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Externalities of CDS Trading: The Effect on Industry Peer Firms' Cost of Debt

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by

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Abstract

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This paper documents externalities associated with the introduction of credit default swaps (CDS) in the corporate bond market. I find that firms without traded CDS contracts (non-CDS firms) experience lower cost of debt when there are more peer firms with traded CDS contracts (CDS firms). This effect is stronger when non-CDS firms are more closely related to a CDS-firm and when the outstanding CDS contracts are more liquid. My findings are consistent with the view that CDS trading provides hedging opportunities and information for bond investors of non-CDS firms. This study provides evidence that CDS trading on peer firms has positive externalities on the cost of public debt for non-CDS firms.

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1. Introduction

Credit default swaps (CDS)[1] have become among the most influential financial innovations since first introduced to the market in the 1990s. There has been a debate among researchers and regulators over the positive and negative outcomes of CDS. On the one hand, CDS contracts provide opportunities for credit risk transfer, and therefore facilitate risk-taking and risk-sharing in the market. On the other hand, CDS may have unintended consequences that bring additional, undesirable risks to the market. Academic researchers have investigated the benefits and costs of CDS, finding mixed evidence. The controversy over CDS has drawn more attention since the financial crisis of 2007-2009, during which CDS were blamed for being one of the main causes for the crisis[2]. Previous studies show that the CDS market impacts referenced-firms' performance, accounting choices, financial decisions, and information environment (Subrahmanyam et al., 2014; Martin and Roychowdhury, 2014; Saretto and Tookes, 2013; Subrahmanyam et al., 2017; Kim et al., 2018; Batta et al., 2016).

Although there are numerous studies on the consequences of CDS, most previous research examines the impact of CDS introduction on CDS-referenced firms (CDS firms hereafter). Much less is known about how CDS trading affects firms that are not CDS-referenced (non-CDS firms hereafter). Understanding the spillover effect of CDS trading is important because only limited number of firms have CDS contracts while the majority of firms do not directly participate in this market. CDS trading may affect non-CDS firms directly or through the interaction between CDS

[1] CDS is a type of contract that the buyer of the CDS makes a series of payments to the seller to get insured on the underlying debt and gets paid by the seller when the debtor defaults or other credit events happen. International Swaps and Derivatives Association (ISDA) defines seven types of credit event: bankruptcy, failure to pay, restructuring, repudiation, moratorium, obligation acceleration, and obligation default.

[2] See the final report released by US Financial Crisis Inquiry Commission (FCIC 2011, p. 50). CDS is described as a key OTC derivative in the financial crisis. An example is AIG, a central player in the financial crisis. AIG insured obligations of various financial institutions through the usage of CDS but failed to support the CDS commitments.

firms and non-CDS firms. Since most firms are not CDS-referenced, we cannot draw conclusions about the impact of CDS trading on the overall market from investigating the effects of CDS trading on CDS firms alone. Therefore, focusing solely on CDS firms limits our understanding of the CDS market. In this paper, I empirically examine the externalities of CDS trading on bond market. Specifically, I hypothesize that CDS trading decreases the cost of public debt for non-CDS firms that are in the same industry, and this effect is stronger when the firms are more closely related to the referenced firms and the liquidity of CDS contracts increase. Two recent studies (Li and Tang, 2016; Cedergren et al., 2018) investigate the externalities of CDS and find that non-CDS firms are affected by the trading of CDS contracts when they have CDS-referenced customers. Unlike these studies, I focus on firms that are not linked to CDS firms directly through the supply chain.

The hypotheses in this paper are based on the argument that bond investors of a non-CDS firm could purchase CDS contracts of peer firms that are CDS referenced to hedge their risk exposure. Researchers have recognized three major roles of CDS contracts: hedging, speculation, and arbitrage. Specifically, investors use CDS to hedge their risk exposure, speculate on default prospects, and arbitrage bond and CDS price differences (Oehmke and Zawadowski, 2016). Oehmke and Zawadowski (2017) provide direct evidence that the trading volume of CDS is associated with hedging motives, suggesting that CDS contracts are purchased by investors to hedge their bond holding or other risk exposure to the referenced entity. In this paper, I argue that CDS contracts are also purchased by investors to hedge the risk of non-CDS industry peers. I first define peer firms as firms operating in the same industry, and then I construct proxies to further narrow down firms that are considered peers. Firms in the same industry are affected by similar economic forces. For example, industry peers may be subject to identical supply or demand shocks,

and they may also face similar operating risks. Thus, CDS contracts can be used by investors of non-CDS firms to partially hedge their risk exposure. I predict that non-CDS firms experience decreased cost of bond issuance as the number of peer firms with CDS trading increases.

Investors of non-CDS firms may choose to purchase peer firms' CDS contracts instead of seeking the firms' own CDS contracts for cost-effectiveness considerations. Because of the nature of over-the-counter market, CDS contracts that are not traded very often gradually die out. Therefore, for majority of firms on the market, either the demand or the supply of CDS contracts is not high enough. As a result, we observe that only a small number of firms have CDS contracts traded. Therefore, investors of non-CDS firms are not able to purchase CDS contracts that reference the firms they invest in. However, purchasing peer firms' CDS contracts may allow these investors to partially hedge their risk exposure in a more cost-effective way. For example, JPMorgan Chase explains in their annual report that they may experience losses on specific exposures that are different than the named reference entities in the purchased CDS, implying that they may hedge risks associated with a firm through purchasing CDS contracts of a different entity[3].

In addition to the opportunities for hedging, another potential mechanism through which CDS trading affects non-CDS firms' cost of bond issuance is the improved information environment. Previous literature finds evidence that CDS trading provides additional information about referenced entities, and the information conveyed by the CDS market improves the overall information environment of both referenced firms and firms that are related to the referenced firms (Batta et al., 2016; Li et al., 2016; Cedergren et al., 2018; Kim et al., 2018). Prior disclosure literature also documents that peer firms' information is negatively associated with a firm's cost

[3] The detailed description can be found in JPMorgan Chase 2017 Annual Report (p.116).

of capital (Shroff et al., 2017). Hence, CDS trading in the industry could lower non-CDS firms' cost of debt by improving the information environment faced by these firms.

Nevertheless, there are also reasons why CDS trading may not benefit non-CDS firms regarding bond issuance costs. First, CDS trading may have no effect on non-CDS firms as CDS contracts are designed to hedge the specific risk related to the underlying debt. Both the exact underlying debt and the credit events that trigger the settlement are specified in the contracts. Since the CDS contracts are narrowly tailored, peer firms may not be affected by CDS trading if investors only use CDS contracts to hedge the underlying bond or other risk exposure to the referenced firms. Second, CDS trading could have negative effect on non-CDS firms' bond issuance. Since investors are provided with the opportunities to hedge risk exposure when they lend to CDS-firms, the bonds issued by CDS-firms could attract investors away from non-CDS firms' bonds. The bond market may view bonds of non-CDS firms as riskier compared to those of CDS firms and price them accordingly. In addition, serving as an alternative trading venue (Oehmke and Zawadowski, 2015; Oehmke and Zawadowski, 2017), the CDS market could crowd out the current demand for bonds and increase the cost to issue bonds.

To test my hypotheses, I start by examining whether and how non-CDS firms' bond issuance is affected by the extent of CDS trading in the industry. Following the intuition from the literature on externalities of public firms (e.g., Shroff et al., 2017; Badertscher et al., 2013), I construct a measure of CDS trading in each industry (*%CDSfirms*) by dividing the number of firms with active CDS trading by the total number of public firms operating in that industry. This measure captures the CDS trading in the industry and it is expected to be negatively associated with cost of debt of non-CDS firms to the extent if captures potential hedging opportunities.

In this paper, I focus on cost of bond instead of cost of other debt (e.g., bank loans), because compared to other types of debt, bonds are most related to the CDS contracts[4]. I construct a comprehensive data set of bond issues covering the period of 2001 to 2017 to study the effects of CDS trading on non-CDS firms' bond issuance. After applying certain screening criteria, I obtain a sample of 2,156 bond issues for both CDS firms and non-CDS firms.

I find that peer firms' CDS trading is negatively associated with non-CDS firms' cost of bond issuance. Specifically, the evidence shows that non-CDS firms issue bonds at a lower spread when the extent of CDS trading in the industry increases. I also find that non-CDS firms can issue bonds with longer maturities and larger issue sizes as there are more peer firms with active CDS contracts outstanding. This effect, however, does not exist for CDS-firms themselves. The results suggest that CDS firms do not experience reduced cost of bond issuance as CDS trading in the industry increases, consistent with evidence documented in previous research that CDS trading does not benefit referenced firms in the bond market (Ashcraft and Santos, 2009; Das et al., 2014)

Next, I test the robustness of my main findings applying two alternative ways of identifying peer firms. Both hedging and information mechanism are based on the assumption that peer firms in the same industry are subject to common shocks. To capture the similarities between two firms, I use two approaches. As debt market investors are concerned about credit risk the most, I use the default risk correlation between two firms in the same industry as the main proxy for the amount

[4] The debt underlying the CDS contract could be municipal bonds, emerging market bonds, mortgage-backed securities, or corporate debt between two parties. As CDS market becomes standardized, corporate bond becomes the most widely used underlying debt. In 2006, Loan Credit Default Swaps (LCDS) were introduced to the market. LCDS is a type of credit derivative in which the underlying obligation is limited to syndicated secured loans. The biggest difference between LCDS and CDS is that the former has higher recovery value as its underlying debt is senior to bonds. As summarized in Culp et al. (2016), most widely used CDS data resources (Markit, Datastream, CMA Datavision, CreditTrade etc.) only capture data on CDS. Therefore, existing research focus on CDS market while little is known about LCDS due to data limitation. Similar to prior studies, I focus on CDS contracts that are referenced mainly on bonds instead of loans.

of common risk faced by both firms[5]. I predict that the effect of CDS trading on non-CDS firms' cost of bond is more pronounced when the non-CDS firm is more related to a CDS firm in terms of credit risks. In addition, I also use stock return correlations as an alternative measure. For each non-CDS firm in a given year, one CDS firm is identified as the referenced firm that is most closely related to the non-CDS firm using credit risk correlations or stock return correlations. I find that a non-CDS firm experiences more reduction in the cost of bond issuance when it is more correlated with a CDS firm in the same industry. The evidence supports the argument that investors of non-CDS firms purchase CDS contracts of peer firms to hedge risk exposure. When the non-CDS firms are more closely related to the CDS firms in the same industry, investors are more likely to hedge their risk exposure related to the non-CDS firms by purchasing the CDS contracts.

To further support my hypotheses, I also examine whether the liquidity of CDS contracts influences the effect of CDS trading on non-CDS firms' cost of bond issuance. Since CDS contracts are traded in an over-the-counter market, the liquidity of contracts is crucial to investors. I construct two measures to capture the liquidity of CDS contracts. The first measure is the number of dealers providing quotes for the contracts following prior studies (Ashcraft and Santos, 2009; Qiu and Yu, 2012; Amiram et al., 2017)[6]. The second measure is the percentage of CDS firms that are included in the CDS index. An CDS index is a credit derivative that can be used to hedge risk or to take a position on a basket of CDS firms. Unlike single name CDS contracts, a CDS index is standardized and more liquid. Since only the most liquid CDS-referenced firms are selected into the CDX index, whether a firm is included in the index indicates the liquidity of its CDS contracts.

