Market versus Contracting: Credit Default Swaps and Creditor Protection in Loans*

Susan Chenyu Shan
Shanghai Advanced Institute of Finance (SAIF), SJTU
E-mail: *cyshan@saif.sjtu.edu.cn*

Dragon Yongjun Tang
Faculty of Business and Economics, University of Hong Kong
E-mail: *yjtang@hku.hk*

Andrew Winton
Carlson School of Management, University of Minnesota
E-mail: *winto003@umn.edu*

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ABSTRACT

We use innovations in financial markets to study security design of debt contracts. The rise of credit default swaps (CDS) provides creditors a market-based alternative way to obtain protection. We find that once CDS on a given firm begin trading, new loans to that firm are less likely to be secured and have laxer net worth requirements. This CDS effect on loan security is more pronounced when agency concerns are less severe. Moreover, loans to CDS-referenced firms are amended less. Our findings suggest that CDS market helps make financial contracts more admissible by substituting costly loan terms on creditor protection.

JEL Classification: G21; G32; L14; O16

Keywords: Creditor Protection; Credit Default Swaps; CDS; Collateral

I. Introduction

Creditors often demand collateral and impose restriction on the borrowing firm's net worth to protect themselves against borrower default. Indeed, Djankov, McLiesh, and Shleifer (2007) show that the enforcement of creditor rights through the legal system is instrumental to credit market development all over the world. Nevertheless, although collateral and other protective terms may be essential for a firm to gain access to credit markets, they are not without costs. Pledging collateral for an existing loan means the firm will not be able to use that collateral to obtain financing if unexpected needs arise in the future; more limited firm collateral is associated with greater opportunity cost. Restrictive covenants including minimum net worth may prevent value-enhancing actions and actions aimed at creditor expropriation, thus requiring costly renegotiation of the covenant; tighter covenants are associated with an increased likelihood that such costly renegotiation will be needed.[1] Moreover, monitoring and enforcing collateral requirements and covenants are also costly for lenders.

When credit default swaps (CDS), a new instrument for credit protection, that reference borrowing firms' debt are available in marketplace, they provide lenders with an alternative means of protecting themselves while avoiding the costs of conventional creditor protection.[2] The value of CDS as protection of creditor cash flow rights is specifically pointed out by Feldhütter, Hotchkiss, and Karakaş (2015), who construct a new measure of creditor control rights based on CDS and bond spreads. In this paper, we empirically examine whether and how the CDS market affects creditor protection terms in corporate loans, such as the use of collateral and restrictions on firm net worth.

Theoretically, the advent of trading CDS that reference a given firm could lead to either looser or tighter credit protection terms in its loans. We discuss the reasoning more fully in the next section, but an overview is as follows. One line of argument (e.g., Parlour and Winton, 2013) focuses on the monitoring role of bank lenders. If lenders can purchase cheap credit protection via CDS, they will not monitor borrowers, increasing borrower agency problems and defaults. However, in equilibrium, CDS sellers charge higher premiums to reflect the

[1] Indeed, Denis and Wang (2014) document that more restrictive covenants are associated with higher ex ante probability of renegotiation and higher ex post likelihood of covenant violation.

[2] Although the most commonly traded CDS contracts reference senior unsecured bonds rather than loans, standard cross-default clauses mean that bonds and loans face default in the same states of the world. Thus, CDS contracts linked to a firm's bonds can hedge the credit risk of its loans, though with some basis risk.

higher default risk, and in turn, banks will prefer to protect themselves with tighter collateral and covenants requirements. The other line of argument (e.g., Bolton and Oehmke, 2011) focuses on ex post renegotiation of debt in distress. If lenders can purchase credit protection via CDS, they will no longer fear borrower default and therefore will have little need to compromise during any subsequent debt renegotiations. Knowing this, borrowers will avoid risk-shifting and other behaviors that increase the chance of default in the first place. Thus, CDS premiums will remain low, and lenders can cheaply protect themselves with CDS rather than collateral and covenants.

Given these conflicting predictions about how the availability of credit protection through the CDS market affects creditor protection terms in corporate loans, we turn to the data to see which effect dominates.[3] We construct a dataset covering U.S. corporate loans and CDS trades from 1994 to 2009 and run tests for the impact of CDS availability on two common and especially relevant creditor protection terms: collateral requirements and covenants that place minimum requirements on borrower net worth. We find that following the start of CDS trading referencing a given firm's debt, bank loans to that firm are less likely to be collateralized and have less stringent requirements on firm net worth. This finding is robust to alternative measures of creditor protection in loan contracts.

Although our baseline finding is consistent with the view that the availability of CDS can make lenders tougher bargainers and loosen collateral and covenant requirements, alternative explanations may be at work. For example, CDS trading may be endogenous: lenders that use looser loan contract terms for other reasons may then find it more advantageous to use CDS to hedge their risk, which may encourage an active market for the borrower's CDS, as predicted by Parlour and Winton (2013). Alternatively, there may be selection effects: firms that have CDS contracts written on them may differ fundamentally from non-CDS firms in ways that make a looser loan contract optimal. We address these concerns using instrumental variable and propensity score matching. Following Saretto and Tookes (2013), we instrument for CDS trading using the amount of foreign exchange (FX) derivatives that the firm's *past* lead banks and bond underwriters use for hedging (not trading) purposes relative

[3]Note that in practice, CFOs and loan officers increasingly *do* take the availability of credit protection into account when setting loan contract terms. Habib Motani, a partner at Clifford Chance in London, notes, "when our lending team puts a loan together, they are asked whether it will be deliverable under a credit derivative. If not, then very often it will not be suitable." He also notes that this situation has only emerged in the last several years. (CFO.com, September 26, 2007)

to their total loans.[4] Our instrumental variable estimation results continue to show a strong negative relation between the onset of CDS trading and loan contractual protection terms. Moreover, we use propensity score matching to construct a matched sample of CDS treated and non-CDS control firms. We then use a difference-in-differences estimator on the matched sample to measure how the actual advent of CDS trading affects loan contracts. We also conduct alternative-sample regressions and within-bank analysis. The result that the advent of CDS trading leads to less collateral and looser net worth requirements remains significant, suggesting that the impact of CDS trading on creditor protection terms is causal.

Our analysis implicitly assumes that banks use CDS linked to their borrowers. This assumption is supported by the evidence presented by Acharya and Johnson (2007). Nevertheless, there is substantial heterogeneity in banks' use of CDS. Taking advantage of our unique data on the quantity of CDS trading, we show that the CDS effect is stronger when more outstanding CDS contracts reference the borrower's debt. To the extent that the number of outstanding contracts serves as a measure of CDS market liquidity and, thus, the ease with which lenders can hedge their exposures to the referenced firm, this is consistent with greater availability of CDS contracts enhancing lender bargaining power and reducing loan contracting costs. Moreover, the loosening effect we find should be concentrated on loans for which the lenders actually use CDS. To the extent that a bank with a larger credit derivative portfolio is more likely to have purchased CDS protection on a CDS-referenced borrower, the impact of CDS trading on collateral and net worth requirement should increase with the bank's aggregate credit derivatives position. This is precisely what we find in the data.

Our main finding is consistent with the view that an optimal contract design should minimize the opportunity cost of pledging collateral and the expected cost of renegotiating contracts in the future. However, loosening creditor protection terms in loan contracts may make it easier for borrowers to engage in risk-shifting and other forms of creditor exploitation. For firms where the underlying risk of agency problems is lower, loosening should have little adverse effect compared with the gains of avoiding these costs, whereas the opposite should be true for firms for which this underlying risk is higher. Thus, the degree of loosening should

[4]Lenders active in foreign exchange derivatives hedging are more likely to have expertise that allows them to hedge their loan risk by participating in the CDS market, but *past* lenders' FX hedging is unlikely to directly drive the choice of contractual protection terms in newly written loans. Our tests show that the instrument is strongly correlated with CDS trading and satisfies the exclusion criterion. This instrument is also used by Subrahmanyam, Tang, and Wang (2014).

be lower for firms that are more subject to concerns about agency problems. Gârleanu and Zwiebel (2009) predict that covenants should be tighter when agency problem is more severe. Their theory implies that the impact of CDS trading on loan contractual protection terms should also be smaller for firms with severe risk-shifting incentives.[5] Accordingly, we run tests in which we interact the availability of CDS on a given firm with proxy for the likelihood that the firm will engage in creditor exploitation. Consistent with theoretical predictions, we find that borrowers with lower credit risk experience *more* loosening in their collateral and net worth requirements following CDS trading, as these firms are less likely to be subject to agency problems.

An implication of the creditor bargaining power theory (e.g., Bolton and Oehmke (2011)) is that loans to CDS-referenced firms would be renegotiated less often. In practice, loan amendments are largely a consequence of the restrictiveness of the initial contracts and a way for borrowers to extract possible surplus that is outside the deal. If lenders loosen the initial contract in the first place, then there is less need for future amendments. Examining loan amendment data, we find that this is indeed the case. This finding suggests that the use of CDS protection may help reduce the costs associated with loan renegotiations.

To the best of our knowledge, this is the first empirical paper to study the impact of the credit derivatives market on non-pricing loan contract terms. As discussed in more depth in the next section, the study most similar to ours is Wang and Xia (2014), who focus on how loan securitization affects covenant tightness. In a similar vein, Chakraborty, Chava, and Ganduri (2015) find that creditors exercise less control rights when CDS are available, especially when lenders have less to gain from monitoring the borrowers. The upshot of our study is that the introduction of CDS contracts has had a significant impact on the design of corporate loan contracts, which is most pronounced for borrowing firms for which the adverse consequences of contract loosening are likely to be smallest. Our findings are most consistent with models that focus on the impact of CDS on potential loan renegotiations and the ensuing effects this has on ex ante debt contract design and borrower behavior. It is often argued that initial loan collateral and covenants are typically set too tight and are subsequently loosened

[5] More precisely, if a lender tried to loosen credit terms on a borrower with a higher risk while laying off its exposure by buying a CDS, the CDS seller would be concerned that the borrower would now have few constraints and, thus, would be at high risk of default. To protect itself, the CDS seller would charge a high premium and incur adverse incentives, which would make the CDS transaction less attractive to the lender in the first place.

(see, e.g., Denis and Wang (2014)); thus, our finding that *initial* requirements on collateral and net worth loosen when CDS are introduced suggests that CDS may improve contracting efficiency, especially for high-quality borrowers.

Our paper highlights a possible "bright side" to the introduction of CDS contracts. This stands in contrast to much of the empirical literature on CDS and lending, which, as surveyed by Augustin, Subrahmanyam, Tang, and Wang (2014), has found that the advent of CDS trading for a given firm often causes loan spreads to rise and leads to higher subsequent default rates. Nevertheless, although our results are certainly consistent with the notion that banks are most likely to actually use CDS to hedge their loans precisely in the cases when it improves contracting efficiency and firm value, further work is needed to establish whether and to what extent the effects are welfare improving.

The remainder of our paper is organized as follows. Section II discusses the relevant theoretical literature, its empirical predictions, and our relationship to existing empirical work. Section III describes our data and empirical specification. Section IV presents our baseline empirical results, addresses endogeneity and selection concerns, and tests more complex predictions of how the effects of CDS trading should vary across firms and lenders. Finally, Section V concludes.

II. Theoretical Background and Empirical Implications

Although there is relatively little theoretical work directly examining how the ability to trade CDS affects the choice of debt terms other than the interest rate, combining theories of how CDS affect borrower-lender interactions with theories of debt contract design yields a number of predictions that we can test using the data. After establishing these predictions, we show how our analysis relates to existing empirical work on loan contract design and on the impact of CDS trading on corporate finance.

Prior theoretical work on CDS trading and borrower-lender interactions emphasizes two effects, both of which follow from the fact that a lender that buys CDS protection on its borrower is now insulated from that borrower's risk of default yet retains the control rights embedded in the loan contract, as carefully discussed and examined by Feldhütter, Hotchkiss, and Karakaş (2015). The first effect, emphasized by Morrison (2005), Hu and Black (2008), and Parlour and Winton (2013), is that once the lender has bought protection against borrower default, it no longer has an incentive to engage in costly loan monitoring or, indeed, in any costly ex post actions aimed at improving the borrower's situation. If it is possible to purchase CDS protection for a given borrower anonymously, the borrower will not be monitored at all, nor will the CDS sellers make up for this by monitoring the borrower: they lack the control rights that allow them to act on observations from such monitoring.[6] If instead, the CDS purchaser's identity is known to its CDS counterparties, banks will make use of CDS only when the benefits of monitoring are negligible to begin with.

The second effect of CDS trading, as emphasized by Bolton and Oehmke (2011), Campello and Matta (2013), and Arping (2014), is that lenders with CDS protection no longer have to worry about the borrower defaulting because this default triggers payment from CDS sellers, which makes these lenders much tougher bargainers in loan renegotiations aimed at preventing costly bankruptcy or liquidation. This gives the borrower more incentive to avoid anything that will trigger such renegotiations, which should lead to less frequent strategic default aimed at extracting surplus (as in Bolton and Oehmke, 2011) and greater borrower effort to avoid poor outcomes in the first place (as in Arping, 2014). The two effects of CDS trading may have implications for borrower and lender's incentives and lead to changes in debt contracts, which we explain below.

