Financial innovation and financial intermediation: Evidence from credit default swaps

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ABSTRACT: We study the influence of credit default swaps (CDS) on the intermediation of the bond issuance process. After CDS initiation, corporate bond underwriting fees are lower due to the hedging opportunities CDS provide to investors. Participation increases for bond offerings by investors facing risk-based regulatory requirements, underwriting fees decline more for riskier issuers and illiquid bonds for which the ability to hedge with CDS is more valuable, and the underwriting quality remains unchanged. Our evidence suggests that CDS-driven innovations in risk sharing contribute to the transactional efficiency of the market by reducing the financial intermediation costs of placing bonds.

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1. Introduction

We examine the effects of financial innovation on financial intermediation. During the last two decades, the bond market has undergone a major transformation with the growth of credit default swaps (CDS)—over-the-counter derivatives that protect the buyer against the credit risk of the underlying debt—as an alternative platform for trading credit risk. The advent of the CDS market provides a useful lens through which to view how financial innovation impacts the agents who participate in the market. In this paper, we investigate the influence of CDS on the intermediation of the bond issuance process by examining the price and quality of the intermediation.

One of the major costs of a bond offering is the fee paid to intermediaries to place the bonds. That fee, called the gross spread, is determined in part by the difficulty and risk of placing the bonds (e.g., Lee, Lochhead, Ritter, and Zhao, 1996; Altinkilic and Hansen, 2000; Chen and Ritter, 2000; Butler, Grullon, and Weston, 2005; Yasuda, 2005). (Throughout the paper we refer to this amount as an "underwriting fee" rather than a "spread" to reduce confusion with interest spreads for the bonds.) This fee that investment banks receive for intermediating between issuers and purchasers is transparent and easily measured. The underwriting fee is one of the outcome variables we focus on because, as we explain below, it offers a more direct picture of the interaction between innovation and intermediation than some other variables might.

The primary market transactions that we study allow us to use variation in underwriting fees to provide new insights into the effects of CDS on the demand

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for the underlying bonds. The literature documents that CDS can have externalities on the underlying firms. For instance, Saretto and Tookes (2013) and Subrahmanyam, Tang, and Wang (2014) show that CDS availability increases the underlying firms' debt capacity and credit risk, respectively, and Das, Kalimipalli, and Nayak (2014) provide evidence that CDS availability can also reduce the liquidity of their bonds in the secondary market.[1] Conditional on such externalities, our study sheds light on whether and how the presence of CDS influences the difficulty of placing bonds in the primary market as reflected in their underwriting fees.

Theoretically, CDS can either decrease or increase underwriting fees. Because trading corporate bonds is costly, the availability of CDS enhances investors' ability to manage credit risk (e.g., Blanco, Brennan, and Marsh, 2005). CDS trading can also provide useful market-based information about a firm's credit risk, reducing uncertainty about an issuer's credit quality (e.g., Acharya and Johnson, 2007). CDS may expand underwriters' profit opportunities by allowing them to cross-sell bonds together with the related CDS contracts. These hedging, information, and cross-selling benefits of CDS can make the bonds of underlying firms more attractive to investors, making them easier for underwriters to place, and thereby lowering underwriting costs. On the other hand, by allowing investors to construct bond payoffs synthetically, CDS can be a substitute for the underlying bonds (Oehmke and Zawadowski, 2015, 2016), hence decreasing the demand for bond offerings and increasing their underwriting costs. Whether CDS

[1] See Augustin, Subrahmanyam, Tang, and Wang (2014) for a detailed survey of CDS literature.

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on average increase or decrease the demand for the bonds is something we can learn from how, and at what cost, the bonds are sold at the time of issuance.

In our first test, we examine the *within-issuer* changes in underwriting fees of new bond issues from the pre- to post-CDS initiation periods. We find that, controlling for numerous bond issue, issuer, and underwriter characteristics (e.g., bond maturity, liquidity, credit ratings, issuer size, leverage, underwriter-issuer relationship, and many others), the initiation of CDS trading on an issuer is associated with a reduction in its underwriting fee. This reduction is quite large: we find a 17% reduction in underwriting fees and a "back of the envelope" calculation suggests that, aggregating this reduction can translate into a $12 billion increase in the net proceeds CDS firms received from bonds issued between 2001 and 2013. Thus, the availability of CDS contracts appears to reduce the financial intermediation costs of placing bonds for the underlying firms.

Because the initiation of CDS contracts is not randomly assigned, we also employ other identification approaches. We address this endogeneity concern with three independent identification approaches that have been used previously in the CDS literature in various ways: (1) a matching procedure, (2) an instrumental variable approach, and (3) a natural experiment. The three approaches have different strengths and weaknesses, but each leads us to similar conclusions. We discuss these approaches very briefly here, and in more detail below.

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Our matching approach balances the ex ante observable characteristics (CDS firms are larger, for instance) that are related to underwriting fees between the two groups. Although we see no evidence of a time trend in underwriting fees in our sample, this approach will mitigate any such possibility. Our matching procedure offers good external validity, but rests on a strong identifying assumption of unconfoundedness (Rubin, 1990). As with any matching approach, the causal implications of this test are limited by the extent to which unobservable characteristics of the treated and control groups do not vary systematically after the match. Nevertheless, the results of this test show that underwriting fees decline with CDS initiation.

An instrumental variable (*lenders' foreign exchange hedging positions*, as in Saretto and Tookes, 2013, and Subrahmanyam, Tang, and Wang, 2014, 2017) approach puts the identification burden on the portion of the variation in the endogenous variable (CDS initiation) only through the instrument (hedging demand from lenders), and hence allows for identifying the CDS effect controlling for the influence of both observable and unobservable covariates. We discuss in detail below why this instrument is plausibly valid in our setting, and we find instrumental variable results that underwriting fees decline with CDS initiation.

Our third identification approach is a natural experiment. Natural disasters can have massive impacts on the cash flows of insurance companies, forcing them to liquidate bond holdings and reducing their demand for subsequent bond offerings. Following and extending Massa and Zhang (2011), we use major

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natural disasters as an exogenous shock to the difficulty intermediaries have in placing bonds. If the availability of CDS makes the underlying bonds more attractive to investors, the effect of CDS on underwriting fees should be stronger during these periods of low investor demand for bond offerings. We find that it is. The results from these three independent identification approaches collectively suggest that the decline in underwriting fees we observe with CDS initiation is causal, and we implement a wide array of tests to confirm that our results are robust to different empirical approaches.

Next, we investigate whether this CDS-related decline in underwriting fees is driven by hedging, information, or cross-selling channels. The hedging, information, and cross-selling channels predict a more pronounced CDS effect for risky issuers, informationally opaque issuers, and underwriters with greater CDS activity, respectively. We find that CDS initiation reduces underwriting fees more for riskier issuers, but not for more informationally opaque issuers or for CDS-active underwriters, suggesting that the availability of CDS reduces bond underwriting costs by enabling better risk sharing.

If hedging is a channel through which CDS affect underwriting fees, then those who benefit most from hedging should be more likely to buy bonds referenced by CDS. We hypothesize insurance companies and banks, who are subject to risk-based regulatory requirements, have strong incentives to hedge with CDS or use them for regulatory arbitrage. We find that the participation of insurance companies and banks in bond offerings increases with the initiation of CDS trading relative to that of other investors. Moreover, if hedging motives are

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driving the decline in underwriting fees following CDS initiation, then this effect should be more pronounced for less liquid bonds because the benefits of CDS in facilitating risk sharing are more valuable for bonds that are costlier to trade in the secondary bond market. We indeed find that underwriting fees decline with CDS initiation more for bonds that are less liquid.

The decline in underwriter compensation could be consistent with a (lower) underwriter quality channel. Lower underwriting quality should be associated with greater bond underpricing, lower underwriter reputation, and higher offering yields. We find no evidence of any of these: underpricing, underwriter market share, and—confirming the main result in Ashcraft and Santos (2009)—offering yields all are essentially unchanged for pre- and post-CDS offerings. Ashcraft and Santos (2009) argue that the non-effect of CDS on offering yields arises because banks have little incentive to monitor troubled borrowers if they can hedge or lay off credit risk with CDS (Parlour and Winton, 2013; Shan, Tang, and Winton, 2018). In contrast, the underwriting process is transactional, and there generally is no subsequent monitoring by the intermediary (see Butler, 2008), so the reduced ex post monitoring argument might apply to offering yields, but not to underwriting fees.

Our evidence provides insight to how the demand and supply sides of the primary bond market interact. CDS contracts alter the financial intermediation of bond offerings in a way consistent with the role of derivative instruments in completing the market (e.g., Ross, 1976; Damodaran and Lim, 1991; Figlewski and Webb, 1993; Kumar, Sarin, and Shastri, 1998). In our setting, CDS improve

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outcomes for issuers through enhanced opportunities for risk sharing and hedging. These intermediation benefits of CDS add a new perspective to the CDS literature that mostly documents their negative externalities (e.g., Das, Kalimipalli, and Nayak, 2014; Subrahmanyam, Tang, and Wang, 2014; Narayanan and Uzmanoglu, 2018).

2. Data and sample characteristics

We construct our sample by identifying all corporate bond issues during 1996-2013 from the Mergent Fixed Income Securities Database (FISD). Starting the sample in 1996 allows us to analyze underwriting fees during the five-year period before and after the earliest CDS initiation date in our sample. Next, we exclude all but public bonds (exclude Reg S, 144A, and other private offerings) that are denominated in U.S. dollars and issued by non-financial U.S. firms. To be able to control for their credit risk, we also require bonds to have at least one credit rating on the offering date from S&P, Moody's, or Fitch. This screening results in a sample of 5,225 bonds offered by 751 firms with available information in CRSP and Compustat databases.

CDS contracts are over-the-counter securities, and hence, identifying the precise date of CDS initiation on a firm is challenging. To address this issue, we construct a comprehensive data set of CDS transactions from the Bloomberg, Credit Market Analysis (CMA), and Depository Trust and Clearing Corporation (DTCC) databases. The Bloomberg and CMA databases start covering the CDS market in 2001 and 2004, respectively, and provide daily consensus CDS quotes

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contributed by dealers. DTCC provides aggregate positions data on the CDS records registered in the Trade Information Warehouse. The CDS positions data is available in weekly periodicity since 2008 for the 1,000 most actively traded CDS reference entities.

