184*	110.113**
	(3.82)	(1.68)	(2.27)
Leverage	3.103***	2.985***	3.096***
	(6.63)	(6.77)	(6.75)
Asset volatility	2.053***	1.943***	2.047***
	(11.68)	(11.03)	(11.93)
Log(Assets)	-5.668***	-5.244**	-7.025***
	(-3.13)	(-2.25)	(-2.99)
Weighted average time-to-maturity	3.528***	4.020***	4.040***
	(5.09)	(6.29)	(6.27)
Net notional dummy	16.613***	17.643***	16.329***
	(3.72)	(3.74)	(3.12)
CDS Exposure			
Normalized net notional	0.650***	0.603***	0.659***
	(8.50)	(11.11)	(10.49)
Liquidation cost			
Intangibility		1.218***	1.171***
		(4.35)	(4.11)
Bargaining power			
Managerial shareholding		8.020***	4.438***
		(4.36)	(3.00)
Interaction			
CDS exposure & Liquidation cost		0.063***	
		(8.67)	
CDS exposure & Bargaining power			-0.141***
			(-4.76)
$\overline{R}^2$	0.670	0.700	0.690
Number of obs.	9042	8918	8918

***,**,* indicate significance at the 1%, 5%, and 10% levels, respectively.

Notes: This table replicates the main results reported in Tables 17 and 18 using weighted average credit spreads based on the bond issue size as the dependent variable. Reported are the average coefficient estimates from 114 weekly cross-sectional regressions, as in Fama and MacBeth (1973). See Table 16 for a definition of the regression sample. *Weighted average time-to-maturity* is the weighted average maturity of the bonds in years where the weight is the each bond's issue size. See Tables 17 and 18 for the methodology and variable definitions. *Rating* and *Industry dummies* are included, but not reported for brevity. Reported in parenthesis are *t-values* calculated using Newey-West adjusted standard errors.

2.5.2 Alternative CDS Exposure Variable

We use normalized net notional-SU as an alternative CDS exposure variable. Given that senior unsecured debt is the reference obligation for the majority of the CDS contracts, using the amount of net notional divided by senior unsecured debt (normalized net notional-SU) may provide insights about the possibility of over-insurance and its impact on the funding costs. We replicate the baseline results reported in Tables 17 and 18 using normalized net notional-SU as a proxy for CDS exposure. Table 20 reports the results.

The coefficient estimate on normalized net notional-SU is 0.350 and significant. Since normalized net notional-SU has a standard deviation of 64.25 bps, one standard deviation increase in normalized net notional-SU results in a 22.49 bps increase in credit spreads. While 22.49 bps is greater than around 17.93 bps (20.83 bps) increase reported using weighted average (randomly selected) credit spreads, it is still not economically significant as it does not outweigh the transaction cost of 27 bps in the bond market reported by Schultz (2001). The interaction terms also maintain their sign and significance. Therefore, the baseline results are robust to the choice of CDS exposure proxy.

2.5.3 Bond Liquidity

CDS market allows investors to hedge a bond's default risk. It might be natural to observe higher CDS activity for firms that have illiquid bonds, because illiquidity increases the cost of short selling bonds in an attempt to hedge credit risk. If CDS exposure is correlated with the liquidity of the underlying bonds, then this would also result in a positive relationship between CDS exposure and credit spreads since credit spreads reflect a positive liquidity

Table 20 Normalized Net Notional – SU

Variables	I	II	III
	Regression Models		
Intercept	259.753***	227.849***	214.639***
	(5.21)	(4.15)	(3.85)
Leverage	3.314***	3.355***	3.292***
	(6.88)	(7.22)	(6.89)
Asset volatility	2.418***	2.429***	2.434***
	(13.83)	(12.80)	(13.31)
Log(Assets)	-10.534***	-13.080***	-12.196***
	(-5.07)	(-4.29)	(-3.93)
Time-to-maturity	4.835***	5.106***	5.088***
	(10.41)	(11.00)	(11.57)
Net notional dummy	23.785***	29.401***	30.255***
	(4.07)	(4.55)	(4.63)
CDS Exposure			
Normalized net notional-SU	0.350***	0.322***	0.338***
	(14.72)	(14.66)	(15.82)
Liquidation cost			
Intangibility		1.044***	0.911**
		(2.98)	(2.61)
Bargaining power			
Managerial shareholding		6.674***	7.998***
		(4.04)	(4.90)
Interaction			
CDS exposure & Liquidation cost		0.007***	
		(4.94)	
CDS exposure & Bargaining power			-0.372***
			(-6.15)
$\overline{R}$	0.663	0.683	0.685
Number of obs.	9042	8918	8918

***,**,* indicate significance at the 1%, 5%, and 10% levels, respectively.

Notes: This table replicates the main results reported in Tables 17 and 18 using *Normalized net notional – SU* as the CDS exposure variable. *Normalized net notional-SU* is equal to net notional divided by the total amount of senior unsecured debt. It take a value of 0 if a firm is not included in the Top 1,000 actively traded reference entity list of DTCC. Reported are the average coefficient estimates from 114 weekly cross-sectional regressions, as in Fama and MacBeth (1973). See Table 16 for a definition of the regression sample. See Tables 17 and 18 for the methodology and variable definitions. *Rating* and *Industry dummies* are included, but not reported for brevity. Reported in parenthesis are *t-values* calculated using Newey-West adjusted standard errors.

premium (e.g., see Chen, Lesmond, and Wei, 2007). This relationship among credit spreads, CDS exposure, and bond liquidity biases the coefficient estimates if the independent variables do not account for bond liquidity. We formally test for this potential omitted variable bias by including a bond liquidity measure in the main regressions.