[5] The default risk correlation between two firms is defined as the correlation of change of default risk (Oscore) in previous 3-year period between the two firms. The stock return correlation is defined as the correlation of monthly stock return for previous 12 months. The detailed calculation can be found in Section 3 and Appendix.
[6] The intuition here is that it is more likely to complete a transaction of a CDS contract if there are more dealers providing quotes on this contract. Therefore, the number of quote providers indicates the liquidity of the contracts.

I find that Non-CDS firms benefit more in the bond market from peer firms' CDS trading when the liquidity of the CDS contracts is higher, supporting the argument that investors of non-CDS firms hedge their risk through purchasing derivative contracts from peer firms that are CDS referenced in the same industry.

Moving beyond bond issuance, I also examine how CDS trading affects non-CDS firms' bond performance in the secondary bond market. The data on bond transactions are obtained from TRACE (Trade Reporting and Compliance Engine) Enhanced database which covers most bond transactions after July 1, 2002. Using a sample of 31,763 quarterly observations, I examine whether peer firms' CDS trading also affect non-CDS firms' bond spreads in the secondary market. The results are consistent with the conclusion drawn from the analysis of bond issuance. I find that for non-CDS firms, bond spreads in the secondary market also decrease as more peer firms have CDS contracts traded in the market. Taken together with the evidence on bond issuance, these results suggest that the presence of CDS trading benefits non-CDS firms in the bond market.

To further explore the types of non-CDS firms that benefit the most from their industry peers' CDS trading, I conduct two cross-sectional tests. First, I find that the effect of CDS trading on non-CDS firms' bond spreads is stronger for firms that are financially constrained compared to firms that are not. Second, I examine the effect of CDS trading on non-CDS firms' bond spreads conditional on bonds' ratings and find that the cost of bond issuance decreases the most for non-CDS firms with bonds rated around the investment threshold (in the range of B to BBB+). Non-CDS firms with bonds rated below B experience smaller reduced cost of bond issuance, while highly rated firms do not seem to benefit from CDS trading.

This paper contributes to the literature on the consequences of CDS trading. Specifically, this study addresses the effect of CDS trading on non-CDS firms. The existing research on CDS

trading implications can be classified into two categories. One stream of literature investigates the implications of CDS trading on market efficiency, liquidity and pricing of other types of assets (e.g., Ashcraft and Santos, 2009; Das et al., 2014). The other stream seeks to understand whether CDS trading affects firms' characteristics and financial decisions (e.g., Martin and Roychowdhury, 2014; Batta et al., 2016; Subrahmanyam et al., 2017). These studies, however, focus on referenced firms themselves. Much less is known about the spill-over effect of CDS trading on firms that are not referenced. Two recent papers (Li and Tang, 2016; Cedergren et al., 2018) take this path and examine the effects of CDS trading on firms that are related to the CDS firms. They provide insights on the externalities of CDS trading on firms that are tied to the CDS firms by the customer-supplier linkages. In contrast, I explore the effect of CDS trading on non-CDS firms using a more general setting which allows me to focus on more non-CDS firms. Since only a small number of firms have CDS contracts traded, studying the implication of CDS trading on non-CDS firms is vital for understanding the broader implications of CDS market. This paper documents an externality of CDS trading on non-CDS firms' cost of public debt.

This paper also contributes to the literature on bond markets and CDS trading. Bond is the asset that most relates to CDS contracts. Previous literature documents various outcomes of CDS trading in the bond market. The evidence provided in this study support the previous research that CDS trading does not benefit referenced firms in the bond market in terms of cost of issuance and liquidity. However, I find that non-CDS firms benefit from CDS trading in the bond market. This finding adds to the prior studies by suggesting that the introduction of CDS may not be detrimental to the bond market as it benefits firms that are not CDS referenced.

The remainder of this paper is organized as follows. Literature review and hypothesis development is presented in Section 2. In Section 3, I describe the research design and sample selection process. Section 4 presents the empirical results and Section 5 concludes.

2. Prior research and hypothesis development

2.1. Prior research

The asset most immediately related to a credit default swap is the reference bond underlying the insurance product. Existing studies provide mixed evidence on how CDS trading influences the bond market. Some studies suggest that the advent of the CDS market had no net effect on the underlying bond market. For example, Oehmke and Zawadowski (2015) show a trade-off associated with CDS introduction because it crowds out existing demand for the bond but improves the bond allocation by allowing investors to hedge their risk exposure and absorb more of the bond supply. Studies that document an effect reach mixed conclusions. For instance, Das et al. (2014) find that the introduction of the CDS trading is detrimental to the bond markets because it provides an alternative trading venue that substitutes for bond trading. They document that, following the emergence of the CDS market, bond markets became less efficient and did not experience improvements in liquidity. However, Massa and Zhang (2012) reach the opposite conclusion by showing that CDSs improve bond liquidity by reducing fire sale risk. As for the cost of bond issuance, Ismailescu and Phillips (2015) find that CDS initiation is associated with a reduction in borrowing costs in the market for sovereign debt. Ashcraft and Santos (2009), however, find no unconditional effect of CDS introduction on corporate bond spreads. My research relates to these studies and provides further evidence regarding the relationship between the CDS and underlying bond markets by documenting that the impact of CDSs on the bond market is not limited to firms that experience CDS trading.

My study also relates to the stream of literature on CDS externalities. Since CDS exist only for a small number of firms, most firms do not directly participate in the CDS market. However, whether the influence of CDSs is solely limited to firms whose debt is referenced in CDS contracts is an open empirical question. Li and Tang (2016) provide the first empirical evidence of CDS externalities. They find that a firm has lower leverage when a larger proportion of its revenue is derived from a customer referenced in CDS contracts, indicating that CDS trading on customers improves the information environment of their suppliers. Cedergren et al. (2018) also use supply chain partnerships as the setting to investigate the externalities of CDS. They document that firms issue fewer forecasts when they derive a greater proportion of their revenue from CDS-referenced customers, suggesting that having customers with an enhanced information environment reduces the benefits of suppliers' disclosure.

Some previous studies on CDS's impact on cost of debt also focus on the private loan market. Ashcraft and Santos (2009) document a small reduction in bond and loan spreads for CDS firms that are less risky and more transparent, though the average borrower with CDS contracts has not benefited from this decreased cost. Amiram et al. (2017), however, find that the initiation of CDS trading increases the share of syndicated loans retained by lead banks and increases loan spreads. They also show that this effect is moderate for firms with greater transparency. Shan et al. (2015) find that loan covenants are loosened after the advent of CDS trading. The mixed results on the impact of CDS trading on firms' cost of debt may stem from heterogeneity in the characteristics of referenced firms.

Prior studies also investigate many other outcomes of CDS introduction that are not debt-related. Treating CDS initiation as an exogenous shock, existing research shows that the CDS market impacts firms' performance, accounting choices, financial decisions, and information

environment (Saretto and Tookes, 2013; Subrahmanyam et al., 2014; Martin and Roychowdhury, 2014; Batta et al., 2016; Subrahmanyam et al., 2017; Kim et al., 2018). Although such studies typically employ a two-stage approach to alleviate the concern that firms chosen to have CDS issued on their debt possess characteristics that may be correlated with the outcome variable, such studies cannot completely rule out endogeneity issues. In this paper, I study the effect of CDS trading on non-CDS firms. The endogeneity problem faced by previous studies is therefore less of a concern in this setting.

2.2. Hypothesis development

Bond investors have various incentives to hedge their risk exposure (e.g., banks sometimes hedge risks to release regulatory capital). Oehmke and Zawadowski (2016) provide evidence that the hedging role of CDS contracts is significant. They find evidence that CDSs are used to hedge bonds but not nonbond debt (e.g., bank loans). However, only a small number of firms have active CDS contracts traded on their bonds and investors of non-CDS firms are unable to directly hedge their risk exposure. In order to partially hedge their exposure, investors of these firms may instead trade CDS contracts of their CDS-referenced peers in the same industry.[7] Operating in the same industry, non-CDS firms and their CDS-referenced peers are subject to similar operating risks and economic forces (e.g., common demand/supply shocks). While purchasing peer firms' CDS contracts will not fully hedge bond holders against firm-specific risks, such contracts offer partial insurance by way of mitigating risks common to non-CDS firms and their CDS-referenced peer firms. The opportunity to hedge risk exposure via CDS contracts of peer firms might generate

[7] Such CDS contracts, in which the buyer does not hold the underlying debt of the referenced firm, are referred to as naked CDS contracts.

higher demand for the bonds of non-CDS firms, leading to a lower cost of bond issuance. Therefore, I predict that non-CDS firms benefit from CDS trading when they issue bonds.

Another mechanism through which CDS trading may reduce the cost of debt for non-CDS firms is improved peer firms' information environment. As documented in prior literature, the CDS market is a preferred venue for informed trading and the information revealed through CDS trading affects stock prices, credit ratings, and analyst forecasts (Acharya and Johnson, 2007; Batta et al., 2016). Previous studies also find that peer information may reduce firms' cost of capital (e.g., Shroff et al., 2017). Therefore, the improved information environment faced by CDS firms may lower the cost of bond issuance for non-CDS firms.

Motivated by the discussion above, my first hypothesis is as follows:

H1: The extent of CDS trading in an industry is negatively associated with the cost of public debt for non-CDS firms in the same industry.

Investors using derivatives of CDS firms to hedge their risk exposure to peer non-CDS firms are more likely to choose CDS contracts of firms that are closely related to their target firms in order to facilitate a more effective hedge. In addition, the information revealed in CDS spread may be more likely to be pertinent to its peer firms when the CDS and the non-CDS firms are more similar. In order the capture the similarities between two firms, I take two approaches. The main approach I take is to measuring the credit risk correlation between two firms and adopt this correlation as a proxy for how closely two firms are related. Debt market investors, unlike equity market investors, have an asymmetric payoff function and care more about protecting downside risks then generating upside returns. Consequently, credit risk plays an important role when they value firms. Secondly, I use stock return correlations as an additional proxy for the similarities between two firms as it can capture the comovement of stock returns for two firms. Firms that

experience stock return comovements are likely to be subject to similar economic forces and events. I expect that non-CDS firms that are more related to CDS firms to benefit more from CDS trading. Thus, I hypothesize that:

H2: The effect of CDS trading on non-CDS firms' cost of public debt is more pronounced for firms that are more closely related to CDS firms.

Because CDS contracts are traded over-the-counter and the market is primarily a dealership market driven by quotes, liquidity is crucial for investors. When CDS contracts are not frequently traded, investors may not be able to trade due to insufficient supply or demand. In addition, illiquid CDS contracts are less likely to provide investors with relevant information due to lack of trading. Therefore, a lack of liquidity in the CDS market weakens the effect of CDS trading on non-CDS firms' cost of debt. I hypothesize that:

H3: The effect of CDS trading on non-CDS firms' cost of public debt increases with average liquidity of outstanding CDS contracts in an industry.