Most standard CDS contracts reference a firm's senior unsecured bonds. However, investors can use these CDS to hedge against the credit risk on any of the underlying firm's bonds by adjusting their CDS notional amounts for the differences in expected default and recovery rates on the referenced and hedged bonds. Therefore, we identify the CDS initiation date for a firm as the earliest date it appears in the Bloomberg and CMA combined database as a reference entity to any single-name CDS contract (all tenures and seniorities). To alleviate identification concerns, we drop firms whose CDS initiation dates fall in the first month CDS coverage starts at the Bloomberg and CMA databases. Because DTCC reports CDS transactions for the most actively traded contracts, the first time a firm appears in the DTCC's list is unlikely to be its CDS initiation date. Instead, we utilize the DTCC's data to improve the precision of our identification. Accordingly, we exclude firms from the sample if they have CDS data in DTCC earlier than their CDS initiation dates. The CDS initiation dates for these firms are inaccurate as they appear in the DTCC's active CDS list in an earlier period. This DTCC filter eliminates about 1% of the CDS observations, suggesting that using the earliest CDS trading date from CMA and Bloomberg databases is a reasonable approach to identify CDS initiation dates.

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We have a sample of 630 firms of which 252 are CDS reference entities. Within our CDS sample, 164 firms had their CDS initiations between 2001 and 2003, 60 firms had their CDS initiations between 2004 and 2006, and the remaining 28 firms had their CDS initiations between 2006 and 2013. To examine the evolution of underwriting fees (i.e., the total gross spread charged by the investment banking syndicate, expressed as a percentage of proceeds) surrounding the CDS initiation date, we identify a sample of 211 CDS firms that issued at least one bond during the ten-year period centered at the initiation of CDS trading.[2] This ten-year event window in our baseline specification matches the median maturity (rollover period) of corporate bonds (e.g., Davydenko and Strebulaev, 2007). Using a longer event window leads to a larger sample size and, hence, it is more inclusive, but it may also lead to noisier estimates. We show in Section 3.6.3 that our findings are similar using shorter event windows.

Next, we select the benchmark firms without trading CDS. Within our initial sample of 630 bond issuers, the average market value of equity is $23 billion for the CDS firms, and it is $4.6 billion for the non-CDS firms. Such a large difference in firm size can affect the elasticity of underwriting fees with respect to firm and bond characteristics—and hence bias estimations—because firm size influences scale economies and information environments. Furthermore, the literature (e.g., Narayanan and Uzmanoglu, 2018) shows that riskier firms are more likely to be referenced by CDS. This credit risk effect creates a bias against finding a negative association between CDS initiation and

[2] Section 3.2.3 reports the results from the analysis of underwriting fees using the entire sample of 630 firms.

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underwriting fees. To address these concerns, for each CDS firm, we select a similar benchmark firm without CDS using a propensity score matching method. We match at the firm level, rather than bond level, because CDS contracts reference all of a firm's outstanding bonds in a given seniority.

We construct a panel data of quarterly firm characteristics between 2001 and 2013 for the issuers in our bond sample, and estimate a probit regression predicting the propensity of CDS initiation for each firm-quarter, controlling for firm characteristics lagged by a quarter (see Appendix A for details). The coefficient estimates presented in Column (1) of Appendix A show that larger, less profitable, and riskier firms are more likely to have CDS trading.

We select, with replacement, a benchmark non-CDS firm for each CDS firm using the nearest propensity score approach within a 10% difference, conditional on the firm issuing at least one bond during the five-year period either before or after the CDS initiation date. If a benchmark firm is referenced by a CDS contract in the subsequent periods, we exclude its bonds with trading CDS from the benchmark sample. Roberts and Whited (2012) explain that using the best-match method to select benchmark firms is the least biased method, but it also generates the least precise estimates. Therefore, we implement alternative matching methods in Section 3.6.3.

Our final sample includes 1,186 bonds issued by 204 CDS firms and 735 bonds issued by 204 non-CDS firms that have non-missing issuer and bond level information. Table 1 reports the summary statistics of firm characteristics for this sample measured in the quarter immediately before CDS initiation, the statistical

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tests for the differences in characteristics of CDS and matched non-CDS firms, and the normalized differences in the means of their covariates. The average probability of CDS trading is 44% for both CDS and non-CDS firms. On average, CDS and matched non-CDS firms also have similar size (market value of equity), leverage (long-term debt/assets), stock volatility (standard deviation of daily stock returns in a quarter), profitability (net income/sales), asset tangibility as in Almeida and Campello (2007) [(Cash + 0.715 x Receivables + 0.547 x Inventory + 0.535 × Capital)/Assets], and credit ratings (investment grade dummy based on the S&P long-term credit ratings). In addition, the maximum absolute value of normalized differences in covariate means is 0.17, which is less than 0.25, suggesting that the covariate distributions of CDS and benchmark non-CDS firms are well balanced (Imbens and Rubin, 2015). We conclude that CDS and matched non-CDS firms in our sample are comparable with respect to their size, profitability, asset tangibility, and credit risk prior to the listing of CDS.

The primary dependent variable in our study is the bond underwriting fee from FISD stated as a percentage of the issue amount. We check and confirm the accuracy of underwriting fees using bond offering documents from Bloomberg and the SEC's EDGAR website. The average underwriting fee in our sample is 71 bps ($3.2 million) with a standard deviation of 44 bps ($4.6 million). Figure 1 shows that almost half of the bonds in our sample have an underwriting fee between 50 and 70 bps.[3]

[3] The average underwriting fee in our sample is slightly lower than what has been reported elsewhere in the literature. For instance, Lee, Lochhead, Ritter, and Zhao (1996) report that the average underwriting fee for the period between 1990 and 1994 is 162 bps, Altinkilic and Hansen (2000) report that it is 109 bps during 1990-1997, Livingston and Zhou (2002) report that it is 72

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Table 1 reports the summary statistics of underwriting fees at the firm level during the pre-CDS initiation period and Appendix B provides detailed summary statistics on the remaining bond characteristics. The mean (median) underwriting fee for CDS firms is 73 bps (65 bps) and it is 80 bps (64 bps) for non-CDS firms with the differences in underwriting fees being statistically insignificant. Therefore, CDS and non-CDS firms have similar underwriting fees before the initiation of CDS trading. We also show some evidence that CDS and non-CDS firms are on parallel trends with respect to their underwriting fees before the initiation of CDS trading by visually examining the time-series trends in underwriting fees presented in Figure 2. Untabulated statistical tests confirm the similarity.[4]

3. Analysis

3.1. Baseline results

In this section, we investigate the influence of CDS initiation on underwriting fees in a multivariate setting by estimating the following regression model:

$$Underwriting\ Fee_{ij} = \alpha + \alpha_i + \alpha_y + X_{it}^{'}\beta + W_j^{'}\gamma + \delta CDS\ Trading_{ij} + \varepsilon_{ij}, \quad (1)$$

bps during 1997-1999, and Sufi (2004) reports that it is 76 bps during 1990-2003. This could be because our sample of large firms (CDS-referenced issuers and their matched non-CDS firms) pay lower underwriting fees than does the average firm.

[4] We compute the differences in underwriting fees of CDS and non-CDS firms in each year relative to CDS initiation dates and perform a joint F-test for the null hypothesis that these differences in underwriting fees are equal during the pre-CDS initiation period. In addition, we perform a similar test in a multi-variate setting while controlling for firm characteristics. We fail to reject the null hypothesis that the time-series of yearly differences in underwriting fees are equal.

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where *Underwriting Fee*$_{ij}$ is the percentage underwriting fee of bond *j* issued by firm *i*, α is the intercept, α_i and α_y are firm and year fixed effects, respectively, X_{it} is a set of quarterly firm characteristics measured prior to bond offering date (*t*), W_j represents bond characteristics, *CDS Trading*$_{ij}$ equals one for bonds issued by CDS firms during the post-CDS initiation period and zero for the remaining bonds, and ε_{ij} is the error term. We cluster standard errors at the firm level to adjust the statistical significance of coefficient estimates for the correlation in errors within a firm. In this regression, the coefficient on *CDS Trading* estimates the within-firm evolution in underwriting fees associated with the initiation of CDS trading.

Firm level regressors include firm size, leverage, stock volatility, profitability, and asset tangibility, all described in the earlier section. The bond level controls in our study are issue amount (normalized by firm size), bond maturity, and dummy variables indicating bond features (callable, puttable, floating, convertible, and global). We also control for bond (il)liquidity, measured as the percentage of non-trading days in the month after the offering observed in Bloomberg, because Das, Kalimipalli, and Nayak (2014) show that CDS initiation reduces the secondary market liquidity of the underlying bonds and this liquidity reduction may lead to an increase in their underwriting fees (Davis, Maslar, and Roseman, 2018). Appendix B provides the statistics on these bond level variables. We also control for credit ratings based on the median of bond ratings received from Moody's, S&P, and Fitch. Our rating controls are at the bond—instead of the firm—level to account for the variation in expected

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recoveries within a firm's bonds based on their seniority and security. We classify these ratings into six dummy variables indicating AAA, AA, A, BBB, BB, and B or below ratings.

We define two more bond level variables using FISD to account for the influence underwriters can have on the underwriting fee. First, *Underwriter Exposure* is the average ratio of the bond offering amount to the book managers' total underwritten amount during the previous year. This variable controls for the additional risk of unsold bonds when the investment bank underwrites a relatively large issue. Second, *Underwriter Relationship* equals one if any of the book managers in the bond syndicate has underwritten the issuer's bonds in the previous ten years, and zero otherwise. This ten-year period matches the median rollover period for corporate bonds. *Underwriter Relationship* variable controls for the influence of underwriting relationships on underwriting fees.

Table 2 reports the coefficient estimates from our baseline regressions of percentage underwriting fees. Controlling for only year and firm fixed effects, Regression (1) shows that the coefficient estimate on *CDS Trading* is -0.166 and significant at the 1% level. This finding suggests that CDS initiation is associated with a 16.6 bps decline in underwriting fees. Regression (2), which includes firm characteristics as additional control variables, shows that the coefficient estimate on *CDS Trading* is -0.177 and significant, indicating a 17.7 bps decline in underwriting fees following CDS initiation.

Regression (3) in Table 2 includes firm and bond characteristics as explanatory variables in addition to firm and year fixed effects. The inclusion of

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bond characteristics increases the model's within R-squared noticeably from 9% to 50%, showing that bond characteristics are important determinants of the underwriting fee. Controlling for firm and bond characteristics, Regression (3) shows that the coefficient estimate on *CDS Trading* is -0.116 and significant at the 1% level. This finding suggests that the initiation of CDS trading is associated with a decline of about 12 bps in underwriting fees, leading to a $0.6 million reduction in issuance costs for the average new bond issue in our sample. This decline in underwriting fees is 17% of the average underwriting fee observed during the pre-CDS initiation period.[5]

To put this CDS-effect into perspective, 12 bps is equivalent to 8% of the average bond risk premium (offering yield minus the risk-free rate) of CDS firms in our sample. Consequently, for a ten-year to maturity bond, CDS initiation is associated with a 0.8% reduction in the annual risk premium. Given the sheer size of the corporate bond market, however, this seemingly small reduction in issuance costs can lead to considerable savings for the underlying firms in the aggregate. According to the bond issuance data from Bloomberg, the U.S. firms with CDS issued about a $10 trillion face value of bonds during our analysis period of 2001-2013, and a 12 bps decline in issuance costs translates into a $12 billion increase in the net proceeds these firms receive from bond offerings.

