Did CDS Make Banks Riskier?
The Effects of Credit Default Swaps on Bank Capital and Lending*

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Abstract

We examine the effects of credit default swaps (CDS) on bank capital adequacy and lending behavior. Contrary to the objective of Basel Capital Accord which recognizes CDS as mitigations for credit risk exposures to strengthen bank capitalization, banks that actively use CDS ("CDS-active banks") have lower regulatory capital ratios. This finding is stronger when we account for the selection of banks into CDS trading by using banks' geographic distance and loan composition as instruments. CDS-active banks grant larger loans at higher rates to CDS-referenced borrowers. During the 2007-2009 financial crisis, these banks raised capital and reduced lending to a greater extent than CDS-inactive banks, although they had better operating performance and higher stock returns before the crisis. Our findings suggest banks use CDS to take more risks instead of reducing their exposures.

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Abstract

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I. Introduction

One puzzling observation from the 2007-2009 financial crisis is that many banks in developed economies such as the U.S. performed poorly even though they had sophisticated risk-management tools in place. One such tool is credit default swaps (CDS). CDS enable banks to manage their credit risk exposure without severing their lending relationships and thus figure prominently in bank capital regulations. Yet, their effect on banks' capital adequacy and risk management appears to be duplicitous. J.P. Morgan, which was credited for creating CDS in 1994 to hedge its loan exposure to Exxon (Tett 2009), suffered a $6.2 billion loss in the 2012 "London Whale" CDS trading fiasco. Former Federal Reserve Chairman Alan Greenspan (2004) proclaimed that CDS contributed to "the development of a far more flexible, efficient, and hence resilient financial system," but this assessment proved to be overly optimistic shortly after his retirement in 2006. Regulatory failure concerning CDS has been retrospectively regarded as a major cause of the 2007-2009 financial crisis (The Financial Crisis Inquiry Committee, 2011).

Under the Basel II capital accord, banks are allowed to hold less capital when they use CDS to mitigate their credit risk exposure as bank assets protected by CDS are deemed as less risky. AIG's 2007 Form 10-K disclosed that banks used 72% of the CDS sold by AIG Financial Products during that year for capital relief.[1] Banks conceivably exploit capital regulation by using CDS to reduce capital requirements. However, if banks use CDS for capital-intensive business (such as risky lending or trading) to expand their asset bases, whether banks can still support their risky assets without adversely affecting their regulatory capital *ratios* becomes an important question. Some observers, including Rajan (2005), have expressed concerns regarding CDS even before the crisis erupted. Banks' use of CDS for trading purpose is also the concern underlying the Volcker Rule (Section 619 of the Dodd-Frank Act). While, in hindsight, banks'

[1] http://www.aig.com/Chartis/internet/US/en/2007-10k_tcm3171-440886.pdf (page 122)

use of CDS could have been better regulated, one may wonder about the question posed by Levine (2012): "why didn't the Fed prohibit banks from reducing regulatory capital via CDS?"

While numerous public discussions and commentaries have focused on CDS, empirical evidence on how CDS interact with bank regulatory capital is lacking. We fill this research void by analyzing the asset-liability management and banking activities of a large sample of U.S. banks for the period from 1994 to 2009. We find that banks that are active CDS users ("CDS-active banks") appear to have similar capital ratios to banks that do not use CDS ("CDS-inactive banks"). Thus, regulators might not have been alarmed by banks' use of CDS. However, poorly capitalized banks may be more likely to use CDS to boost their capital ratios (by reducing the risk-weighted asset base). Once we account for the potentially endogenous selection of banks' CDS use by instrumenting bank CDS trading with the distance between a bank's headquarters and New York City (NYC) and with the bank's portfolio concentration, we indeed find that capital ratios are significantly lower for CDS-active banks than for banks with no CDS positions. Moreover, the quality of bank capital, measured by the proportion of Tier 1 capital as a share of total capital, is significantly lower for CDS-active banks than for CDS-inactive banks. These findings suggest that banks may have used CDS for purposes other than credit risk mitigation, the use encouraged by regulators, as CDS usage appears to result in worse capital positions for CDS-active banks relative to their non-CDS peers.

Lower capital ratios may indicate either more efficient banking or more aggressive risk taking. The distinction lies in the practice of lending, which is the core activity of banking. If a lower bank capital base can support the same amount or a greater volume of loans, then borrowers may enjoy better access to bank credit. However, theories are ambiguous regarding whether CDS increase or decrease bank lending. On one hand, banks may lend more aggressively, as some of

the credit risk exposure can be hedged with CDS. On the other hand, banks may divert capital from lending to directly support their CDS trading. Our empirical evidence indicates that banks increase corporate lending after CDS trading. Further, we find that loan loss provision increases in response to banks' CDS trading, suggesting that banks recognize their own risk-taking behavior. Loan-level evidence also corroborates the finding that banks adopt more aggressive lending practices when CDS are available. Firms receive larger loans at a higher spread when their debt is referenced by CDS contracts, and this result is most pronounced when their lead lenders are actively trading CDS.

The combined effect of lower capital ratios and more aggressive lending is riskier banking. Indeed, using both accounting-based and market-based risk measures, such as the bank Z-score and distance-to-default, we find that banks are riskier when they lend more to CDS-referenced borrowers. The positive relationship between bank risk and CDS trading prevails even after we account for the endogenous selection of banks into CDS trading. The evidence suggests that banks do not merely use CDS to hedge their credit risk exposure, and the net effect of banks' CDS trading implies greater risk taking for CDS-active banks. However, such risk taking practice via CDS is rewarded with these banks' better operating performance during normal periods, as the net interest margin and return on assets were higher for CDS-active banks when they granted more loans to CDS-referenced borrowers before the 2007-2009 financial crisis.