We use weekly bond volume as a proxy for bond liquidity. Intraday bond volume is from TRACE (variable *ascii_rptd_vol_tx)*. TRACE reports +1MM and +5MM for intraday quantities exceeding 1,000,000 and 5,000,000, respectively. We assume that these figures represent the lower bound of their quoted volume (1,000,000 and 5,000,000) and aggregate the intraday volume for each bond during the week matching the credit spread observation date. We take the natural logarithm of the volume in order to reduce the impact of bonds with extremely large trading activity and reduce the influence of aforementioned lower bound assumption.

Table 21 reports the results for the baseline results presented in Tables 17 and 18. Regression I shows that liquid bonds have lower spreads. A coefficient estimate of -6.039 on *log(1+weekly bond volume)* indicates that 1% increase in weekly bond volume reduces the credit spreads by about 6 bps. Normalized net notional has a coefficient of 0.681, which is identical to 0.671 reported in Table 17 regression III. The coefficient estimate on the interaction term between CDS exposure and liquidation cost is 0.064. Table 18 regression I reports an identical interaction coefficient of 0.069. The coefficient estimate on the interaction between CDS exposure and debtor bargaining power is -0.155, which is identical to -0.156 reported in Table 18 regression V. These results show that bond liquidity is an important determinant of credit spreads, but liquidity does not influence the observed relationship between CDS exposure and credit spreads.

Table 21 Bond Liquidity

Variables	Regression Models I	II	III
Intercept	216.882***	129.888**	153.539***
	(4.59)	(2.54)	(3.06)
Leverage	3.223***	3.128***	3.238***
	(6.70)	(6.76)	(6.73)
Asset volatility	2.092***	2.038***	2.128***
	(10.32)	(9.26)	(9.87)
Log(Assets)	-3.96	-4.669	-6.149**
	(-1.65)	(-1.55)	(-2.00)
Time-to-maturity	4.156***	4.350***	4.377***
	(7.53)	(8.14)	(8.15)
Log(1+weekly bond volume)	-6.039***	-6.795***	-7.033***
	(-4.94)	(-7.09)	(-6.90)
Net notional dummy	10.454*	10.480*	8.412
	(1.81)	(1.67)	(1.31)
CDS exposure			
Normalized net notional	0.681***	0.630***	0.691***
	(9.29)	(11.09)	(11.24)
Liquidation cost			
Intangibility		1.626***	1.590***
		(4.81)	(4.63)
Debtor bargaining power			
Managerial shareholding		8.945***	5.108***
		(4.76)	(3.75)
Interaction			
CDS exposure & Liquidation cost		0.064***	
		(7.48)	
CDS exposure & Bargaining power			-0.155***
			(-4.28)
$\overline{R}^2$	0.675	0.705	0.697
Number of obs.	8995	8873	8873

***,**,* indicate significance at the 1%, 5%, and 10% levels, respectively.

Notes: This table replicates the main results reported in Tables 17 and 18 using bond liquidity as an additional independent variable. Reported are the average coefficient estimates from 114 weekly cross-sectional regressions, as in Fama and MacBeth (1973). See Table 16 for a definition of the regression sample. *Weekly bond volume* is the sum of the intraday bond volume in each week. See Tables 17 and 18 for the methodology and variable definitions. *Rating* and *Industry dummies* are included, but not reported for brevity. Reported in parenthesis are *t-values* calculated using Newey-West adjusted standard errors.

2.5.4 Missing Net Notional

As discussed in section 2.3.2.3, DTCC reports net notional for the most actively traded 1,000 reference entities. The majority of our sample firms (82.82%) are in the DTCC' list. We assume CDS exposure for firms with missing net notional has limited influence in altering the renegotiation dynamics. While this assumption makes economic sense, it may introduce a measurement error. In order to understand the impact of the zero net notional assumption on the baseline results, we replicate the baseline results by dropping the firms without net notional. As an alternative approach, we also replicate the baseline results by predicting net notional for the sample to fill the missing net notional data, and then using the predicted CDS exposure in the regression models.

Table 22 reports the main results in Tables 17 and 18 when we drop the observations without net notional data. Regression I shows that the magnitude of CDS exposure increases to 0.947 and it is still significant. The interaction term between CDS exposure and liquidation cost is 0.063 and significant. The interaction term between CDS exposure and bargaining power proxy is -0.302 and significant. Hence, the results are robust to the exclusion of observations without net notional data.

As an alternative approach, we attempt to fill the missing net notional data by using an in-sample prediction model. While estimating net notional, we face a problem of data censoring. When net notional for firms with CDS contracts is not reported, we know that it is lower than a threshold value, but most likely it is greater than zero. As Wooldridge (2010) explains, ignoring the censored nature of the dependent variable results in biased coefficient estimates. In order to correct for censoring in the net notional data, we use a Tobit regression framework.