The above discussion notwithstanding, whether CDS trading is negatively associated with the cost of public debt for non-CDS firms in the same industry is an empirical question. First, CDS trading may have no effect on firms other than referenced firms. The underlying debt for CDS contracts is firm-specific and the contracts are designed to hedge the risks related to the underlying debt. Therefore, peer firms may not be affected by CDS trading if investors only use CDS contracts to hedge their risk exposure to the referenced firms. Second, CDS trading could have negative effect on non-CDS firms' bonds. With CDS contracts actively traded, referenced firms' bonds could be preferred by investors. Bonds of non-CDS firms could be perceived as riskier compared to those of CDS firms and priced accordingly. Further, the CDS market may serve as an alternative

trading venue for bond trading, resulting in a reduction in bond demand. The overall decreased demand in the bond market could make it more costly for non-CDS firms to issue bonds.

3. Sample selection and research design

3.1. Research design

I estimate a regression of the following form to test the effect of CDS trading on the cost of bond issuance for non-CDS firms in the same industry:

$$Bond\ Spread_{i,b} = \alpha_0 + \alpha_1 \times \%CDSfirms_{ind,t} + Firm\ Characteristics_{i,t-1} + Bond\ Characteristics_{i,b} + \varepsilon_{i,b} \quad (1)$$

Where *i, b, ind,* and *t* index firms, bonds, industries, and years, respectively. Both year and industry fixed effects are included to control for year and industry heterogeneity, respectively. Industries are defined based on Fama-French 48-industry classification.[8] *Bond Spread* is the excess of a bond's yield-to-maturity over that of a matched treasury bond with same maturity on the day of bond issuance. *%CDSfirms* is the proxy for CDS trading activity in the industry. It is computed as number of firms with active CDS trading divided by total number of firms in a given industry. The intuition is similar to that presented in other streams of literature. For example, models in the public firm externalities literature (e.g., Shroff et al., 2017; Badertscher et al., 2013) show that the percentage of public firms in an industry has an impact on the cost of capital and investment decisions of the private firms in the same industry. In my setting, I predict that the coefficient for *%CDSfirms* will be negative, implying that an increase in number of firms with active CDS contracts outstanding is associated with a decrease in the cost of bond issuance. I include control variables in the regressions on firm and bond specific attributes following previous studies (Shroff

[8] The results are robust to using 3-digit SIC and 4-digit SIC to classify industries.

et al., 2017; Bharath et al., 2008). Firm specific controls include firm size (*Log(Asset)*), leverage (*Leverage*), accrual quality (*AQ*), tangibility (*Tangibility*), current ratio (*Current*), market-to-book ratio (*Market-to-Book*), and default risk (*Oscore*). The firm characteristics are measured as of the fiscal year end proceeding the bond issuance. Bond specific controls include bond issue amount (*Log(Amount)*), maturity (*Maturity*), seniority (*Senior*), and whether the issue is secured (*Secured*).

In addition, I also examine whether CDS trading has an impact on non-CDS firms' bond issuance maturity and size, which are two important non-price contract terms for bonds. *Maturity* is the maturity (in months) at issuance and *Amount* is the issue size. Since bond investors of a non-CDS firm can hedge their risk exposure by purchasing derivatives of firms with active CDS contracts, they are able to offer bonds with greater amounts and longer maturities.

I then examine whether the above effect of CDS trading on non-CDS firms' cost of public debt varies among firms. Peer firms operating in the same industry are subject to common economic shocks and share similar operating risks. Hedging risks related to a firm's bond through another firm's derivatives could only mitigate risks that are common to both firms. I expect that non-CDS firms that are more closely related to a CDS-referenced firm are more likely to benefit from CDS trading. Debt holders have different payoff functions from equity holders and they care about credit risk the most. Therefore, I use the correlation of credit risk as the main proxy for how similar a non-CDS firm and a CDS firm are. First, I use credit risk correlation to proxy for the closeness between a non-CDS firm and a CDS firm. I calculate *Oscore* (and change of *Oscore*) for every firm-year following Ohlson (1980). Then, in order to capture the comovement of credit default risks between two firms, I construct *Correlation_raw,* for each pair of non-CDS and CDS firm, as the correlation between the change of *Oscore* of the two firms for the past three years. Since there could be multiple firms with active CDS trading in an industry at a given time, for each

non-CDS firm-year, I rank *Correlation_raw* and keep the highest value as the proxy for how closely a non-CDS firm is related to a CDS firm in terms of credit risk (*Correlation). Correlation*, therefore, captures the closeness of credit risks between a non-CDS firm and a peer firm that 1) has CDS contracts outstanding and 2) is more closely related to this non-CDS firm than any other CDS referenced firms. Furthermore, I use the correlation of stock returns between two firms as an additional proxy to capture their similarity. Similar to the calculation of credit risk correlation, I construct *Correlation_S* which measures the correlation of 12-month monthly stock return between a non-CDS firm and the CDS firm that is most related to this non-CDS firm. I include both *Correlation* (*Correlation_S*) and its interaction with *%CDSfirms* (*Correlation×%CDSfirms/ Correlation_S×%CDSfirms*) in the regression. The variable of interest is *Correlation×%CDSfirms / Correlation_S×%CDSfirms* and I expect the coefficient to be negative, showing that the effect of peer firms' CDS trading on bond spreads is stronger if firms are more closely related to a referenced firm.

The third part of my analysis examines whether the liquidity of CDS contracts has impact on the effect of CDS trading on non-CDS firms' bond issuance. I construct two measures to capture the liquidity of outstanding CDS contracts: *Dealer* and *Index*. Following previous studies (Ashcraft and Santos, 2009; Qiu and Yu, 2012; Amiram et al., 2017), I first use number of CDS dealers providing quotes for each reference entity to capture the liquidity of the derivative. *N-Dealers* is the industry average number of quote providers for five-year CDS contracts by the time of each bond issuance. The second proxy for liquidity of CDS contracts is the percentage of firms included in the CDS index in an industry. CDS index only includes entities with the most liquid CDS contracts. CDS indexes are more widely used than single name CDS contracts and the trading

volume of CDS indexes is much larger than that of single name CDS contracts.[9] Credit indices were first introduced to the market in 2001. After that, the two main families of corporate CDS indices were established: CDX and iTraxx. CDX indices cover companies from North America and emerging markets, while iTraxx indices cover companies from the rest of the world. Among the CDS indices that cover North America, the CDX.NA.IG Index is the most actively traded index (Haynes and McPhail, 2017).[10] The CDX.NA.IG Index is composed of 125 of the most liquid North American entities with investment grade credit ratings that trade in the CDS market (Markit CDX High and CDS Investment Grade Index Rules). The CDX.NA.IG Index rolls over every 6 months, and its 125 entities enter and leave the index as appropriate.[11] *Index* is the number of firms included in the CDX.NA.IG Index scaled by the total number of firms within an industry. The idea is that the inclusion of a reference firm in the index indicates that the firm has liquid CDS contracts. Both the measure of liquidity (*Dealer* and *Index*) and its interaction with *%CDSfirms* are included in the regression to test whether liquid CDS contracts help peer firms decrease cost of bond issuance more. I predict that the coefficient of the interaction is negative, indicating that the impact of CDS trading on non-CDS firms' cost of bond issuance is stronger when CDS contracts are more liquid in the industry.

[9] According to Depository Trust & Clearing Corporation (DTCC), a service company providing clearing and settlement services to the financial markets, the sum of average daily trading notional amount for top 1000 single name CDS contracts globally is 11.6925 billion dollars for the period of Jun 20, 2018 through September 19, 2018. The sum of average daily trading notional amount for CDS indexes globally is 83.550 billion dollars for the same period. CDS indexes are synthetic. Therefore, trading of CDS index does not necessarily involve trading of the single name CDS contracts of the firms included in the index.

[10] According to DTCC, the average daily trading notional amount for all active CDX.NA.IG indexes is 28.36 billion dollars for the period of Jun 20, 2018 through September 19, 2018. The average daily trading notional amount for all other CDS indexes covering firms in North America is10.6 billion dollars for the same period.

[11] An entity leaves the index due to various reasons. The index removes an entity when it is no longer one of the 125 most liquid North American entities in terms of CDS trading. An entity also leaves the index when it is downgraded from investment grade to under investment grade. Merge and acquisition can lead to adjustments of the 125-entity name list as well.

Finally, I examine whether CDS trading affects bond trading in the secondary market. The above analysis focuses on bond issuance, while secondary bond market is also an important aspect to investigate. Another likely consequence of CDS trading is that it is beneficial to bond trading of non-CDS firms. Das et al. (2014) document evidence suggesting that CDS introduction was largely detrimental to bond trading in the secondary market. They focus on reference firms' own bonds and show that CDS trading does not improve the referenced firms' bond trading efficiency or liquidity. However, I investigate whether CDS trading helps lower down non-CDS firms' bond trading price in the secondary market and provide more evidence for understanding how CDS trading influences secondary market of corporate bonds. The dependent variable bond spread

(*Bond Spread_2nd*) is the quarter end spread as the average yield to maturity (adjusted by matched treasury bond) on the last trading day in the quarter. Following previous studies (Anderson et al., 2004; Campbell and Taksler, 2003; Dick-Nielsen et al., 2012), I control for firm characteristics (Volatility, *Operating, Leverage, Pretax interest coverage*), bond characteristics (*Bond Rating, Bond Age, Log(Maturity), Coupon, Log(Amount)*), and general economic environment (*Treasury_10yr_2yr*).

3.2. Sample selection

I construct the sample from U.S. and Canadian non-financial firms in Compustat. I obtain data on bond characteristics from the Mergent Fixed Income Securities Database (FISD), data on bond trading from the Trace Enhanced Database, and data on CDS trading from Datastream. I also hand collected the names of referenced entities that are included in the most liquid index in North America: CDX. Firms' financial information is obtained from Compustat and stock returns are obtained from CRSP. The sample spans a period from 2001 when CDS data became available to the end of 2017. I use the first CDS trading date as the CDS introduction date and study the change

in non-CDS firms' cost of issuing bond following the introduction. The detailed variable definition and data source are listed in Appendix A.

The bond issuance sample consists of bonds that are issued between 2001 and 2017 from FISD. I exclude private placements, foreign issues, and issues made in foreign currencies. Convertible bonds are also excluded from the sample. To establish the link between FISD and Compustat, I use the linking table employed in Kerr and Ozel (2015).[12] Then bonds without sufficient data to calculate firm level controls are further deleted. The above procedure produces a sample of 8,203 bond issues, among which 2,156 are issued by non-CDS firms and 6,046 are issued by CDS firms. It is intuitive that CDS firms issue more bonds then non-CDS firms. Demanded by investors on debt market, CDS was first introduced to the market serving as a hedging tool. Oehmke and Zawadowski (2016) provide evidence that there are three motivations for CDS trading: hedging, speculating, and arbitraging. These incentives are higher for firms with more debts outstanding. Therefore, firms with more debts are more likely to have CDS trading (Subrahmanyam et al., 2017).