Banks can be overly conservative in their lending practices in the absence of risk transfer tools, as argued by Inderst and Müeller (2006). Therefore, by inducing banks to take greater risk through extending more loans to otherwise less qualified borrowers, CDS may actually improve banking efficiency. Indeed, Parlour and Winton (2013) show that CDS can be a preferred risk transfer instrument and can facilitate efficient risk sharing. Thus, CDS may help move bank

lending toward an optimal level (Allen and Gale, 1994). However, CDS can also generate potentially adverse externalities such as contagion (Allen and Carletti, 2006) and the "empty creditor" problem (Bolton and Oehmke, 2011). Duffee and Zhou (2001) model the impact of the CDS market and argue that "theory alone cannot determine whether a market for credit derivatives will help banks better manage their loan credit risks." Similarly, Duffie (2007) notes that "the available data do not yet provide a clear picture of whether the banking system as a whole is using these forms of CRT [credit risk transfer] to shed a major fraction of the total expected default losses of loans originated by banks." Moreover, Stulz (2010) observes that "there is a dearth of serious empirical studies" on the implications of CDS. The empirical findings in this paper fill this research gap and provide evidence on the real effect of CDS trading that could inform policy debates.

The 2007-2009 financial crisis provides a natural laboratory to further study the effect of CDS. CDS-active banks were caught short-handed during the crisis when the CDS market was disrupted by the bankruptcy of Lehman Brothers and the collapse of AIG as some of the bank loans made in prior years turned sour. Affected banks were required to raise additional capital and had to further restrict lending during the crisis. Moreover, they suffered larger stock price declines during the crisis than CDS-inactive banks, in contrast to the gains in stock prices that they enjoyed before the crisis.

Our paper has implications for the interaction of derivatives markets, banking activities, and regulations. For example, our findings suggest that when banks use CDS, bank lending becomes more procyclical (i.e., increased credit supply during booms and more severe credit crunches during recessions). Banks may exploit CDS to manage their capital positions and maximize their profits. Shleifer and Vishny (2010) show that profit-maximizing activities can reduce bank

stability, and our empirical evidence corroborates this insight. In addition, CDS may cause downward spirals, as riskier lending practices can result in increased corporate defaults, challenging the solvency of CDS sellers and leading to further turbulence in the CDS market.

Our analysis sheds light on why banks use CDS and why bank regulators have failed to rein in CDS activities, which were going awry in some instances. Although CDS-active banks suffered larger losses during the crisis period, they obtained greater profits than CDS-inactive banks before the crisis. We stress that our evidence does not suggest that bank shareholders are worse off when banks use CDS for risk taking. If loans are priced fairly, then CDS can help banks use their capital more efficiently and exploit opportunities in the lending market.

This study contributes to the burgeoning empirical literature examining the implications of CDS trading, which includes Ashcraft and Santos (2009) on the cost of debt, Saretto and Tookes (2013) on leverage, and Subrahmanyam, Tang, and Wang (2014) and Arentsen, Mauer, Rosenlund, Zhang, and Zhao (2014) on bankruptcy risk. These studies focus on the effects of CDS on reference firms. The results in this study suggest that active engagement in the CDS market ultimately leads to riskier bank profile. This finding is contrary to the intended effect of CDS on managing banks' credit risk exposure, but it is consistent with the theoretical model developed by Yorulmaezer (2013), which predicts that banks take excessive risk in the presence of capital relief tied to CDS. Our study therefore provides a new perspective on bank risk taking, which has so far been linked to, for example, bank governance and executive compensation in the literature. Our analysis also bolsters the view offered in Beltratti and Stulz (2012) that factors that are rewarded in normal periods may have adverse realizations during crisis periods. Furthermore, this paper is related to studies on the effects of securitization on bank risk taking, such as Acharya, Schnabl, and Suarez (2013) and Wang and Xia (2013), among others.

The rest of the paper proceeds as follows: Section II provides the background of our study and reviews the relevant literature. Section III describes our datasets and sample selection. Section IV presents the empirical results on bank capital. Section V provides evidence on bank lending. Section VI shows how CDS affect bank risk profiles and financial performance before and during the 2007-2009 crisis. Section VII concludes.

II. Background

Banks are the major players in the global CDS market, which is organized by the International Swaps and Derivatives Association (ISDA). The notional value of outstanding CDS contracts increased more than two-hundred-fold from 1998 to 2007, and the rapid growth of the CDS market was partly driven by the recognition of CDS in the regulatory capital requirements for bank risk-weighted assets (RWA), as stipulated in Basel II by the Basel Committee for Banking Supervision (BCBS). Basel II treats CDS and other credit derivatives that are similar to guarantees as instruments for credit risk mitigation.[2] AIG's 2007 Form 10-K disclosed that banks used 72% of the CDS sold by AIG Financial Products during that year for capital relief, suggesting that capital relief was a major reason for banks' use of CDS.

CDS frequently appeared in headlines during the 2007-2009 financial crisis because many banks had bought CDS protection from AIG, which had to be bailed out by the U.S. government.[3] Minton, Stulz, and Williamson (2009) document that a substantial amount of CDS

[2] Basel II is rather flexible in recognizing CDS as a hedge for banks. For example, a mismatch between the underlying obligation and the reference obligation under CDS is permissible if the reference obligation is junior to the underlying obligation. In other words, bond CDS can be counted as a loan risk hedge. Basel II also allows a maturity mismatch and partial hedging (for credit event definitions and coverage). If CDS protection is counted as a hedge, the CDS seller's credit risk is used to determine the underlying obligation risk weight.