Table 22 Missing Net Notional

	Regression Models		
Variables	I	II	III
Intercept	-205.17***	-283.76***	-282.01***
	(-3.91)	(-5.72)	(-5.35)
Leverage	3.518***	3.443***	3.614***
	(6.29)	(6.54)	(6.47)
Asset volatility	1.910***	1.712***	1.827***
	(8.73)	(7.45)	(7.82)
Log(Assets)	9.469***	9.061***	8.128***
	(4.70)	(4.04)	(3.50)
Time-to-maturity	3.870***	4.181***	4.377***
	(6.06)	(6.75)	(7.37)
Average net notional dummy			
CDS Exposure			
Normalized net notional	0.947***	0.961***	1.021***
	(11.51)	(16.09)	(14.96)
Normalized net notional-Ave.			
Liquidation cost			
Intangibility		1.410***	1.325***
		(4.75)	(4.33)
Bargaining power			
Managerial shareholding		7.770***	3.166*
		(3.55)	(1.70)
Interaction			
CDS exp. & Liq. cost		0.063***	
		(7.90)	
CDS exp. & Barg. power			-0.302***
			(-4.58)
Rating dummies	Yes	Yes	Yes
Industry dummies	Yes	Yes	Yes
$\overline{R}^2$	0.659	0.692	0.684
Number of obs.	7961	7879	7879

***,**,* indicate significance at the 1%, 5%, and 10% levels, respectively.

Notes: This table replicates the main results reported in Tables 17 and 18 while excluding the firms without net notional data. Reported are the average coefficient estimates from 114 weekly cross-sectional regressions, as in Fama and MacBeth (1973). See Table 16 for a definition of the regression sample. See Tables 17 and 18 for the methodology and variable definitions. Reported in parenthesis are *t-values* calculated using Newey-West adjusted standard errors.

Assume that the model of interest is to estimate a latent net notional variable, y^*,

$$y^* = x_i'\beta + \varepsilon_i \tag{8}$$

where x_i is a 1xk vector of explanatory variables and an intercept, β is a kx1 vector of coefficient estimates, and ε_i is an error term distributed normally with a mean of zero and standard deviation of σ . Because y^* is censored, we instead observe y,

$$y = \begin{cases} y^* & if \;\; y^* > L \\ L & if \;\; y^* \leq L \end{cases} \tag{9}$$

where L is the lowest net notional value (censoring point) that DTCC reports for the top 1,000 most active reference entities. Because the expected value of y is not equal to the expected value of y^* due to censoring, the estimation of the coefficients of interest renders using a maximum likelihood estimator. We maximize the following likelihood function:

$$\lambda = \prod_{i=1}^{n} \left[\frac{1}{\sigma} \phi\left(\frac{y_i - x_i'\beta}{\sigma} \right) \right]^{d_i} \left[\Phi\left(\frac{L - x_i'\beta}{\sigma} \right) \right]^{1-d_i} \tag{10}$$

where d_i takes the value of 1 if an observation is not censored, 0 otherwise, $\phi(\ )$ and $\Phi(\ )$ denote the probability density function and cumulative distribution function for a standard normal distribution.

Another complication arises while determining the threshold. As Oehmke and Zawadowski (2011) also discuss, DTCC reports the 1,000 most active reference entities based on gross notional variable. We are, however, interested in net notional due to its economic relevance as a proxy for hedged creditors. It is perceivable that firms with high gross notional also would have high net notional. Oehmke and Zawadowski (2011) show that on average net notional is 10% of gross notional while there is considerable variation.

Carson and Sun (2007) show that when the censoring point is unknown, setting it to the minimum observable variable in the sample would result in consistent estimates. Hence, we assume that the lowest net notional value that DTCC reports in each week represents the threshold censoring point for that week. We estimate this model for each week and then predict the net notional for all firms. This way we are able to replace missing values of net notional with the predicted ones and reduce the possibility of bias due to measurement error.

While estimating net notional, we control for risk and size related variables that have been introduced in the earlier sections - leverage, asset volatility, log(assets), credit rating dummies, and industry dummies. In addition, we also introduce a new set of independent variables that may economically explain net notional.

The first additional variable that we use is analyst forecast dispersion. Following Oehmke and Zawadowski (2011), we calculate it as the standard deviation of the 2-year EPS estimate normalized by the absolute value of the mean 2-year EPS estimate from I/B/E/S database. Oehmke and Zawadowski (2011) show that forecast dispersion is significantly related with net notional. This suggests that greater disagreement about a firm's growth prospects may lead investors to make bests in the CDS market.

The second variable that may lead to a higher net notional is the amount of senior unsecured bonds a firm has proportional to its total debt. As senior unsecured bond class the primary reference obligation in the single name CDS market, firms that are financed with more senior unsecured bonds may face greater net notional activity. We find the details of the firms' capital structure from FactSet.

Another variable of interest is the liquidity of a firm's bonds. Given that it is harder to short-sale bonds with low liquidity, the investors may substitute their hedging needs by purchasing CDS contracts that accordingly increases net notional. We calculate the average bond liquidity {log(1+weekly bond volume)} for a firm using its outstanding senior unsecured bonds in our sample as a proxy for its bond liquidity.[43] Using these bonds, we also calculate average time-to-maturity in years for firms' senior unsecured debt. A shorter debt maturity structure may induce greater net notional activity because firms may open up doors to new creditors through refinancing their debt that may lead to greater CDS activity. The maturity structure of debt may also influence the CDS activity due to a possible increase in roll over risk or expectations about possible difficulty that firms may face in paying off the face value of debt.