A decline in underwriting fees following CDS initiation implies that the competition among investment banks is sufficient enough for the benefits of CDS

[5] The effect is not transitory. Untabulated results show that the first bond issued after CDS initiation and the subsequent bond issues during the analysis period experience a similar decline in underwriting fees. The finding in Section 3.6.3 that the economic magnitude of the CDS effect is similar when studying a shorter event window also supports this claim.

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to accrue to the issuers. However, if the competition is imperfect, investment banks might be splitting the gains from the declining underwriting costs with—instead of fully transferring them to—issuers. In this case, the role of CDS in reducing underwriting costs can be more economically significant than that measured by a 12 bps reduction in underwriting fees. Our finding, however, does not imply that CDS initiation leads to a transfer of wealth from investment banks to issuers. Instead, we conjecture, and later provide suggestive evidence, that a decline in underwriting fees represents a reduction in the costs investment banks incur in underwriting the offer.

Overall, the evidence in this section suggests that bond issuance costs decline with the development of the CDS market. Next, we investigate the robustness of our finding by addressing the endogeneity of CDS initiation.

3.2. Addressing endogeneity concerns with three separate approaches

To address the endogeneity of CDS initiation, we study the influence of CDS on underwriting fees within a sample of firms selected for CDS trading, exploit the period after natural disasters as a laboratory to examine the CDS effect, and implement an instrumental variable approach.

3.2.1. Studying firms with CDS

The sample in our baseline regression includes firms with and without CDS that have similar observed characteristics prior to the initiation of CDS trading. However, the differences in unobserved firm characteristics across CDS and non-CDS firms may also bias our estimates. To alleviate this concern, we study the CDS effect within a sample of firms that are selected for CDS trading

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because the differences in firm characteristics should be less pronounced within this sample of CDS firms.

Column (1) in Table 3 reports the results from the baseline regression of underwriting fees using only the CDS firms. The coefficient estimate on *CDS Trading* is -0.083 and significant. Consistent with the baseline finding, this evidence indicates that CDS initiation is associated with a decline in underwriting fees within firms that are selected for CDS trading.

3.2.2. Natural experiment

The empirical tests we have implemented so far do not address the possibility that the timing of CDS initiation is endogenous. For instance, if the introduction of CDS on a firm coincides with an increase in overall interest in its securities, the underwriting fee would also decline with CDS initiation. Another possibility is that, if investors demand CDS contracts when they expect an increase in the firm's credit risk, the CDS initiation event would reflect higher expected credit risk and, therefore, increase the underwriting fee. We implement additional tests to address these concerns that can bias our estimates.

In this section, we use natural disasters as exogenous shocks to the demand for corporate bonds from insurance companies, and investigate whether CDS availability reduces underwriting fees more during these periods when placing bonds is likely to be more difficult. It is important to use disasters that are large enough that insurers will be forced to change their balance sheets. Accordingly, we obtain the ten largest natural disasters in the U.S. based on their costs to insurance companies from the Swiss Re and Insurance Information

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Institute's web-site.[6] Following the evidence in Massa and Zhang (2011) that the negative impact of Hurricane Katrina on the demand for bonds from insurance companies lasted for several months, we define a *Post-Disaster (3-month)* variable that equals one for bond offerings announced within three months after a natural disaster, and zero otherwise. *Post-Disaster (3-month)* variable identifies 94 bond offerings announced during the post-disaster periods.

Column (2) in Table 3 reports the coefficient estimates on *CDS Trading* and its interaction with *Post-Disaster (3-month)* variable included in the baseline regression of underwriting fees. The coefficient estimate on the interaction term is negative and significant, indicating that the effect of CDS on underwriting fees is more pronounced during periods of low investor demand for bonds. Because we select the three-month period arbitrarily, we re-estimate this regression using *Post-Disaster (2-month)* and *Post-Disaster (1-month)* variables that identify bond issues announced during the two-and one-month periods after the natural disasters, respectively.

Columns (3) and (4) in Table 3 report the coefficient estimates on the interactions of *CDS Trading* with *Post-Disaster (2-month)* and *Post-Disaster (1-month)* variables, respectively. We find that the interaction variables reported in both Columns (3) and (4) are negative and significant. Furthermore, we observe that the magnitude of the coefficient estimate on the interaction term increases monotonically from -0.084 in the three-month specification to -0.14 in the one-

[6] The disasters in our sample, with their dates and insured losses (in billions of 2013 dollars) in parentheses, are Charley (08/09/04; $11), Frances (08/25/04; $7), Ivan (09/02/04; $18), Katrina (08/23/05; $75), Rita (09/18/05; $13), Wilma (10/15/05; $15), Ike (09/01/08; $21), Super Outbreak (4/25/11; $8), Irene (08/20/11; $7), and Sandy (10/22/12; $31). Our results are similar when we study the natural disasters with insured losses greater than $10 billion.

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month specification, suggesting that the CDS effect is more pronounced as offering announcement dates approach the exogenous disaster dates.

A concern with studying bond offerings following natural disasters is that firms self-select to issue bonds during these periods of low investor demand. Hence, firms expecting to pay lower underwriting fees may be the ones issuing bonds, thereby leading us to observe lower underwriting fees. We believe that this self-selection issue does not influence our experiment because we compare the changes in underwriting fees of CDS and non-CDS firms that both choose to issue bonds during the same period. This relative analysis alleviates the self-selection bias. Furthermore, firms determine the maturity structure of their bonds several years before these disasters. Therefore, firms may have limited flexibility to postpone rolling-over their bonds or switch to other forms of financing in response to the decline in demand for bonds.

The findings in this section show that, as predicted, the effect of CDS on underwriting fees is more pronounced following natural disasters that serve as exogenous shocks to the demand for bond offerings. This evidence provides additional support for the hedging channel through which the availability of CDS reduces underwriting fees.[7]

3.2.3. Instrumental variable approach

[7] We also consider using the implementation of the Big Bang Protocol (BBP) on April 8, 2009, as a laboratory to test the CDS effect. In brief, the BBP induced upfront fees for trading CDS. Wang, Wu, Yan, and Zhong (2017) show that this fee is a function of a fixed coupon rate and CDS spread levels, making CDS contracts with lower funding fees more liquid than those with higher funding fees. Therefore, the hedging benefits of CDS may be more pronounced for reference entities traded at certain spread levels (i.e., lower funding fees) following the BBP. However, we do not find evidence of this, perhaps because the financial crisis of 2008 (which coincides with the pre-BBP period) or the other changes driven by the BBP (e.g., changes to the credit event definitions) contaminate the experiment.

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An instrumental variable approach gives us a more direct and compelling way to address the endogeneity of the timing of CDS initiation. In estimating the instrumental variable regressions, we use all firms with public bonds in our sample, instead of the matched sample in our baseline specification, which increases the sample size and helps us with generalizing our findings. We follow the literature on CDS in identifying the instrument for CDS trading.

Prior literature on CDS (e.g., Saretto and Tookes, 2013; Subrahmanyam, Tang, and Wang, 2014, 2017) uses the average foreign exchange hedging positions (normalized by assets) of institutions that have lending or bond underwriting relationships with a firm as the instrument for CDS trading. The intuition is that institutions that hedge their foreign exchange risk would be also likely to hedge their credit risk exposure to a firm, thereby leading to the initiation of CDS trading on the firm's debt independent of its characteristics. Different from the literature, we construct this instrumental variable using only the bank lenders to eliminate the possibility that the instrument predicts underwriting fees due to its correlation with bond underwriter characteristics. Our findings are nevertheless similar when we instrument CDS initiation with the combined foreign exchange hedging positions of bank lenders and bond underwriters.

To construct the instrumental variable, for each firm-quarter, we identify the bank lenders that serve as a lead arranger to loans within a five-year period preceding the quarter from Dealscan.[8] Next, we obtain their foreign exchange hedging positions and assets from the Consolidated Financial Statements for

[8] We obtain the Dealscan-Compustat link file from Michael R. Robert's web-site. See Chava and Roberts (2008) for the details on constructing the data. When the links are not available, we manually match firms with the loan information from Dealscan.

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Holding Companies maintained by the Federal Reserve. Finally, we construct the instrumental variable—*Lender FX*—as the average of foreign exchange hedging positions divided by assets of the lenders, measured in the quarter prior to the CDS initiation date. The average *Lender FX* in our sample is 3.45% for the firms with trading CDS and 2.33% for the ones without trading CDS, indicating that foreign exchange hedging positions of banks are positively correlated with the availability of CDS on their borrowers.

The endogenous variable in our study is a dummy variable, and hence, we follow the method explained in Wooldridge (2002) to implement a two-stage instrumental variable regression of underwriting fees. Accordingly, we first estimate a probit regression of *CDS Trading* using the firm-quarter panel data for all firms with public bonds in our sample. Column (3) in Appendix A reports the results from this probit regression and shows that the coefficient estimate on *Lender FX* is positive and significant, consistent with lenders' foreign exchange hedging positions increasing the probability of CDS listing. Appendix A also reports that the incremental likelihood ratio and F-tests for *Lender FX* are statistically significant with test statistics equal to 125 and 51, respectively. Therefore, *Lender FX* is unlikely to be a weak instrument.

Next, we predict the probability of CDS trading and use it as an instrument in a two-stage least squares regression of underwriting fees where *CDS Trading* is the endogenous variable. Column (5) in Table 3 reports that the coefficient estimate on instrumented *CDS Trading* variable from the second stage regression is -0.168 and significant, indicating a 17 bps decline in underwriting fees

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following CDS initiation. This finding suggests that our baseline finding is robust to controlling for the endogeneity of CDS listing and studying all firms with public bond issues—instead of the propensity score matched firms—in our sample.

3.3. Why do underwriting fees decline with CDS initiation?

Having established that our baseline finding is robust to endogeneity concerns, we next investigate whether the information, hedging, or cross-selling motives explain the reduction in underwriting fees following CDS initiation.

3.3.1. Information channel

The literature shows that the CDS market reveals new information on credit risk, which may reduce adverse selection costs in bond offerings, and thus lower the underwriting fee. The information benefits of CDS should be more pronounced for informationally opaque firms because CDS spreads are more likely to provide new information about these firms' creditworthiness. To investigate this prediction, we study the variation in the CDS effect by proxies of a firm's transparency.