[3] For instance, Goldman Sachs bought CDS from AIG to protect its securities linked to mortgages (http://online.wsj.com/news/articles/SB10001424052748704201404574590453176996032). Concerns were raised that if AIG defaulted, banks may have to bring billions of assets back onto their balance sheets because they bought CDS from AIG to reduce their regulatory capital (http://online.wsj.com/news/articles/SB12363-8394500958141).

are not used for hedging purposes. A prominent example is that J.P. Morgan, arguably the best performing bank during the financial crisis and the most vocal opponent of tighter regulations (e.g., Dodd-Frank and Basel III), suffered a large CDS trading loss in 2012. The J.P. Morgan incident has shone a spotlight on bank risk taking through CDS dealer activities.

A natural place to start in examining the effects of CDS is the banking book. Of particular importance in understanding the net effect of CDS is a bank's regulatory capital position. Capital adequacy is the first measure of bank risk in the CAMELS ratings that are used by U.S. bank examiners. Bank regulatory capital ratios are defined as capital divided by RWA. CDS affect the denominator of the regulatory capital ratio in two ways. First, CDS can reduce the risk weights on assets. Second, asset size can increase owing to the increased lending and trading induced by CDS (both on and off the balance sheet). Banks may convert their holding assets to trading assets to support their derivatives trading activities which may have higher risk weights, or banks may lend more aggressively to risky borrowers, both leading to a larger RWA base and a lower capital ratio.

The net effect depends on the relative amount of risk reduction versus risk taking. With higher regulatory capital ratios, banks may appear to be safer if they use CDS to hedge credit risk and to reduce RWA. However, banks may hedge only partially, or they may not hedge immediately after they make loans. Moreover, if the availability of CDS as a hedging tool encourages banks to take greater risks and to increase risky lending, bank capital ratios could even be lower because of the larger asset size.

Figure 1 illustrates these expected structural changes in banks' on- and off-balance-sheet items. Banks' on- and off-balance-sheet activities may both increase, as CDS may expand both trading and banking assets and facilitate securitization, and the latter appears in the off-balance-sheet

activities. The component on the right side of the balance sheet affected by CDS is the core capital ratio. On the asset side, apart from trading assets, other components that are affected include C&I loans and loan loss provision.

If banks hold less capital during normal periods because of CDS, they may become more vulnerable to crises. Regulators have become more concerned with banks' risk-taking activities related to CDS since the 2007-2009 financial crisis. Consequently, the U.S. Congress enacted the Dodd-Frank Act in 2010, which, among its main objectives, aims to improve the oversight of both bank risk taking and CDS market function. For example, bank activities in trading CDS are curbed according to the Volcker Rule in the Dodd-Frank Act. The basic role of CDS in the bank capital regulation has been maintained in Basel III, albeit with some modification. For instance, banks are now subject to greater capital charges for derivatives trading, including CDS (via the so-called "incremental risk charge"). Moreover, the credit value adjustment for the counterparty risk, a new component of Basel III, is primarily managed through CDS protections.

Prior studies offer a mixed picture of how risk-management tools and practices affect bank risk taking. Cebenoyan and Strahan (2004) demonstrate that banks that actively trade loans for risk management hold less capital and make more risky loans. Conversely, Ellul and Yerramilli (2013) illustrate that better risk controls lead to lower bank risk. Moreover, bank risk is positively associated with the use of interest rate derivatives (Begenau, Piazzesi, and Schneider, 2013) and noninterest income (Demirgüc-Kunt and Huizinga, 2010).[4] Banks may also exploit their informational advantage in the CDS market (Acharya and Johnson, 2007). However, CDS could induce adverse incentive problems. For instance, a moral hazard problem arises when the

[4] One form of noninterest income can arise from securitization. Several studies have analyzed how securitization affects bank risk taking. Banks relax screening and reduce monitoring when they can securitize loans (Keys, Mukherjee, Seru and Vig, 2010; Wang and Xia, 2013). Acharya, Schnbl, and Suarez (2013) demonstrate "securitization without risk transfer." Jiang, Nelson, and Vytlacil (2013) show that loans that remain on a bank's balance sheet ex post incur higher delinquency rates than loans that are sold into securitization products.

protection seller finds out his position is likely to be loss-making (Biais, Heider, and Hoerova, 2012).[5] The hedging role of CDS may also be dampened by contagion effects (Allen and Carletti, 2006), "empty creditors" and creditor coordination failure (Bolton and Oehmke, 2011; Subrahmanyam, Tang, and Wang, 2014).

Theoretical arguments of the effects of CDS on bank lending are not conclusive. On one hand, regulatory arbitrage motivates banks to grant more risky loans when CDS are available (Yorulmazer, 2013). In a model by Parlour and Winton (2013), banks create riskier borrowers when they reduce monitoring after they buy CDS. Therefore, CDS facilitate the transformation of relationship lending into transactional lending while maintaining banks as relationship lenders. More loan transactions produce bigger commissions which can also be another motive for excessive credit volume (Acharya and Naqvi, 2012). On the other hand, if banks choose to sell CDS instead of making loans when acquiring credit exposure (Che and Sethi, 2014), the supply of bank loans may decline. Hirtle (2009) finds limited evidence that bank use of credit derivatives affects loan supply. Therefore, whether CDS encourage or "crowd out" banks' risky lending and how CDS consequently affect banks' risk profiles are ultimately empirical issues.

In this paper, we investigate whether banks' use of CDS leads to higher bank risk by focusing on the effects of CDS on banks' capital positions and lending practice. We first provide bank-level evidence on the impact of CDS on banks' regulatory capital ratios and loan portfolios. Then we carry out an analysis at the loan level by examining changes in the characteristics of loans extended by CDS-active banks to borrowers referenced by CDS. Lastly, we investigate the effect of CDS on banks' risk profiles and analyze the differential performance of CDS-active banks vs CDS-inactive banks before and during the 2007-209 financial crisis.

[5] Fung, Wen, and Zhang (2012) demonstrate that insurance companies that use CDS for income generation purposes, such as AIG, are riskier.