Finally, we control for the creditor concentration differences in firms. If bondholders are more dispersed, this may lead to disagreements and holdout problems during the resolution of distress (e.g., Franks and Torous,1994). Firms that are more concentrated would have less demand for insurance since holdout problems in distress would be less of an issue if creditors' interest are unified. We construct a Hefindahl index of bonds in line with Betker (1995). We calculate the creditor concentration measure for a firm as:

$$\sum_{j=1}^{n} V_j^2 \Big/ \left(\sum_{j=1}^{n} V_j\right)^2 \tag{11}$$

where V_j is the face value of claims in each bond j. The debt structure details are from FactSet.

Regression I in Table 23 reports the average coefficient estimates from the weekly censored regressions of *log(net notional in million USD)*. We use a log-transformed amount of net notional following Oehmke and Zawadowski (2011). This way, we reduce the impact of large net notional

[43] See section 2.5.3 for a detailed explanation of bond liquidity.

Table 23 Estimation Error

Variables	Estimated Net Notional I	Base Model II	Interaction Model III	Interaction Model IV
Intercept	-1.058***	79.133	14.396	10.153
	(-2.93)	(1.36)	(0.24)	(0.16)
Leverage	0.002***	3.285***	3.218***	3.352***
	(3.35)	(6.65)	(7.01)	(6.76)
Asset volatility	0.002**	2.160***	2.158***	2.187***
	(2.18)	(15.02)	(13.98)	(14.11)
Log(Assets)	0.345***	-0.897	-2.837	-2.958
	(25.10)	(-0.43)	(-0.94)	(-0.97)
Analyst forecast dispersion	0.014***			
	(7.30)			
Sen. unsec. debt/Total debt	0.005***			
	(9.37)			
Average log(1+weekly bond volume)	-0.008			
	(-1.06)			
Average time-to-maturity	-0.019***			
	(-10.23)			
Creditor concentration	-2.532***			
	(-18.02)			
Time-to-maturity		3.794***	4.255***	4.178***
		(6.20)	(7.64)	(7.24)
CDS exposure				
Estimated net notional/Total debt		0.568***	0.630***	0.629***
		(10.18)	(12.21)	(11.50)
Liquidation cost				
Intangibility			1.441***	1.432***
			(3.72)	(3.66)
Bargaining power				
Managerial shareholding			6.116***	4.345***
			(3.72)	(2.75)
Interaction				
CDS exposure & Liquidation cost			0.051***	
			(4.14)	
CDS exposure & Bargaining power				-0.137***
				(-2.95)
$\overline{R}^2$	.	0.642	0.666	0.669
Number of obs.	8444	8444	8326	8326

***,**,* indicate significance at the 1%, 5%, and 10% levels, respectively.

Notes: This table replicates the main results reported in Tables 17 and 18 by first estimating net notional and then replacing the normalized net notional with *estimated net notional/total debt*. Reported are the average coefficient estimates from 114 weekly cross-sectional regressions, as in Fama and MacBeth (1973). Regression I is a Tobit regression censored at the lowest value of net notional in the DTCC's weekly database where the dependent variable is *log(Net notional in million USD)*. Regressions II, III, and IV are credit spread regressions as discussed in Tables 17 and 18. *Rating* and *Industry dummies* are included, but not reported for brevity. Reported in parenthesis are *t-values* calculated using Newey-West adjusted standard errors.

observations on the model. Newey-West adjusted standard errors adjust for autocorrelation in the time-series data. The coefficient estimates are consistent with our economic intuition. Leverage, asset volatility, log(assets), analyst forecast dispersion, and senior unsecured debt proportional to total debt variables are all positive and significant. Average time-to-maturity and creditor concentration variables are negative and significant. While bond liquidity is not significant, it has a negative sign in line with our expectations. We predict net notional using the parameter estimates from each cross sectional regression and divide the predicted net notional by actual total debt as a measure of CDS exposure.

Regression II in Table 23 uses the estimated CDS exposure measure as an explanatory variable in predicting credit spreads and replicates the baseline results in Table 17 regression II. Estimated CDS exposure is 0.568 and statistically significant. The magnitude of the coefficient estimate is economically identical to 0.755 reported in Table 17. Not surprisingly, log(assets) lost its significance since firm size is highly correlated with net notional in the estimation regression I.

Regressions III and IV in Table 23 replicate the interaction models regression I and V in Table 18, respectively. Consistent with the earlier results, while CDS exposure leads to an increase in credit spreads as liquidation costs increase, CDS exposure is associated with lower credit spreads as debtor bargaining power increases. The results are robust to the alternative liquidation costs and bargaining power proxies.[44]

2.5.5 Simultaneity

CDS exposure may reflect investors' expectations about future credit spreads. Creditors that predict future downturns in credit quality may purchase credit insurance in advance or

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[44] The results in this section are identical for the following estimation approaches: (1) net notional is predicted for all of the observations rather than only for the missing ones, (2) actual net notional is modeled instead of log(net notional), or (3) a censoring threshold of zero is selected.

simultaneously with increasing credit spreads. In this case, predicting credit spreads at the same time with CDS exposure may result in a spurious relation and explain little about the effect of empty creditors. We dissect the simultaneity by using lagged variables of normalized net notional. If lagged normalized net notional variable is insignificant, then this would indicate that indeed investors' expectations about future credit quality derive the earlier findings. On the other hand, if lagged normalized net notional maintains its significance, then it is more likely that creditors' CDS exposure explains the positive association between the CDS exposure and credit spreads.