I obtain daily trading data on five-year maturity CDSs from Datastream and identify the starting date of each firm's CDS trading. After merging these results with Compustat, I identify 766 firms that have CDS contracts issued during the period between 2001 and 2017. Panel A of Table 1 summarizes the distribution of CDS initiation by year and show that most firms experienced CDS initiation before 2005, which suggest that the variable of interest (*%CDSfirms*) may be lack of variation after 2005. However, this study focuses on the effect of active CDS

[12] To establish the link between FISD and Compustat, Kerr and Ozel (2015) first match the firm CUSIPs provided in Mergent to those in Compustat. They verify company name and industry for each matched observation. Next, they manually match the observations in FISD that cannot be matched based on CUSIP with firms in Compustat based on company name and industry. Last, they adjust for name changes, mergers and acquisitions, and spinoffs. I thank Jon Kerr and Bugra Ozel for sharing their linking table with me.

trading on non-CDS firms and the liquidity of CDS contracts is measured continuously. Therefore, the CDS trading in each industry varies across time as the liquidity of CDS contracts varies over different time periods. Panel B of Table 1 presents the distribution of CDS initiations by industries classified following Fama-French 48-industry classification. The number of firms with CDS contracts traded are aggregated at the industry level. Markit also discloses the name lists of firms included in the CDX.NA.IG Index every six months. I obtain names of these reference entities from Markit and match them manually with Compustat.[13] The CDX.NA.IG Index rolls over every 6 months, and the 125 entities included in the index enter and leave the index as appropriate. However, once a group of 125 entities is formed, all 125 entities stay with the index for 6 months. Since the CDX.NA.IG Index was first introduced to the market Oct 21, 2003, variable *Index* is only available for period after Oct 21, 2003.

The bond trading data is obtained from Trace (Trade Reporting and Compliance Engine) Enhanced database which lists secondary over-the-counter corporate bond transactions happened since July 1, 2002. Trades in almost all bonds except slightly traded bonds are captured by Trace Enhanced database. The bond trading sample in this paper includes bond transactions between July 1, 2002 and Dec 31, 2017. I impose certain screening criteria on this sample and exclude trades in foreign issues, private placements, issues made in foreign currencies, and bonds that are convertible. Then, after filtering out erroneous trades following Dick-Nielsen (2009) and Dick-Nielsen (2014), I construct a sample of 31,763 observations for non-CDS firms and 110,154 observations for CDS firms.

[13] CDX indices include both public and private reference firms. I only include public reference firms in this study. Therefore, number of firms included in the CDX.NA.IG Index is smaller than 125. The exact number of firms varies from time to time.

4. Results

4.1. Summary statistics

Table 2 presents the descriptive statistics for variables used in the analysis. Panel A summarizes firm characteristics and Panel B summarizes bond characteristics for both non-CDS and CDS firms. As suggested in Panel A of Table 2, CDS firms are larger in size and exhibit higher growth potential (higher Market-to-Book ratio), while non-CDS firms have higher leverage and default risk. Regarding bond characteristics, Panel B shows that bonds issued by non-CDS firms have higher spread than those issued by CDS firms. The average rating of bonds issued by non-CDS firms is 11.61 (lies between S&P rating BB and BB+), which is lower than the average rating of bonds issued by CDS firms (15/ lies between S&P rating BBB and BBB+). The statistical difference in bond characteristics between non-CDS firms and CDS firms show that bonds issued by non-CDS firms on average are less risky than those issued by CDS firms. This difference does not affect the analysis in this study as I focus on the spillover effects of CDS trading on firms that never have CDS contracts issued. However, the fact that bonds issued by non-CDS and CDS firms are different helps explain the different effects of CDS trading on the bond markets for non-CDS firms and CDS firms. Panel C of Table 2 summarizes CDS trading at the industry level. On average, 10% of firms in a given industry have CDS contracts traded over the sample period and these CDS firms have an average of 4.86 quote providers. Further, among firms that have CDS contracts outstanding, 13% are listed in the CDSX Index.

4.2. Peer firms' CDS trading and cost of bond issuance

Table 3 presents the results from regressing bond spreads on peer firms' CDS trading and control variables. The variable of interest is *%CDSfirms*, which measures peer firms' CDS trading at the industry level and is calculated as the percentage of firms with outstanding CDS contracts

in an industry (Fama-French 48-industry classification) by the time of bond issuance. The coefficient for *%CDSfirms* is negative and statistically significant at 1% level for non-CDS firms, consistent with the prediction that peer firms' CDS trading lowers the cost of bond issuance of non-CDS firms in the same industry. In terms of economic magnitude, the coefficient of -5.402 for *%CDSfirms* implies that 0.01 increase in *%CDSfirms* is associated with a basis point of 5.402 decrease in bond spreads for non-CDS firms (which equals 1.6% of the average spread in the sample). However, as presented in columns (3) and (4) of Table 3, this effect only exists for non-CDS firms, suggesting that CDS firms do not benefit from increased number of CDS firms in the industry. As documented in Batta et al. (2016) and Li and Tang (2016), CDS market provides information about referenced firms. Therefore, for these referenced firms, additional information provided by peers' CDS trading is limited because their own derivative trading conveys information. Similarly, investors of these reference firms do not benefit much from the additional hedging opportunity provided by peers' CDS trading. The evidence provided in column (3) adds to previous studies which show that the introduction of CDS trading was not beneficial to the bond market (Ashcraft and Santos, 2009; Das et al., 2014). Overall, evidence provided in Table 3 is consistent with H1 that CDS trading in the industry is negatively associated with the cost of public debt for non-CDS firms.

To support the result that CDS trading in the industry helps non-CDS firms raising bond, I also regress bond maturity (Maturity) and bond issue amount (Amount) on peer firms' CDS trading and control variables. Results are presented in Table 4. Maturity and issue amount are non-price contract terms in bond contracts. Consistent with Bharath et al. (2008), results show that longer maturity and larger issue amount are both related to lower default risks. The variable of interest is *%CDSfirms*. As shown in columns (1) and (4), non-CDS firms issue bonds with longer maturity

and larger amount when higher percentage of firms in the industry have outstanding CDS contracts on the market, supporting the argument in H1 that CDS trading in the industry helps non-CDS firms lower cost of public debt. In addition, results presented in columns (2) and (5) suggest that CDS-referenced firms are not able to issue bonds with longer maturity or larger issue size as number of CDS firms increases in the industry.

Overall, the results presented in Table 3 and Table 4 support the first hypothesis (H1) that peer firms' CDS trading affects the cost of bond issuance for non-CDS firms. The evidence also shows that this effect does not exist for CDS-referenced firms.

4.3. Correlation between firms and the effect of CDS trading on cost of bond issuance

Hypothesis 2 states that the effect of CDS trading on non-CDS firms are more pronounced for firms that are more closely related to CDS-referenced firms. I argue that the decay in the relation between industry CDS trading and bond spreads is due to increased hedging opportunities and improved information environment. In this section, I conduct tests to support H2 and therefore, explore the validity of hedging and information mechanism. Specifically, I examine whether the effect of industry CDS trading on bond spreads depends on the default risk correlation and stock return correlation between the firm and the closest related CDS firm.

To capture the default risk correlation between two firms, I calculate the correlation of change of *Oscore* (Ohlson, 1980) for the past 3-year period and obtain the correlation between a non-CDS firm and each of the CDS firm in the same industry. I then identify the referenced firm that has the highest correlation with the non-CDS firm and obtain the value of this correlation as the value for the variable *Correlation*. Therefore, the higher the value of *Correlation* is, the more closely the non-CDS firm is related to a CDS-referenced firm in the industry, and it is easier for investors to hedge their risk exposure towards the non-CDS firm via the CDS firm's contracts.

Table 5 presents the results of regressing bond spreads on the interaction between *Correlation* and *%CDSfirms*. The variable of interest is *Correlation*%CDSfirms*. As shown in column (1) of Table 5, the coefficient of *Correlation*%CDSfirms* is negative and significant at 1% level, indicating that the effect of CDS trading on non-CDS firms' bond spreads is more pronounced for firms that are more closely related to CDS-reference firms in terms of default risk. Consistent with results shown in Table 3 and Table 4, the results only hold for non-CDS firms. Investors of CDS firms can hedge credit risks by purchasing firms' own derivatives. Therefore, as shown in column (3) of Table 5, the magnitude and significance of coefficient of *Correlation*%CDSfirms* is weakened after CDS firms are included in the sample. Results presented in Table 5 are consistent with H2 and support the hedging mechanism.

Table 6 presents similar results as Table 5 by using stock return correlation to measure the closeness between a non-CDS firm and a CDS firm. To capture the stock return correlation between two firms, I calculate the correlation of monthly stock return for a 12-month period preceding the bond issuance. Similar to default risk correlation calculation, one referenced firm that has the highest correlation is identified for each non-CDS firm. Variable *Correlation_S* is constructed as the value of this highest correlation. As shown in column (1), the coefficient of *Correlation_S*%CDSfirms* is significantly negative, which indicates that the effect of CDS trading on non-CDS firms' bond issue spreads is stronger for firms that are more closely related to a CDS-firm in the same industry.

4.4. Liquidity and the effect of peer firms' CDS trading on cost of bond issuance

Next, I investigate whether CDS contracts' liquidity affects the effect of peer firms' CDS trading on bond spreads in order to provide further evidence supporting the validity of hedging and information mechanisms. The liquidity of CDS contracts are measured by *N_dealers*

and *%Index*. The first measurement *N_dealers* is the industry average number of dealers providing CDS quotes for each CDS reference firm by the time of bond issuance. Previous studies (Ashcraft and Santos, 2009; Qiu and Yu, 2012; Amiram et al., 2017) argue that number of dealers providing CDS quotes is a reasonable indicator for the liquidity of a firm's outstanding CDS contracts. The second measurement *%Index* captures how many of the CDS entities in an industry are included in the CDX Index. This measure indicates the liquidity of the overall CDS contracts in the industry, since CDX Index only selects the entities that are most liquid on the CDS market. It is calculated as the number of CDS firms included in CDX Index divided by the total number of CDS firms in the industry. The results from the sample of non-CDS firms are shown in Columns (1) and (4) from Table 7. The coefficients of *N_dealers*%CDSfirms* and *%Index*%CDSfirm* are both significantly negative, suggesting that the effect of peer firms' CDS trading on non-CDS firms' bond issue price is more pronounced when the average liquidity of these CDS contracts is better. The results are consistent with the prediction in H3 and support the argument that non-CDS firms experience reduced bond issue price as the investors have the option of partially hedge their risk exposure through purchasing CDS contracts of other firms in the same industry. Since it is easier for bond investors to complete the trading of peer firms' CDS contracts when the contracts are more liquid in the market, firms are able to issue bonds at an even lower price when the average liquidity of CDS contracts is higher in the industry. However, as indicated in columns (2) and (5), there is no such conclusive inference for CDS-referenced firm.