III. Data and Sample Description

We employ three main datasets on banks, syndicated loans, and corporate borrowers. The first dataset concerns bank data and includes characteristics such as banks' credit derivatives positions, regulatory capital ratios, risk measures, profits, and plus stock prices for publicly listed banks. The second dataset contains information on individual syndicated corporate loans with loan contract terms at origination, including loan size, interest rate, and lender identities. The third dataset provides CDS market information for U.S. corporate borrowers.

A. Bank CDS Position Data

Our primary source of bank CDS position data for the period from 1994 to 2009 is the Federal Reserve Consolidated Financial Statements for Holding Companies ("FR Y-9C").[6] Banks with more than $150 million in assets are required to file FR Y-9Cs (the threshold increased to $500 million in 2006). We focus on banks that act as syndicate lead arrangers in Loan Pricing Corporation's Dealscan database, although we also conduct robustness checks with a broader set of banks. We manually match an RSSD ID in the bank dataset to the name of a lead lender in Dealscan to identify the list of lending banks that are active in CDS trading in a given quarter. We refer to a field in Dealscan called "Lead Arranger Credit", which can take values of "Yes" or "No" for every bank, to identify syndicate lead arrangers. We ensure that the match is made in the same year to account for possible bank name changes. Finally, we restrict the sample to the period from 1994 to 2009 because Dealscan only began providing relatively complete loan information in 1994 and because our borrower CDS dataset ends in 2009, when a substantial change also occurred in the CDS market. FR Y-9C filers include 7,646 banks, 121 of them act as syndicate lead lenders in Dealscan.

[6] http://www.chicagofed.org/webpages/banking/financial_institution_reports/bhc_data.cfm.

CDS position data for foreign banks are not available from FR Y-9C filings. We collect additional bank CDS position data from the Quarterly Report on Bank Derivatives of the Office of the Comptroller of the Currency (OCC) to include large foreign banks. The OCC reports list the top banks, including the U.S. subsidiaries of foreign banks, with the largest credit derivative positions every quarter beginning in 1998. Both the FR Y-9C filings and the OCC reports provide aggregate CDS positions and positions held by banks as beneficiaries ("bought") or guarantors ("sold"). We crosscheck the CDS position data covered by the two datasets. Based on the quarterly CDS positions held by banks reported in the FR Y-9C and OCC reports, we define banks that have a non-zero CDS position in a given quarter, either a long position or a short position as "CDS-active banks".[7] Banks with zero CDS positions are denoted as "CDS-inactive banks".

For consistency between our bank-level and loan-level analysis, we restrict our sample banks to Dealscan syndicate lead lenders, which can be matched with bank identifiers in Compustat. We use the full sample of all Compustat banks for robustness checks. Other bank-level control variables are extracted from Compustat. Our base sample includes 84 banks with complete financial information, 43 of which traded CDS at some point during the sample period.

B. Corporate Loan and Borrower Financial Data

At the loan level, we are interested in the effects of CDS trading on the initial contract terms of loans issued to the firms whose debt is referenced in CDS. We sum the loan amount, take a simple average of the all-in-drawn spread and maturity to aggregate different tranches (also called facilities) from the same loan deals, and conduct our analysis at the deal level. We use

[7] The banks act as the beneficiary for long positions, which are specified by the variable BHCKC969 in the FR Y-9C report or the "CDS bought" column in the OCC report. The banks act as the guarantor for the short positions, which are specified by the variable BHCKC968 in the FR Y-9C report or the "CDS sold" column in the OCC report.

other deal-level information in Dealscan, including the security of the issue, loan type, loan purpose, and number of syndicate lenders, as control variables. We merge Compustat/CRSP with Dealscan loan records by using borrower identifiers in Compustat to obtain financial data of borrowing firms.[8] This matching procedure leaves us with 67,747 loan deals during the 1994-2009 period. Of these, 47,247 list their distribution mode as "syndication."

In our multivariate analysis, we exclude firms with missing loan characteristics, such as loan amount, spread, maturity, security, loan type, loan purpose, and lender information, and those with missing firm-level financial data, such as total assets, cash-to-total assets ratio, book leverage, firm age, market-to-book ratio, sales-to-total assets ratio, tangible assets, and Altman's Z-score. Our base regression sample contains 15,546 syndicated loans. In robustness checks, we also use the combined sample of syndicated loans and sole-lender loans, totaling 17,268 observations.

C. CDS Data on Borrowing Firms

We determine whether CDS contracts referencing a borrowers' debt exist at the time of loan issuance by using two major datasets on the sources of CDS transactions: CreditTrade and GFI Group. The CreditTrade data cover the period from June 1997 to March 2006; the GFI data cover the period from January 2002 to April 2009. The overlapping feature of the data allows us to perform a crosscheck to ensure data accuracy. We further validate the data by using Markit quotes. Similarly to Subrahmanyam, Tang, and Wang (2014), we use the first CDS transaction record for the issuer appearing in the data as the CDS introduction date. We identify 921 U.S. firms with debt referenced in CDS contracts from June 1997 to April 2009, accounting for 8.1% of the total number of unique borrowers in the same period.

[8] We appreciate the Dealscan-Compustat link file provided by Chava and Roberts (2008).

We include all borrowing firms, whether they are large or small, whereas Saretto and Tookes (2013) restrict their sample to S&P 500 firms. Among the 47,247 Dealscan syndicated loans, 9,341 are made to 867 CDS firms that have CDS referencing their debt at any time during the sample period ("CDS firm"), and 6,641 of them are made to firms with CDS trading at the time of loan origination ("CDS trading").