As noted in the previous section, to protect themselves against borrower default, lenders often demand that the borrower pledge collateral and agree to restrictive covenants concerning the borrower's ability to repay the loan. As reviewed by Berger, Frame, and Ioannidou (2011), theories of why lenders require collateral fall into two groups: those in which pledging collateral serves as a signal that the borrower's (hidden) ex ante credit quality is good and those in which collateral serves to reduce ex post frictions that are most problematic for (observably) riskier borrowers, such as risk-shifting, costly contract enforcement or costly state verification. Although these two sets of theories have somewhat opposing predictions, empirical work suggests that the first mechanism is more critical for small privately held firms, whereas the second mechanism is more important for large publicly held firms (see, e.g., Jimenez, Salas, and Saurina (2006)). Given that CDS exist mostly for large publicly traded firms, we focus our discussion on theories based on ex post frictions.

[6]Moreover, Biais, Heider, and Hoerova (2015) argue that bad news about borrowers may lead protection sellers to underinvest in reducing the risk of *their* own assets, generating endogenous counterparty risk for CDS buyers.

Although it may protect lenders, using collateral imposes costs on both lenders and borrowers. Collateral is rarely as valuable to the lender as it is to the borrower, and the lender must expend costly effort on making sure the collateral exists and is of sufficient quality and quantity; moreover, as we have noted, pledging collateral now reduces the borrower's ability to pledge it in the future when needs become greater.[7] This means that borrowers and lenders will both have incentives to substitute CDS for collateral *if* CDS are a cheaper means of providing both lender protection and reducing borrower moral hazard. However, if lenders' use of CDS exacerbates borrower agency problems, then CDS sellers will charge higher premiums and lenders may demand the same or even higher collateral requirements as a cheaper means of protection.

Most theories of why lenders require restrictive covenants such as minimum net worth focus on preventing ex post exploitation of the lender by the borrower; examples include Smith and Warner (1979), Berlin and Mester (1992), Rajan and Winton (1995), and Gârleanu and Zwiebel (2009). Such covenants are also costly.[8] The optimal tightness of covenants will depend on the likelihood of exploitative behavior: factors that make exploitation less likely, such as lower default risk, allow optimal covenants to be looser, and vice versa. These arguments should apply most forcefully to covenants that are based on more easily observable accounting information such as net worth because these covenants are likely to be more useful in aligning the interests of equity holders and debt holders (Aghion and Bolton, 1992). Moreover, because risk-shifting and other forms of exploitative behavior are more likely to occur when a firm's net worth is low (Gârleanu and Zwiebel, 2009), we expect any CDS effect to be most acute for covenants linked to the borrower's net worth. As in the case of collateral, both borrowers and lenders will have incentives to substitute CDS for tight covenants *if* CDS provide a cheaper way of preventing exploitative behavior by borrowers, but lenders may prefer tighter covenants if CDS exacerbate borrower agency problems.[9]

[7]Indeed, Vig (2013) demonstrates potential adverse effects of strengthening creditor protection due to legal changes, as borrowers shy away from secured borrowing. Cerqueiro, Ongena, and Roszbach (2015) show that reductions in the value of collateral to lenders reduce their willingness to lend and to monitor borrowers.

[8]They may require that the lender monitor at a cost (as in Rajan and Winton (1995)); in addition, they may prevent the borrower from pursuing useful projects or be violated in circumstances where default and bankruptcy are inefficient, either of which will require costly renegotiation (as in Berlin and Mester (1992) and Gârleanu and Zwiebel (2009)).

[9]Matters are somewhat different if, as argued by Rajan and Winton (1995), the failure to monitor impairs lenders' ability to detect covenant violations in the first place. In such a situation, CDS would lead to no effective controls on borrowers, making CDS protection extremely (and perhaps prohibitively) expensive, which should make it less likely for CDS to be available to borrowers when covenants themselves require intensive monitoring. In fact, CDS are often unavailable to less well-known borrowers with severe potential

Note that it needs not be the case that one line of argument or another always dominates. For firms for which borrower agency problems are especially severe, loosening credit terms is likely to be especially costly: such firms will find it difficult to avoid distress regardless of lender bargaining power and will instead focus on exploiting their lenders through risk-shifting and similar behavior. In this case, we would expect that the argument that CDS lead to no change in, or even the tightening of, credit terms would apply. By contrast, for borrowers for whom agency problems are less likely, loosening terms while toughening lender bargaining power should be more likely to be beneficial.

Thus far, we have taken for granted that lenders will purchase CDS if they are available at a reasonable cost. As already mentioned, the cost of CDS protection may become unattractive if CDS sellers expect significant agency problems and subsequent defaults. Lenders may also forgo CDS protection if such contracts are difficult to arrange or if the lender has little understanding of the pricing and operation of such contracts.[10] This suggests that lenders will be more likely to purchase CDS if there is a liquid market for these contracts or if lenders have significant expertise in using credit derivatives. Thus, the impact of CDS on loan contract terms should be more pronounced in these situations.

There is a growing body of literature on how CDS affect specific aspects of corporate financing. Saretto and Tookes (2013) find that the advent of CDS trading allowed borrowers to increase their leverage and their debt's average maturity. Ashcraft and Santos (2009), Shan, Tang, and Yan (2015), and Chakraborty, Chava, and Ganduri (2015) study how the advent of CDS trading affected loan spreads, lenders' regulatory capital, and exercise of control rights, respectively. Our paper complements these studies by examining how the protective non-price terms of loans are affected. This also allows us to gain further insight into the mechanisms involved, i.e., whether the use of market-based protection tools does in fact affect lenders' attitudes towards renegotiation, which in turn may affect the initial design of the loan contract and the borrower's behavior. This may shed light on the question of whether credit derivatives improve debt contracting efficiency.[11]

agency problems. That said, our empirical focus on collateral and net worth, which are easily monitored, should make this issue less critical.

[10] Minton, Stulz, and Williamson (2009) argue that banks' CDS positions are intended mostly for trading purposes; however, if banks do not link CDS to loans, then we should not find any CDS effect on loan terms.

[11] Another stream of literature focuses on the risk consequences of the underlying firm. For example, Karolyi (2013) shows that borrowing firms increase their operational risk after CDS begin trading on their debt. Arentsen, Mauer, Rosenlund, Zhang, and Zhao (2015) find similar evidence for mortgages. Subrahmanyam, Tang, and Wang (2014) suggest firms become more default risky after they become CDS referenced. Demiroglu

We also contribute to a growing stream of literature on how the development of markets for credit risk transfer affects loan contracting terms. Related studies include Wang and Xia (2014), who examine whether a bank's activity in overall loan securitization as proxied by CDO underwriting affects its monitoring incentives.[12] Drucker and Puri (2009) examine the impact of loan sales on initial loan contracting; they find that sold loans tend to be riskier and have tighter and more numerous covenants than loans that are not sold, which, according to the authors, is intended to allay loan buyer' concerns that loan originators will monitor these borrowers less intensively. Our work thus examines a potential "bright side" of credit risk transfer via CDS: whereas loan sales lead to tighter covenants (increasing expected renegotiation costs), CDS have the potential to loosen collateral and net worth requirements for some borrowers.

III. Data and Summary Statistics

We compile data on CDS introduction and loan contracts for U.S. corporations from 1994 to 2009. CDS introduction data are difficult to retrieve from a single data source, given that CDS are not traded in centralized exchanges (the central clearing of CDS began in 2013, which is after the end of our sample period). Similar to Subrahmanyam, Tang, and Wang (2014), we assemble CDS introduction data from two major transaction data sources: CreditTrade and GFI Group. The CreditTrade data cover the period from June 1997 to March 2006. The GFI data cover the period from January 2002 to April 2009. Both databases contain complete information on intra-day CDS binding quotes and trades. We identify the first trading date for each firm's CDS from these two real transaction data sources. We focus on CDS contracts written on non-sovereign North American corporate issuers. The overlapping period of the two databases from January 2002 to March 2006 allows us to cross-check the first CDS trading dates. We further validate our CDS introduction dates with Markit quote data to ensure accuracy.

and James (2015) study the role of CDS in debt restructuring.

[12]Wang and Xia's findings suggest that securitization-active banks monitor their corporate borrowers less intensively than other banks do: loan covenants are looser, borrowers increase risk more after loan origination, and lenders are more likely to waive covenant violations without requiring any change in loan terms. Our paper differs in three key respects: first, and most obviously, we focus on the impact of CDS rather than on loan securitization; second, we are able to focus on the impact of CDS activity tied to a specific borrower; third, we examine how differences across borrowing firms affect the impact of CDS on collateral and net worth requirements. Finally, CDS typically cover higher-quality borrowers, while junk-rated loans are more often securitized. Therefore, our analysis complements Wang and Xia's analysis.

To account for the liquidity of CDS transactions and the ease of access to the CDS market for investors, we retrieve data on the quantity of CDS trading and outstanding positions. The detailed transaction data include contract specifics such as size, maturity and credit event clauses. We assemble data on the daily number of CDS contracts outstanding on each firm's debt, and we aggregate the number of outstanding CDS contracts by quarter to be consistent with the frequency of borrowers' financial information.

Our loan contract data are obtained from Loan Pricing Corporation (LPC)'s Dealscan. We combine firm financial data from Compustat with loan data using the link file provided by Chava and Roberts (2008). We obtain loan contractual protection data and other loan characteristics from initial loan contracts covered in Dealscan. The initial sample includes the private debt agreements made by bank and non-bank lenders to U.S. corporations during the period from 1981 to 2009. The Dealscan database contains between 50% and 70% of all commercial loans in the U.S. issued during the early 1990s (Chava and Roberts, 2008). Dealscan coverage increases to include an even greater fraction of commercial loans from 1994 onward. Moreover, the first CDS trading in our sample occurred in 1997. Firm fundamentals may change significantly from the early observations before CDS introduction to after CDS introduction if the time span is too large. We therefore start our loan sample period in 1994. The loans in Dealscan are reported at the facility level. We aggregate facilities in the same loan packages (deals) to conduct our analysis at the loan package level because the net worth requirement is specified at this level. Loan security information is reported at facility level; however, facilities that belong to the same package usually have the same security status.[13] Other loan characteristics, such as the dollar amount, maturity, loan spread, loan type and loan purpose are reported at the facility level. We define the loan amount as the total amount aggregated across facilities that compose a loan package. Loan maturity and loan spread are the simple average maturity and average all-in-drawn spread of all facilities in the same loan package.

We are interested mainly in loan contractual protection terms. One type of contractual protection measure is to secure loans with collateral. In Dealscan, whether a loan is collateralized is denoted by the indicator "secured". If "secured" takes the value of "Yes", the repayment of the loan is backed by collateral. The other type of contractual protection is

[13]Out of the raw sample of 56,040 loans with security information available, only 775 loans contain both secured and unsecured facilities. The other 55,265 loans are either entirely secured or unsecured.

the minimum net worth requirement, which specifies the minimum net worth that the firm must maintain before the loan matures. We measure the restrictiveness of the net worth requirement by calculating the tightness measure of the net worth covenants introduced by Murfin (2012). Specifying the minimum net worth value is effective in controlling debt-equity conflicts by requiring the borrower to maintain sufficient equity capital. It is also among the most frequently violated and renegotiated covenants (Denis and Wang, 2014). If a lender has bought protection from the CDS seller, she may become less interested in requiring as much protection from loan contractual terms as she did before if the costs of setting these terms outweigh the costs of using CDS. In this regard, collateral and net worth requirements are the most direct form of protection devices, as they are straightforward measures of firm value that the lender may claim when the firm is in trouble.

The final CDS introduction sample for our empirical analysis contains 921 unique U.S. firms with CDS trading during the period from June 1997 to April 2009.[14] We start our loan issuance sample in 1994 so that borrowing firms have a pre-CDS control sample period. Table I presents the year-by-year summary of the loans in our sample. The whole sample includes 67,677 loans issued to 13,385 unique firms. Approximately 62.2% loans are secured by collateral. The average net worth requirement is 0.322 for those firms with such covenants, suggesting that the probability of the net worth covenant violation over the next year is 32.2%.

Table I also summarizes the characteristics of loans issued to CDS firms. A total of 5,471 (8.1%) loans are issued to 807 (6%) firms that have an active CDS market referencing their debt at loan origination. The number of unique CDS firms peaked at 485 in 2005. The number dropped to 225 in 2008 during the 2007-2009 credit crisis. 37.8% of the CDS-referenced loans are secured, which is approximately half of the level of non-CDS firms' loans. The average net worth requirement is 0.214 for CDS firms, lower than the average of 0.322 for the whole sample. This suggests that CDS firms have an lower ex ante probability to breach the net worth requirement specified in the initial loan contract than non-CDS firms. Table II reports the summary statistics of the loan contractual protection items and other loan contract terms, as well as borrower characteristics. The average loan amount, all-in-drawn spread and maturity for our sample loans are $320.8 million, 98 basis points and 46 months, respectively. Approximately 33% of the loan borrowers have S&P credit ratings.

[14]Li and Tang (2015) document that approximately 8% of U.S. firms have CDS referencing their debt.

IV. Empirical Results

In this section, we first present our baseline results on the relationship between CDS trading and loan protection terms in the initial contract. Then, we account for the selection of CDS trading. Furthermore, we provide evidence that the CDS effect on loan contract terms is channeled through CDS transactions. Last, we analyze the mechanisms for the CDS effects.