Furthermore, I also test H3 by comparing the effect of CDS trading on non-CDS firms' bond spreads during financial crisis of 2007-2009 and periods before or after the crisis. The observations are partitioned into two groups based on the time when bonds are issued. CDSs have been blamed for causing the financial crisis of 2007-2009. The market value of CDS dropped

dramatically during the crisis and the market lost confidence on this derivative. Since CDS market participants are not active during that period, the overall liquidity of CDS market is not as good as it is before or after the crisis. As seen in Table 8, the coefficient of *%CDSfirms* is significantly negative for bonds issued outside the time frame of the crisis, while it is not significant for bonds issued during the crisis. The results show that the effect of industry CDS trading on bond spread does not hold during the financial crisis of 2007-2009, suggesting that this effect depends on the liquidity of CDS contracts. The results provided in Table 8 are consistent with H3.

4.5. Additional evidence: bonds traded on the secondary market

The analysis so far reveals that peer firms' CDS trading helps non-CDS firms lower cost of bond issuance. However, corporate bonds are also frequently traded in the secondary market. Therefore, in order to provide more comprehensive evidence of the impact of CDS trading on the bond market, I examine whether peer firms' CDS trading also has effect on non-CDS firms bond spreads in the secondary corporate market. In addition, Trace Enhanced database includes a more comprehensive set of bonds than Mergent FISD does, which allows me to construct a trading sample that includes the bonds not captured by the issuance sample. The results are presented in Table 9 where dependent variable is the quarter-end bond spread as the average bond spread for all trades on the last day in the quarter where the bond is traded. As shown in Column (1), the coefficient of *%CDSfirms* is significantly negative, suggesting that peer firms' CDS trading decreases non-CDS firms' bond spreads in the secondary bond market. In terms of economic magnitude, the coefficient is -2.361 for *%CDSfirms*, suggesting that a 0.01 increase in *%CDSfirms* is associated with a basis point of 2.361 decrease in bond spread for non-CDS firms. This effect does not exist for CDS firms of which the results are in presented in Column (2), consistent with the evidence shown in Das et al. (2014). The results shown in Table 9 suggest that the effect of

CDS trading on non-CDS firms' bond price does not only apply to bond issuance, but also hold in the secondary bond market. These results further support the argument in this paper that CDS trading has positive externalities in the bond market.

4.6. Cross-sectional tests

In this section, I conduct two tests to explore the cross-sectional variation in the effect of peer firms' CDS trading and bond spreads. First, I examine whether the relation between peer firms' CDS trading and bond spreads depends on the financial constraints faced by the non-CDS firms and predict that peer firms' CDS trading has a stronger effect on the bond spreads in the cross-section of firms that are more financially constrained. Second, I investigate whether the effect of peer firms' CDS trading on bond spreads varies across firms with different credit ratings.

Table 10 examines the impact of peer firms' CDS trading on bond spreads, conditional on firms' financial constraints. According to Lamont et al., (2001), financially constrained firms face frictions that prevent them from funding all desired investments. I find that those firms having difficulties getting access to capital are also the firms that benefit the most in the bond market from the externalities of CDS trading. Following previous literature, I use both KZ index (proposed by Kaplan and Zingales (1997) and developed by Lamont, Polk, and Saa-Requejo (2001)) and WW index (proposed by Whited and Wu (2006)) to measure the tightness of financial constraints faced by a firm. Both indexes are higher for firms that are more financially constrained. Following Lamont, Polk, and Saa-Requejo (2001), I rank all firms from Compustat each year by the KZ index and WW index respectively. I refer to firms ranked top tercile of all firms as constrained firms, and those ranked bottom tercile as unconstrained firms. Next, I examine the effect of CDS trading on bond spreads and compare the effect between financially constrained and financially unconstrained firms. Again, the variable of interest is *%CDSfirms*, which captures the impact of

peer firms' CDS trading on firm's bond spreads. The results in Table 10 show that only financially constrained firms benefit from their peers' CDS trading when they issue bonds, which indicates that CDS trading helps firms in the same industry that have difficulties raising external funds to issue bond at a lower cost. The results also provide evidence supporting the argument that CDS introduction improves the bond allocation as it allows investors to hedge their risk exposure and absorbs more of the bond supply (Oehmke and Zawadowski, 2015).

To explore the effect of CDS trading on bond spreads conditional on credit ratings, I partition observations into 3 different groups based on the rating of the bonds issued: (1) bonds with credit ratings equal to or above A-, (2) bonds with credit ratings within the range of B- to BBB+, (3) bonds with credit ratings equal to or lower than CCC+. I repeat the main analysis for each of the three groups and explore whether the effect of CDS trading on bond spreads varies among firms with different ratings. As shown in Table 11, I find that the peer firms' CDS trading decreases spreads of bonds with credit ratings equal to or below B-. The effect is stronger for bonds with ratings within the range from B- to BBB+, indicating that these bonds benefit the most from peer firms' CDS trading. In addition, the results also show that spreads of bonds with high grade ratings do not decrease as *%CDSfirms* increases. Overall, the evidence in Table 11 suggests that bonds with ratings in the middle range benefit the most from having more industry peers with CDS contracts outstanding.

Furthermore, In the untabulated robustness tests, I adopt 3-digit SIC industry classification instead of Fama-French 48- industry classification and conduct all main analysis in this paper. I find that all the results still hold.

5. Conclusion

This study examines the externalities of CDS trading on the bond market and shows that CDS trading benefits non-CDS firms in the same industry when they issue bond. Specifically, using a sample of qualified bonds issued between 2001 to 2017, I investigate whether peer firms' CDS trading helps decrease the cost of bond issuance for non-CDS firms. The results show that non-CDS firms issue bonds with lower spreads, longer maturity, and larger issue size when there are more firms in the industry with outstanding CDS contracts.

I further show that, firms that are more closely related to CDS firms benefit more from industry CDS trading in the bond market, which indicates that the investors can better hedge their risk exposure through purchasing this CDS firm's contracts when a firm is more closely related to a CDS firm. This evidence suggests that industry CDS trading affects non-CDS firms' bond issuance through hedging mechanism where peer firms' CDS contracts provide additional hedging opportunities for investors of non-CDS firms. In addition, I also show that the effect of CDS trading on non-CDS firms' bond issuance is more pronounced when the CDS contracts are more liquid, consistent with the mechanism that investors hedge risk exposure by purchasing peer firms' CDS contracts.

This paper contributes to the ongoing debate of CDS market. On the one hand, CDS trading has been blamed for causing unintentional negative outcomes which lead to the financial crisis. On the other hand, researchers defend it by showing that CDS trading facilitates risk transfers and improves market liquidity. Instead of studying the implication of CDS market on referenced firms, I focus on firms that are not referenced and find that CDS trading has positive externalities on these firms in the bond market. The results provided in this study add to the current evidence of CDS's implications. The results further contribute to the previous studies that investigate whether

bond market benefits from CDS trading. Although Das et al. (2014) show that CDS introduction was detrimental to the bond market for referenced firms, this study provide evidence that CDS trading is beneficial to bond issuance for non-CDS firms. The results, overall, document the positive externalities of CDS trading and advent our understanding of the welfare of CDS market.

Table 1
Distribution of bond CDS initiations and bond issuances by year and industry.

This table presents the distribution of CDS initiations and bond issuances in our sample by year and by industry.

Table 1 Sample Distribution

Panel A: Distribution of CDS initiations and bond issuances by year

Year	Number of new CDS introductions		Number of bond issuances by non-CDS firms	
2001	235	37.07%	257	11.92%
2002	104	16.40%	96	4.45%
2003	103	16.25%	144	6.68%
2004	82	12.93%	110	5.10%
2005	38	5.99%	96	4.45%
2006	21	3.31%	86	3.99%
2007	27	4.26%	91	4.22%
2008	8	1.26%	67	3.11%
2009	1	0.16%	155	7.19%
2010	3	0.47%	179	8.30%
2011	8	1.26%	119	5.52%
2012	3	0.47%	144	6.68%
2013	0	0.00%	160	7.42%
2014	0	0.00%	133	6.17%
2015	1	0.16%	114	5.29%
2016	0	0.00%	99	4.59%
2017	0	0.00%	106	4.92%
Total	634	1	2156	1

Table 1 (continued)

Panel B: Distribution of CDS initiations and bond issuances by industries

Fama-French 48 Industry classification	Number of new CDS introductions		Number of bond issuances by non-CDS firms	
Agriculture	3	0.47%	0	0.00%
Food Products	15	2.37%	18	0.83%
Candy & Soda	4	0.63%	25	1.16%
Beer & Liquor	6	0.95%	10	0.46%
Tobacco Products	3	0.47%	0	0.00%
Recreation	4	0.63%	4	0.19%
Entertainment	16	2.52%	38	1.76%
Printing and Publishing	12	1.89%	24	1.11%
Consumer Goods	14	2.21%	8	0.37%
Apparel	9	1.42%	13	0.60%
Healthcare	13	2.05%	26	1.21%
Medical Equipment	7	1.10%	40	1.86%
Pharmaceutical Products	27	4.26%	78	3.62%
Chemicals	32	5.05%	73	3.39%
Rubber and Plastic Products	3	0.47%	26	1.21%
Textiles	2	0.32%	2	0.09%
Construction Materials	13	2.05%	34	1.58%
Construction	14	2.21%	7	0.32%
Steel Works	14	2.21%	41	1.90%
Fabricated Products	0	0.00%	3	0.14%
Machinery	28	4.42%	45	2.09%
Electrical Equipment	4	0.63%	32	1.48%
Automobile and Trucks	15	2.37%	22	1.02%
Aircraft	8	1.26%	43	1.99%
Shipbuilding, Railroad Equipment	0	0.00%	4	0.19%
Defense	2	0.32%	4	0.19%
Precious Metals	1	0.16%	25	1.16%
Non-Metallic and Industrial Metal Mining	4	0.63%	21	0.97%
Coal	2	0.32%	23	1.07%
Petroleum and Natural Gas	44	6.94%	324	15.03%
Utilities	63	9.94%	383	17.76%
Communication	40	6.31%	181	8.40%
Personal Services	7	1.10%	5	0.23%
Business Services	33	5.21%	100	4.64%
Computers	13	2.05%	25	1.16%
Electronic Equipment	24	3.79%	54	2.50%
Measuring and Control Equipment	6	0.95%	37	1.72%
Business Supplies	20	3.15%	28	1.30%
Shipping Containers	6	0.95%	19	0.88%
Transportation	24	3.79%	108	5.01%
Wholesale	18	2.84%	65	3.01%
Retail	38	5.99%	69	3.20%
Restaurants, Hotels, Motels	12	1.89%	41	1.90%
Other	11	1.74%	28	1.30%
Total	634	100.00%	2156	100.00%

Table 2
Descriptive statistics.

This table provides summary statistics for the bond issuance sample. Panel A summarizes firm characteristics and panel B provide summary statistics of bond characteristics for both CDS firms and non-CDS firms. Panel C summarizes variables related to industry CDS trading. * indicates the correlation coefficients are statistically significance at 10% or better.