D. Overview of the Sample

Our base sample primarily consists of large banks that are required to file quarterly reports with the Federal Financial Institutions Examination Council. This is expected as the lead arrangers of syndicated loans are frequently large banks. Panel A of Table I shows that the mean book value of assets among our sample banks is $331.573 billion. Because CDS-active banks are large, focusing on large banks facilitates the comparison of our treatment and control groups and alleviates concerns that bank characteristics drive our findings. Table IA1 of the Internet Appendix shows more detailed bank characteristics by bank types. It shows that the average book value of assets of CDS-active banks in our sample is $325.547 billion, which is close to the average book value of assets of CDS-inactive banks ($341.964 billion). Other bank characteristics are comparable to those reported in Loutskina (2011). The univariate comparison in Table IA1 shows that CDS-active banks hold less capital, make more profits, and grant more commercial and industrial (C&I) loans than CDS-inactive banks. CDS-active banks have smaller Z-scores but larger distance-to-default ratios, but the difference is only significant at the 10%

level.[9] CDS-active banks have higher sales growth, higher market-to-book ratios, and higher noninterest income-to-total operating income ratios. The average notional amount of total credit derivatives positions at the quarter end for banks in our sample is $65.085 billion. The CDS bought, sold, and net positions are on average $32.977, $32.108, and $0.869 billion, respectively.

Panel B of Table I presents the year-by-year summary of the bank sample. The first instance of a bank reporting CDS positions occurred in 1997. Banks enter and exit the CDS market over time. The maximum number of CDS-active banks at any given time in our sample is 20. The average amount of bank total assets grew steadily during the sample period. The total amount of new loans grew from $491.51 billion in 1994 to $4.56 trillion in 2007 and then declined to $2.66 trillion in 2008 and to $2.12 trillion in 2009.

Panel C of Table I summarizes the syndicated loans in our sample by year. Approximately 20% (or 9,341) of the total number of loans are from 867 CDS firms. The largest number of syndicated loans issued is 3,828 in 2005, whereas 2007 witnessed the largest average loan size in our sample ($598.79 million). Although CDS firms account for less than 10% of our entire sample of borrowers, they account for 43% of the syndicated loan volume in dollar terms. The average loan size for CDS firms ($868 million) is more than twice as large as the average loan size for non-CDS firms. The average loan spread for CDS firms is 109.62 basis points, which is 78.07 basis points lower than the average spread for non-CDS firms.

[9] Bank *Z-score* is defined as (ROA+CAR)/ σ (ROA), where ROA is return on assets, CAR is the capital asset ratio, and σ (ROA) is the standard deviation of ROA in the past four quarters. The Z-score measures the distance from insolvency and is the most commonly used bank risk measure (see Laeven and Levine, 2009 and Houston, Lin, Lin, and Ma, 2010). A higher Z-score indicates a lower probability of bank insolvency. *Distance-to-default* is calculated by using the Bharath and Shumway (2008) method and is only applicable for publicly listed banks.

IV. Effects of Bank CDS Trading on Bank Capital

A. Bank CDS Trading and Capital Ratio: Baseline Results

Bank capital ratios are among the top regulatory indicators. Basel II requires an 8% minimum total capital ratio and a 4% minimum Tier 1 capital ratio. Table I shows that all banks in our sample maintain capital ratios that are higher than the minimum requirements. Basel III increases the minimum Tier 1 capital ratio to 6%. The minimum common equity capital ratio is 4.5%, as the level of equity capital measures the extent to which a bank is prepared to internalize the cost of bank failure rather than to rely extensively on deposit-based financing (Allen, Carletti, and Marquez, 2011). Risk-weighted assets are used as the denominator to calculate the regulatory capital ratios.

Basel II allows banks to "take account of such credit protection in calculating capital requirements" when they fulfill certain minimum operational conditions related to risk management process.[10] If banks exclusively use CDS for hedging, then RWA should be lower, and capital ratios should be higher. If banks are more involved in dealer activities by using CDS, then more trading assets will appear on the banks' balance sheets, which can be riskier and result in larger RWA. Alternatively, if banks extend more risky loans, larger RWA can also result owing to the riskier banking book, and the capital ratio will decline. The net impact of CDS on RWA and the capital ratio depends on the mode in which a bank uses CDS. If the counterbalancing effects cancel out one another, then banks are able to maintain the same capital ratio by using CDS. If the effect of CDS on capital relief is substantial, then the capital ratio can rise, making the bank appear to be safer. If the increase in the riskiness of banks' loan portfolios

[10] See page 35 of "International Convergence of Capital Measurement and Capital Standards – A Revised Framework Comprehensive Version" by BCBS, June 2006.

outweighs the reduction of RWA due to hedging with CDS, then a lower capital ratio will result as CDS may lead to "excessive" risk-taking by banks.

We begin our empirical analysis by examining how banks' CDS trading activities affect banks' capital ratios. The univariate comparison in Table IA1 of the Internet Appendix shows that banks that trade CDS hold less capital than CDS-inactive banks. However, this comparison is cross-sectional and does not provide us with the time-series change in the capital ratio after CDS trading began for the same bank, which is the focus of this study. Our baseline specification for bank capital ratio is as follows：

$$\begin{aligned}\text{Bank Capital Ratio}_{it} &= \alpha + \beta\text{CDS Active Bank}_{it} + \gamma_1 X_{it-1} + \gamma_2 \text{Year Fixed Effects}_t \\ &\quad + \gamma_3 \text{Bank Fixed Effects}_i + \varepsilon_{it}\end{aligned} \tag{1}$$

We use two regulatory capital ratio measures: (1) the *Risk-weighted Total Capital Ratio*, which is the total capital (Tier 1, Tier 2, and Tier 3) divided by total RWA, and (2) the *Tier 1 Capital Ratio*, which is the Tier 1 capital divided by total RWA.