A. CDS Trading and Loan Contractual Protection: Baseline Findings

We conduct a difference-in-differences analysis in our main empirical specifications. The dependent variables for our panel regressions using loan-initiation observations are measures of loan contractual protection terms: whether the loan is collateralized and the strictness of the covenant on net worth. For the explanatory variables, we construct two CDS variables similar to those in prior related studies such as Ashcraft and Santos (2009), Saretto and Tookes (2013) and Subrahmanyam, Tang and Wang (2014): *CDS Trading*, a dummy representing whether the borrower's debt has active CDS trading in the quarter of loan origination, and *CDS Traded*, a dummy representing whether the issuer has a CDS market on its debt at any time during the entire sample period. We aim to identify time-series changes in the use of loan contractual protection devices after CDS introduction. Therefore, *CDS Trading* is the variable of primary interest. *CDS Traded* is designed to capture unobservable differences that may drive the different levels of loan contractual protection between CDS and non-CDS firms. By incorporating both *CDS Trading* and *CDS Traded* into the specifications, we can identify the effect of CDS trading after the inception of CDS from before CDS introduction for the same CDS firms. Moreover, this difference-in-differences setting also helps insulate the CDS effect from any potential time trend in loan contract variables. Specifically, we employ the following specification:

$$\begin{aligned}\text{Loan Contractual Protection}_{ijt} &= \alpha_1 + \beta_1 \text{CDS Trading}_{ijt} + \beta_2 \text{CDS Traded}_i \\ &\quad + \gamma_1 \text{Controls}_{ijt} + \gamma_2 \text{X}_{1i} + \gamma_3 \text{X}_{2t} + \epsilon_{ijt}\end{aligned} \tag{1}$$

where i represents the borrowing firm, j represents the loan, and t represents the loan origination time. We include a host of control variables identified in prior studies as determinants of loan contract terms to ensure that the effect comes from CDS trading and that it is not driven by other loan or borrower characteristics. Specifically, the loan-level control variables include the loan issuance amount, maturity, loan spread and the number of lenders in the loan syndicate.[15] We aim to control for firm size and credit risk using borrower-level control variables; therefore, we include the logarithm of total assets, a dummy representing whether the firm has an S&P rating, and Altman's Z-score in the specifications. Controls of borrower characteristics are extracted at the end of the quarter prior to loan initiation. In addition to including the loan origination year and borrower industry fixed effects, we construct dummy variables for loan purposes to account for any possibility that the level of loan contractual protection systematically varies across loans issued for different purposes.[16]

Table III presents the baseline OLS regression results under the difference-in-differences framework. The dependent variable for models 1 and 2 is a dummy representing whether the loan is secured by collateral. *CDS Trading* and *CDS Traded* are positively correlated because only CDS firms can have active CDS trading at loan origination. We show the estimation results of *CDS Trading* both with and without the inclusion of *CDS Traded* to demonstrate that the CDS trading effect is distinct from the CDS firm effect. Controlling for the loan origination year, borrower industry and loan purpose effects, model 1 indicates that the marginal effect of CDS trading on the probability that the loan is secured by collateral is -0.076 (or 21.1% relative to the proportion of secured loans for the CDS firms three years prior to CDS introduction). The coefficient estimate is -0.113 when the CDS firm effect is not accounted for. These coefficient estimates are statistically significant and at a plausible economic magnitude. We cluster standard errors by firm to eliminate the cross-dependence of contractual characteristics within firms.

Similar CDS effects are obtained with the net worth requirement measure in models 3 and 4, where the dependent variable, net worth requirements, is measured by the strictness of net worth covenants:

$$\text{Net Worth Requirement} = 1 - \Phi\left(\frac{w - \underline{w}}{\sigma}\right), \tag{2}$$

where w is the current net worth of the firm at loan initiation. $\underline{w}$ is the minimum net worth that the firm must maintain before the loan is matured. This measure represents the probability that the net worth covenant is violated, as first proposed by Murfin (2012).

[15] We include both syndicated loans and sole-lender loans in our sample. For sole-lender loans, the number of lenders is set to one.

[16] Major loan purposes specified in the contracts include general corporate purposes, working capital, debt repayment, takeover, and CP backup.

The coefficients of *CDS Trading* are negative, suggesting that the minimum requirement for the firm's net worth is loosened after CDS trading is introduced. The estimation results on other explanatory variables are consistent with the literature. For example, borrowers with a larger size, available S&P rating and higher Z-score are imposed relatively lower net worth requirements, as borrowers that are more financially constrained are more subject to agency problems such as wealth transfer from debtholder to shareholder. Therefore, these firms are imposed stricter net worth requirements.

Our findings of less-secured loans and looser net worth requirements suggest that lenders demand less loan contractual protection when they can obtain protection from the CDS market. In other words, the market-based protection of lenders may substitute traditional protection provided in loan contracts. Lenders become less concerned about their claims on collateral and about shareholders' "skin in the game" when they can separate cash flow rights through the CDS market. This is a result of the possibility that the costs, both direct and indirect, of designing loan contractual protection devices may outweigh the cost of purchasing CDS for hedging. We explore these costs mainly from the aspect of debt-equity conflicts in the following sections. In terms of CDS effects on the pricing terms of loans, Shan, Tang, and Yan (2015) and Ashcraft and Santos (2009) find that loan spreads increase after the reference firms' CDS trading. Hence, the lender may be compensated with higher rates for reduced contractual protection. Table III shows a reduction in loan contractual protection even when loan spread is controlled for. Although CDS may not directly benefit borrowers in terms of the lowered cost of debt, borrowers may indirectly benefit through less restrictive non-pricing terms and lower contracting costs.

B. Addressing Endogeneity and Selection in CDS Trading

Our study, similar to other studies on the impact of CDS trading, is subject to the concern that CDS firms are not randomly assigned and that the starting point of CDS trading can be endogenously determined. This endogeneity has two possible sources. The first is reverse causality. That is, lenders may initiate a CDS market in anticipation of the lending standards being loosened. In other words, lenders may have a greater demand for hedging contracts such as CDS when they anticipate a greater supply of unsecured loans or loans with less-restrictive contracts. We conducted a supplementary analysis, constraining the sample by skipping observations in which loan contracting is within one year, two years or three years after first CDS trading, and found similar results (see Table IA1 of the Internet Appendix), suggesting that our findings are not due to reverse causality. Our reasoning is that it may be possible for lenders to anticipate changes in loan contracts in the near future, but it becomes more difficult to expect changes in the remote future, such as in three years. Thus, the reverse causality problem is more likely to occur for the observations right after CDS introduction and become less severe as time passes.

The other source of endogeneity is the omitted variable problem. Specifically, CDS firms are not randomly assigned in the sense that some factors that drive the contract to be looser may also determine the likelihood of the firm to be selected into CDS referencing. For instance, changes in borrowers' riskiness over time may explain contract features as well as the onset of CDS trading. However, Subrahmanyam, Tang and Wang (2014) show that firms become more default risky after they are referenced with CDS. Higher default risks should lead to more collateral protection and drive net worth requirements to become tighter rather than looser. Therefore, predictions from the omitted correlated variables oppose our findings.

Nevertheless, we formally address the endogeneity issue using various econometric techniques. The selection of firms into CDS trading will result in biased coefficient estimates on *CDS Trading*, which may be correlated with the regression error term. Specifically, we are interested in obtaining

$$\text{Treatment Effects(TT)} = E(Y_1|X, D = 1) - E(Y_1|X, D = 0) \tag{3}$$

while we are only able to observe

$$\text{Treatment Effects(TT')} = E(Y_1|X, D = 1) - E(Y_0|X, D = 0) \tag{4}$$

where D indicates whether the observation receives treatment. We want to observe how treatment firms would have behaved if they were not treated. To make TT' as close to TT as possible, we employ the instrumental variable (IV) approach by carrying out a two-stage-least-squares (2SLS) regression. Second, we use the propensity score matching approach by assuming that all factors that determine CDS introduction are accessible. These approaches are standard and can potentially alleviate the endogeneity concern.

B.1. Instrumental Variable (IV) Approach

The endogeneity concern we have is about the correlation between our main variable of interest, *CDS Trading*, and the residual term in the loan contractual protection regression. We use instrumental variables for *CDS Trading* to address this correlation issue. The ideal instrument should affect loan contractual protection only through *CDS Trading*. We follow the guidelines from Roberts and Whited (2012) regarding IVs. The instrument, *Past Lender's Foreign Exchange Derivatives*, is selected based on the existing literature, namely, Saretto and Tookes (2013) and Subrahmanyam, Tang and Wang (2014). This instrument is the amount of foreign exchange derivatives used for hedging (not trading) purposes relative to the total loans of the lead syndicate banks a firm has borrowed from during the past five years. This variable is constructed for each firm as the average across all banks that have served as a syndicate member over the past five years. The ratio is lagged by one quarter when included in the first-stage probit regression. Lenders' foreign exchange derivative data are available from the Federal Reserve's Call Report, which tracks the lending banks' quarterly derivatives usage and the compositions of their loan portfolios. The idea is that banks that hedge their loan portfolios are generally more likely to be active risk managers and use more than one type of derivative. Thus, this instrumental variable captures the hedging demand of firms' creditors and is expected to be related to the existence of CDS markets for firms' debt.

We believe that this instrumental variable broadly satisfies the two conditions for valid instruments discussed by Roberts and Whited (2012). First, the partial correlation between the instrument and the endogenous variable is not zero. The relevance condition requires that the coefficient γ in the regression

$$\begin{aligned}\text{Prob}(\text{CDS Trading}_{it}) = \alpha + \beta \text{Past Lender's Foreign Exchange Derivatives}_{it-1} \\ + \gamma \text{Other Borrower Characteristics}_{it-1} + u_{it}\end{aligned} \tag{5}$$

does not equal zero, where x_{it-1} refers to a set of exogenous variables that explain the onset of CDS trading. The *relevance* requirement essentially translates to the first-stage regression (results reported in Internet Appendix Table IA2). We employ the OLS regression of *CDS Trading* on the t-1 (one-quarter-lagged) value of the *past* lender's foreign exchange derivatives, controlling for other exogenous variables. Consistent with our expectation, a larger *past* lender's foreign exchange derivatives hedging position relates to a higher probability of CDS trading, i.e., the probability of a firm being selected into CDS trading. The partial correlation between the instrumental variable and *CDS Trading* is both economically and statistically significant.

The second requirement for a valid IV is the *exclusion* condition $cov(\text{IV}, \epsilon)$=0. That is, the instrument influences the outcome *Loan Contractual Protection* only through its effect on the endogenous variable *CDS Trading*. A lender's foreign exchange derivatives position is a macro hedge and characterizes the lender's global risk management strategy. More importantly, the firms in our sample are U.S. firms, making a bank's decision to hedge foreign exchange exogenous to its domestic borrowers' U.S. dollar-denominated loan contracts. Finally, the instrument is constructed based on the lender's *past* derivative position, which should not affect the firm's *current* loan contract terms. Therefore, this variable is unlikely to directly affect loan contractual protection measures.

The second-stage estimation results using the fitted values of *CDS Trading* are reported in Table IV. The coefficient estimates on the instrumented *CDS Trading* are negative and statistically significant at 5% or better. This evidence is consistent with a causal interpretation of the CDS effect on loan contractual protection. Recognizing the limitations of the IV approach, we next use alternative approaches to further tackle the endogeneity concern.

B.2. Propensity Score Matching

Our ultimate goal is to purge the marginal effects of CDS trading on loan contractual protection. However, it is impossible to obtain a treatment group to observe what firms would have experienced had they not experienced the treatment because firms are not randomly assigned to be treated with or without CDS trading. The approach of propensity score matching is aimed to address the selection bias issue. We attempt to observe whether the changes in loan contract items are still robust after pairing each treatment firm (CDS firm) with a matching firm (non-CDS firm) whose propensity to have CDS trading is nearest that of the treatment firm. We need to ensure that any change in loan contractual items is due purely to the advent of CDS trading instead of other factors that determine the firm's "selection" into the treatment group.

First, we use a probit regression to estimate the propensity score, which measures the possibility that a borrower's debt is referenced with CDS trading. The selection model of

CDS trading we use follows Ashcraft and Santos (2009), Saretto and Tookes (2013), and Subrahmanyam, Tang, and Wang (2014). The sample we use for the first-stage regression includes all loan quarters for non-CDS firms and only the loan quarter observations from the year 1994 until the first quarter that CDS trading begins for CDS firms. Given the trade-off between full information and possible selection bias due to incomplete Compustat information, we incorporate all relevant variables that may potentially affect CDS introduction conditioned on data availability. The explanatory variables for estimating the propensity score include the one-quarter lag of the following: the *past* lender's foreign exchange derivatives position (for hedging), logarithm of total assets, current ratio, return-on-assets, leverage ratio and Altman's Z-score.

Next, we pair CDS firms with a control group using *Nearest Neighborhood Matching*. Among the 807 CDS-referenced firms with collateral information available, 658 firms are paired with one matching firm each. Internet Appendix Table IA3 reports the comparison of loan characteristics for CDS and non-CDS firms before and after matching. Loans from the matched firms have much more similar characteristics to loans from CDS firms. The difference in the propensity score between firms with and without CDS trading decreases from 0.211 before matching to -0.007 after matching. More importantly, the propensity score difference becomes statistically insignificant after matching. Table V reports the regression results using the matched sample constructed from the prediction model. The coefficient estimates for *CDS Trading* remain significantly negative, suggesting that the observed CDS effect on loan security is not driven by characteristics that select the firm into the treatment group.