We define three variables measured in the quarter before CDS initiation date to proxy a firm's information environment: number of analysts following, analyst forecast dispersion, and relative bid-ask spread of stock price. We obtain the analyst data from I/B/E/S and define analyst forecast dispersion as the standard deviation of annual earnings estimates observed at the end of the quarter. In addition, we compute the bid-ask spread as the average of daily stock bid-ask spread scaled by the closing price during the quarter. Accordingly, we assume

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that firms with a less analyst coverage, a greater analyst forecast dispersion, and a higher stock bid-ask spread are more informationally opaque.

Columns (1) and (2) in Table 4 report the coefficient estimates on *CDS Trading* and its interactions with *Log(1+Number of Analysts)* and *Analyst Forecast Dispersion*, respectively, included in the baseline regression of underwriting fees. We find that the coefficient estimates on these interaction variables are insignificant. Untabulated regression estimates show that the coefficient on the *CDS Trading* and *Stock Bid-Ask Spread* interaction is also insignificant. These results suggest that, within our firms with publicly traded bonds, CDS initiation is unlikely to reduce underwriting fees through revealing new information about firms.

3.3.2. Hedging channel

The availability of CDS contracts on a firm expands the hedging opportunities for the investors. These hedging benefits would make the underlying bonds more attractive to investors, thereby reducing underwriting costs. If CDS initiation reduces underwriting fees by enhancing hedging opportunities, the effect should increase with the credit risk of the offer.

To examine the influence of this hedging mechanism on our findings, we investigate the variation in the CDS effect based on stock volatility, high-yield rating dummy, and distressed dummy variables. *Distressed Dummy* variable equals one if the *Altman's Z-score* (Altman, 1968) measured in the quarter preceding CDS initiation is below 1.81, and zero otherwise. If the hedging benefits of CDS drive the results, then distressed firms, firms with higher stock

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volatility, and high-yield rated bonds should experience a greater reduction in underwriting fees with the inception of CDS trading.

Columns (3) and (4) in Table 4 report the coefficient estimates on *CDS Trading* and its interactions with credit risk variables of *Distressed Dummy* and *Stock Volatility*, respectively, included in the baseline regression of underwriting fees. The coefficient estimates on these interaction variables are negative and significant. An untabulated regression of underwriting fees reports that the coefficient on the *CDS Trading* and *High-yield Dummy* interaction is also negative and significant. For instance, the coefficient estimate on the stock volatility interaction is -4.287, suggesting that firms with a one percentage point higher daily stock volatility experience an additional 4 bps decline in underwriting fees with CDS initiation. These findings show that, as the hedging channel predicts, the CDS-related reduction in underwriting fees increases with credit risk.[9] Hence, this evidence suggests that the reduction in underwriting fees arises from the effect CDS have on improving risk sharing.

3.3.3. Cross-selling channel

It is possible that underwriters get synergies between providing underwriting services and initiating CDS on the same firms. If so, then competition among underwriters may lead to lower underwriting fees for firms with CDS. That is, underwriters may elicit economic gains from cross-selling bonds and the related CDS contracts to their clients. Because data on bank-firm

[9] The greater benefit CDS provide for high-yield bonds arises from BB rated bonds. This finding suggests that marginally distressed bonds benefit the most from the availability of CDS as opposed to severely distressed bonds.

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specific CDS positions (i.e., positions of underwriters in issuers' CDS) that are needed to test this cross-selling channel directly are not available publicly, we test it indirectly by examining the variation in the CDS effect by underwriters' overall CDS positions.

We first investigate whether the CDS effect is more pronounced for underwriters who are also major CDS dealers. To do so, we classify an underwriter as a *CDS Dealer* if it is listed as a CDS dealer at the International Swaps and Derivatives Association's Credit Derivatives Determinations Committees website.[10] We find that about 40% of underwriters in our sample are CDS dealers. These dealer-underwriters tend to be larger than the average underwriter. Column (5) in Table 4 reports that, in a regression of underwriting fees, the coefficient on the interaction between *CDS Trading* and *CDS Dealer* variables is insignificant, indicating that whether an underwriter is a CDS dealer does not influence the effect CDS have on underwriting fees. In a similar way, we also examine whether the CDS effect is larger for underwriters who actively write CDS contracts than for those who do not. We obtain the notional amount of CDS contracts sold by underwriters from their Y9C reports maintained by the Federal Reserve, and compute an underwriter's *CDS Activity* as the log of average quarterly notional amount of CDS contracts it sells during our analysis period. The mean (median) quarterly notional amount of CDS contracts sold is $1.2 ($1.4) billion with a standard deviation of $1.1 billion. Column (6) in Table 4 shows that the coefficient estimate on the *CDS Trading* and *CDS Activity*

[10] See https://dc.isda.org/about-dc-committees/ for more details.

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interaction is insignificant.[11] These regression results show that there is no meaningful difference in the CDS effect across underwriters who engage in CDS-related activities and who do not. This finding is inconsistent with the cross-selling channel.

As an additional test, we investigate whether issuers are more likely to switch underwriters following CDS initiation. If certain types of underwriters offer lower underwriting fees for issuers with CDS, these issuers would be more likely to switch underwriters following the inception of CDS trading on them. To test whether this is the case, we run a probit regression where the dependent variable is a dummy variable that takes the value of one if a firm's bond is underwritten by a lead underwriter that has not led the firm's bond issues during the pre-CDS period, and zero otherwise.[12] We identify the lead underwriters for the bonds in our sample from FISD, and trace these underwriters to their parent institutions. We find that 67% of issuers switch to new underwriters during the post-CDS initiation period. Untabulated probit regression results show that, controlling for the variables from the baseline regression of underwriting fees, the coefficient estimate on *CDS Trading* is insignificant. This finding indicates that CDS initiation does not affect the probability of an issuer switching to a new underwriter, which is inconsistent with the cross-selling channel.

3.4. CDS and bond ownership structure

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[11] We find similar results when we define *CDS Activity* as a dummy variable that indicates whether an underwriter sells more CDS contracts than the median notional of CDS contracts sold.

[12] When a bond has multiple lead underwriters, the dummy variable takes the value of one if any of the underwriters is a new one, and zero otherwise.

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Having established robust evidence in favor of the hedging channel, we now investigate how CDS initiations influence bond ownership structure to further explore the hedging benefits of CDS. The Financial Accounts of the U.S. report published by the Federal Reserve in 2013 shows that the major investors in the U.S. corporate bond market are insurance companies (life insurance and property-casualty insurance), mutual funds, retirements funds (private and public), and commercial banks. Among them, insurance companies and banks face risk-based regulatory capital requirements that impose additional costs for holding risky securities. Hence, relative to other investors, insurance companies and banks should benefit more from the new hedging opportunities CDS create for the underlying bonds.

For insurance companies, the National Association of Insurance Commissioners (NAIC) develops the risk-based capital adequacy standards as a tool for state regulators to monitor the capital deficiency of insurance companies. Federal level regulations also impose capital requirements for large insurance companies following the financial crisis of 2008. Accordingly, the risk-based capital that insurance companies are required to maintain varies based on the credit quality of their holdings (Ellul, Jotikasthira, and Lundblad, 2011). For banks, the Basel Committee on Banking Supervision develops the risk-based capital standards that the banking regulators in the U.S. adopt. Banks are also required to maintain minimum capital levels that increase with the riskiness of their assets.

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The risk-based regulations thereby impose costs for insurance companies and banks when the credit risk of their bond holdings increase, which do not arise for other major investors in the bond market. Thus, if CDS provide hedging (or regulatory arbitrage) benefits, the relative ownership of insurers and banks in the bonds of reference firms should increase with the inception of CDS trading. To test this prediction, we obtain the ownership data for each bond in our sample from Bloomberg as of the quarter-end immediately following the offering date.

Bloomberg aggregates the holding data for each institution using the 13F and Schedule D filings. The 13F form is an SEC form that must be filed quarterly by institutional investors with $100 million or more in equities. The Schedule D form is a filing made to NAIC by the U.S. insurance companies disclosing their holdings and trades in their securities portfolios. We are able to construct the ownership data for 1,669 bonds in our sample, and find that, on average, insurance companies and banks combined hold 25% of the bonds in our sample. To investigate the influence of CDS on bond ownership, we run a regression of percentage insurer and bank holdings, controlling for the firm and bond characteristics in our baseline specification. Column (1) in Table 5 reports that the coefficient estimate on *CDS Trading* is 0.056 and significant. This finding suggests that the bond ownership of institutions with risk-based capital requirements increases by almost 6 percentage points with the inception of CDS trading, consistent with the role of CDS in creating valuable hedging opportunities for investors.

3.5. Hedging benefits of CDS for illiquid bonds

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Above, we find that investors who benefit more from the hedging opportunities CDS provide hold a greater fraction of bonds referenced by CDS. In a similar way, investors should also find the availability of CDS to be more valuable for less liquid bonds. This is because the transaction cost advantage of hedging in the CDS market relative to trading credit risk in the bond market increases with bond illiquidity. Therefore, if the hedging channel is driving the decline in underwriting fees we observe with CDS initiation, then this effect should be more pronounced for illiquid bonds.

To test this prediction, we estimate our baseline regression of underwriting fees and introduce the interaction of *CDS Trading* with *Bond Illiquidity* as an additional regressor. As defined in Section 3.1, *Bond Illiquidity* equals the percentage of non-trading days measured during the month after the bond's offering date. Column (2) in Table 5 reports that the coefficient estimate on the interaction variable is -0.083 and significant. This coefficient estimate shows that bonds with no trading within a month after offering (*Bond Illiquidity* equals one) experience an additional 8 bps decline in underwriting fees with CDS initiation. This evidence suggests that, as predicted, the new hedging opportunities CDS provide are more valuable when the underlying bonds are less liquid.

3.6. Additional analyses

3.6.1. Initiation of CDS trading and underwriting quality

We have so far assumed that a decline in underwriting fees benefits firms by reducing their bond issuance costs. The underwriting fee, however, represents the level of underwriter compensation and its reduction may lower the quality of

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underwriting services. Whether CDS initiation benefits firms by reducing underwriting fees, therefore, depends on its influence on underwriting quality. We investigate this question by using bond underpricing, offering yield spreads, and underwriter reputation as proxies for underwriting quality.

Bond underpricing is the bond's first trading day price run-up relative to its offering price. Cai, Helwege, and Warga (2007) report a significantly positive first day return in bond offerings, suggesting that, on average, bonds could be offered to the market at higher prices. Therefore, if the underwriter quality declines, the issuer would experience a greater underpricing. A decline in underwriting quality would also increase the offering yield spread (offering yield minus the maturity matched risk-free rate), which represents the cost of bond financing.