The key independent variable is the indicator *CDS Active Bank*, which takes one if the bank is taking a non-zero CDS position in the given quarter and zero otherwise (see the variable definitions in Section III for details).[11] To control for other unobservable differences that may systematically drive capital ratios between banks that trade CDS and those that do not, we control for bank fixed effects to ensure that the CDS-active bank dummy only captures time-series variation of the same bank.

The vector X comprises other variables that are identified by the literature (e.g., Ellul and Yerramilli, 2013) to affect a bank's regulatory capital ratio, including the bank's total assets,

[11] We use the dummy representing CDS-active banks rather than a continuous variable representing the quantity of CDS positions held by banks in the baseline regression because CDS positions are highly skewed across banks. The top two CDS-active banks, Bank of America and J.P. Morgan Chase & Co, hold CDS positions far exceeding those of other banks. We focus on the qualitative measure to capture the first-order effects.

sales growth rate, deposits-to-assets ratio, loans-to-assets ratio, and market share in bank deposits. These variables are lagged one quarter in the regressions. To capture the potentially nonlinear relationship between bank capital ratio and bank size, we include total assets squared in the regressions. To allow for the possibility that banks with different funding strategies or sources of revenue may hold different levels of capital, we also control for the deposits-to-liabilities ratio and the noninterest income-to-total operating income ratio. These variables describe banks' operating strategies and act as controls for bank types. In all the specifications, we control for year fixed effects to isolate time trends in the capital ratios.

The estimation results of the baseline regressions presented in Table II show that banks' capital ratios decline slightly after they begin trading CDS. However, the coefficients of the CDS-active bank dummy are not statistically significant. This is interesting, as it appears that the use of CDS does not increase a bank's capital ratio, in contrast to the potential role of CDS intended in bank capital regulation for reducing the risk weight of RWA. This can be the consequence of two possibilities, either the bank does not use CDS for the purpose of managing its credit exposure, or it reduces the amount of capital it holds. But the situation may not raise the eyebrows of bank regulators since on the surface, there does not seem to be a significant change in capital ratio for a bank when it trades in CDS.

The estimation results for the control variables are consistent with the literature. For example, an increase in the capital ratio is associated with an increase in the deposits-to-assets ratio, suggesting that banks use capital as complementary funding to deposits, consistent with the view that high-level bank capital provides signals of bank creditworthiness that are relevant to potential depositors (Demirgüc-Kunt and Huizinga, 2010). The finding that a higher loans-to-assets ratio is associated with a lower capital ratio may suggest that a positive relationship exists

between noninterest-generating income and bank capital levels. If noninterest-generating activities have a higher risk weight, then additional capital is needed to support such activities.

To check the robustness of our baseline findings, we conduct same analysis using two alternative samples: (1) all Compustat banks and (2) the baseline sample excluding the largest banks with deposits exceeding 10% of the total deposits aggregated across all banks in the same quarter, following Houston, Lin, Lin, and Ma (2010). The results in Internet Appendix Table IA2 are similar and show a more significant negative relationship between bank CDS trading and capital ratio than that for the main sample. While these results are consistent with each other and with the cross-sectional comparison in Internet Appendix Table IA1, they suggest that banks may not use CDS in the way anticipated by regulators. Instead of hedging with CDS, which should have boosted banks' capital ratios, banks maintain lower capital ratios after they begin trading CDS.

B. Selection of Bank CDS Trading

The observed negative relationship between banks' use of CDS and bank capital, significant or not, may be confounded by the selection of banks into CDS trading. For instance, when suffering negative shocks to its loan portfolio (i.e., default by a group of borrowers), a bank's demand for capital to cover the loss and its use of credit derivatives to hedge can both increase simultaneously. The observed capital ratio with such endogeneity would then be higher than in the case in which only the causal effect of CDS is present. In other words, this endogeneity may result in an underestimation of the negative association between CDS trading and the capital ratio. Another source of endogeneity could arise from reverse causality: banks begin CDS

trading in anticipation of increasing loan issuance. We construct instrumental variables to identify the causal effect of CDS trading on bank capital ratios.

Our first instrument is based on the geographic location of the banks. Prior literature documents that firms' geographic locations can affect investors' portfolio returns (Coval and Moskowitz, 2001), lending decisions (Agarwal and Hauswald, 2010; Degryse and Ongena, 2005), and employee protection (Landier, Nair and Wulf, 2009), among other outcomes. Because geographic proximity may facilitate information production and nurture lending relationships, Bharath, Dahiya, Saunders, and Srinivasan (2011) use the geographic distance between a lender and its borrower as an instrument for the lending relationship. We use the distance between banks' headquarters and NYC to instrument for banks' likelihood of trading CDS, since NYC is the largest world financial center and contains the headquarters of the ISDA, the trade organization for participants in the market for over-the-counter derivatives including CDS. Soft information plays a role in whether banks obtain access to the OTC market. The clustering of financial institutions in NYC also facilitates banks' efforts to find a counterparty for trading CDS. The closer a bank's headquarter is to NYC, the more likely it will trade CDS.[12] We believe the distance satisfies the exclusion condition as bank capital regulations are not dependent on geographic locations of bank headquarters. We use U.S. banks for this instrumental variable approach.