B.3. Other Analyses to Address Endogeneity Concerns

To further eliminate the reverse causality concern that firms that have a looser loan contract happen to become CDS-referenced for some other reasons, we examine other types of financial covenants that restrict borrower risk-shifting behavior that may exacerbate borrower-lender conflicts. Most relevant covenants are those restricting debt ratios, including debt-to-EBITDA ratio, debt-to-tangible net worth ratio and leverage ratio. We conduct the same analyses for these debt restrictions and report the results in Table IA4. As shown by the coefficients of *CDS Trading*, the tightness of these debt-ratio covenants is not significantly associated with the availability of CDS trading. It suggests the relation between CDS trading and covenant tightness is not a mechanical relation across all types of restrictions. Also, the relationship is not driven by certain borrower traits that enable the firm to obtain a generally looser loan contracts and also determine the start of CDS trading. Instead, the effect is only relevant to the restriction on net worth requirement which ensures repayment ability most forcefully.

Another endogeneity concern comes from the reasoning that the lowered contractual protection is due to different lending strategies employed by different banks. One case could be that banks that lend to CDS firms are totally different from the group of banks that lend to non-CDS firms and that the former always write looser contracts. Therefore, the observed contract differences are due to fixed bank effects as opposed to whether the borrower is CDS referenced. Such a predetermined bank-borrower match may contaminate our findings. To address this concern, we restrict the sample of lending banks to those that lend to both CDS and non-CDS firms. Furthermore, we restrict the sample to banks that lend to CDS firms both before and after CDS trading. Panels A and B of Internet Appendix Table IA5 show the results of the "within-bank" analysis and demonstrate that our findings are robust to the possible selection of banks. Heterogeneity in banks' lending strategies does not seem to be the driving factor for the changes in loan contractual protection devices.

C. CDS Market Liquidity and Bank Use of CDS

Thus far, we have shown that loan contractual protection is less frequently available for new loans issued after the advent of CDS. Our analysis implicitly assumes that lenders actually use the CDS of their borrowers. Acharya and Johnson (2007) and Shan, Tang and Yan (2015) provide evidence supporting this assumption (see Augustin, Subrahmanyam, Tang, and Wang (2014) for more detailed discussions). In this section, we demonstrate that the CDS effect on loan contractual protection is stronger when the CDS market is more liquid and when lenders are indeed active CDS users.

C.1. Effects of CDS Market Liquidity

If CDS provide alternative protection for lenders and loosen credit terms, then the magnitude of the effects should depend on the costs of buying CDS. If the underlying credit is too risky or the CDS transaction is difficult to arrange, then the cost of buying CDS protection would be unattractive and the effect of CDS limited. In this case, we should expect CDS effects to be stronger when the cost of using CDS is lower. This could be the case when the CDS market referencing the borrower's debt is more liquid, as lenders would find a greater ease of access to the CDS market and more likely trade CDS at fair prices.

We construct measures of CDS market liquidity to test the above prediction. CDS liquidity is difficult to measure because CDS contracts are not exchange traded and not continuously traded. Our transaction data record each trade from this source and from specific contract terms, such as expiration dates. Therefore, we can calculate outstanding CDS positions by summing all contracts that have not yet matured in a given quarter. The positions are in dollar terms. We further scale this dollar amount by the total value of debt outstanding of the reference firm to make the ratio more comparable across large and small firms. This relative CDS amount outstanding can be understood as the "open interest" of CDS, and it is our first liquidity measure. We also calculate for each reference issuer the trading volume in a given time period, such as a quarter, by counting the total number of transactions, which is our second CDS liquidity measure.[17]

We extend the baseline analysis by replacing the CDS trading indicator with these two CDS market liquidity measures. The regression estimation results are reported in Table VI. Model 1 shows a significant and negative coefficient estimate for *CDS Outstanding Amount/Total Amount of Debt* while controlling for CDS firm characteristics and other loan and firm characteristics. The results are consistent in model 3 when we use net worth requirements as the dependent variable. When there is a larger CDS position outstanding relative to the firm's debt at the time of loan origination, both collateral and net worth requirements are relaxed more. It is conceivable that part of the outstanding CDS positions is held by existing lenders (see Acharya and Johnson, 2007). Differently put, it is safe to assume that this measure is positively correlated with the lender's hedged positions. When much of the firm's debt is already hedged with CDS, creditors will be better able to initiate the new loan. Hence, they can offer a looser loan contract that is more favorable to the borrower. Once a loan is issued, lenders may further find the CDS market to be valuable for future hedging and trading opportunities. We find similar results when we use the scaled CDS trading volume as the

[17] Alternatively, we construct the two measures on a monthly basis and report the regression results of the monthly variables in Table IA6. The loan syndication process usually takes between one and three months. Ivashina and Sun (2011) document that the number of days between the formal start of syndication and the loan closing day is, on average, approximately four weeks. Before the launch, the lead bank discusses the deal structure with the issuer and obtains credit ratings.

liquidity measure in models 2 and 4 in Table VI. This result suggests that borrowers pledge less collateral and set looser net worth requirements when the reference firm's CDS are more actively traded during the period of loan contract design and origination.

C.2. Lenders' Use of Credit Derivatives

Thus far, we have assumed that the lenders indeed use CDS that reference the borrower's debt. If we can observe each lender's CDS portfolio holdings to identify whether and when the lenders use CDS referencing the specific borrower, then we can directly test whether the CDS effects exist only for such lenders using the borrower's CDS. Unfortunately, we do not have such detailed information on lenders' CDS portfolios. Regulations require the disclosure of the lenders' aggregate credit derivatives position only (recently, the positions have been separated into hedging and trading positions, but in our sample period, only the aggregate is reported). Therefore, we use such aggregate data to test whether CDS effects on loan contractual protection are stronger when lenders have larger credit derivatives positions.

We obtain data on lenders' credit derivatives from the Federal Reserve's FR Y-9C quarterly report on bank credit derivatives positions for commercial banks and bank holding companies. We interact the lenders' credit derivatives positions in the quarter of loan initiation with the CDS trading dummy.

$$\text{Loan Contractual Protection}_{ijt} = \alpha + \beta_1 \text{CDS Trading}_{ijt} \times \text{Lenders' Credit Derivatives} \quad (6)$$
$$\text{Position}_{ijt} + \beta_2 \text{CDS Trading}_{ijt} + \beta_3 \text{CDS Traded}_i + \gamma_1 \text{Controls}_{ijt} + \gamma_2 \text{X}_{1i} + \gamma_3 \text{X}_{2t} + \epsilon_{ijt}$$

where *Lenders' Credit Derivatives Position* refers to the *lead* bank's credit derivatives position in the quarter of loan initiation. We also use an alternative measure in Table IA7, *All Lenders' Credit Derivatives Position*, which aggregates *all* syndicate lenders' positions in the quarter of loan initiation.

Table VII reports regression results with a focus on the interaction term between borrower CDS availability and lender CDS position. The first two columns report the regression results of collateral, and columns 3 and 4 report the results of the net worth requirement. The coefficient estimates on the interaction terms are negative and statistically significant in all specifications. Moreover, the standalone effect of *CDS Trading* remains negative and significant. Hence, lender CDS usage enhances the effect of CDS trading on the usefulness of loan contractual protection devices. As the credit derivatives position the lender takes increases, the effect CDS has on credit terms in the initial contract increases.

D. Understanding the Mechanism

In this section, we examine the specific situations under which CDS effects are most pronounced to understand the channels and mechanisms of the CDS effect.[18] If CDS encourage borrowers to rely less on loan contractual protection and to become less willing to renegotiate, then CDS should reduce the pledge of collateral and loosen some relevant covenants in the first place, as we have already shown. Furthermore, the effect should differ across firms based on the costs of reducing contractual protection, as less collateral and looser covenants open doors to borrowers' exploitative behavior. The cost depends on the severity of borrower-lender conflicts, which are associated with borrower credit quality.

D.1. Potential for Borrower Risk-Shifting

For firms for which the underlying risk of agency problems is lower, the decrease in collateral and loosening of net worth requirement have lower costs compared with the gains of avoiding bargaining and renegotiation costs associated with demand for collateral and tight covenants; the opposite is true for firms for which the underlying risk of agency problems is higher. This potential for transfer from debt to equity varies across firms: it should be more prominent for firms close to financial distress but more remote for profitable and high-credit-quality firms. In the case of CDS, the possible adverse effect of loosening the initial loan contract should be less severe for firms with better credit quality; therefore, the loosening effect should be more prominent for such firms.

As suggested by Demiroglu and James (2010), the agency cost of debt is generally thought to be inversely related to the financial condition of the borrowing firm. Risk-shifting, or asset substitution, is a more pertinent concern for firms closer to default. Firms with a larger Altman's Z-score is expected to be less risky and have less uncertainty in future debt repayment. Gaming incentives for high-quality firms should be lower, as there is larger potential return of keeping the firm over the long run rather than milking the firm in the short run and risking

[18] Our exploration is guided partly by theoretical predictions from Gârleanu and Zwiebel (2009) in terms of potential transfer from debt to equity, conflicts between syndicate lenders, and renegotiation incentive.

creditor punishment. Therefore, such firms should be subject to less agency conflict concerns. They also have larger bargaining power relative to their lenders when negotiating a lending contract, leading to a larger degree of contract loosening.

We distinguish firms with larger Z-scores using the 50% breakpoints of all sample firms in the same quarter. We report the estimation results in Table VIII, with a key interest in the interaction term between the CDS trading indicator and the agency severity dummy. As expected, firms that are more distant from default see a greater reduction in collateral and relaxation of the net worth requirement following the advent of CDS. The coefficient estimates on the interaction terms are both statistically significant and economically meaningful. The results are robust to the inclusion of the CDS firm effect.

Our findings support the prediction of Bolton and Oehmke (2011) that "the commitment benefits of CDS are largest for firms whose creditors' bargaining position is weak in the absence of CDS." Shareholders from financially healthier firms have an advantageous position when bargaining against creditors. Both the theoretical models and the empirical evidence show that loans to borrowers with *higher* credit quality are more likely to be hedged using CDS.[19] Transferring risks through the CDS market may prove too costly for borrowers facing high agency conflicts. If the CDS seller charges a high premium, it will make the purchase of CDS for protection less attractive to the lender in the first place. Indeed, the results are consistent with our expectations.

D.2. Lead Lender-Participating Lender Past Collaboration

The effect of CDS on creditor protection should not only vary with borrower credit quality, but with possible conflicts among lenders within a syndicate. As the lead bank is managing the syndication process and structuring the loan, it has to set reasonable loan contract terms to maximize the chance of a successful syndication (Esty, 2001). Lead banks consider both the borrower's potential to repay the loan and participant banks' demand for credit protection when setting the loan contract. In contrast to cases where the lenders have multiple collaborations in the past and are familiar with each other, creditor protection is more important when the lead bank distributes the loan to other participating banks they have never worked with. Put differently, participant banks should be more likely to accept a looser contract if

[19] See Parlour and Winton (2013), Minton, Stulz and Williamson (2009), and Ashcraft and Santos (2009) for examples.

they trust the lead bank more.

We expect that participant banks tend to trust lead banks that they worked with in the same loan syndicate before. We use a dummy *Lead Lender-Participant Lender Past Collaboration* to measure whether any of the participant banks worked with the lead lender in the past five years. If CDS substitute collateral and net worth requirement as credit protection devices, such effect should be stronger for loans in which the syndicate lenders have more collaboration in the past. Although it is possible for both lead banks and participant banks to access CDS market, the reality is lead banks use relatively more CDS as they are larger and more matured derivative users. If only the lead lender uses CDS while other participant banks do not, then loan contract terms may not be loosened as much. However, if the participant banks collaborated with the lead lender before in other deals, they may become less concerned with the repayment risk and accept a less stringent contract.

Table IX shows that the decrease of loan security after CDS trading is more pronounced when the lead bank has collaborated with participating banks in other loan deals in the past. On average, CDS reduce the proportion of secured loans by 1.2% and the tightness of net worth requirement by 2.8%. If the lead bank worked with the participant banks in past syndicate loan deals, the proportion of secured loans is further reduced by 8.9%. Similar results are found for the net worth requirement. These results suggest that when CDS are available, creditor protection in loan contract terms becomes even less important when the lead bank and participating lenders have collaboration before. More collaboration indicates less severe agency conflicts between lenders. Therefore, this finding is consistent with our previous results that CDS mitigate loan contracting costs more when the agency problem of a syndicate is less severe.

Thus far, we have shown that to what extent that CDS reduce loan contractual protection depends on two layers of agency problem: one is the borrower-lender conflict; the other is within-syndicate conflict. These results emphasize the concern of possible adverse effect from loosening credit protection terms, which is important to the interpretation of the empirical finding. Therefore, they highlight the implication that the benefits of CDS on reducing contracting costs accrue more to borrowers with more upside.