Panel A: Descriptive statistics of firm characteristics

	Non-CDS firms				CDS firms			
Variable	**N**	**Mean**	**Median**	**Std. Dev**	**N**	**Mean**	**Median**	**Std. Dev**
AQ	2,157	0.16	0.19	0.43	6,046	0.17	0.18	0.35
Correlation	1,133	0.91	0.989	0.25	5,979	N/A	N/A	N/A
Current Ratio	2,157	1.57	1.29	1.04	6,046	1.44	1.30	0.73
Leverage	2,157	0.34	0.32	0.20	6,046	0.28	0.26	0.16
Log(Asset)	2,157	8.36	8.46	1.41	6,046	9.90	10.03	1.30
Market-to-Book	2,157	1.62	1.38	0.82	6,046	1.84	1.53	0.92
Oscore	2,157	-1.20	-1.30	2.05	6,046	-1.99	-2.00	1.58
Tangibility	2,157	0.43	0.45	0.28	6,046	0.37	0.31	0.23

Panel B: Descriptive statistics of bond characteristics

	Non-CDS firms				CDS firms			
Variable	**N**	**Mean**	**Median**	**Std. Dev**	**N**	**Mean**	**Median**	**Std. Dev**
Bond Spread	2,157	3.32	2.84	2.15	6,046	1.96	1.43	1.64
Bond Rating	2,157	11.61	11	2.41	6,046	14.82	15	3.43
Log(Amount)	2,157	12.40	12.69	1.55	6,046	12.37	12.90	1.87
Maturity	2,157	126.14	111	87.84	6,046	135.08	120	106.80
Secured	2,157	0.08	0	0.27	6,046	0.035	0	0.18
Senior	2,157	0.82	1	0.38	6,046	0.94	1	0.24

Panel C: Descriptive statistics of CDS trading

Variable	**N**	**Mean**	**Median**	**Std. Dev**
%CDSfirms	2,157	0.100	0.07	0.074
%Index	2,157	0.13	0.12	0.09
N_dealers	2,157	4.86	4.58	1.99

Table 2 (continued)

Panel D: Correlation matrix

		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
1	AQ	1.00																
2	Correlation	0.04	1.00															
3	Current Ratio	0.05*	-0.10*	1.00														
4	Leverage	0.02	0.10*	-0.14*	1.00													
5	Log (Asset)	0.11*	0.10*	-0.22*	-0.12*	1.00												
6	Market-to-Book	-0.01	-0.05	0.19*	-0.12*	0.03	1.00											
7	Oscore	-0.01	0.04	-0.31*	0.62*	-0.28*	-0.20*	1.00										
8	Tangibility	-0.26*	0.07*	-0.35*	0.15*	0.04*	-0.24*	0.09*	1.00									
9	Bond Spread	-0.04*	0.01	0.04*	0.29*	-0.48*	-0.28*	0.40*	0.04*	1.00								
10	Bond Rating	0.04*	0.03	-0.09*	-0.37*	0.55*	0.26*	-0.42*	-0.00	-0.73*	1.00							
11	Log (Amount)	-0.07*	-0.09*	0.19*	-0.20*	0.07*	0.24*	-0.29*	-0.08*	0.01	0.11*	1.00						
12	Maturity	-0.04*	-0.04	-0.03	-0.11*	0.15*	0.08*	-0.17*	0.15*	-0.29*	0.32*	0.16*	1.00					
13	Secured	0.02	0.00	-0.00	0.14*	-0.23*	-0.14*	0.25*	0.04*	0.33*	-0.13*	-0.02	-0.06*	1.00				
14	Senior	-0.01	0.05*	-0.08*	-0.13*	0.43*	0.12*	-0.21*	0.07*	-0.33*	0.38*	0.04*	0.08*	-0.60*	1.00			
15	%CDSfirms	-0.07*	0.16*	-0.01	0.09*	0.13*	-0.07*	-0.00	0.04*	-0.06*	0.09*	0.22*	0.10*	0.02	0.08*	1.00		
16	%Index	0.03	0.12*	0.00	-0.05*	-0.04*	0.12*	-0.01	0.04*	0.00	-0.04	-0.02	-0.02	-0.01	-0.03	-0.14*	1.00	
17	N_dealers	0.02	0.21*	-0.07*	-0.07*	-0.17*	0.02	-0.02	0.10*	-0.03	-0.08*	-0.00	0.07*	-0.05*	-0.12*	-0.11*	0.24*	1.00

Table 3
Effect of peer firms' CDS trading on bond spreads.

This table presents the results from regressing bond spreads on peer firms' CDS trading and other control variables of bond spread. Variables in this table are defined in Appendix A. Colum (1) shows the results from the baseline analysis where only non-CDS firms are included. Colum (2) reports the results from the sample that includes non-CDS firms and excludes firms within industries without any CDS-referenced firms. Colum (3) shows the results from the sample comprised of CDS-referenced firms only. Colum (4) reports results from the sample that includes both non-CDS and CDS firms. Year and industry fixed effects are included. Standard errors are robust and clustered at the firm level, and t-statistics are reported in parentheses. ***, **, and * indicate statistical significance at 1%, 5% and 10%, respectively.

Dependent Variable	Bond Spread			
	(1) Non-CDS Firms	(2) Non-CDS Firms	(3) CDS Firms	(4) All Firms
%CDSfirms	-5.402***	-5.462***	0.890	-0.969
	(-3.85)	(-3.89)	(0.85)	(-1.06)
AQ	-0.054	-0.057	-0.067	-0.083
	(-0.61)	(-0.64)	(-1.07)	(-1.59)
Leverage	1.156***	1.160***	1.600***	1.407***
	(3.31)	(3.32)	(4.17)	(5.27)
Log(Asset)	-0.590***	-0.589***	-0.315***	-0.460***
	(-11.16)	(-11.15)	(-9.61)	(-16.70)
Tangibility	-0.376	-0.380	-0.291	-0.311
	(-1.04)	(-1.05)	(-1.10)	(-1.42)
Current Ratio	0.097*	0.098*	0.225***	0.141***
	(1.85)	(1.86)	(3.59)	(3.36)
Market-to-Book	-0.706***	-0.706***	-0.322***	-0.420***
	(-8.51)	(-8.52)	(-6.99)	(-9.28)
Oscore	0.187***	0.187***	0.252***	0.208***
	(5.18)	(5.17)	(6.97)	(7.45)
Log(Amount)	0.141**	0.141**	0.051**	0.0384*
	(2.54)	(2.54)	(2.07)	(1.74)
Log(Maturity)	-0.495***	-0.494***	0.065*	-0.061*
	(-4.98)	(-4.97)	(1.92)	(-1.66)
Secured	0.465	0.473	0.328	0.549***
	(1.61)	(1.63)	(1.26)	(2.64)
Senior	-0.364**	-0.359**	-0.575***	-0.512***
	(-2.50)	(-2.46)	(-3.61)	(-5.02)
Year Fixed Effects	Yes	Yes	Yes	Yes
Industry Fixed Effects	Yes	Yes	Yes	Yes
Number of Observation	2,156	2,149	6,046	8,203
Adjusted R-squared	0.58	0.59	0.55	0.58

Table 4
Effect of peer firms' CDS trading on bond maturity and issue amount.

This table presents the results from regressing bond maturity and issue amount on peer firms' CDS trading and other control variables. Variables in this table are defined in Appendix A. Colums (1) and and (4) show the results from the sample of non-CDS firms. Colums (2) and (5) report the results from the sample that includes CDS firms only. Colums (3) and (6) show the results from the sample of both non-CDS and CDS firms. Year and industry fixed effects are included. Standard errors are robust and clustered at the firm level, and t-statistics are reported in parentheses. ***, **, and * indicate statistical significance at 1%, 5% and 10%, respectively.

Dependent Variable	Maturity			Amount		
	(1) Non-CDS Firms	(2) CDS Firms	(3) All Firms	(4) Non-CDS Firms	(5) CDS Firms	(6) All Firms
%CDSfirms	1.925***	-0.182	0.552	7.739***	-10.81***	-3.701
	(3.33)	(-0.39)	(1.27)	(2.86)	(-3.66)	(-1.01)
AQ	-0.006	0.027	0.019	-0.033	0.154	0.076
	(-0.24)	(1.11)	(1.01)	(-0.50)	(1.58)	(0.95)
Leverage	-0.117	0.036	-0.046	-0.199	-0.401	-0.481
	(-1.58)	(0.42)	(-0.71)	(-0.65)	(-1.02)	(-1.16)
Log(Asset)	0.032*	-0.009	0.003	0.153***	-0.150**	-0.082
	(1.91)	(-0.66)	(0.26)	(2.59)	(-1.98)	(-1.17)
Tangibility	0.417***	0.210**	0.323***	1.163***	1.068**	1.460***
	(4.21)	(2.38)	(4.33)	(2.64)	(2.09)	(2.66)
Current Ratio	-0.001	0.014	0.004	0.008	-0.159**	-0.104*
	(-0.08)	(0.83)	(0.34)	(0.24)	(-2.15)	(-1.90)
Market-to-Book	0.061***	-0.017	-0.004	0.0945***	-0.135	-0.070
	(3.82)	(-1.31)	(-0.34)	(2.86)	(-1.49)	(-0.77)
Oscore	-0.023***	-0.031***	-0.031***	-0.0641***	-0.060	-0.084**
	(-3.42)	(-2.83)	(-4.46)	(-2.78)	(-1.15)	(-2.22)
Secured	-0.119**	-0.215***	-0.192***	-0.065	0.765***	0.311*
	(-2.28)	(-2.64)	(-3.75)	(-0.48)	(3.09)	(1.80)
Senior	-0.087**	-0.280***	-0.182***	-0.203*	0.223**	0.015
	(-2.57)	(-3.83)	(-4.40)	(-1.83)	(1.99)	(0.11)
Year Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Industry Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Number of Observation	2,156	6,046	8,203	2,156	6,046	8,203
Adjusted R-squared	0.13	0.07	0.07	0.60	0.55	0.46

Table 5
Non-CDS firms' default risk correlation with CDS firms and the effect of CDS trading on bond spreads.

This table presents the results of examining whether the effect of CDS trading on non-CDS firms' bond spreads is more pronounced for firms that are more closely related to CDS-referenced firms in terms of credit risk. Variables in this table are defined in Appendix A. Colum (1) shows the results from the baseline analysis where only non-CDS firms are included. Colum (2) reports the results from the sample comprised of CDS-referenced firms only. Colum (3) reports results from the sample that includes both non-CDS and CDS firms. For CDS reference firms after their CDS initiations, the variable Correlation equals to 1. Year and industry fixed effects are included. Standard errors are robust and clustered at the firm level, and t-statistics are reported in parentheses. ***, **, and * indicate statistical significance at 1%, 5% and 10%, respectively.