To calculate the geographic distance between a bank's headquarters and NYC, we extract the city, state, and zip code of the bank's headquarters from Compustat and map the location to the

[12] From the organizational structure perspective, headquarter proximity to financial centers may facilitate a bank's decision to trade derivatives because the traders can communicate better with the top management. In the J.P. Morgan "London Whale" incident, the CEO Jamie Dimon acknowledged that the trading in London were "flawed, complex, poorly reviewed, poorly executed, and poorly monitored" (*Financial Times*, May 14, 2012).

latitude and longitude of the bank. We apply the Great Circle distance formula[13] to obtain the geographic distance. As discussed in Peterson and Rajan (2002), we use log(1+distance) to take into account the skewness in the distance variable. An alternative measure to the geographic distance between bank headquarters and NYC is an indicator variable measuring whether the bank is headquartered in a major financial center. NYC and Chicago are considered to be the two largest financial centers in the U.S. according to the International Financial Centers Development Index.[14] Internet Appendix Table IA3 shows that the probability that a bank will trade CDS decreases with its distance from NYC and is higher if it is headquartered in a financial center. The *F*-statistics are 35.83 and 42.45, rejecting the null hypothesis that the coefficients on the instruments are insignificantly different from zero, at the 1% level.

Our second instrument is based on prior theoretical and empirical work in the credit derivatives and banking literature. One major rationale for banks to use credit derivatives is to improve the diversification and manage concentration in their credit portfolios (Morrison, 2005). Additionally, banks that focus on a smaller group of firms or sectors may accumulate relatively more information on a borrower. This informational advantage and lending expertise may encourage a bank to initiate a CDS contract on the borrower's debt. Acharya and Johnson (2007) document insider trading in the CDS market by banks. We believe this instrument is valid as there is no clear relationship between loan concentration and bank capital according to the literature.[15] We use the Herfindahl-Hirschman Index to measure loan concentration (first

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[13] $$\text{Geographic Distance} = r \times \arccos[\sin(\text{latitude(bank)}) \times \sin(\text{latitude(NY)}) + \cos(\text{latitude(bank)}) \times \cos(\text{latitude(NY)}) \times \cos(\text{longitude(bank)} - \text{longitude(NY)})]$$

[14] http://en.wikipedia.org/wiki/International_financial_centre. Our results are similar if we also include Boston and San Francisco as major financial centers.

[15] Loan concentration has two offsetting effects on bank risk. On one hand, holding a concentrated loan portfolio may expose a bank to risks that are more correlated, increasing the impact of idiosyncratic shocks on the bank's loan portfolio; on the other hand, concentrated banks can gain expertise in the sectors or regions that they lend to, which

calculate the ratio of each loan relative to the total loan amount from the same bank in the same quarter, then sum the squared ratios). This measure is higher for more concentrated loan portfolios. Internet Appendix Table IA3 shows that banks with more concentrated loan portfolios are more likely to trade CDS.

The empirical results of the second-stage IV estimation with instrumented bank CDS trading are presented in Table III. The instrumented CDS-active bank variable are significantly related to bank capital ratios in all specifications, suggesting that the negative impact of CDS trading on the capital ratio is attenuated by the selection of banks into CDS trading. This finding provides evidence for our conjecture that banks have lower capital ratios after they begin CDS trading. The reduction in the capital ratio could be due to a reduction in the capital level (the numerator), an increase in RWA (the denominator), or both. Because the Basel capital accord allows banks to use credit derivatives to hedge and to substitute the asset risk weight with the (lower) insurer risk weight for the calculation of RWA, and such reductions in risk weights should lead to lower RWA and hence a higher capital ratio, all else equal. Therefore, this finding of lower capital ratios after bank CDS trading is striking.

C. CDS Trading and Quality of Bank Capital

In this subsection we focus on the numerator of the bank regulatory capital ratio. Specifically, we analyze the effect of bank CDS trading on capital quality, measured by the ratio of Tier 1 capital to total capital which consists of Tier 1, Tier 2 and Tier 3 capital. Table IV presents the regression results using the same specification on the right hand side as in the previous capital ratio analysis. The coefficients of the CDS-active bank dummy in the baseline regressions are

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may reduce risks from the loan portfolio. The Basel capital accord does not explicitly link regulatory capital to loan concentration, although the granularity of loan portfolio is often discussed by bank regulators.

negative and significant, indicating that the composition of bank capital tilts toward lower quality capital after a bank begins trading CDS. The Tier 1 capital to total capital ratio is 0.032 lower (or 4.26% lower relative to the mean of the ratio) for CDS-active banks than for banks that do not trade CDS. This difference is statistically significant at the 1% level after we control for bank fixed effects. The decline in capital quality remains robust in the instrumental variable estimations that use the fitted value of the CDS-active bank variable estimated from the instruments.

The 1996 Amendment of the Basel capital accord allows Tier 3 capital to be used for the market risk of the trading book. Many of the CDS positions are for trading purposes. The results in Table IV suggest that bank capital regulations during our sample period may have induced banks to shift from controlling risk to controlling capital ratios and RWA.[16] While the capital ratios remain unchanged, the growth in RWA is supported more by Tier 2 and Tier 3 capital than by core capital (Tier 1). Because there is no obvious trend in capital ratios, regulators may overlook the risk accumulated by banks ("regulatory arbitrage"). If banks pursue a strategy that controls or limits a specific risk target and if banks can do so independently of the impact of the strategy on other risk measures or the principles of common-sense risk management, then such a strategy would not effectively reduce risk but rather introduce new risks. Indeed, we find that capital quality is significantly worse for banks that trade CDS. One goal of Basel III is to "raise both the quality and quantity of the regulatory capital base."[17] Indeed, regulators closed the loopholes in previous capital regulations by (1) improving bank capital definitions, specifically,

[16] Sheila Bair, former chairman of the U.S. Federal Depository Insurance Corporation, has expressed her concern in the calculation of RWA: "The risk weightings are highly variable in Europe and have led to continuing declines in capital levels…There's pretty strong evidence that the RWA calculation isn't working as it's supposed to." (http://www.risk.net/risk-magazine/news/2081139/europe-lax-rwa-calculations-bair)

[17] See page 2 of "Basel III: A global regulatory framework for more resilient banks and banking systems".

abolishing Tier 3 capital, and by (2) including the leverage ratio (i.e., Tier 1 capital to total assets, rather than RWA, must be greater than 3%) into the capital accord.