We use three-month lagged normalized net notional measured starting one week prior to a trade date as an alternative measure of CDS exposure since it is unlikely that CDS exposure can predict credit spreads three-months in advance of the security prices.[45] Table 24 regressions I and II report the results from the interaction regressions. The coefficient estimate on the CDS exposure is 0.583 (0.626) and statistically significant for the liquidation cost (bargaining power) interaction models. The coefficient estimate on the interaction variable between CDS exposure and liquidation cost (bargaining power) is 0.053 (-0.148) and statistically significant. We also observe identical patterns for alternative combinations of liquidation and bargaining power variables.

As alternative measures, we use mean and median normalized net notional measured prior to three-month before a trade date. In addition to alleviating possible simultaneity concerns, this approach also reduces the number of observations with missing net notional. Regressions III through VI in Table 24 report the results for the main findings reported in Tables 17 and 18. Mean and median normalized CDS exposure variables maintain their significance and magnitude

[45] Results are identical by using 6- or 12-month lagged CDS exposure.

Table 24 Simultaneity

Variables	3-Month Lagged CDS Exposure I	II	3-Month Mean CDS Exposure III	IV	3-Month Median CDS Exposure V	VI
Intercept	72.977	97.199	51.592	76.000	51.278	76.506
	(1.17)	(1.60)	(0.90)	(1.33)	(0.90)	(1.33)
Leverage	2.633***	2.703***	2.605***	2.682***	2.603***	2.682***
	(6.60)	(6.66)	(6.62)	(6.62)	(6.62)	(6.61)
Asset volatility	1.904***	2.038***	1.936***	2.063***	1.943***	2.065***
	(10.58)	(11.61)	(10.47)	(11.64)	(10.49)	(11.62)
Log(Assets)	-5.111	-6.457**	-4.091	-5.495*	-4.090	-5.531*
	(-1.58)	(-2.06)	(-1.41)	(-1.90)	(-1.42)	(-1.92)
Time-to-maturity	5.059***	5.059***	5.007***	5.036***	5.012***	5.039***
	(12.48)	(12.02)	(12.02)	(11.84)	(12.04)	(11.86)
Net notional dummy	17.334***	13.364**	10.979**	7.357	11.004**	7.871
	(2.97)	(2.35)	(2.01)	(1.32)	(2.06)	(1.44)
CDS exposure						
Normalized net notional	0.583***	0.626***	0.622***	0.669***	0.623***	0.668***
	(10.04)	(9.41)	(10.93)	(10.07)	(10.93)	(10.03)
Liquidation cost						
Intangibility	0.838***	0.775***	0.862***	0.798***	0.862***	0.796***
	(3.82)	(3.78)	(4.07)	(3.99)	(4.08)	(3.98)
Bargaining power						
Managerial shareholding	6.328***	3.549**	6.136***	3.422**	6.143***	3.465**
	(3.73)	(2.43)	(3.54)	(2.24)	(3.54)	(2.27)
Interaction						
CDS exp. & Liquidation cost	0.053***		0.055***		0.055***	
	(9.78)		(9.75)		(9.57)	
CDS exp. & Bargaining power		-0.148***		-0.153***		-0.154***
		(-5.91)		(-5.09)		(-5.19)
$\overline{R}^2$	0.686	0.676	0.685	0.676	0.685	0.676
Number of obs.	8066	8066	8066	8066	8066	8066

***,**,* indicate significance at the 1%, 5%, and 10% levels, respectively.

Notes: This table replicates the main results reported in Tables 17 and 18 using alternative CDS exposure measures. Reported are the average coefficient estimates from 102 weekly cross-sectional regressions, as in Fama and MacBeth (1973). See Table 16 for a definition of the regression sample. See Tables 17 and 18 for the methodology and variable definitions. "3-Month Lagged CDS Exposure" regression models use three-month lagged normalized net notional as a proxy for CDS exposure. "3-Month Mean (Median) Net Notional" regression models use the mean (median) normalized net notional within the last three-month of an observation as a proxy for CDS exposure. *Rating* and *Industry dummies* are included, but not reported for brevity. Reported in parenthesis are *t-values* calculated using Newey-West adjusted standard errors.

using these alternative measures. Regression III shows that the interaction term between CDS exposure and liquidation cost is 0.055 and it is significant. Regression IV reports a coefficient of -0.153 on CDS exposure and debtor bargaining power interaction variable. The results are identical for regression specifications V and VI.

These results imply that possible forward-looking credit risk information in CDS exposure does not derive our main results associated with CDS exposure.

2.5.6 Endogeneity

Our baseline regressions control for the known determinants of credit spreads in order to understand the marginal effect of CDS exposure on credit spreads. However, our proxy for CDS exposure – normalized net notional – may be correlated with credit spreads through channels other than the influence of empty creditors. Failure to account for these unobservable effects may result in biased coefficient estimates. While estimating credit spreads, the unobservable effects will be left in the error term because the prediction model does not account for endogeneity. Since the unobservable effects are correlated with CDS exposure, this will also lead to a correlation between the error term and CDS exposure, violating a basic assumption of the linear regression.

In order to address the potential for endogeneity, we follow a 2-stage instrumental variable (IV) regression approach. We use two IVs: the bond underwriters' foreign exchange hedging positions divided by their assets and analysis forecast dispersion.