D.3. Loan Amendments

Thus far, we have shown that CDS provide alternative protection for lenders' cash flow rights and make lenders demand less protection from loan contractual devices. As a result, CDS-referenced borrowers receive loan contracts with less collateral and lower net worth requirements.[20] If CDS reduce the pledge of collateral and loosen the requirement on borrower credit quality, then lenders' incentives to renegotiate the contract should also be affected, as Roberts and Sufi (2009b) conclude that the accrual of new information concerning the credit quality and collateral are important determinants of loan contract renegotiation. More importantly, they document that the motivations for amending a contract are largely a consequence of the restrictiveness of the initial contracts and improvement in credit quality, as increases in collateral can shift the relative bargaining power in favor of the borrower and make borrowers able to renegotiate more advantageous terms. In other words, most renegotiations of loan contracts happen due to borrowers' intention to argue for better terms. Given that CDS reduce the pledge of collateral, borrowers may have lower bargaining power than before and initiate fewer renegotiations. On the lender side, regardless of changes in the initial loan contract items, lenders may also become less interested in renegotiating the loan contract with their borrowers, as their payoff is hedged in liquidation.

We directly examine how the frequency of loan amendments is affected by CDS trading. If lenders become less interested in renegotiating the loan with the borrower when they can buy protection from the CDS market, we should observe fewer amendments to the contract after loan origination. We obtain the loan amendment information from the "Amendment" table in Dealscan. The "Comments" column lists the amended items in detail. Lenders and borrowers may make amendments to the loan amount, maturity, spread, payment schedule, pricing grid or covenants.

For our sample loans, 14.6% of the loan packages are amended at least once. We acknowledge that this could be a sub-sample of the whole population of loan amendments, as Roberts and Sufi (2009b) report that 64.5% of the 1,000 sample loans that are randomly selected from the SEC filings are ever renegotiated. However, our sample appears to represent the larger loan amendment sample well. In particular, Roberts and Sufi (2009b) document that

[20] Denis and Wang (2014) document that stricter loan covenants are associated with a higher likelihood of renegotiations during the life of the loan.

approximately 28% of loans are renegotiated when time has elapsed 25%-50% of the stated maturity. This proportion is 30.25% in our sample. The distribution of frequency in other time elapses is also comparable. Ivashina and Sun (2011) report that the average amendment takes place within 18 months of loan origination. We find the average amendment occurs at 16.53 months after loan origination in our sample.

We examine changes in loan amendment possibility and frequency by regressing a loan amendment indicator and the number of amendments on CDS market characteristic variables, controlling for firm characteristics in the quarter before loan amendment. Following the empirical design in Roberts and Sufi (2009b) and Denis and Wang (2014), we also control for changes in firm characteristics from loan origination to loan amendment, including changes in profitability (Δ EBITDA/Assets), leverage (Δ Total Debt/Assets), firm size (Δ Log (Assets)) and earnings volatility (Δ EBITDA Volatility). We control for year fixed effects to account for possible changes in macroeconomic conditions over time.

Table X reports the regression results of the frequency of loan amendments on CDS trading. The coefficients of *CDS Trading* are significantly negative, suggesting that CDS-referenced loans are amended less frequently. Column 1 shows that on average, loans are 5.5% less likely to be amended after the borrower becomes CDS referenced. Compared with the percentage of amended loans in the whole sample, 14.6%, the effect is as large as 37.7% on a relative basis. Most of the loans are amended more than once.[21] For the whole sample, each loan receives 0.679 amendments before maturity. Column 2 shows that the average number of loan amendments is reduced by 0.248 (or 36.5% relative to the mean number of amendments) after CDS introduction.

We control for the stated maturity in the original loan contract because longer maturity is related to a higher likelihood that the loan contract is amended later by the borrower and the lender, as there is more uncertainty at loan origination. We are concerned with the possibility that the fewer observed amendments are driven by shorter loan maturity after CDS trading starts. We mitigate the effect of changes in maturity by scaling the number of loan amendments by the stated maturity in the original loan contract and conduct the same regressions with the scaled variable in column 3. The coefficient is still negative and

[21] We compare the average number of amendments in our sample with that in the extant literature. Conditional on a renegotiated loan, the average number of amendments over the average stated loan life of 50 months is 5 in our sample. Roberts (2014) reports that each loan experiences 3.5 renegotiations over an average loan life of 51 months.

significant. This suggests that the average number of amendments is reduced by 0.054 (or 39.1% relative to the mean of the sample) each year following loan origination. These results are consistent with the view that CDS make renegotiations between borrowers and lenders less valuable, hence, loans are less frequently amended.

V. Conclusion

This study provides the first empirical evidence on how the trading of credit default swaps (CDS) affects the design of loan contracts in terms of creditor protection. We show that loans are issued with less restrictive requirements on collateral and minimum net worth of the borrowing firms. The effect is stronger when the CDS market is deeper, when the lender takes on larger credit derivatives positions, and when there are fewer debt-equity and within-creditor conflicts. Theories suggest that when the bargaining and renegotiation costs of loan contracts outweigh the costs incurred from agency problems, initial contracts with less protective terms could be optimal. Indeed, we find that loan contracts are less frequently amended when there are CDS available at the time of loan closing. This evidence is consistent with the view that CDS, as market-based credit protection devices, may substitute for loan contractual protection devices, which could be costly, especially for good quality borrowers.

Our findings further the understanding of financial contracting and the implications of credit derivatives trading. Notwithstanding their derivative nature, CDS can have real effects on contract design. We show that the availability of CDS can have a substantial impact on ex ante creditor protection clauses in bank loans. Our study is among the first to demonstrate the effects of CDS on non-price terms of loan contracts. Our findings can provide useful evidence for policy debates, which are in a critical phase, given the increasing regulatory actions on CDS (e.g., the implementation of Title VII of the Dodd-Frank Act and the settlement in CDS lawsuit[22]). We emphasize that, although our evidence is consistent with the view that contract loosening by CDS is beneficial to both lenders and borrowers in terms of reducing contracting costs, establishing the overall welfare effect of CDS trading requires further study.

[22] http://www.bloomberg.com/news/articles/2015-09-11/wall-street-banks-reach-settlement-on-cds-lawsuit-lawyer-says

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Appendix: Variable Definition

Variable	Definition
CDS Market Characteristics	
CDS Trading	A dummy variable representing whether there are CDS contracts referencing the borrower's debt at the time of loan initiation
CDS Traded	A dummy variable representing whether the borrower ever had a CDS market on its debt at any time during the sample period
CDS Trading Volume /Total Amount of Debt	The number of CDS trades referencing the borrower's debt in the quarter (or month) of loan initiation scaled by total amount of debt in the prior quarter
CDS Outstanding Amount /Total Amount of Debt	The number of outstanding CDS contracts referencing the borrower's debt in the quarter (or month) of loan initiation over the total amount of debt outstanding of the borrower by the end of the prior quarter
Loan Characteristics	
Secured	A dummy taking one if the loan is secured by collateral at issuance and zero otherwise
Net Worth Requirement	1 - $\Phi[(w - \underline{w})/\sigma]$, where Φ is the standard normal cumulative distribution function; w is the logarithm of the value of (tangible) net worth of the borrower at the end of the quarter prior to loan initiation; $\underline{w}$ is the logarithm of the minimum (tangible) net worth that the firm must maintain during the life of the loan required by a net worth covenant; σ is the standard deviation of the quarterly change in the logged value of (tangible) net worth across all loans, varying by the 1-digit SIC industry and year (industry-year volatility) of net worth volatility
Loan Amount ($Million)	The aggregated amount of facilities that comprise a loan package in $million
Maturity	The equal-weighted average maturity of the facilities that comprise a loan package
Loan Spread	The equal-weighted average all-in-drawn spread of facilities that compose a loan package
Number of Lenders	The number of banks that participate in the loan syndicate, including both lead banks and participating banks. For sole-lender loans, it equals one
Borrower Characteristics	
**All firm financial information is extracted at the end of the quarter prior to loan issuance*	
Total Assets ($Billion)	The total book assets of the firm
Current Ratio	Total current assets/total current liabilities
Leverage	Total book debt/total book assets
Total Amount of Debt	Short-term debt + 0.5*long-term debt outstanding
Market-to-Book	Market value of equity/book value of equity
Has S&P Rating	A dummy taking one if the borrower has an S&P credit rating available for long-term issuer
Net Worth	Total assets - total liabilities
Tangible Net Worth	Total assets - total liabilities - intangible assets
Profitability	Operating income before depreciation/total assets
Tangibility	Tangible assets/total assets
Altman's Z-score	3.3* EBIT/total assets + 0.999* sales/total assets + 1.4* retained earnings/total assets + 1.2*(current assets - current liabilities)/total assets+0.6* market value of equity/total liabilities
EBITDA Volatility	The standard deviation of quarterly EBITDA
Excess Stock Return	The quarterly stock return less the value-weighted market return, calculated from monthly returns
Stock Return Volatility	The standard deviation of monthly stock returns in a given quarter

Table I
Sample Distribution

This table describes the distribution of sample loans and loans issued to CDS-referenced firms by year. CDS-referenced firms refer to firms that have CDS contracts outstanding that reference the firm's debt in the quarter of loan initiation. A loan (package) is composed of facilities (tranches). Sample loan data are extracted from the Loan Pricing Corporation (LPC)'s Dealscan database. Columns 2 and 6 report the number of loans in the whole sample and loans issued by CDS-referenced firms. Columns 3 and 7 report the number of unique borrowers in each year. Columns 4 and 8 report the proportion of loans secured by collateral out of total loans (or loans to CDS-referenced firms). A loan package is imposed either a total net worth requirement or a tangible net worth requirement, or neither of them. Columns 5 and 9 report the tightness of net worth requirement averaged across loans. Net worth requirement is calculated as: 1 - $\Phi[(w - \underline{w})/\sigma]$, where Φ is the standard normal cumulative distribution function; w is the logarithm value of (tangible) net worth of the borrower at the end of the quarter prior to loan initiation; $\underline{w}$ is the logarithm of the minimum (tangible) net worth that the firm must maintain above during the life of the loan, required by the (tangible) net worth covenant; σ is the standard deviation of the quarterly change in the logged value of (tangible) net worth across all loan packages, varying by the 1-digit SIC industry and by year. A larger requirement measure represents a stricter requirement on the firm's (tangible) net worth.

	All Sample				Loans to CDS-Referenced Firms			
Year	# of Loans	# of Unique Borrowers	Proportion of Secured Loans	Net Worth Requirement	# of Loans	# of Unique Borrowers	Proportion of Secured Loans	Net Worth Requirement
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
1994	2805	2122	0.643	0.372	0	0	.	.
1995	2987	2220	0.619	0.399	0	0	.	.
1996	4065	2830	0.600	0.390	0	0	.	.
1997	5185	3398	0.567	0.388	18	12	0.333	0.143
1998	4289	2887	0.573	0.370	78	44	0.421	0.198
1999	4356	2782	0.464	0.376	170	79	0.194	0.371
2000	4490	2812	0.406	0.359	284	148	0.187	0.229
2001	4676	2909	0.460	0.357	435	249	0.313	0.270
2002	4699	2989	0.545	0.360	549	357	0.366	0.272
2003	4875	3047	0.768	0.335	629	422	0.496	0.247
2004	5083	3374	0.708	0.296	726	483	0.381	0.203
2005	5151	3340	0.663	0.274	746	485	0.338	0.205
2006	4827	3192	0.698	0.228	671	454	0.411	0.207
2007	4545	3039	0.751	0.203	598	409	0.460	0.104
2008	3418	2408	0.738	0.206	329	225	0.452	0.199
2009	2068	1647	0.754	0.236	238	186	0.558	0.136
Total	67677	13385	0.622	0.322	5471	807	0.378	0.214

Table II
Summary Statistics of Sample Loans and Borrowers

This table reports the summary statistics of our sample loans and borrowing firms. Loan amount refers to the amount of loan at package level in $million. *Loan Spread* is the all-in-drawn spreads in basis points. It is averaged across facilities that comprise one loan package. *Maturity* refers to the average maturity of facilities of each loan package in months. *Number of Lenders* refers to the number of lead banks and participating banks in a loan syndicate. For sole-lender loans, the number of lenders equals one. *Secured* is a dummy taking one if the loan is secured by collateral. *Net Worth Requirement* is constructed following the method introduced in Table I. All loan characteristics are extracted from the initial loan contract. Borrower characteristic variables are summarized in the lower rows. *Leverage* refers to the book leverage, calculated as (short-term debt+0.5*long-term debt)/total assets. *Profitability* is the ratio of quarterly operating income before depreciation to total assets. *Current Ratio* is the ratio of current assets over current liabilities. *Tangibility* is the ratio of tangible assets relative to total assets. *Market-to-Book* is the ratio of market value of equity to book value of equity. *Excess Stock Return* is the quarterly stock return less the value-weighted market return, calculated from monthly returns. *Stock Return Volatility* is the standard deviation of monthly stock returns in a given quarter. *Has S&P Rating* is a dummy taking one if the borrower has a S&P long-term credit rating available at loan initiation. *Altman's Z-score* is calculated as 3.3* EBIT/total assets + 0.999* sales/total assets + 1.4* retained earnings/total assets + 1.2*(current assets - current liabilities)/total assets+0.6* market value of equity/total liabilities.