We obtain the offering yields from FISD and adjust them for the maturity-matched (through linear interpolation) risk-free rates from Bloomberg. The average offering yield spread in our sample is 1.58%. To estimate bond underpricing, we use the transaction prices from TRACE. Following the method of Dick-Nielsen (2009), we screen the pricing data from TRACE for cancelled and corrected entries. We estimate the end of day price as the weighted average transaction prices in a day where the trading amounts represent the weights.

To minimize the number of missing observations, we use the first closing day price available within seven calendar days of the offering date to compute bond returns.[13] When they are not available in TRACE, we obtain the first

[13] Following Cai, Helwege, and Warga (2007), we also compute bond returns using the first trading price within 14 days of the offering date and find that our results remain unchanged.

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closing day prices from Bloomberg. The mean (median) number of days between the date of the first closing day price and the offering date is 1.73 (1.00) in our sample. We find that the average first day return—adjusted for the return on credit rating matched bond indices from Bloomberg—is 0.52% in our sample.

Our final measure of underwriting quality is underwriter reputation. We expect more reputable underwriters to provide higher quality underwriting services (e.g., Carter, Dark, and Singh, 1998). Therefore, if firms switch to less reputable underwriters following the inception of CDS trading, this would reduce the underwriting quality. To test this prediction, we estimate underwriter reputation in each quarter as the underwriter's market share in the U.S. corporate bond market measured using the bond issuance activity in the preceding year from FISD. For each bond, we take the average of its lead underwriters' (also identified from FISD) market share, which equals 10% for the average bond in our sample. We then examine whether firms use lower reputation underwriters after CDS trading starts. As an additional test, in each quarter, we rank underwriters into reputation deciles, and control for reputation fixed effects in our baseline regressions of underwriting fees to control for underwriter ability.

Columns (1), (2), and (3) in Table 6 report the results from regressions of first day returns, offering yield spreads, and underwriter reputations, respectively. Controlling for the firm and bond characteristics, the coefficient estimate on *CDS Trading* is insignificant in all of these regression models. Column (4) in Table 6 also shows that underwriting fees decline with CDS initiation even after controlling for underwriter reputation fixed effects that account for the ability of

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bond underwriters. Column (5) in Table 6 reports similar results from a regression that includes underwriter-level fixed effects. These findings show that the availability of CDS on a firm's bonds reduces underwriting fees without influencing the underwriting quality.

3.6.2. Initiation of CDS trading and loan fees

In this section, we investigate the influence of CDS on loan fees because syndicated loans are also an important source of corporate financing. Identifying the initiation date of CDS contracts referencing corporate loans (LCDS) is challenging because the data on LCDS transactions are scarce. As bank lenders can also purchase CDS contracts referencing their borrowers' bonds to hedge their credit risk, we study whether CDS initiation on bonds affects loan fees.

We obtain the loan data for our sample firms from Dealscan (see Section 3.2.3 for details). The typical fees for a revolver loan are facility fee, commitment fee, utilization fee, and upfront fee, and those for a term loan are upfront fee and cancellation fee. We first estimate a regression of all types of fees, controlling for firm characteristics, loan characteristics, and fee types. We also estimate a regression of loan-level fees (total loan fee) constructed following the method of Berg, Saunders, and Steffen (2016).[14] The average total loan fee is 28 bps in our sample.

Columns (1) and (2) in Table 7 report the results from regressions of individual loan fees and the total loan fee, respectively. We find that the coefficient estimate on *CDS Trading* is insignificant in both regressions,

[14] See Section 4 (pp. 24-36) in the Internet Appendix of Berg, Saunders, and Steffen (2016) for the details on constructing loan-level fees.

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suggesting that CDS initiation on a firm's bonds does not significantly influence its loan fees. Keeping in mind the limitations of studying a sample of bond issuers, this finding implies that CDS initiation primarily reduces the issuance costs for the underlying debt class (bonds), and hence, the benefits of CDS in reducing debt issuance costs accrue to the firms active in the bond market.[15]

3.6.3. Robustness tests

We now examine whether our estimate of the CDS effect is robust to alternative specifications and report the findings in Table 8. We first examine the sensitivity of our finding to the discretionary steps in the propensity score matching method. In our baseline approach, we require the absolute difference in the propensity scores of a CDS and its one-to-one matched benchmark non-CDS firm to be within a 10% distance. Alternatively, we construct the benchmark sample by matching each CDS firm with one and two non-CDS firms with the nearest propensity scores, respectively. In addition, we study the changes in underwriting fees within a one-year and a three-year event window—instead of the five-year event window—surrounding CDS initiation to investigate the robustness of our finding to the choice of event horizon.

Next, we test the sensitivity of our baseline finding to over or under representation of firms in the sample. We first study the effect of CDS on underwriting fees within a balanced sample, instead of the unbalanced sample in our baseline specification, constructed by randomly selecting one bond for each

[15] Given that CDS initiation reduces issuance costs for bonds but not for loans, firms may prefer bonds over loans to raise capital following CDS initiation. We do not find evidence in support of this prediction possibly because security issuance costs are relatively small to influence firms' capital structure decision.

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firm during the pre-and post-CDS initiation periods. We then investigate the CDS effect using a sample of firms with at least one bond offering during the five-year period both before and after the CDS initiation date. This sample ensures that all issuers in our sample are represented during the pre- and post-CDS initiation periods.

We also investigate whether our finding is driven by outliers in the sample. We re-estimate the baseline model using a sample of bonds excluding those offered during the financial crisis of 2008 (between August 2007 and December 2009). Next, we eliminate CDS firms (and their matched non-CDS firms) from the sample if they have a propensity score less than 10% or greater than 90% to reduce the influence of matching errors on our finding. We also drop convertible bonds when estimating the CDS effect because these hybrid securities can have different fee structures. As an additional test, we examine the robustness of our finding to including unrated bonds to our sample.

Finally, we investigate whether our baseline finding holds when using alternative control variables. We control for the bond issue amount instead of the issue amount normalized by firm size as a proxy for scale economies. Finally, we control for the liquidity of a firm's stock as an additional regressor because Butler and Wan (2010) show that stock liquidity of an issuer can also affect its bond underwriting fees.

Table 8 reports the coefficient estimates on *CDS Trading* from regressions that implement the aforementioned alternative specifications, and shows that the onset of CDS trading is associated with about a 12 bps decline in underwriting

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fees in all regression estimates. These findings demonstrate that the negative influence CDS have on underwriting fees is not sensitive to the empirical specification.

4. Conclusion

CDS contracts are derivative instruments that allow for swapping the credit risk of a reference obligation from one party to another. In a perfect world, CDS are redundant securities because a combination of the underlying bond and a risk-free asset replicates their pay-offs. In a world with transaction costs and information asymmetries, however, the introduction of CDS can have real effects on the underlying bond market. In this paper, we investigate the influence CDS have on the financial intermediation of the bond offering process.

We provide evidence that CDS contracts can impact the intermediation of bond offerings through providing new hedging opportunities to investors. Other papers have examined this hedging channel indirectly by looking at how CDS impact bond offering yields (e.g., Ashcraft and Santos, 2009). However, yields reflect, among other things, ex post monitoring by banks. Recent research, both theoretical (Parlour and Winton, 2013) and empirical (Shan, Tang, and Winton, 2018) shows that the advent of CDS can lead to reduced monitoring incentives by banks because they can lay off default risk through CDS contracts, and that reduction in monitoring is priced in bond offerings (Ashcraft and Santos, 2009), creating a confounding effect that makes it difficult to estimate the beneficial effect CDS might have through improving risk sharing. Our approach is,

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arguably, better for studying this hedging channel because the underwriting process ends at the issuance and placement of bonds; there is, in general, no ex post monitoring by the lead underwriter.

We find that CDS initiation is associated with a 17% decline in bond underwriting fees on average. Although underwriting fees decline, the quality of underwriting services, as proxied by bond underpricing, offering yield spread, and underwriter reputation, is not affected by CDS initiation. The reduction in underwriting fees is more pronounced among riskier firms and illiquid bonds for which the hedging benefits CDS provide are greater. Furthermore, investors with risk-based regulatory requirements—insurance companies and banks—who can use CDS to manage such requirements increase their participation in bond offerings following CDS inception on the bonds. These findings indicate that the hedging benefits of CDS lead to the decline in the cost of underwriting bonds.

Overall, our findings show that financial innovation in the form of credit insurance contributes to the transactional efficiency of the bond market by reducing financial intermediation costs. For the underlying firms, this CDS-related decline in intermediation costs increases their net proceeds from bond offerings and improves their financial flexibility.

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Appendix A. First Stage Regressions Estimating the Probability of CDS Trading

This table presents the coefficient estimates and their marginal effects from probit regressions that predict CDS trading. Our initial sample includes 630 non-financial public U.S. firms (of which 252 have CDS) that issued U.S. dollar denominated public bonds with non-missing information between 1996 and 2013. Using these firms, we construct a firm-quarter panel data from 2001 to 2013. The panel data starts in 2001 because it is the earliest year CDS initiation is observed in our sample. We define a *CDS Trading* variable that equals one for quarters following the CDS initiation day and zero otherwise, and estimate probit regressions of *CDS Trading* controlling for the firm characteristics lagged by a quarter. Therefore, we estimate the probability of CDS trading in a quarter based on observed firm characteristics in the previous quarter. *Lender FX* variable is the instrument for *CDS Trading*. In a quarter, *Lender FX* for a firm equals the average of foreign exchange derivatives (normalized by assets) used for hedging purposes by banks that serve as the lead arranger in the firm's syndicated loans within the five-year period before the quarter. Credit rating fixed effects are based on the S&P long-term ratings grouped into five categories: AAA, AA, A, BBB, BB, and B or below. Industry fixed effects are based on Fama and French twelve-industry classifications. See Table 1 for the remaining variable definitions. Columns (1) and (3) report the coefficient estimates from probit regressions used for implementing the propensity score matching and instrumental variable methods, respectively. Columns (2) and (4) report the marginal effects at the mean values of the explanatory variables presented in Columns (1) and (3), respectively. Reported in parenthesis are z-values calculated using robust standard errors clustered at the firm level.

Method:	**Propensity Score Matching**		**Instrumental Variable**	
Model:	**Probit Regression**	**Marginal Effects**	**Probit Regression**	**Marginal Effects**
Variables	**(1)**	**(2)**	**(3)**	**(4)**
Log(MVE)	0.835***	0.281***	0.903***	0.337***
	(11.14)	(12.02)	(12.65)	(13.24)
Long-Term Debt/Assets	1.658***	0.558***	1.661***	0.619***
	(4.22)	(4.30)	(4.01)	(4.05)
Stock Volatility	9.476***	3.188***	10.156***	3.786***
	(4.46)	(4.36)	(4.59)	(4.54)
Net Income/Sales	-0.123**	-0.041**	-0.173***	-0.065***
	(-2.48)	(-2.48)	(-2.68)	(-2.68)
Tangibility	-0.054	-0.018	0.465	0.173
	(-0.11)	(-0.11)	(0.91)	(0.91)
Lender FX	.	.	3.971**	1.481**
	.	.	(2.39)	(2.41)
Intercept	-9.365***	.	-10.059***	.
	(-9.43)	.	(-10.79)	.
Number of observations	21919	.	19256	.
Pseudo R^2	0.414	.	0.414	.
Tests for *Lender FX*				
Incremental LR Test			125.15***	
F-test	.	.	50.99***	.
Year Fixed Effects	Yes	Yes	Yes	Yes
Credit Rating Fixed Effects	Yes	Yes	Yes	Yes
Industry Fixed Effects	Yes	Yes	Yes	Yes

*, **, *** denote significance at the 10, 5, and 1 percent levels, respectively.