Dependent Variable	Bond Spread		
	(1) Non-CDS Firms	(2) CDS Firms	(3) All Firms
%CDSfirms	6.103	-0.610	6.125**
	(1.58)	(-0.14)	(2.06)
Correlation	0.094	-0.249	0.102
	(0.39)	(-1.04)	(0.56)
Correlation*%CDSfirms	-10.69***	1.795	-5.781**
	(-2.97)	(0.42)	(-2.08)
AQ	0.079	-0.075	-0.065
	(0.49)	(-1.19)	(-1.10)
Leverage	1.199***	1.470***	1.474***
	(3.24)	(3.86)	(5.09)
Log(Asset)	-0.516***	-0.308***	-0.392***
	(-8.72)	(-9.44)	(-13.82)
Tangibility	-1.044**	-0.204	-0.452**
	(-2.37)	(-0.79)	(-2.00)
Current Ratio	0.040	0.241***	0.167***
	(0.54)	(3.80)	(3.44)
Market-to-Book	-0.810***	-0.312***	-0.384***
	(-6.31)	(-6.80)	(-8.15)
Oscore	0.197***	0.262***	0.216***
	(5.10)	(7.23)	(7.34)
Log(Amount)	0.161***	0.050**	0.043**
	(3.21)	(2.02)	(2.01)
Log(Maturity)	-0.687***	0.066**	-0.026
	(-4.30)	(1.96)	(-0.70)
Secured	0.364	0.367	0.511**
	(1.04)	(1.44)	(2.28)
Senior	-0.299*	-0.542***	-0.492***
	(-1.87)	(-3.82)	(-4.72)
Year Fixed Effects	Yes	Yes	Yes
Industry Fixed Effects	Yes	Yes	Yes
Number of Observation	1,128	5,979	7,112
Adjusted R-squared	0.59	0.55	0.57

Table 6
Non-CDS firms' stock return correlation with CDS firms and the effect of CDS trading on bond spreads.

This table presents the results of examining whether the effect of CDS trading on non-CDS firms' bond spreads is more pronounced for firms that are more closely related to CDS-referenced firms in terms of stock return. Variables in this table are defined in Appendix A. Colum (1) shows the results from the baseline analysis where only non-CDS firms are included. Colum (2) reports the results from the sample comprised of CDS-referenced firms only. Colum (3) reports results from the sample that includes both non-CDS and CDS firms. For CDS reference firms after their CDS initiations, the variable Correlation equals to 1. Year and industry fixed effects are included. Standard errors are robust and clustered at the firm level, and t-statistics are reported in parentheses. ***, **, and * indicate statistical significance at 1%, 5% and 10%, respectively.

Dependent Variable	Bond Spread		
	(1) Non-CDS Firms	(2) CDS Firms	(3) All Firms
%CDSfirms	-2.485	0.190	-0.634
	(-1.10)	(0.04)	(-0.33)
Correlation_S	-0.141	-0.431	-0.628***
	(-0.34)	(-1.33)	(-2.81)
Correlation_S*%CDSfirms	-4.711**	0.447	-0.441
	(-2.09)	(0.09)	(-0.25)
AQ	0.007	-0.099	-0.092
	(0.06)	(-1.47)	(-1.56)
Leverage	0.941*	1.500***	1.276***
	(1.91)	(3.49)	(3.86)
Log(Asset)	-0.693***	-0.294***	-0.406***
	(-9.85)	(-8.41)	(-12.75)
Tangibility	0.033	-0.262	-0.180
	(0.08)	(-0.94)	(-0.75)
Current Ratio	0.108	0.226***	0.151***
	(1.56)	(3.44)	(3.18)
Market-to-Book	-0.761***	-0.337***	-0.423***
	(-8.00)	(-6.23)	(-8.19)
Oscore	0.194***	0.278***	0.237***
	(3.15)	(6.77)	(6.33)
Log(Amount)	0.371***	0.053**	0.048*
	(2.94)	(2.03)	(1.72)
Log(Maturity)	-0.513***	0.052	-0.072*
	(-4.76)	(1.42)	(-1.82)
Secured	0.547	0.463*	0.675***
	(1.56)	(1.68)	(2.84)
Senior	-0.446**	-0.597***	-0.531***
	(-2.56)	(-3.47)	(-4.52)
Year Fixed Effects	Yes	Yes	Yes
Industry Fixed Effects	Yes	Yes	Yes
Number of Observation	1,717	5,747	7,465
Adjusted R-squared	0.57	0.53	0.55

Table 7
CDS liquidity and the effect of peer firms' CDS trading on bond spreads.

This table presents the results on whether CDS liquidity affects the effects of CDS trading on bond spreads. Variables in this table are defined in Appendix A. Colums (1) and and (4) show the results from the sample of non-CDS firms. Colums (2) and (5) report the results from the sample that includes CDS firms only. Colums (3) and (6) show the results from the sample of both non-CDS and CDS firms. Year and industry fixed effects are included. Standard errors are robust and clustered at the firm level, and t-statistics are reported in parentheses. ***, **, and * indicate statistical significance at 1%, 5% and 10%, respectively.

Dependent Variable	Bond Spread					
	(1) Non-CDS Firms	(2) CDS Firms	(3) All Firms	(4) Non-CDS Firms	(5) CDS Firms	(6) All Firms
%CDSfirms	-3.569**	1.709	0.257	-4.983**	1.447	-0.230
	(-2.43)	(1.57)	(0.26)	(-2.15)	(0.82)	(-0.15)
N_dealers	0.016	0.045	0.034			
	(0.31)	(1.01)	(0.93)			
N_dealers*%CDSfirms	-0.677**	-0.220*	-0.372***			
	(-2.49)	(-1.74)	(-2.94)			
%Index				-0.102	0.375	0.261
				(-0.16)	(0.37)	(0.43)
%Index*%CDSfirms				-17.60**	-10.92	-13.37**
				(-2.10)	(-1.37)	(-2.32)
AQ	-0.053	-0.068	-0.084	-0.073	-0.121	-0.126**
	(-0.60)	(-1.07)	(-1.61)	(-0.75)	(-1.46)	(-1.98)
Leverage	1.159***	1.604***	1.411***	0.848**	1.556***	1.317***
	(3.31)	(4.17)	(5.29)	(1.97)	(3.58)	(4.13)
Log(Asset)	-0.591***	-0.314***	-0.459***	-0.702***	-0.308***	-0.470***
	(-11.23)	(-9.58)	(-16.64)	(-11.14)	(-8.69)	(-16.14)
Tangibility	-0.375	-0.291	-0.311	0.208	-0.280	-0.131
	(-1.04)	(-1.10)	(-1.42)	(0.50)	(-0.93)	(-0.52)
Current Ratio	0.097*	0.225***	0.141***	0.092*	0.188***	0.125***
	(1.83)	(3.60)	(3.38)	(1.65)	(3.00)	(2.87)
Market-to-Book	-0.697***	-0.324***	-0.420***	-0.698***	-0.422***	-0.501***
	(-8.33)	(-7.01)	(-9.27)	(-8.10)	(-7.30)	(-9.73)
Oscore	0.189***	0.252***	0.208***	0.194***	0.237***	0.202***
	(5.21)	(6.97)	(7.45)	(4.07)	(6.06)	(6.43)
Log(Amount)	0.144***	0.052**	0.040*	0.383***	0.040	0.042
	(2.60)	(2.09)	(1.83)	(3.17)	(1.38)	(1.43)
Log(Maturity)	-0.489***	0.064*	-0.061*	-0.378***	0.102***	-0.017
	(-4.93)	(1.90)	(-1.67)	(-3.91)	(2.94)	(-0.46)
Secured	0.473*	0.326	0.555***	0.659**	0.246	0.560***
	(1.65)	(1.26)	(2.67)	(2.53)	(0.89)	(2.68)
Senior	-0.359**	-0.577***	-0.510***	-0.228	-0.629***	-0.508***
	(-2.47)	(-3.62)	(-5.00)	(-1.27)	(-3.23)	(-4.01)
Year Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Industry Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Number of Observation	2,156	6,046	8,203	1,680	4,759	6,441
Adjusted R-squared	0.58	0.55	0.58	0.60	0.55	0.58

Table 8
Financial crisis and the effect of peer firms' CDS trading on bond spreads

This table presents the results from regressing bond spreads on peer firms' CDS trading after partitioning the sample into a period during financial crisis of 2007-2009 and a period before or after the financial crisis. Only non-CDS firms are included in the sample. Variables in this table are defined in Appendix A. Colum (1) shows the results from the sample of bonds issued during the financial crisis (2007-2009) period. Colums (2) shows the results from the sample of bonds issued before or after the financial crisis. Year and industry fixed effects are included. Standard errors are robust and clustered at the firm level, and t-statistics are reported in parentheses. ***, **, and * indicate statistical significance at 1%, 5% and 10%, respectively.

Dependent Variable	Bond Spread	
	(1) Financial Crisis	(2) Before/after the Financial crisis
%CDSfirms	-19.73	-5.649**
	(-0.82)	(-4.29)
AQ	-0.063	-0.090
	(-0.18)	(-1.03)
Leverage	0.959	1.144***
	(0.92)	(3.28)
Log(Asset)	-0.790***	-0.583***
	(-5.76)	(-10.09)
Tangibility	0.478	-0.475
	(0.67)	(-1.25)
Current Ratio	0.172	0.099*
	(1.09)	(1.76)
Market-to-Book	-1.116***	-0.687***
	(-5.56)	(-8.01)
Oscore	0.163	0.193***
	(1.41)	(5.06)
Log(Amount)	0.696***	0.115**
	(3.38)	(2.11)
Log(Maturity)	-0.639***	-0.462***
	(-3.30)	(-4.58)
Secured	-0.674	0.581*
	(-1.15)	(1.84)
Senior	8.628**	10.65***
	(2.45)	(11.93)
Year Fixed Effects	Yes	Yes
Industry Fixed Effects	Yes	Yes
Number of Observation	306	1,843
Adjusted R-squared	0.61	0.58

Table 9
Effect of peer firms' CDS trading on bond spread

This table presents the results from regressing secondary market bond spreads on peer firms' CDS trading and other control variables of bond spread. Variables in this table are defined in Appendix A. Colum (1) shows the results from the sample of non-CDS firms. Colum (2) reports the results from the sample comprised of CDS-referenced firms only. Colum (3) reports results from the sample that includes both non-CDS and CDS firms. Year and industry fixed effects are included. Standard errors are robust and clustered at the firm level, and t-statistics are reported in parentheses. ***, **, and * indicate statistical significance at 1%, 5% and 10%, respectively.