Subrahmanyam, Tang, and Wang (2012) and Saretto and Tookes (2012) identify a firm's lenders and bond underwriters, and use their average foreign exchange (FX) hedging position as an instrument for the availability of CDS contracts. Subrahmanyam, Tang, and Wang (2012, p. 3) provide the intuition for this IV on "Lenders with a larger FX hedging position are more likely,

in general, to trade the CDS of their borrowers". Using a similar approach, we identify the bond underwriters for each firm in our sample using Bloomberg. The underwriters' FX positions and total assets at the bank holding level are from the Y9C reports maintained by the Federal Reserve. We use each firm's bond underwriters' average FX position divided by their total assets as an IV for CDS exposure. Accordingly, if a greater the underwriters have greater FX position, they are more likely to be active in the CDS market – leading to greater CDS exposure. The underwriters' FX position is less likely to be related with credit spreads except through its correlation with the CDS exposure.

We first predict normalized net notional using the FX position as an IV, and then use the predicted normalized net notional in the second stage regressions. Predicting normalized net notional is subject to the similar censoring issues as described in section 2.5.4. The censoring point for normalized net notional, however, is unpredictable. Unobservable normalized net notional values may be greater than or less than the observed normalized net notional depending on the magnitude of total debt. In order to apply censoring from below, we need evidence that censored normalized net notional figures are less than the observed ones. In a non-reported analysis, we test whether this is reasonably correct.

A ratio of the lowest observable net notional divided by total debt gives the largest value of normalized net notional that firms with missing net notional may have. We find that the mean (median) normalized net notional is 25.91% (14.97%) for the firms with net notional in our regression sample and 7.67% (2.98%) for firms without net notional. The difference in normalized net notional for the censored data is significantly lower than the observed sample as a t-test of differences in means assuming unequal variances results in a t-value of 34.32, and Wilcoxon rank-sum test of differences in medians results in a z-value of 34.58. Given that we

picked the largest possible normalized net notional levels for the firms without net notional, we are reasonably confident that firms with missing net notional also have lower normalized net notional. Therefore, we can apply the Tobit regression methodology as described in section 2.5.4.

Regression I in Table 25 reports the first stage regression results using normalized net notional as the dependent variable[46]. The average underwriter FX position is positive and significant. This implies that the FX position is a strong IV. Regression II in Table 25 reports the second stage regression results where CDS exposure proxy is predicted from the first stage regression. The coefficient estimate on estimated CDS exposure is 3.432 and significant. The magnitude of the coefficient estimate is larger than the estimate reported earlier, yet it is still positive and significant.

Second, we use analyst forecast dispersion as an additional IV[47]. Briefly, analyst forecast dispersion is the standard deviation of a firm's 2-year EPS estimate divided by the absolute value of the mean 2-year EPS estimate at each week. Oehmke and Zawadowski (2011) and section 2.5.4 show that analyst forecast dispersion is significantly related with the amount of net notional. This suggests that greater disagreement about a firm's growth prospects may lead investors to trade in the CDS market. Analysts' prediction about the level of earnings may affect the credit spreads, but analyst forecast dispersion is less likely to affect the level of credit spreads after controlling for the know determinants of credit risk. Regression III in Table 25 reports the first stage regression results. The coefficient estimate on analyst forecast dispersion is 0.156 and

[46] We replicate results by using normalized net notional and log(1+normalized net notional) as dependent variables, and by censoring normalized net notional at zero and at the mean/median of the maximum normalized net notional levels for the censored data. The results are identical.

[47] See section 2.5.4 for a definition of analyst forecast dispersion.

Table 25 Endogeneity

	Alternative IV - 1		Alternative IV - 2	
	First Stage	Second Stage	First Stage	Second Stage
Variables	I	II	III	IV
Intercept	276.674***	-727.44***	243.376***	-588.22***
	(11.10)	(-3.40)	(13.55)	(-5.00)
Leverage	-0.102***	3.208***	-0.081***	3.053***
	(-5.62)	(6.78)	(-4.43)	(6.58)
Asset volatility	0.174**	2.350***	0.183***	1.625***
	(2.07)	(8.14)	(2.94)	(5.51)
Log(Assets)	-10.249***	27.034***	-9.013***	23.313***
	(-10.29)	(3.35)	(-13.00)	(5.31)
Time-to-maturity	-0.093**	4.551***	0.033	4.261***
	(-2.01)	(5.92)	(0.93)	(7.30)
Average underwriter FX position	1.838***			
	(4.38)			
Analyst Forecast Dispersion			0.156***	
			(3.08)	
CDS exposure				
Predicted Normalized Net Notional		3.432***		4.435***
		(5.61)		(9.41)
$\overline{R}^2$	.	0.687	.	0.652
Number of obs.	6981	6981	8616	8616

***,**,* indicate significance at the 1%, 5%, and 10% levels, respectively.

Notes: This table replicates the main results reported in Table 17 using an instrumental variable regression methodology. Reported are the average coefficient estimates from 114 weekly cross-sectional regressions, as in Fama and MacBeth (1973). See Table 16 for a definition of the regression sample. *First Stage* regression is a Tobit regression censored at zero where the dependent variable is normalized net notional. *Second Stage* regression is an OLS regression of credit spreads that uses predicted normalized net notional from the weekly cross sectional first stage regressions. *Alternative IV – 1* column reports the results using *Average underwriter FX position* (average of the bond underwriters' foreign exchange hedging positions divided by their total assets) as an IV. *Alternative IV – 2* column reports the results using *Analyst Forecast Dispersion* (standard deviation of a firm's 2-year EPS estimate divided by the absolute value of the mean 2-year EPS estimate at each week) as an IV. See Tables 17 and 18 for the methodology and variable definitions. *Rating* and *Industry dummies* are included, but not reported for brevity. Reported in parenthesis are *t-values* calculated using Newey-West adjusted standard errors.

significant. Regression IV in Table 25 reports the second stage regression results where the CDS exposure proxy is predicted from the first stage regression. Predicted CDS exposure variable is 4.435 and significant, consistent with the baseline result reported in Table 17.