	Mean	Median	Std. Dev	Min	Max
Loan Characteristics					
Loan Amount ($Million)	320.865	95.000	666.492	0.094	4300.000
Loan Spread	98.391	32.500	133.616	0.000	650.000
Maturity (Months)	46.000	36.000	36.000	3.000	1212.000
Number of Lenders	6.012	3.000	7.122	1.000	37.000
Secured	0.622	1.000	0.491	0.000	1.000
Net Worth Requirement	0.322	0.351	0.178	0.032	0.543
Firm Characteristics					
Total Assets ($Billion)	42.018	1.270	152.493	0.009	1,034.222
Leverage	0.218	0.209	0.115	0.000	0.754
Profitability	0.003	0.007	0.038	−0.226	0.087
Cash/Total Assets	0.042	0.015	0.072	0.000	0.473
Tangibility	0.310	0.294	0.213	0.000	0.915
Current Ratio	1.875	1.518	1.379	0.236	8.885
Market-to-Book	1.441	2.463	4.129	0.000	186.623
Excess Stock Return	0.071	−0.003	0.664	−1.301	26.570
Stock Return Volatility	0.118	0.097	0.083	0.000	2.782
Has S&P Rating	0.331	0.000	0.470	0.000	1.000
Altman's Z-score	2.394	1.848	3.221	−4.047	26.906

Table III
Impact of Borrower CDS on Loan Contractual Protection

This table reports the baseline difference-in-differences regression results of the effects of CDS trading in borrower's name on loan contractual protection devices. The dependent variables are the secured dummy and the net worth requirement. The independent variable we are interested in is *CDS Trading*, a dummy variable which takes the value of one if CDS are actively traded in the borrower's debt when the loan is initiated, and zero otherwise. *CDS Traded* is a dummy variable which takes the value of one if the borrower ever had a CDS market at any point of time during the sample period, and zero otherwise. Borrower characteristic variables are extracted at the end of the quarter prior to loan initiation. All specifications control for loan purpose, loan origination year and borrower industry fixed effects. Dealscan reports 6 types of loan purposes: corporate purposes, debt repayment, working capital, takeover, CP backup and others. Numbers in parentheses are standard errors adjusted for heteroskedasitisity and clustered at firm-level. ***, **, and * represent statistical significance at 1%, 5% and 10% level, respectively. See Appendix for variable definitions.

	Secured Loan		Net Worth Requirement	
Variable	Model1	Model2	Model3	Model4
CDS Trading	-0.076***	-0.113***	-0.063***	-0.082***
	(0.017)	(0.015)	(0.010)	(0.010)
CDS Traded	-0.048***	.	-0.027***	.
	(0.014)	.	(0.006)	.
Loan Spread	0.001***	0.001***	0.001***	0.001***
	(0.000)	(0.000)	(0.000)	(0.000)
Log (Number of Lenders)	-0.194***	-0.199***	0.026***	0.026***
	(0.031)	(0.031)	(0.010)	(0.010)
Log (Maturity)	0.062***	0.062***	0.003**	0.003***
	(0.004)	(0.004)	(0.001)	(0.001)
Log (Loan Amount)	0.012***	0.011***	-0.001	-0.002
	(0.003)	(0.003)	(0.001)	(0.001)
Log (Total Assets)	-0.047***	-0.048***	-0.014***	-0.015***
	(0.002)	(0.002)	(0.001)	(0.001)
Has S&P Rating	-0.046***	-0.050***	-0.004	-0.008***
	(0.009)	(0.009)	(0.003)	(0.003)
Altman's Z-score	-0.003***	-0.003***	-0.000***	-0.000***
	(0.001)	(0.001)	(0.000)	(0.000)
Intercept	0.677***	0.684***	0.607***	0.615***
	(0.025)	(0.025)	(0.011)	(0.011)
Loan Initiation Year Fixed Effects	Yes	Yes	Yes	Yes
Borrower Industry Fixed Effects	Yes	Yes	Yes	Yes
Loan Purpose Fixed Effects	Yes	Yes	Yes	Yes
Clustered Standard Errors by Borrower	Yes	Yes	Yes	Yes
R-squared (%)	36.45	35.35	45.27	44.61
Observations	35323	35323	6952	6952

Table IV
CDS Endogeneity Control: Instrumental Variable (IV) Approach

This table reports the two-stage-least-square regression results of the impact of CDS trading on loan contractual protection. In the first stage we estimate an OLS model to obtain the fitted value of the independent variable, *CDS Trading*, using the instrumental variable *Past Lender's Foreign Exchange Derivatives Position. Past Lender's Foreign Exchange Derivatives Position* is the amount of foreign exchange derivatives used for hedging purposes (not trading) relative to the amount of loans of the lead syndicate banks that the firm has borrowed money from in the past five years. In the first-stage regression, the dependent variable is *CDS Trading*, a dummy variable which takes the value of one if CDS trading referencing the borrower's debt is active at loan origination, and zero otherwise. The explanatory variables include the one quarter lag of the following: the logarithm of total assets, leverage, cash-to-total assets, tangibility, profitability, current ratio, market-to-book ratio, Altman's Z-score, excess stock return, and the logarithm of stock market volatility. The dependent variables in the second stage are the secured dummy and the tightness of net worth requirement. The independent variable of interest is the fitted value of CDS trading estimated from the instrumental variable. We use the same control variables as we use in the baseline regressions. All specifications include loan purpose, loan origination year and borrower industry fixed effects. Numbers in parentheses are standard errors adjusted for heteroskedasitisity and firm-level clustering. ***, **, and * represent statistical significance at 1%, 5% and 10% level, respectively. First-stage regression results are reported by Internet Appendix Table IA2. See Appendix for variable definitions.

	Secured Loan	Net Worth Requirement
Variable	Model1	Model2
Fitted Value of CDS Trading	-0.068^{***}	-0.069^{**}
	(0.008)	(0.035)
Loan Spread	0.001^{***}	0.001^{***}
	(0.000)	(0.000)
Log (Number of Lenders)	-0.202^{***}	0.023^{***}
	(0.030)	(0.009)
Log (Maturity)	0.062^{***}	0.005^{***}
	(0.004)	(0.001)
Log (Loan Amount)	0.010^{***}	-0.002
	(0.003)	(0.001)
Log (Total Assets)	-0.052^{***}	-0.018^{***}
	(0.002)	(0.001)
Has S&P Rating	-0.054^{***}	-0.018^{***}
	(0.008)	(0.002)
Altman's Z-score	-0.003^{***}	-0.000^{***}
	(0.001)	(0.000)
Intercept	0.663^{***}	0.626^{***}
	(0.025)	(0.011)
Loan Initiation Year Fixed Effects	Yes	Yes
Borrower Industry Fixed Effects	Yes	Yes
Loan Purpose Fixed Effects	Yes	Yes
Clustered Standard Errors by Borrower	Yes	Yes
R-squared (%)	46.36	40.35
Observations	32924	6731

Table V
CDS Endogeneity Control: Propensity Score Matching

This table reports the results of regressions that examine the impact of CDS trading on loan contractual devices using a matched sample of loans, which is formed by matching on the propensity scores of CDS trading. We estimate a probit model to obtain the propensity scores of CDS trading for each loan observation. In the first stage, the explanatory variables include the one quarter lag of the following: the instrumental variable (*Past* Lender's Foreign Exchange Derivatives Position), the logarithm of total assets, leverage, cash-to-total assets, profitability, current ratio, and Altman's Z-score. After the propensity scores are obtained, we employ the nearest neighborhood matching to form the control group. We select the one from the same 1-digit SIC industry non-CDS firms that has the nearest propensity score to the CDS firm as the matching firm. Then we extract the loans issued by the matching firm in the same year as the CDS firm to form the matching group of loans. The independent variable we are interested in is *CDS Trading*, a dummy variable which takes the value of one if there is CDS contracts referencing the borrower's debt at loan initiation, and zero otherwise. *CDS Traded* is a dummy taking one if the borrower has a CDS market at any point of time during the sample period, and zero otherwise. Other control variables are the same as we use in the baseline regressions. All specifications include loan purpose, loan origination year and borrower industry fixed effects. Numbers in parentheses are standard errors adjusted for heteroskedasitisity and firm-level clustering. ***, **, and * represent statistical significance at 1%, 5% and 10% level, respectively. See Appendix for variable definitions.

Variable	Secured Loan	Net Worth Requirement
	Model 1	Model 2
CDS Trading	−0.026***	−0.034***
	(0.010)	(0.007)
CDS Traded	0.006	−0.042***
	(0.014)	(0.012)
Loan Spread	0.002***	0.001***
	(0.000)	(0.000)
Log (Number of Lenders)	−0.031***	0.018***
	(0.004)	(0.003)
Maturity	0.193***	−0.023***
	(0.005)	(0.006)
Log (Loan Amount)	−0.039***	−0.017***
	(0.003)	(0.004)
Log (Total Assets)	−0.033***	−0.059***
	(0.003)	(0.003)
Has S&P Rating	−0.101***	−0.002
	(0.010)	(0.006)
Altman's Z-score	−0.027***	−0.011***
	(0.002)	(0.001)
Intercept	0.839***	0.707***
	(0.032)	(0.038)
Loan Initiation Year Fixed Effects	Yes	Yes
Borrower Industry Fixed Effects	Yes	Yes
Loan Purpose Fixed Effects	Yes	Yes
Clustered Standard Errors by Borrower	Yes	Yes
R-squared (%)	41.03	48.31
Observations	19816	3081

Table VI
Impact of Borrower CDS Market Liquidity

This table reports the regression results of the effects of CDS market liquidity on loan contractual protection terms. The dependent variables are the secured dummy and the net worth requirement specified in the initial loan contract. The independent variables of interest are (1) the number of outstanding CDS contracts referencing the borrower's debt in the quarter of loan initiation scaled by the amount of total outstanding debt in the prior quarter (*CDS Outstanding Amount/Total Amount of Debt*); (2) the number of CDS trades referencing the borrower's debt in the quarter of loan initiation scaled by the amount of total outstanding debt in the prior quarter (*CDS Trading Volume/Total Amount of Debt*). In all specifications, we control for CDS firm fixed effect, *CDS Traded*, a dummy variable taking one if the borrower has a CDS market on its debt at any time during the sample period, and zero otherwise. Other control variables are the same as we use in the baseline regressions in Table III. To conserve space we do not report coefficients of all control variables. All specifications include loan purpose, loan origination year and borrower industry fixed effects. Numbers in parentheses are standard errors adjusted for heteroskedasitisity and firm-level clustering. ***, **, and * represent statistical significance at 1%, 5% and 10% level, respectively. See Appendix for variable definitions.

	Secured Loan		Net Worth Requirement	
Variable	Model1	Model2	Model3	Model4
CDS Outstanding Amount	-0.933*	.	-0.703***	.
/Total Amount of Debt	(0.540)	.	(0.054)	.
CDS Trading Volume	.	-23.270**	.	-7.372***
/Total Amount of Debt	.	(10.540)	.	(2.131)
CDS Traded	-0.077***	-0.076***	-0.051***	-0.050***
	(0.013)	(0.013)	(0.007)	(0.007)
Intercept	0.653***	0.658***	0.496***	0.497***
	(0.029)	(0.029)	(0.017)	(0.017)
Loan Characteristics Controls	Yes	Yes	Yes	Yes
Borrower Characteristics Controls	Yes	Yes	Yes	Yes
Loan Initiation Year Fixed Effects	Yes	Yes	Yes	Yes
Borrower Industry Fixed Effects	Yes	Yes	Yes	Yes
Loan Purpose Fixed Effects	Yes	Yes	Yes	Yes
Clustered Standard Errors by Borrower	Yes	Yes	Yes	Yes
R-squared (%)	43.14	43.16	43.63	43.32
Observations	35323	35323	6952	6952

Table VII
Lender Credit Derivatives Position and the Impact of Borrower CDS

This table reports the regression results of the impact of lenders' credit derivatives positions on the CDS effects. The dependent variables are the secured dummy and the net worth requirement specified in the initial loan contract. The independent variables we are interested in are the interaction terms of *CDS trading* and syndicate *Lead Lenders' Credit Derivatives Position* (in $trillion). Lead lenders' credit derivatives positions are extracted in the quarter of loan initiation. Banks' credit derivatives trading data are provided by the Federal Reserve Consolidated Financial Statements for Bank Holding Companies ("FR Y-9C") and the Office of the Comptroller of the Currency (OCC) Quarterly Report on Bank Derivatives Activities. *CDS Trading* is a dummy variable which takes the value of one if there is active CDS trading in the borrower's debt at loan initiation, and zero otherwise. *CDS Traded* is a dummy variable taking one if the borrower has a CDS market at any time during the sample period, and zero otherwise. Other control variables are the same as we use in the baseline regressions. To conserve space we do not report all coefficients of control variables. All specifications include loan purpose, loan origination year and borrower industry fixed effects. Numbers in parentheses are standard errors adjusted for heteroskedasitisity and firm-level clustering. ***, **, and * represent statistical significance at 1%, 5% and 10% level, respectively. See Appendix for variable definitions.