Dependent Variable	Bond Spread_2nd		
	(1) Non-CDS Firms	(2) CDS Firms	(3) All Firms
%CDSfirms	-2.361***	0.412	-0.865**
	(-2.73)	(1.24)	(-2.46)
Bond Rating	-0.380***	-0.282***	-0.302***
	(-13.27)	(-26.76)	(-27.68)
Bond Age	0.002*	-0.0003	-0.001**
	(1.94)	(-1.24)	(-2.43)
Log(Maturity)	-0.148**	0.266***	0.119***
	(-2.10)	(11.40)	(4.56)
Coupon	0.272***	0.100***	0.169***
	(7.33)	(6.24)	(10.27)
Log(Amount)	-0.151***	-0.142***	-0.229***
	(-3.26)	(-12.28)	(-15.97)
Volatility	21.14***	15.21***	18.48***
	(12.23)	(24.03)	(24.88)
Operating	-1.255***	-0.010***	-0.009***
	(-3.44)	(-26.91)	(-19.98)
Leverage	2.259***	1.007***	1.345***
	(3.12)	(5.63)	(4.99)
IRC_ dummy1	-0.014	-0.050***	-0.057***
	(-0.58)	(-5.06)	(-6.07)
IRC_ dummy2	0.034***	0.0233***	0.027***
	(4.25)	(8.03)	(9.24)
IRC_ dummy3	0.082***	0.040***	0.054***
	(4.98)	(9.48)	(10.79)
IRC_ dummy4	0.0002***	0.001**	0.0004**
	(4.19)	(2.16)	(2.55)
Treasury_10yr-2yr	-0.576***	-0.162***	-0.258***
	(-3.44)	(-2.92)	(-4.66)
Time Fixed Effects	Yes	Yes	Yes
Industry Fixed Effects	Yes	Yes	Yes
Number of Observation	31,763	110,154	141,918
Adjusted R-squared	0.52	0.50	0.50

Table 10
Cross-sectional differences in the effect of peer firms' CDS trading on bond spreads: financial constraints.

This table presents the results from regression bond spreads on CDS trading after partitioning the sample into firms that are financially constrained and firms that are not. Only non-CDS firms are included in the sample. Variables in this table are defined in Appendix A. Colums (1) and and (3) show the results from the sample of unconstrained firms. Colums (2) and (4) report the results from the sample of constrained firms. Year and industry fixed effects are included. Standard errors are robust and clustered at the firm level, and t-statistics are reported in parentheses. ***, **, and * indicate statistical significance at 1%, 5% and 10%, respectively.

Dependent Variable	Bond Spread			
	KZ Index		WW Index	
	(1) Unconstrained	(2) Constrained	(3) Unconstrained	(4) Constrained
%CDSfirms	1.115	-4.184**	-3.205	-12.02**
	(0.45)	(-2.06)	(-1.48)	(-2.21)
AQ	0.230	-0.058	-0.008	0.073
	(1.06)	(-0.42)	(-0.07)	(0.32)
Leverage	-0.111	1.203***	0.920*	-0.430
	(-0.19)	(2.65)	(1.68)	(-0.49)
Log(Asset)	-0.755***	-0.469***	-0.679***	-0.860***
	(-6.29)	(-5.66)	(-8.42)	(-8.62)
Tangibility	-1.350*	-0.618	-0.329	-0.495
	(-1.70)	(-1.17)	(-0.73)	(-0.67)
Current Ratio	0.094	-0.110	0.099	0.101
	(1.04)	(-1.32)	(1.47)	(0.99)
Market-to-Book	-0.612***	-0.992***	-0.812***	-0.605***
	(-4.62)	(-6.40)	(-4.88)	(-5.57)
Oscore	0.182***	0.216***	0.186**	0.202***
	(3.54)	(3.35)	(2.43)	(2.69)
Log(Amount)	0.286	0.181**	0.580***	0.193
	(1.38)	(2.25)	(3.71)	(1.07)
Log(Maturity)	0.235***	-0.892***	-0.435***	-0.265*
	(2.91)	(-3.08)	(-3.50)	(-1.72)
Secured	0.712	0.686***	0.491	0.915**
	(1.09)	(2.66)	(1.33)	(2.35)
Senior	-1.399***	0.162	-0.345	-0.308
	(-3.39)	(0.78)	(-1.48)	(-1.18)
Year Fixed Effects	Yes	Yes	Yes	Yes
Industry Fixed Effects	Yes	Yes	Yes	Yes
Number of Observation	460	893	794	517
Adjusted R-squared	0.62	0.62	0.58	0.66

Table 11
Cross-sectional differences in the effect of peer firms' CDS trading on bond spreads: credit ratings.

This table presents the results from regression bond spreads on CDS trading after partitioning the sample into firms that are in different rating categories. Only non-CDS firms are included in the sample. Variables in this table are defined in Appendix A. Colum (1) shows the results from the sample of credit ratings equal to or above A-. Colum (2) reports the results from the sample of bonds with ratings within the range of B- to BBB+. Colum. Colum (3) reports the results from the sample of bonds with credit ratings equal to or lower than CCC+. Year and industry fixed effects are included. Standard errors are robust and clustered at the firm level, and t-statistics are reported in parentheses. ***, **, and * indicate statistical significance at 1%, 5% and 10%, respectively.

Dependent Variable	Bond Spread		
	(1) A- ~ AAA	(2) B- ~ BBB+	(3) D ~ CCC+
%CDSfirms	-1.836	-5.644***	-4.580*
	(-1.54)	(-3.80)	(-1.92)
AQ	0.235**	0.217**	-0.099
	(2.20)	(2.22)	(-1.03)
Leverage	0.789*	0.211	-0.298
	(1.82)	(0.39)	(-0.83)
Log(Asset)	0.045	-0.416***	-0.349***
	(0.88)	(-6.68)	(-5.15)
Tangibility	-1.003*	-0.094	-0.514
	(-1.87)	(-0.25)	(-1.18)
Current Ratio	0.030	0.091*	-0.002
	(0.31)	(1.79)	(-0.03)
Market-to-Book	-0.031	-0.517***	-0.377***
	(-0.33)	(-6.78)	(-3.88)
Oscore	0.010	0.182***	0.098***
	(0.14)	(3.56)	(3.34)
Log(Amount)	0.103**	0.117**	0.163*
	(2.09)	(2.41)	(1.93)
Log(Maturity)	0.171***	-0.154	-2.698***
	(3.13)	(-1.46)	(-8.21)
Secured	-0.235	0.156	0.769***
	(-1.48)	(0.27)	(3.28)
Senior	-0.143	-0.508**	0.370**
	(-0.97)	(-2.03)	(2.52)
Year Fixed Effects	Yes	Yes	Yes
Industry Fixed Effects	Yes	Yes	Yes
Number of Observation	302	1,147	701
Adjusted R-squared	0.59	0.51	0.50

Appendix A

Detailed definitions and sources of all variables used in the empirical analyses.

This table provides a detailed description of variables used in the empirical analyses. The data are obtained through Mergent FISD, Trace Enhanced, Markit, or Compustat. The variables are listed according to alphabetical order.

Variable	Definition	Source
AQ	Accounting quality measured as the absolute abnormal accruals multiplied by -1. The abnormal accruals are calculated and standardized for each firm using cross-section of all firms in the industry for a given year following Jones Model (Jones, 1991) as modified by Dechow et al. (1995).	Compustat
Bond Age	The difference between the bond's transaction date and the issue date in months.	Trace Enhanced Mergent FISD
Bond Spread	The excess of the bond's yield-to-maturity over that of a maturity-matched US Treasury bond on the issue day.	Mergent FISD Federal Reserve Bank Reports
Bond Spread_2nd	The quarter-end bond spread as average spread for all trades on the last day in the quarter. Bond spread is calculated as the excess of the bond's yield-to-maturity over that of a maturity-matched US Treasury bond on the trading day	Trace Enhanced Federal Reserve Bank Reports
Bond Rating	The credit rating on the bond when it is issued (bond issuance tests) or the lasted credit rating when the bond is traded on the secondary market. The letter ratings are transformed into numerical equivalents using an ordinal scale ranging from 1 for the lowest rating (D) to 22 for the highest rating (AAA). I use S&P credit rating in the tests. When S&P rating is not available, I use rating the rating from Moddy's instead. Following Campbell and Taksler (2003), Moddy's ratings are converted to equivalent S&P rating (e.g., Moody's Aa is recorded as AA and Baa as BBB).	Mergent FISD
%CDSfirms	The percentage of CDS firms within each of the Fama-French 48 industries by the time of bond issuance. Computed as the ratio of number of CDS firms to the number of total firms within each industry in a given year. The number of total firms in the industry is measured as the number of firms in Compustat each year.	Compustat Markit
Correlation	The three-year correlation of change of Oscore between a non-CDS firm and a CDS firm. The variable captures the correlation between a non-CDS firm and the CDS firm that is most closely related to this non-CDS firm in terms of change of Oscore. This variable is measure as of the fiscal year end proceeding the bond issuance.	Compustat
Correlation_S	The 12-month correlation of monthly stock return between a non-CDS firm and a CDS firm. The variable captures the correlation between a non-CDS firm and the CDS firm that is most closely related to this non-CDS firm in terms of stock return.	CRSP
Coupon	The bond's annual coupon rate.	Mergent FISD
Current Ratio	The ratio of current assets (data ACT) to current liabilities (data LCT).	Compustat
%Index	The percentage of CDS firms included in CDS index within each Fama-French 48 industry-year. Computed as the ratio of number of CDS firms included in the index to the number of total CDS firms within each industry in a given year.	Markit
Leverage	The ratio of long-term debt (data DLTT) to total assets (data AT).	Compustat
Log(Amount)	The natural log of the bond issue amount.	Mergent FISD
Log(Asset)	The natural log of total assets (data AT).	Compustat
Log(Maturity)	The natural log of the maturity period (in month) of the bond.	Mergent FISD

Market-to-Book	Market to book ratio measured as book value of assets minus book value of equity plus market value of equity (data AT – data CEQ + data PRCC*data CSHO) divided by total assets (data AT), following Bharath et al. (2008).	Compustat
N_dealers	The industry average number of dealers providing CDS quotes for each CDS reference firm by the time of bond issuance.	Markit
Oscore	The proxy for default risk measured following Ohlson (1980).	Compustat
Operating	The ratio of operating income (data OIBDPQ) to sales (data SALEQ)	Compustat
Secured	An indicator variable set to 1 if the bond is secured with collateral, and 0 otherwise.	Mergent FISD
Senior	An indicator variable set to 1 if the bond is senior, and 0 otherwise.	Mergent FISD
Tangibility	The ratio of net PP&E (data PPENT) to total assets (data AT).	Compustat
Volatility	The standard deviation of monthly stock returns for the prior 12 months.	CRSP
IRC	The ratio of pretax interest coverage as operating income after depreciation plus interest (data OIADPQ + data XINTQ) divided by interest expenses (data XINTQ).	Compustat
IRC_dummy1	A dummy variable set to IRC if IRC is less than 5, and 5 if IRC is above 5.	Compustat
IRC_dummy2	A dummy variable set to IRC minus 5 if IRC lies between 5 and 10, 5 if IRC is above 10, and 0 if IRC is below 5.	Compustat
IRC_dummy3	A dummy variable set to IRC minus 10 if IRC lies between 10 and 20, 10 if IRC is above 20, and 0 if IRC is below 10.	Compustat
IRC_dummy4	A dummy variable set to IRC minus 20 if IRC is above 20, and 0 if IRC is less than 20.	Compustat

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