In this section, we show that the influence of CDS exposure on credit spreads is unlikely to be driven by endogeneity.

2.6 Summary

CDS may alter the balance of bargaining power between the debtor and creditors, and affect distressed debt renegotiations. Bolton and Oehmke (2011) identify primarily two mechanisms through which CDS may have an economic impact on the underlying firms.

First, creditors hedged with CDS would be indifferent to a firm's survival and may raise the probability of default over renegotiations. Since renegotiations require accepting a recovery below par while default triggers payment on their CDS contracts and leads to a full recovery, hedged creditors may increase the costs of inefficient renegotiations by preferring a default to renegotiations.

Second, hedged creditors would have greater bargaining power in distress renegotiations since their CDS contracts promise full recovery in default. By making hedged creditors tougher in renegotiations, CDS may deter the debtor from behaving opportunistically in order to extract rents from the creditors. In other words, CDS may reduce the probability of strategic default, and hence create benefits for the creditors.

We follow the empirical methodology of Davydenko and Strebuleav (2007) and analyze bonds' credit spreads – the default risk component of bond yields – to investigate whether creditors' CDS exposure creates renegotiation frictions, and if so when these frictions are more pronounced. Using the amount of CDS contracts outstanding per dollar of total debt as a proxy for creditors' CDS exposure, we show that CDS related costs of inefficient renegotiations outweigh the benefits of deterring strategic default. Although CDS related renegotiation frictions

are not economically significant, on average, we provide evidence that over-insurance in the CDS market creates economic costs. The results are robust to the inclusion of other strategic behavior proxies, implying that CDS create additional renegotiation frictions. We run several robustness tests to control for the bond liquidity, the simultaneity between credit spreads and CDS exposure, the measurement error in our CDS exposure proxy, the endogeneity issues, and the alternative dependent and independent variables, but the results do not change.

In addition, we report that the costs of CDS are more pronounced when liquidation costs are higher. This implies that firms with higher liquidation costs (lower expected recoveries in default) are likely to suffer more so from the increased probability of default since default is much costlier for these firms compared with out-of-court renegotiations. On the other hand, we also provide evidence that the benefits of CDS are more pronounced when debtor bargaining power is higher. When the debtors' interests are more in line with the shareholders', additional protection that CDS provide to the creditors reduces the probability that debtor may behave opportunistically.

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APPENDIX A

	Regression Models			
Variables	All Firms	All Firms	Firms w/ Cushion	Firms w/o Cushion
Intercept	0.14	0.09	0.38	0.40
	(0.88)	(0.58)	(0.45)	(1.29)
EBITDA/Sales	-0.48***	-0.46***	-0.72	-0.22
	(-3.05)	(-2.80)	(0.20)	(-0.96)
Total Debt/Assets	0.10	0.07	-0.30	0.10
	(0.79)	(0.61)	(0.13)	(0.43)
Int. Exp./Total Debt	3.79***	3.55**	2.43	-0.49
	(2.85)	(2.54)	(0.53)	(-0.17)
Cash/Total Debt	-0.18	-0.18	-0.71	0.48
	(-0.48)	(-0.50)	(0.53)	(0.92)
CDS Dummy	-0.10	-0.10	0.01	-0.28*
	(-1.11)	(-1.09)	(0.938)	(-1.83)
Sen. Unsec./Total Debt		0.12	0.16	0.26
		(0.79)	(0.60)	(0.37)
Junior/Total Debt		0.31	0.69	.
		(1.37)	(0.37)	.
Number of Obs.	83	83	30	31
R^2	0.22	0.24	0.21	0.34

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

Notes: This table reports the restructuring regression results (Tables 5 and 6) for all firms and firms with comparable debt structures using an alternative dependent variable. The dependent variable in all of the regressions is the aggregate participation rate calculated as the total amount of debt restructured divided by the total amount of debt in each creditor class targeted. For example, assume that a firm has a total debt of $300 comprised of $50 senior secured, $100 senior unsecured, and $150 junior debt. If this firm restructures $20 of senior unsecured debt, the dependent variable becomes 20% ($20/$100). Instead, if the firm restructures $20 of senior unsecured and $40 of junior debt, the dependent variable becomes 24% {($20+$40)/($100+$150)}. The sample comprises of 83 distressed exchanges (DE) completed between January 2004 and December 2011. A firm is classified as a *Reference Entity* if it has an outstanding single name CDS contract with spread quotes available in the 6-months preceding the DE completion date. Firms *with cushion* have both senior unsecured and junior debt. Conversely, firms *without cushion* have senior unsecured but no junior debt. The t-statistics in parenthesis reflect White (1980) robust standard errors.