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Appendix B. Summary Statistics on Bond Characteristics

This table compares the bond characteristics across the CDS and matched non-CDS firms in our sample during the pre-CDS initiation period. Appendix A describes that our initial sample includes 630 non-financial public U.S. firms that have complete information and issued at least one U.S. dollar denominated public bond during the 1996-2013 period. Among these firms, 211 firms with CDS issued bonds during the ten-year period centered at the CDS initiation date. For each of these CDS firms, we select (with replacement) a benchmark non-CDS firm with the closest probability of CDS trading within a 10% absolute difference using the probit estimates in Column (1) of Appendix A. We also require the benchmark firms to have bond offerings during the ten-year period centered at the CDS initiation date. If a benchmark firm is referenced by a CDS contract in the subsequent periods, we exclude its bonds with trading CDS from the benchmark sample. This table reports the summary statistics for the bond characteristics issued by 204 CDS firms and their one-to-one matched benchmark non-CDS firms. For each firm, bond characteristics reported in the table equals the mean of each characteristic on the firm's bonds issued during the pre-CDS initiation period. *Offering Yield Sprea*d equals the offering yield minus the risk-free rate. *Underwriter Exposure* is the ratio of bond offering amount to the book manager's total underwritten amount during the previous year. *Underwriter Relation Dummy* equals one if any book manager in the bond syndicate has underwritten the issuer's bonds in previous ten years, and zero otherwise. *Bond Illiquidity* is the percentage of non-trading days in the month following the offering date. "Test of Differences" column reports the statistics from the tests of differences in mean (t-statistic from a two-tailed Student's t-test) and median (z-statistic from a two-tailed Wilcoxon rank-sum test) bond characteristics across the CDS and benchmark non-CDS firms. "Covariate Balance" column reports the normalized differences in covariate means between the CDS and benchmark non-CDS firms.

Sample:	**CDS Firms**			**Benchmark non-CDS Firms**			**Test of Differences**		**Covariate Balance**
Variables	**Mean**	**Median**	**St. Dev.**	**Mean**	**Median**	**St. Dev.**	**t-stat.**	**z-stat.**	**Norm. Diff.**
Offering Yield Spread (%)	1.668	1.549	0.826	1.695	1.413	0.941	-0.27	0.44	-0.03
Underwriter Exposure	0.014	0.005	0.036	0.014	0.004	0.048	-0.02	3.32***	0.00
Underwriter Relation Dummy	0.519	0.600	0.414	0.475	0.500	0.418	0.94	0.90	0.11
Offering Amount/MVE	0.064	0.047	0.060	0.059	0.035	0.062	0.61	1.53	0.07
Log(Maturity in Years)	2.214	2.301	0.513	2.236	2.135	0.565	-0.37	0.25	-0.04
Bond Illiquidity	0.455	0.238	0.441	0.467	0.318	0.429	-0.48	-0.10	-0.03
Callable Dummy	0.750	1.000	0.336	0.755	1.000	0.361	-0.11	-0.56	-0.01
Puttable Dummy	0.052	0.000	0.159	0.044	0.000	0.182	0.4	1.93**	0.05
Global Dummy	0.131	0.000	0.287	0.105	0.000	0.287	0.81	1.79*	0.09
Floating Dummy	0.089	0.000	0.195	0.040	0.000	0.132	2.62***	3.01***	0.29
Convertible Dummy	0.043	0.000	0.177	0.058	0.000	0.214	-0.68	-0.42	-0.08

*, **, *** denote significance at the 10, 5, and 1 percent levels, respectively.

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Table 1. Summary Statistics on Firm Characteristics and Underwriting Fees

This table reports the summary statistics for the characteristics of 204 CDS firms and their one-to-one matched benchmark non-CDS firms as of the quarter preceding CDS initiation. Appendix B provides the details on the sample selection criteria. *Propensity Score* is the probability of CDS trading estimated using the probit model presented in Column (1) of Appendix A. *MVE* is the market value of equity in millions. *Long-Term Debt/Assets* is the ratio of long-term debt to book value of assets. *Stock Volatility* equals the standard deviation of stock returns in the quarter preceding CDS initiation. *Net Income/Sales* is the ratio of net income to sales. *Tangibility* is the ratio of (Cash and Equivalents + 0.715 x Receivables + 0.547 x Inventories + 0.535 x PP&E) to assets. *Investment Grade Dummy* equals one if the S&P long-term credit rating is BBB- or above, and zero otherwise. *Underwriting Fee* is the bond underwriting fee stated as a percentage of the offering amount. For each firm, *Underwriting Fee* reported in the table equals the mean of underwriting fees on the firm's bonds issued during the pre-CDS initiation period. Appendix B reports the summary statistics on the remaining bond characteristics. "Test of Differences" column reports the statistics from the tests of differences in mean (t-statistic from a two-tailed Student's t-test) and median (z-value from a two-tailed Wilcoxon rank-sum test) firm characteristics across the CDS and benchmark non-CDS firms. "Covariate Balance" column reports the normalized differences in covariate means between the CDS and benchmark non-CDS firms.

Sample:	**CDS Firms**			**Benchmark non-CDS Firms**			**Test of Differences**		**Covariate Balance**
Variables	**Mean**	**Median**	**St. Dev.**	**Mean**	**Median**	**St. Dev.**	**t-stat.**	**z-stat.**	**Norm. Diff.**
Propensity Score	0.442	0.417	0.251	0.441	0.421	0.248	0.01	0.00	0.00
Log(MVE)	9.115	9.102	1.132	8.946	8.978	1.055	1.55	1.14	0.15
Long-Term Debt/Assets	0.273	0.252	0.149	0.282	0.261	0.152	-0.57	-0.66	-0.06
Stock Volatility	0.022	0.020	0.010	0.021	0.019	0.011	0.26	1.11	0.03
Net Income/Sales	0.043	0.050	0.147	0.050	0.066	0.130	-0.49	-1.74*	-0.05
Tangibility	0.407	0.416	0.111	0.389	0.404	0.126	1.48	1.05	0.15
Investment Grade Dummy	0.858	1.000	0.350	0.819	1.000	0.386	1.07	1.07	0.11
Underwriting Fee (%)	0.730	0.650	0.385	0.804	0.638	0.473	-1.54	0.43	-0.17

*, **, *** denote significance at the 10, 5, and 1 percent levels, respectively.

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Table 2. Baseline Regressions of Underwriting Fees

This table presents the results from the baseline regressions of underwriting fees using the sample of 204 CDS firms (1,186 bond issues) and their one-to-one matched benchmark non-CDS firms (735 bond issues). Appendix B and Table 1 provide the details of sample selection criteria and variable definitions. Our regression equation is as follows: $Underwriting\ Fee_{ij}=\alpha+\alpha_i+\alpha_y+X_{it}^{'}\beta+W_j^{'}\gamma+\delta CDS\ Trading_{ij}+\varepsilon_{ij}$, where *i*, *j*, *y*, and *t* denote firm, bond, year, and bond offering date, respectively, and *X* and *W* are controls for firm and bond level characteristics, respectively. The variable of interest is *CDS Trading* which takes the value of one for bonds with trading CDS, and zero otherwise. Bond credit rating fixed effects are based on the median of ratings from Moody's, S&P, and Fitch. We classify the ratings into six categories: AAA, AA, A, BBB, BB, and B or below. Reported in parentheses are t-statistics calculated using robust standard errors clustered at the firm level.

Variables	**(1)**	**(2)**	**(3)**
CDS Trading	-0.166***	-0.177***	-0.116***
	(-3.79)	(-4.02)	(-3.86)
Log(MVE)	.	-0.094**	-0.028
	.	(-2.39)	(-0.99)
Long-Term Debt/Assets	.	0.427***	0.190
	.	(2.83)	(1.54)
Stock Volatility	.	5.496***	2.738**
	.	(3.03)	(2.02)
Net Income/Sales	.	-0.211*	-0.088
	.	(-1.75)	(-1.46)
Tangibility	.	0.319	0.089
	.	(1.22)	(0.48)
Bond Offering Amount/MVE	.	.	0.386
	.	.	(1.27)
Log(Bond Maturity in Years)	.	.	0.224***
	.	.	(22.16)
Bond Illiquidity	.	.	0.057**
	.	.	(1.98)
Callable Dummy	.	.	0.071***
	.	.	(2.80)
Puttable Dummy	.	.	-0.197***
	.	.	(-2.86)
Global Dummy	.	.	-0.066***
	.	.	(-3.00)
Floating Dummy	.	.	-0.032
	.	.	(-1.17)
Convertible Dummy	.	.	0.811***
	.	.	(5.86)
Underwriter Exposure	.	.	0.842***
	.	.	(3.31)
Underwriter Relation Dummy	.	.	0.020
	.	.	(1.51)
Intercept	1.208***	1.814***	1.447*
	(11.34)	(4.09)	(1.78)
Number of Observations	1921	1921	1921
Adjusted R^2	0.058	0.092	0.495
Firm Fixed Effects	Yes	Yes	Yes
Year Fixed Effects	Yes	Yes	Yes
Bond Credit Rating Fixed Effects	No	No	Yes

*, **, *** denote significance at the 10, 5, and 1 percent levels, respectively.

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Table 3. Alternative Identification Strategies

This tables presents the results from regressions that address the endogeneity of CDS availability. The dependent variable in all regressions is the underwriting fee. See Appendix B and Table 1 for sample selection criteria and variable definitions. Regression (1) is the baseline regression of underwriting fees like Column (3) in Table 2, but estimated within the sample of CDS firms. Regressions (2)-(4) explore the ten natural disasters in the U.S. with the largest insured losses during the sample period as exogenous shocks to the demand for bonds from insurance companies. The regression specification is the same as in Regression (3), Table 2. *Post-Disaster (3-month)*, *Post-Disaster (2-month)*, and *Post-Disaster (1-month)* variables identify the bond offerings announced within three months, two months, and one month after a natural disaster, respectively. These regressions control for the direct effects of disasters on underwriting fees through controlling for year fixed effects. Regression (5) is a two-stage least squares regression where the foreign exchange hedging positions (normalized by assets) of bank lenders affiliated with a firm is the instrument for *CDS Trading*. The sample in this regression includes all firms in our initial sample of public bond issuers with non-missing information described in Appendix A, which also reports the results from the first stage regression predicting *CDS Trading*. Industry fixed effects are based on Fama and French twelve-industry classifications. Reported in parentheses are t-statistics computed using robust standard errors clustered at the firm level.