	Secured Loan		Net Worth Requirement	
Variable	Model1	Model2	Model3	Model4
CDS Trading*Lead Lenders' Credit Derivatives Position	-0.027***	-0.026***	-0.029**	-0.029*
	(0.008)	(0.008)	(0.014)	(0.015)
Lead Lenders' Credit Derivatives Position	-0.005	-0.006	0.005***	0.005***
	(0.006)	(0.006)	(0.001)	(0.001)
CDS Trading	-0.072***	-0.005	-0.063***	-0.042***
	(0.020)	(0.023)	(0.011)	(0.013)
CDS Traded	.	-0.090***	.	-0.030***
	.	(0.023)	.	(0.007)
Intercept	0.823***	0.797***	0.488***	0.617***
	(0.060)	(0.063)	(0.017)	(0.012)
Loan Characteristics Controls	Yes	Yes	Yes	Yes
Borrower Characteristics Controls	Yes	Yes	Yes	Yes
Loan Initiation Year Fixed Effects	Yes	Yes	Yes	Yes
Borrower Industry Fixed Effects	Yes	Yes	Yes	Yes
Loan Purpose Fixed Effects	Yes	Yes	Yes	Yes
Clustered Standard Errors by Borrower	Yes	Yes	Yes	Yes
R-squared (%)	36.38	36.57	43.95	44.12
Observations	35323	35323	6952	6952

Table VIII
Borrower Credit Quality and the Impact of Borrower CDS

This table reports the regression results that examine the impact of borrower credit quality on the CDS effects. The dependent variables are the secured dummy and the net worth requirement specified in the initial loan contract. The independent variable we are interested in is the interaction term of *CDS Trading* and *Higher Altman's Z-score*, a dummy representing whether the borrowing firm has higher Altman's Z-score, which is determined by the 50% breakpoints across all sample firms at the end of the quarter prior to loan initiation. *CDS Trading* is a dummy taking one if there is an active CDS market referencing the borrower's debt at loan origination, and zero otherwise. *CDS Traded* is a dummy taking the value of one if the borrower has a CDS market on its debt at any time during the sample period, and zero otherwise. Other control variables are the same as we use in the baseline regressions. To conserve space we do not report all coefficients of control variables. All specifications include loan purpose, loan origination year and borrower industry fixed effects. Numbers in parentheses are standard errors adjusted for heteroskedasitisity and firm-level clustering. ***, **, and * represent statistical significance at 1%, 5% and 10% level, respectively. See Appendix for variable definitions.

	Secured Loan		Net Worth Requirement	
Variable	Model1	Model2	Model3	Model4
CDS Trading*Higher Altman's Z-score	-0.082***	-0.082***	-0.043***	-0.044***
	(0.030)	(0.030)	(0.011)	(0.011)
Higher Altman's Z-score	-0.108***	-0.107***	-0.008**	-0.006*
	(0.012)	(0.012)	(0.003)	(0.003)
CDS Trading	-0.071***	-0.006	-0.061***	-0.038***
	(0.021)	(0.024)	(0.008)	(0.008)
CDS Traded	.	-0.086***	.	-0.032***
	.	(0.023)	.	(0.006)
Intercept	0.906***	0.880***	0.634***	0.621***
	(0.060)	(0.062)	(0.066)	(0.066)
Loan Characteristics Controls	Yes	Yes	Yes	Yes
Borrower Characteristics Controls	Yes	Yes	Yes	Yes
Loan Initiation Year Fixed Effects	Yes	Yes	Yes	Yes
Borrower Industry Fixed Effects	Yes	Yes	Yes	Yes
Loan Purpose Fixed Effects	Yes	Yes	Yes	Yes
Clustered Standard Errors by Borrower	Yes	Yes	Yes	Yes
R-squared (%)	37.29	37.46	37.18	37.86
Observations	35323	35323	6952	6952

Table IX
Lead Lender-Participant Lender Past Collaboration and Impact of Borrower CDS

This table reports the regression results that examine how the lead lender and participant lenders' past collaboration affects the impact of borrower CDS. We measure the past collaboration using a dummy *Lead Lender-Participant Lender Past Collaboration*, which takes one if the lead bank and any of the participant banks acted as syndicate lenders in the same syndicate loan in the past five years. *CDS Trading* is a dummy taking the value of one if there is active CDS trading referencing the borrower's debt at loan origination, and zero otherwise. *CDS Traded* is a dummy taking one if the borrower ever has a CDS market on its debt at any time during the sample period, and zero otherwise. We use the same control variables as we use in the baseline regressions. To conserve space we do not report the coefficients of all control variables. All specifications include loan purpose, loan origination year and borrower industry fixed effects. All results are based on quarterly observations. Numbers in parentheses are standard errors adjusted for heteroskedasitisity and firm-level clustering. ***, **, and * represent statistical significance at 1%, 5% and 10% level, respectively. See Appendix for variable definitions.

	Secured Loan		Net Worth Requirement	
Variable	Model1	Model2	Model3	Model4
CDS Trading*Lead Lender-Participant Lender	-0.086***	-0.089***	-0.047***	-0.048***
Past Collaboration	(0.017)	(0.017)	(0.014)	(0.014)
Lead Lender-Participant Lender Past	-0.047***	-0.046***	0.001	0.001
Collaboration	(0.007)	(0.007)	(0.002)	(0.002)
CDS Trading	-0.049***	-0.012	-0.048***	-0.028**
	(0.014)	(0.016)	(0.012)	(0.012)
CDS Traded	.	-0.047***	.	-0.028***
	.	(0.009)	.	(0.004)
Intercept	0.547***	0.542***	0.634***	0.626***
	(0.012)	(0.012)	(0.011)	(0.011)
Loan Characteristics Controls	Yes	Yes	Yes	Yes
Borrower Characteristics Controls	Yes	Yes	Yes	Yes
Loan Initiation Year Fixed Effects	Yes	Yes	Yes	Yes
Borrower Industry Fixed Effects	Yes	Yes	Yes	Yes
Loan Purpose Fixed Effects	Yes	Yes	Yes	Yes
Clustered Standard Errors by Borrower	Yes	Yes	Yes	Yes
R-squared (%)	41.76	41.81	45.08	45.77
Observations	35046	35046	6611	6611

Table X
Impact of Borrower CDS on Loan Outcome: Loan Contract Amendment

This table reports results of regressions that examine the impact of the borrower CDS on loan amendment after initiation. The dependent variables are measures for the frequency of loan amendments. In model 1, the dependent variable is a dummy *Ever Amended* which takes one if the loan is amended at least once after initiation. In model 2, the dependent variable is the *# Amendments*, which is the total number of amendments made to the loan after initiation. In model 3, the dependent variable is the average number of amendments per year throughout the life of the loan. The independent variable of interest is *CDS Trading*, a dummy variable taking one if there is active CDS trading referencing the borrower's debt at loan origination, and zero otherwise. *CDS Traded* is a dummy variable if the borrower has CDS market at any time during the sample period, and zero otherwise. We control for loan contract terms in the initial contract and borrower characteristics which are extracted at the end of the quarter prior to loan initiation. We also control for Δ firm characteristics including firm size, profitability, leverage and volatility between the quarter before loan initiation and the current quarter (of loan amendment). EBITDA volatility is the standard deviation of quarterly EBITDA measured on yearly basis. All specifications include loan purpose, loan origination year and borrower industry fixed effects. Numbers in parentheses are standard errors adjusted for heteroskedasitisity and firm-level clustering. ***, **, and * represent statistical significance at 1%, 5% and 10% level, respectively. See Appendix for variable definitions.

	Ever Amended	# Amendments	# Amendments/Year
Variable	Model1	Model2	Model3
CDS Trading	-0.055^{***}	-0.248^{***}	-0.054^{***}
	(0.007)	(0.046)	(0.009)
CDS Traded	0.006	0.035	-0.001
	(0.006)	(0.041)	(0.008)
Loan Spread	0.001^{***}	0.002^{***}	0.001^{***}
	(0.000)	(0.000)	(0.000)
Log (Loan Amount)	0.020^{***}	0.065^{***}	0.015^{***}
	(0.001)	(0.007)	(0.003)
Log (Loan Maturity)	0.048^{***}	0.973^{***}	-0.040^{***}
	(0.004)	(0.060)	(0.008)
Δ EBITDA/Assets	0.019^{*}	0.047	0.031
	(0.011)	(0.047)	(0.021)
Δ Total Debt/Assets	0.001	0.001	0.001
	(0.001)	(0.001)	(0.001)
Δ Log (Assets)	-0.006	-0.006	0.013
	(0.005)	(0.048)	(0.030)
Δ EBITDA Volatility	-0.001^{***}	0.001	0.001
	(0.001)	(0.001)	(0.001)
Log (Total Assets)	-0.013^{***}	-0.055^{***}	-0.017^{***}
	(0.001)	(0.009)	(0.005)
Has S&P Rating	0.013^{***}	0.084^{**}	-0.005
	(0.005)	(0.035)	(0.011)
Altman's Z-score	0.000	-0.004	-0.002^{**}
	(0.000)	(0.003)	(0.001)
Intercept	-0.020	-0.548^{***}	0.010
	(0.021)	(0.170)	(0.035)
Loan Initiation Year Fixed Effects	Yes	Yes	Yes
Borrower Industry Fixed Effects	Yes	Yes	Yes
Loan Purpose Fixed Effects	Yes	Yes	Yes
Clustered Standard Errors by Borrower	Yes	Yes	Yes
R-squared (%)	13.71	9.41	2.89
Observations	37190	37190	37190

Internet Appendix to

"Market versus Contracting: Credit Default Swaps and Creditor Protection in Loans"

Table IA.1

Impact of Borrower CDS: Restricted Sample of Loans by Skipping Short Windows

This table shows the regression results of the effects of CDS trading on loan contractual protection measures with a restricted sample of loans. We exclude loans issued within short windows immediately after CDS introduction to alleviate endogeneity concern. Specifically, we exclude loans issued within one year after first CDS introduction in models 1 and 2, loans issued within two years in models 3 and 4, and loans issued within three years in models 5 and 6. We are interested in the coefficients of *CDS Trading*, a dummy variable taking the value of one if there are CDS contracts referencing the borrower's debt at loan origination, and zero otherwise. *CDS Traded* is a dummy variable if the borrower has CDS market at any time during the sample period, and zero otherwise. Other control variables are the same as we use in the baseline regressions. All specifications include loan purpose, loan origination year and borrower industry fixed effects. Numbers in parentheses are standard errors adjusted for heteroskedasitisity and firm-level clustering. ***, **, and * represent statistical significance at 1%, 5% and 10% level, respectively. See Appendix for variable definitions.

Panel A. Secured Loan

	Skip 1 Year		Skip 2 Years		Skip 3 Years	
Variable	Model1	Model2	Model3	Model4	Model5	Model6
CDS Trading	-0.120***	-0.083***	-0.127***	-0.090***	-0.127***	-0.091***
	(0.016)	(0.018)	(0.017)	(0.019)	(0.018)	(0.010)
CDS Traded	.	-0.047***	.	-0.047***	.	-0.047***
	.	(0.014)	.	(0.014)	.	(0.014)
Intercept	0.557***	0.553***	0.562***	0.557***	0.562***	0.562***
	(0.020)	(0.020)	(0.020)	(0.020)	(0.021)	(0.019)
Loan Characteristics Controls	Yes	Yes	Yes	Yes	Yes	Yes
Borrower Characteristics Controls	Yes	Yes	Yes	Yes	Yes	Yes
Loan Initiation Year Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Borrower Industry Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Loan Purpose Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
R-squared (%)	41.47	41.52	41.24	41.48	41.29	41.34
Observations	34577	34577	34231	34231	33848	33848

Panel B. Net Worth Requirement

	Skip 1 Year		Skip 2 Years		Skip 3 Years	
Variable	Model1	Model2	Model3	Model4	Model5	Model6
CDS Trading	-0.085***	-0.066***	-0.091***	-0.069***	-0.089***	-0.065***
	(0.006)	(0.006)	(0.006)	(0.007)	(0.007)	(0.008)
CDS Traded	.	-0.031***	.	-0.032***	.	-0.034***
	.	(0.004)	.	(0.004)	.	(0.004)
Intercept	0.561***	0.556***	0.562***	0.554***	0.560***	0.552***
	(0.007)	(0.007)	(0.007)	(0.007)	(0.007)	(0.007)
Loan Characteristics Controls	Yes	Yes	Yes	Yes	Yes	Yes
Borrower Characteristics Controls	Yes	Yes	Yes	Yes	Yes	Yes
Loan Initiation Year Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Borrower Industry Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Loan Purpose Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
R-squared (%)	31.03	33.82	32.30	33.55	29.54	31.03
Observations	6833	6833	6769	6769	6704	6704

Table IA.2
First-Stage Regressions of the Instrumental Variable Approach

This table shows the first-stage OLS regression of CDS trading on the instrumental variable. The sample is composed of loans in Dealscan with the instrumental variable and financial information available. The dependent variable is *CDS Trading*, a dummy taking one if there are CDS contracts referencing the borrower's debt in the quarter of loan initiation. The instrumental variable is *Past Lender's Foreign Exchange Derivatives Position*, which is the amount of foreign exchange derivatives used for hedging purposes (not trading) relative to the total amount of loans of the syndicate lead banks that the firm has borrowed money from in the past five years. Data on banks' foreign exchange derivatives position are from the Federal Reserve's Call Report on commercial banks and bank holding companies. Other explanatory variables are extracted at the end of the quarter prior to loan origination. Excess stock return and stock return volatility are calculated from monthly stock returns. The first-stage regression includes year and industry fixed effects. We form the sample by keeping loans for CDS-referenced firms originated from 1994 until the first quarter when CDS trading started, and all loans issued by the non-CDS borrowers. Numbers in parentheses are standard errors adjusted for heteroskedasitisity and firm-level clustering. ***, **, and * represent statistical significance at 1%, 5% and 10% level, respectively. See Appendix for variable definitions.