APPENDIX B

Methodology	Reference N	Reference Mean (Median)	Non-Reference N	Non-Reference Mean (Median)	Test of Differences t-value (z-value)
Only senior unsecured bonds – All firms (Randomly select one bond if multiple senior unsecured bonds exist)	24	34.85 (26.33)	25	38.12 (30.53)	-0.37 (-0.99)
Only senior unsecured bonds – All firms (Weighted average spread based on the bond issue size)	24	30.13 (22.80)	25	37.64 (30.53)	0.99 (0.99)
Only senior unsecured bonds – Firms w/ cushion (Weighted average spread based on the bond issue size)	14	27.86 (21.94)	9	35.56 (23.93)	0.53 (0.83)
Only senior unsecured bonds – Firms w/o cushion (Weighted average spread based on the bond issue size)	10	33.30 (29.39)	16	38.80 (32.28)	0.58 (0.90)

Notes: This table reports the credit spreads for 49 distressed exchanges (DE) in our sample that have senior unsecured bond prices available one-month prior to the announcement of the DE. Credit spread is the difference between the yield-to-maturity of a bond and the maturity matched risk-free rate from the interest rate swap curve. *Methodology* column describes the methodology and firm types compared. Firms with cushion have senior unsecured and junior debt. Firms without cushion have senior unsecured debt but no junior debt. “Test of Differences” column reports t-values from a t-test assuming unequal variances and z-values from the Wilcoxon rank-sum test. The results reported in this table are robust to the choice of risk-free rate in credit spread calculations.

APPENDIX C

We use an instrumental variable (IV) approach to control for the endogeneity issues. Subrahmanyam, Tang, and Wang (2012) investigate whether CDS contracts increase the probability of distress (credit rating downgrade and bankruptcy) and use two IVs. Even though our sample firms are already in distress, these IVs might be potentially beneficial. They identify a firm's lenders and bond underwriters, and use their average foreign exchange (FX) hedging position and their average Tier 1 capital ratios as IVs. They provide intuition for these IVs on page 3 of their paper: "Lenders with a larger FX hedging position are more likely, in general, to trade the CDS of their borrowers… Banks with lower capital ratios have a greater need to hedge the credit risk of their borrowers via CDS."

Using a similar approach, we identify the bond underwriters for each firm in the DE using Bloomberg. Because banks' FX positions from Y9C reports (item BHCK 8726) are not available prior to 2008, our first IV is the underwriters' Tier 1 ratio. The Table below presents the results from probit regressions where the dependent variable is 1 if a firm is a reference entity, and 0 otherwise. The explanatory variables are from the restructuring regressions in Table 5.

Regression I reports that the sample size drops from 83 to 42 due to the missing Tier 1 ratios. The coefficient estimate on the average underwriter's Tier 1 ratio is -0.02 and insignificant. Alternatively, Regression II uses these underwriters' average size as an IV because larger underwriter may have greater activity in the CDS market. The coefficient estimates on the underwriter assets is -0.34 and insignificant. Finally, we create a dummy variable equal to 1 if the underwriter is a bank holding company. Assuming that these large banks would have greater

	Probit Regressions		
Explanatory Variables	I	II	III
Intercept	0.33	0.59	-0.38
	(0.21)	(0.38)	(-0.50)
EBITDA/Sales	3.56***	3.54***	4.04***
	(2.76)	(2.75)	(2.82)
Total Debt/Assets	1.16	1.16	0.09
	(1.19)	(1.24)	(0.17)
Interest Expense/Total Debt	-30.04***	-30.33***	-14.54**
	(-2.60)	(-2.67)	(-2.52)
Cash/Total Debt	5.83***	5.98***	4.35**
	(2.78)	(2.91)	(2.41)
Underwriter - Tier 1	-0.02		
	(-0.22)		
Underwriter assets		-0.34	
		(-0.53)	
Underwriter is a bank holding company			0.11
			(0.38)
Number of Observations	42	42	83
Pseudo R^2	0.22	0.2266	0.21

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

Notes: The table reports the results of probit regression where the dependent variable is equal to 1 if the firm is a reference entity, and 0 otherwise. A firm is classified as a *Reference Entity* if it has an outstanding single name CDS contract with spread quotes available in the 6-months preceding the DE completion date. The sample comprises of 83 distressed exchanges (DE) completed between January 2004 and December 2011. *Underwriter* represents the bond underwriter. If multiple bond underwriters exist for a firm, *Underwriter Tier 1* and Underwriter *assets* variables reflect the average values. *Underwriter is a bank holding company* equals 1 if any of the bond underwriters of a firm is a bank holding company, and 0 otherwise. All other variable definitions are provided in Table 2.

activity in the CDS market, this approach could reduce the missing number of observations and result in a stronger IV. Regression III reports that the coefficient estimate on the bank holding dummy is 0.11 and insignificant.

These results show that the small sample size and/or the distressed status of the sample firms make the IV approach difficult to implement.

VITA

Cihan Uzmanoglu was born in Turkey. He obtained his Bachelor of Science in Materials Engineering in 2004 from Yildiz Technical University. After graduating from college, he continued his academic pursuits and earned his Master of Business Administration degree in 2007 from the University of Texas at Dallas. In January 2008, he joined Bloomberg L.P. as an equity analyst. He started the doctoral program in finance at Louisiana State University in August 2009, and expects to obtain his Doctor of Philosophy degree in May 2013.