Model:	**CDS Firms**	**Natural Experiment**			**2SLS**
Variables	**(1)**	**(2)**	**(3)**	**(4)**	**(5)**
CDS Trading	-0.083*	-0.111***	-0.110***	-0.110***	.
	(-1.96)	(-3.72)	(-3.72)	(-3.73)	.
Interactions					
CDS Trading x Post Disaster (3-month)	.	-0.084**	.	.	.
	.	(-2.14)	.	.	.
CDS Trading x Post Disaster (2-month)	.	.	-0.096**	.	.
	.	.	(-2.13)	.	.
CDS Trading x Post Disaster (1-month)	.	.	.	-0.140***	.
	.	.	.	(-2.71)	.
Instrumented CDS Trading	.	.	.	.	-0.168***
	.	.	.	.	(-2.99)
Number of Observations	1199	1921	1921	1921	2739
Adjusted R^2	0.589	0.496	0.496	0.497	0.747
Firm Fixed Effects	Yes	Yes	Yes	Yes	No
Year Fixed Effects	Yes	Yes	Yes	Yes	Yes
Bond Credit Rating Fixed Effects	Yes	Yes	Yes	Yes	Yes
Firm and Bond Characteristics	Yes	Yes	Yes	Yes	Yes
Industry Fixed Effects	No	No	No	No	Yes

*, **, *** denote significance at the 10, 5, and 1 percent levels, respectively.

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Table 4. Source of the CDS Effect: Information, Hedging, and Cross-Selling Channels

This table presents the results from regressions that examine the influence of CDS on underwriting fees through the information, hedging, and cross-selling channels. See Appendix B and Table 1 for sample selection criteria and variable definitions. The information, hedging, and cross-selling channels predict that the CDS effect is more pronounced for less transparent firms, riskier firms, and bonds underwritten by CDS-active institutions, respectively. This table reports the coefficient estimates on *CDS Trading* and its interactions with proxies for transparency, risk, and CDS activity from the following regression: $Underwriting\ Fee_{ij}=\alpha+\alpha_i+\alpha_y+X_{it}^{'}\beta+W_j^{'}\gamma+\delta CDS\ Trading_{ij}+\zeta CDS\ Trading_{ij}xProxy_i+\varepsilon_{ij}$, where *i*, *j*, *y*, and *t* denote firm, bond, year, and bond offering date, respectively, and *X* and *W* are controls for firm and bond level characteristics, respectively. The proxies for information transparency are the *Number of Analysts* providing annual earnings estimates on the firm, and *Analyst Forecast Dispersion* measured as the standard deviation of annual earnings estimates. The proxies for credit risk are a *Distressed Dummy* indicating whether a firm's *Altman's Z-score* is below 1.81, and *Stock Volatility* measured as the standard deviation of stock returns. The proxies for an underwriter's CDS positions are a *CDS Dealer* dummy indicating whether an underwriter is a major CDS dealer, and *CDS Activity* measuring the average notional amount of CDS contracts sold by the underwriter in a quarter. Regressions (1)-(4) estimate the variation results based on firm characteristics measured in the quarter before the CDS initiation date, and hence, they control for the direct effects through controlling for firm fixed effects, and Regressions (5)-(6) control for the direct effects of underwriters' CDS positions by including these proxies as additional controls. Reported in parentheses are t-statistics computed using robust standard errors clustered at the firm level.

Model:	**Information**		**Hedging**		**Cross-Selling**	
Variables	**(1)**	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**
CDS Trading	-0.111*	-0.121***	-0.080**	-0.031	-0.107***	-0.52
	(-1.91)	(-3.54)	(-2.49)	(-0.59)	(-3.08)	(-0.59)
Interaction Variables						
CDS Trading x Log(1+Number of Analyst)	-0.000	.	.	.	.	.
	(-0.10)	.	.	.	.	.
CDS Trading x Analyst Forecast Dispersion	.	0.064				
	.	(0.38)	.	.	.	.
CDS Trading x Distressed Dummy	.	.	-0.089**	.	.	.
	.	.	(-2.15)	.	.	.
CDS Trading x Stock Volatility	.	.		-4.287**	.	.
	.	.	.	(-1.70)	.	.
CDS Trading x CDS Dealer	.	.	.	.	-0.010	.
	.	.	.	.	(-0.31)	.
CDS Trading x CDS Activity	.	.	.	.	.	0.020
	.	.	.	.	.	(0.48)
Number of Observations	1921	1921	1921	1921	1921	1692
Adjusted R^2	0.495	0.495	0.497	0.496	0.495	0.489
Firm Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Year Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Bond Credit Rating Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Firm and Bond Characteristics	Yes	Yes	Yes	Yes	Yes	Yes

*, **, *** denote significance at the 10, 5, and 1 percent levels, respectively.

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Table 5. Hedging Benefits of CDS: Analysis of Bond Ownership and Illiquidity

This table presents the results from regressions that investigate the influence of CDS on bond ownership and the variation in the CDS effect by bond illiquidity. The regression equation is as follows: $Dependent\ Variable_{ij}=\alpha+\alpha_i+\alpha_y+X_{it}'\beta+W_j'\gamma+\delta CDS\ Trading_{ij}+\varepsilon_{ij}$ where *i*, *j*, *y*, and *t* denote firm, bond, year, and bond offering date, respectively, and *X* and *W* are controls for firm and bond level characteristics, respectively. See Appendix B and Table 1 for sample selection criteria and variable definitions. The hedging benefits of CDS should be more valuable to insurance companies and banks who are subject to risk-based capital requirements compared to other investors who do not face such requirements. To test this prediction, we measure the ownership of insurance companies and banks in each bond at the end of the quarter in which bonds are offered, and examine whether their combined bond ownership increases with CDS initiation. Regression (1) estimates the influence of CDS on the percentage ownership of insurance companies and banks in bonds. The hedging benefits of CDS should also be more valuable among less liquid bonds for which trading costs in the secondary market are higher. To test this prediction, Regression (2) introduces the interaction of *CDS Trading* and *Bond Illiquidity* variables as an additional regressor to the baseline specification. The sample in all regressions includes CDS and benchmark firms that have at least one bond with non-missing information during either the pre-or post-CDS initiation periods. The number of CDS (and also non-CDS) firms is 195 in Regression (1) and 204 in Regression (2). Reported in parentheses are t-statistics computed using robust standard errors clustered at the firm level.

Model:	**Insurer and Bank Ownership**	**Bond Illiquidity Interaction**
Variables	**(1)**	**(2)**
CDS Trading	0.056***	-0.089***
	(2.95)	(-3.16)
CDS Trading x Bond Illiquidity	.	-0.083**
	.	(-2.18)
Number of Observations	1669	1921
Adjusted R^2	0.272	0.496
Firm Fixed Effects	Yes	Yes
Year Fixed Effects	Yes	Yes
Bond Credit Rating Fixed Effects	Yes	Yes
Firm and Bond Characteristics	Yes	Yes

*, **, *** denote significance at the 10, 5, and 1 percent levels, respectively.

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Table 6. CDS Initiation and Underwriting Quality

This table presents the results from regressions that investigate the influence of CDS on underwriting quality. See Appendix B and Table 1 for sample selection criteria and variable definitions. Our proxies for underwriting quality are bond underpricing, offering yield spread, and underwriter reputation. Bond underpricing is the increase in the bond price from the offering price measured at the end of the first day of trading. A greater underpricing suggests that bonds could have been sold at a higher offering price. To reduce the number of missing observations, we use the first available closing day price in TRACE within seven calendar days of the offering date to compute the first day return, and substitute the pricing data from Bloomberg when it is missing from TRACE. We adjust the first day return by the market return (return on the credit rating matched bond indices from Bloomberg) to control for the market conditions. Offering yield spread equals the offering yield minus the risk-free rate. As a measure of cost of debt, offering yield spread would increase with a decline in underwriting quality. Underwriter reputation is the market share of a bond underwriter measured quarterly using its activity in the U.S. corporate new issues market during the previous year. For each bond, underwriter reputation equals the average reputation of its lead underwriters. The intuition is that a more reputable underwriter provides higher quality underwriting services. Columns (1)-(5) report the coefficient estimate on *CDS Trading* from the following regression: $Dependent\ Variable_{ij}=\alpha+\alpha_i+\alpha_y+X'_{it}\beta+W'_j\gamma+\delta CDS\ Trading_{ij}+\varepsilon_{ij}$ where i, j, y, and t denote firm, bond, year, and bond offering date, respectively, and X and W are controls for firm and bond level characteristics, respectively. The dependent variables in Regressions (1)-(3) are *First Day Return*, *Offering Yield Spread*, and *Underwriter Reputation*, respectively, and that in Regressions (4)-(5) is *Underwriting Fee*. Regressions (4)-(5) include underwriter reputation fixed effects (based on deciles of quarterly reputation rankings) and underwriter-level fixed effects, respectively, as additional controls for underwriter ability. The sample in all regressions includes CDS and benchmark non-CDS firms that have at least one bond with non-missing information during either the pre-or post-CDS initiation periods. The number of CDS (and also non-CDS) firms is 174 in Regression (1), 184 in Regression (2), and 204 in Regressions (3)-(5). Reported in parentheses are t-statistics computed using robust standard errors clustered at the firm level.

Dependent Variable:	**First-Day Return**	**Offering Yield Spread**	**Underwriter Reputation**	**Underwriting Fee**	**Underwriting Fee**
Variables	**(1)**	**(2)**	**(3)**	**(4)**	**(5)**
CDS Trading	0.071	-0.090	0.005	-0.109***	-0.077***
	(0.24)	(-1.01)	(0.83)	(-3.47)	(-2.64)
Number of Observations	1312	1609	1921	1921	1921
Adjusted R^2	0.092	0.591	0.335	0.516	0.740
Firm Fixed Effects	Yes	Yes	Yes	Yes	Yes
Year Fixed Effects	Yes	Yes	Yes	Yes	Yes
Bond Credit Rating F.E.	Yes	Yes	Yes	Yes	Yes
Firm and Bond Characteristics	Yes	Yes	Yes	Yes	Yes
Underwriter Quality F.E.	No	No	No	Yes	No
Underwriter Fixed Effects	No	No	No	No	Yes

*, **, *** denote significance at the 10, 5, and 1 percent levels, respectively.