Variable	Estimate
Instrument for CDS Trading	
Past Lender's Foreign Exchange Derivatives Position	5.957***
	(0.584)
Other Explanatory Variables	
Log (Total Assets)	0.121***
	(0.002)
Market-to-Book	11.943***
	(1.876)
Current Ratio	0.349
	(0.344)
Profitability	−0.249**
	(0.117)
Cash-to-Total Assets	0.089*
	(0.051)
Leverage	0.064*
	(0.037)
Tangibility	0.011
	(0.016)
Altman's Z-score	−0.004**
	(0.002)
Excess Stock Return	−0.022***
	(0.006)
Log (Stock Return Volatility)	0.072
	(0.057)
Intercept	−0.693***
	(0.047)
Loan Initiation Year Fixed Effects	Yes
Borrower Industry Fixed Effects	Yes
F-Statistics	88.72***
R-squared (%)	38.56
Observations	29150

Table IA.3
Matched Sample Diagnostics: Nearest Neighbor Matching on Propensity Scores

This table compares differences in propensity scores and borrower characteristics between CDS firms and Non-CDS firms for the original sample and the nearest neighbor matched sample. The matching is based on the propensity of CDS trading estimated from a probit model, in which the dependent variable is *CDS Trading*, a dummy taking one if there are CDS contracts referencing the borrower's debt in the quarter of loan initiation, and the explanatory variables include the instrument, the logarithm of total assets, current ratio, return-on-assets, leverage ratio, and Altman's Z-score. Then we select the one from non-CDS firms in the same 1-digit SIC industry with the nearest propensity score to the CDS firm as the matching firm. We extract loans issued by the matching firms in the same year as the matched CDS firms to form to control group of loans. CDS firms refer to firms that ever have a CDS market referencing its debt at any time during the sample period. Non-CDS firms refer to firms that never have a CDS market during the sample period. Borrower characteristic variables take the value at the end of the quarter prior to loan initiation. The numbers in the first column are the mean of the differences in the corresponding variables between CDS and non-CDS firms before matching. The numbers in the second column are the mean of the differences in the corresponding variables between CDS firms and their one-on-one matched firms. ***, **, and * represent significance level of 1%, 5% and 10% level, respectively, at which the differences are statistically different from zero. See Appendix for variable definitions.

Variable	Before Matching (CDS Firm - Non-CDS Firm)	After Matching (CDS Firm - Non-CDS Firm)
Propensity Score	0.211**	−0.007
Log (Total Assets)	2.536***	−0.054
Current Ratio	−0.537***	0.004
Cash/Total Assets	−0.018***	0.003
Leverage	0.016***	−0.005
Tobin's Q	0.010	0.000
Profitability	0.008***	0.000

Table IA.4

Impact of Borrower CDS: Other Restrictions on Borrower Risk-Shifting Incentives

This table shows the results of regressions that examine the effects of CDS trading on other types of restrictions on borrower risk-shifting activities. The dependent variables are the tightness measures of the restrictive covenants, which are calculated in the same approach as we use for calculating the net worth requirement. We are primarily interested in three types of restrictions: debt-to-EBITDA ratio, debt-to-tangible net worth, and the leverage ratio. We are interested in the coefficients of *CDS Trading*, a dummy variable taking the value of one if there are CDS contracts referencing the borrower's debt at loan origination, and zero otherwise. *CDS Traded* is a dummy variable if the borrower has CDS market at any time during the sample period, and zero otherwise. Other control variables are the same as we use in the baseline regressions. All specifications include loan purpose, loan origination year and borrower industry fixed effects. Numbers in parentheses are standard errors adjusted for heteroskedasitisity and firm-level clustering. ***, **, and * represent statistical significance at 1%, 5% and 10% level, respectively. See Appendix for variable definitions.

	Debt/EBITDA Ratio	Debt/Tangible Net Worth	Leverage Ratio
Variable	Model1	Model2	Model3
CDS Trading	0.001	0.060	−0.006
	(0.013)	(0.105)	(0.028)
CDS Traded	−0.021*	−0.072	0.021
	(0.011)	(0.063)	(0.023)
Loan Spread	−0.001***	0.001	0.001
	(0.001)	0.000	0.000
Maturity	−0.018***	−0.035	0.015
	(0.006)	(0.026)	(0.019)
Log (Loan Amount)	0.002	0.010	−0.006
	(0.005)	(0.012)	(0.010)
Log (Number of Lenders)	−0.001	−0.021	0.008
	(0.004)	(0.020)	(0.009)
Log (Total Assets)	−0.010***	0.003	0.010
	(0.003)	(0.008)	(0.007)
Has S&P Rating	−0.040***	0.006	0.013
	(0.007)	(0.051)	(0.019)
Altman's Z-score	0.018***	0.004**	0.001
	(0.001)	(0.002)	(0.003)
Intercept	0.574***	0.593***	1.070***
	(0.045)	(0.124)	(0.095)
Loan Characteristics Controls	Yes	Yes	Yes
Borrower Characteristics Controls	Yes	Yes	Yes
Loan Initiation Year Fixed Effects	Yes	Yes	Yes
Borrower Industry Fixed Effects	Yes	Yes	Yes
Loan Purpose Fixed Effects	Yes	Yes	Yes
Clustered Standard Errors by Borrower	Yes	Yes	Yes
Observations	25680	6156	11599
R-squared (%)	11.62	49.74	53.45

Table IA.5
Control Lender Effects: Within-Bank Analysis

This table reports the baseline difference-in-differences regression results of the impact of CDS trading on loan contractual protection devices. Panel A restricts the sample to loans from banks that lend to both CDS and non-CDS firms during the sample period. Panel B further restricts the sample to loans from banks that lend to CDS firms both before and after CDS introduction. The dependent variables are the secured dummy and the tightness of net worth requirement. The independent variable we are interested in is *CDS Trading*, a dummy taking the value of one if there are CDS contracts referencing the borrower's debt when the loan is initiated, and zero otherwise. *CDS Traded* is a dummy variable which takes the value of one if the borrower has a CDS market at any time during the sample period, and zero otherwise. Other control variables are the same as we use in the baseline regressions. All specifications include loan purpose, loan origination year and borrower industry fixed effects. All results are based on quarterly observations. Numbers in parentheses are standard errors adjusted for heteroskedasitisity and firm-level clustering. ***, **, and * represent statistical significance at 1%, 5% and 10% level, respectively. See Appendix for variable definitions.

Panel A. Sub-sample of Loans from Banks Lending to Both CDS and Non-CDS Firms

	Secured Loan		Net worth Requirement	
Variable	OLS	Probit	OLS	Tobit
CDS Trading	-0.051***	-0.215***	-0.044***	-0.063***
	(0.017)	(0.051)	(0.007)	(0.023)
CDS Traded	-0.118***	-0.324**	-0.016**	0.041**
	(0.014)	(0.040)	(0.005)	(0.017)
Intercept	0.217***	0.188	0.478***	0.249***
	(0.036)	(0.116)	(0.019)	(0.035)
Loan Characteristics Controls	Yes	Yes	Yes	Yes
Borrower Characteristics Controls	Yes	Yes	Yes	Yes
Loan Initiation Year Fixed Effects	Yes	Yes	Yes	Yes
Borrower Industry Fixed Effects	Yes	Yes	Yes	Yes
Loan Purpose Fixed Effects	Yes	Yes	Yes	Yes
Clustered Standard Errors by Borrower	Yes	Yes	Yes	Yes
R-squared (%)	43.84	43.21	42.88	43.21
Observations	18443	18443	5134	5134

Panel B. Sub-sample of Loans from Banks Lending Both Before and After CDS Introduction

	Secured Loan		Net Worth Requirement	
Variable	OLS	Probit	OLS	Tobit
CDS Trading	-0.025**	-0.106**	-0.034**	-0.038***
	(0.012)	(0.051)	(0.015)	(0.015)
CDS Traded	-0.062***	-0.147***	-0.012**	-0.031*
	(0.011)	(0.047)	(0.005)	(0.017)
Intercept	0.509***	0.111	0.281***	0.379***
	(0.031)	(0.130)	(0.055)	(0.051)
Loan Characteristics Controls	Yes	Yes	Yes	Yes
Borrower Characteristics Controls	Yes	Yes	Yes	Yes
Loan Initiation Year Fixed Effects	Yes	Yes	Yes	Yes
Borrower Industry Fixed Effects	Yes	Yes	Yes	Yes
Loan Purpose Fixed Effects	Yes	Yes	Yes	Yes
Clustered Standard Errors by Borrower	Yes	Yes	Yes	Yes
R-squared (%)	43.84	43.15	44.16	44.32
Observations	15155	15155	4936	4936

Table IA.6
Impact of Borrower CDS Market Liquidity: Alternative Measure

This table reports the regression results of the effects of CDS market liquidity on loan contractual protection terms with alternative measures of CDS market liquidity. The dependent variables are the secured dummy and the net worth requirement specified in the initial loan contract. The independent variables of interest are (1) the number of outstanding CDS contracts referencing the borrower's debt in the *month* of loan initiation scaled by the amount of total outstanding debt in the prior quarter (*CDS Outstanding Amount/Total Amount of Debt*); (2) the number of CDS trades referencing the borrower's debt in the *month* of loan initiation scaled by the amount of total outstanding debt in the prior quarter (*CDS Trading Volume/Total Amount of Debt*). In all specifications, we control for CDS firm fixed effect, *CDS Traded*, a dummy variable taking one if the borrower has a CDS market on its debt at any time during the sample period, and zero otherwise. Other control variables are the same as we use in the baseline regressions in Table III. To conserve space we do not report coefficients of all control variables. All specifications include loan purpose, loan origination year and borrower industry fixed effects. Numbers in parentheses are standard errors adjusted for heteroskedasitisity and firm-level clustering. ***, **, and * represent statistical significance at 1%, 5% and 10% level, respectively. See Appendix for variable definitions.

	Secured Loan		Net Worth Requirement	
Variable	Model1	Model2	Model3	Model4
CDS Outstanding Amount	-1.824*	.	-0.701***	.
/Total Amount of Debt	(1.065)	.	(0.040)	.
CDS Trading Volume	.	-21.788**	.	-5.952***
/Total Amount of Debt	.	(10.536)	.	(0.843)
CDS Traded	-0.077***	-0.078***	-0.051***	-0.051***
	(0.013)	(0.013)	(0.007)	(0.007)
Intercept	0.653***	0.656***	0.496***	0.498***
	(0.029)	(0.029)	(0.017)	(0.017)
Loan Characteristics Controls	Yes	Yes	Yes	Yes
Borrower Characteristics Controls	Yes	Yes	Yes	Yes
Loan Initiation Year Fixed Effects	Yes	Yes	Yes	Yes
Borrower Industry Fixed Effects	Yes	Yes	Yes	Yes
Loan Purpose Fixed Effects	Yes	Yes	Yes	Yes
Clustered Standard Errors by Borrower	Yes	Yes	Yes	Yes
R-squared (%)	43.14	43.17	43.63	43.29
Observations	35323	35323	6952	6952

Table IA.7
Lenders' Credit Derivatives Position and the Impact of Borrower CDS: Alternative Measures

This table reports the regression results of the impact of lenders' credit derivatives positions on the CDS effects. The dependent variables are the secured dummy and the net worth requirement specified in the initial loan contract. The independent variables we are interested in are the interaction terms of *CDS Trading* and *All Lenders' Credit Derivatives Position* (in $trillion), including the positions held by both the lead and participant lenders. Syndicate lenders' credit derivatives positions are extracted at the quarter of loan initiation. Banks' credit derivatives trading data are provided by the Federal Reserve Consolidated Financial Statements for Bank Holding Companies ("FR Y-9C") and the Office of the Comptroller of the Currency (OCC) Quarterly Report on Bank Derivatives Activities. *CDS Trading* is a dummy variable which takes the value of one if there is active CDS trading in the borrower's debt at loan initiation, and zero otherwise. *CDS Traded* is a dummy variable taking one if the borrower has a CDS market at any time during the sample period, and zero otherwise. Other control variables are the same as we use in the baseline regressions. To conserve space we do not report all coefficients of control variables. All specifications include loan purpose, loan origination year and borrower industry fixed effects. Numbers in parentheses are standard errors adjusted for heteroskedasitisity and firm-level clustering. ***, **, and * represent statistical significance at 1%, 5% and 10% level, respectively. See Appendix for variable definitions.

	Secured Loan		Net Worth Requirement	
Variable	Model1	Model2	Model3	Model4
CDS Trading*All Lenders' Credit Derivatives Position	-0.021***	-0.020***	-0.028**	-0.028**
	(0.006)	(0.006)	(0.013)	(0.013)
All Lenders' Credit Derivatives Position	-0.008*	-0.009*	0.004***	0.005***
	(0.005)	(0.005)	(0.001)	(0.001)
CDS Trading	-0.074***	-0.007	-0.063***	-0.042***
	(0.013)	(0.019)	(0.011)	(0.013)
CDS Traded	.	-0.091***	.	-0.030***
	.	(0.018)	.	(0.007)
Intercept	0.826***	0.800***	0.487***	0.617***
	(0.043)	(0.044)	(0.017)	(0.012)
Loan Characteristics Controls	Yes	Yes	Yes	Yes
Borrower Characteristics Controls	Yes	Yes	Yes	Yes
Loan Initiation Year Fixed Effects	Yes	Yes	Yes	Yes
Borrower Industry Fixed Effects	Yes	Yes	Yes	Yes
Loan Purpose Fixed Effects	Yes	Yes	Yes	Yes
Clustered Standard Errors by Borrower	Yes	Yes	Yes	Yes
R-squared (%)	36.37	36.55	42.45	42.93
Observations	35323	35323	6952	6952