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Table 7. CDS Initiation and Syndicated Loan Fees

This table presents the results from the following regression model that investigates the influence of CDS on loan fees: $Dependent\ Variable_{ij} = \alpha + \alpha_i + \alpha_y + X'_{it}\beta + W'_j\gamma + \delta CDS\ Trading_{ij} + \varepsilon_{ij}$ where *i*, *j*, *y*, and *t* denote firm, bond, year, and bond offering date, respectively, and *X* and *W* are controls for firm and bond level characteristics, respectively. See Appendix B and Table 1 for sample selection criteria and variable definitions. The typical fees for a revolver loan are facility fee, commitment fee, utilization fee, and upfront fee, and those for a term loan are upfront fee and cancellation fee. Each loan can have multiple types of fees and the fee structure is not uniform across loans. In Regression (1), the dependent variable is the individual loan fee, and the control variables include firm and loan characteristics, and dummy variables identifying the fee types. The loan characteristics are the log of loan maturity in years, loan amount adjusted by firm size, and dummy variables indicating whether the loan is a revolver or secured. In Regression (2), the dependent variable is a loan level aggregate fee (total loan fee) estimated using the method of Berg, Saunders, and Steffen (2016). The sample in all regressions includes CDS and benchmark non-CDS firms that have at least one loan with non-missing information during either the pre- or post-CDS initiation periods. There are 200 CDS (and also non-CDS) firms in both Regressions (1) and (2). Reported in parentheses are t-statistics computed using robust standard errors clustered at the firm level.

Dependent Variable:	**Individual Loan Fee**	**Total Loan Fee**
Variables	**(1)**	**(2)**
CDS Trading	-0.012	0.007
	(-0.56)	(0.26)
Number of Observations	4370	3415
Adjusted R^2	0.362	0.330
Firm Fixed Effects	Yes	Yes
Year Fixed Effects	Yes	Yes
Firm Credit Rating Fixed Effects	Yes	Yes
Firm and Loan Characteristics	Yes	Yes
Fee Type Fixed Effects	Yes	No

*, **, *** denote significance at the 10, 5, and 1 percent levels, respectively.

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Table 8. Robustness Tests

This table presents the results from regressions that examine the robustness of our baseline finding. Reported in this table is the coefficient estimate on *CDS Trading* from the following regression: $Underwriting\ Fee_{ij}=\alpha+\alpha_i+\alpha_y+X_{it}'\beta+W_j'\gamma+\delta CDS\ Trading_{ij}+\varepsilon_{ij}$, where *i, j, y*, and *t* denote firm, bond, year, and bond offering date, respectively, and *X* and *W* are controls for firm and bond level characteristics, respectively. See Appendix B and Table 1 for sample selection criteria and variable definitions. Section A re-estimates the baseline regression using a sample of benchmark non-CDS firms selected based on the nearest match and nearest two matches methods, respectively. Section B re-estimates the baseline regression including firms that issued bonds in the one-year and three-year periods—instead of the five-year period—either before or after the CDS initiation date. Section C uses alternative sample selection methods to address the potential biases caused by over or under representation of sample firms. Specifically, we estimate the CDS effect using a balanced panel data, constructed by randomly selecting a bond for each firm during the five-year period pre-and post-CDS initiation. We also analyze the CDS effect using firms with at least one bond issuance during the five-year period both before and after the CDS initiation date. Section D estimates the CDS effect using a sample that excludes bonds issued during the financial crisis of 2008 (between August 2007 and December 2009), CDS firms (and their matched non-CDS firms) if their probability of CDS initiation (propensity score) estimated in Regression (1) of Appendix A is less than 10% or greater than 90%, or convertible bonds, and a sample that includes both rated and unrated bonds. Section E controls for issue size using *Log(Bond Issue Amount)* instead of *Bond Offering Amount/MVE*, and *Stock Liquidity*. *Stock Liquidity* is Amihud's (2002) illiquidity measure estimated during the one-month period prior to the offering date. All regressions control for firm, bond, and underwriter characteristics, and include firm, year, and bond credit rating fixed effects. Reported in parentheses are t-statistics computed using robust standard errors clustered at the firm level.

	Coefficient Estimate on CDS Trading		Number of Observations	Adjusted R^2
A. Alternative Matching Criteria				
Nearest One	-0116***	(-3.86)	1927	0.496
Nearest Two	-0.105***	(-3.92)	2725	0.505
B. Shorter Event Windows				
One-Year Period	-0.195***	(-3.12)	501	0.376
Three-Year Period	-0.108***	(-2.88)	1207	0.492
C. Over or Under Representation of Firms				
Balanced Panel	-0.139**	(-1.97)	573	0.599
Non-Missing during both Pre- and Post-Periods	-0.107***	(-3.48)	1487	0.548
D. Alternative Samples				
Excluding the Financial Crisis Period	-0.111***	(-3.36)	1793	0.492
Excluding High and Low Propensity Scores	-0.116***	(-3.34)	1590	0.522
Excluding Convertible Bonds	-0.115***	(-3.75)	1812	0.443
Including Unrated Bonds	-0.105***	(-3.58)	2055	0.539
E. Alternative Control Variables				
Controlling *Log(Bond Issue Amount)*	-0.122***	(-4.00)	1921	0.500
Controlling *Stock Liquidity*	-0.128***	(-4.16)	1921	0.498

*, **, *** denote significance at the 10, 5, and 1 percent levels, respectively.

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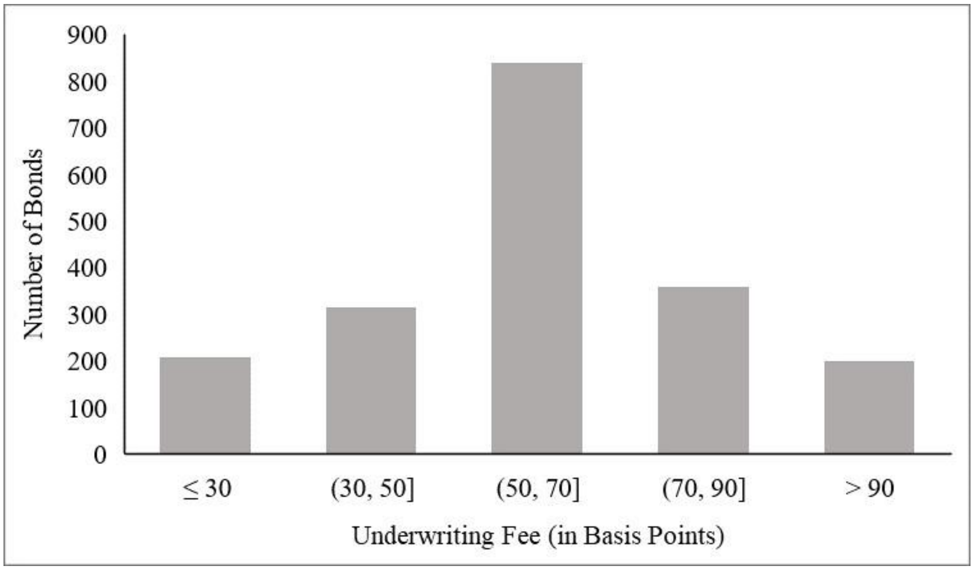

Figure 1. Histogram of Underwriting Fees

This figure presents the distribution of underwriting fees for our sample of 1,921 bonds contributed by 204 firms with CDS and their one-to-one matched benchmark non-CDS firms. The mean (median) underwriting fee is 71 (65) bps with a standard deviation of 44 bps. See Appendix B for details on sample selection procedures.

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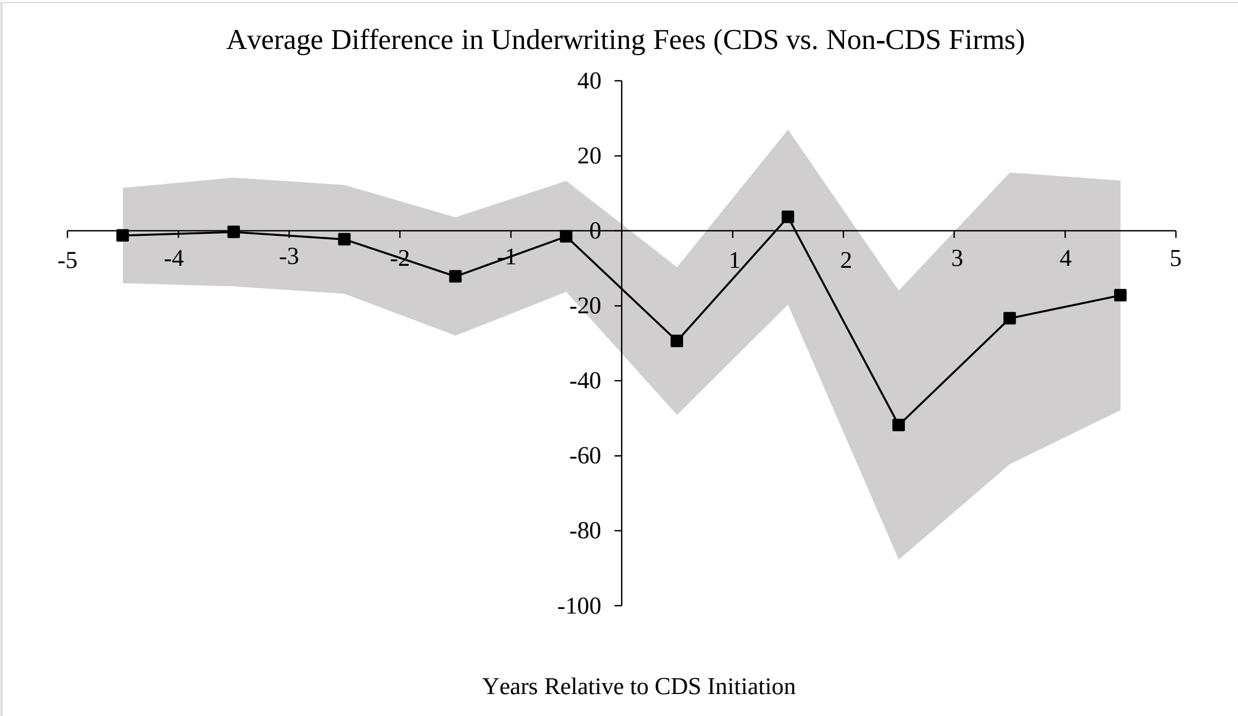

Figure 2. Time-Series Trends in Underwriting Fees

This figure plots the average difference in underwriting fees for bonds issued by 204 CDS firms (1,186 bonds) and their one-to-one matched benchmark non-CDS firms (735 bonds) by years relative to CDS initiation dates. The shaded area represents the 90 percent confidence interval for the average difference in underwriting fees. See Appendix B for details on sample selection procedures.

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