Overall, our bank-level evidence indicates that banks' capital level and quality deteriorate after banks begin trading CDS. While neither the total capital ratio nor Tier 1 capital is significantly lower for CDS-active banks in the baseline regressions, the coefficients become significant after instrumentation. Moreover, the share of Tier 1 capital in total capital, which we use to measure capital quality, is substantially lower after CDS trading. One factor driving the decline in the capital ratios is the increased risky asset base of banks after they begin trading CDS. To corroborate this channel, we examine how CDS affect banks' lending practice at both the bank level and the loan level in the next section.

V. Bank Loan Portfolio and Lending Practice

To underpin the link between CDS trading and bank lending, we first investigate how bank-level loan issuance is affected by banks' CDS trading. Next, we examine how the terms of individual syndicated loans are affected by the introduction of CDS on a borrower's debt (hence available for lenders to trade). We then study how banks incorporate the availability of CDS on a borrower's debt into their lending practice based on their participation in the CDS market.

A. Bank CDS Trading and Lending: Bank-Level Evidence

The reduction in the bank capital ratio for CDS-active banks suggests increase in risk-weighted assets. Specifically, banks may expand their lending activities after they begin trading CDS. Panel A of Figure 2 plots the time series of borrowers' CDS market activities and the aggregate amount of syndicated loans issued to them over the period from 1997 to 2009. It illustrates the co-movement of CDS market activities and syndicated loan issuance over time.

Both loan issuance and CDS trading increase rapidly from early 2000 until mid-2007, when the credit crisis erupted. The Pearson correlation coefficient of the quarterly volume of syndicated loan issuance and the number of CDS trades in the borrowers' names is 0.59, significant at the 5% level. In addition, CDS trading is more active in the months leading up to loan initiation, as indicated by Panel B of Figure 2. The number of CDS trades peaks in the month of loan initiation and declines over the next six months. This finding suggests that banks may open a CDS contract referencing the borrower's debt when they initiate a new loan, consistent with the conjecture that banks use CDS for purposes related to loan issuance. A plausible explanation for this observation is that CDS trading facilitates bank lending. Alternatively, lenders may begin to trade CDS in anticipation of increasing loan issuance in the coming months. Changes in macro-economic conditions may also cause CDS and lending to grow simultaneously. These issues of reverse causality and spurious correlation are addressed after we show the baseline results.

Bank loan portfolios comprise various types of loans, such as C&I loans, home mortgages, consumer loans, of which C&I loans usually account for the largest percentage of total loans in terms of both issuance and outstanding amount. The mean share of C&I loans in total loans outstanding in our sample is 19.9%. In contrast to mortgage loans and consumer loans which are more often sold and securitized, C&I loans are more likely to be hedged with credit derivatives. Most liquid names in the CDS market are large, investment-grade U.S. firms and foreign multinational companies (Minton, Stulz and Williamson, 2009; Loutskina and Strahan, 2009; Wang and Xia, 2014). Securing lending relationships with such high-quality firms with repeated financing needs is considerably valuable to banks. Using CDS allows banks to hedge against their credit exposures while maintaining their relationships with borrowers. Thus, we expect that C&I loans are most likely to be affected by banks' use of CDS that reference corporate names.

Table V shows a positive relationship between banks' share of C&I loans in their total loan portfolios and their CDS trading. The ratio of C&I loans to total loans is 0.015 higher (or 7.6% higher relative to the mean) for CDS-active banks than for CDS-inactive banks when we control for bank fixed effects and other bank characteristics. The findings regarding C&I loans help distinguish CDS effects from securitization. Mortgage and consumer loans are securitized more frequently than corporate loans; therefore, securitization is more likely to increase the issuance of mortgage and consumer loans. Our finding concerning the larger share of C&I loans in the total loan portfolio corroborates the effects of CDS.

To further understand banks' lending practices, we examine *Loan Loss Provision*, the allowance set aside for a bank's expected loan loss. This measure is a bank's own estimate of loan portfolio risk; banks are prepared to absorb such losses using their own capital. A higher loan loss provision suggests that banks are aware of the additional risks they are taking on through lending. Table V shows that loan loss provision for CDS-active banks is 0.001 higher (or 25% higher relative to the mean) than that for CDS-inactive banks. This finding suggests that banks knowingly use CDS to assume greater risks via increasing risky lending.

B. Borrower CDS and Loan Terms: Loan-Level Evidence

Now we turn our attention to individual loans extended to CDS-referenced corporations. We use a difference-in-differences estimator to examine the CDS effect on the initial loan terms. The first difference is between firms whose debt is referenced by CDS contracts ("CDS firm") versus firms whose debt is not referenced by CDS contracts. The second difference is for CDS firms after CDS trading begins ("CDS Trading") versus before the trading begins. Specifically, we estimate the following panel regressions:

$$\begin{aligned}\text{Loan Amount}_{it}\,(\text{or Loan Spread}_{it}) = \alpha + \beta_1 \text{CDS Trading}_{it} + \beta_2 \text{CDS Firm}_{jt} + \gamma_1 X_{1it} + \gamma_2 X_{2jt-1} \\ + \gamma_3 \text{Year Fixed Effects}_t + \gamma_4 \text{Industry Fixed Effects}_j \\ + \gamma_5 \text{Loan Purpose Fixed Effects}_{it} + \varepsilon_{it}\end{aligned} \quad (2)$$

where subscript i denotes the loan, subscript j denotes the borrowing firm, and subscript t denotes the quarter of loan issuance. We classify borrowers into 2-digit SIC industries. The dependent variables—loan amount and spread—are observed at loan initiation. We scale the loan amount by firm assets in the quarter prior to loan origination. The key independent variable of interest is *CDS Trading*, which equals one if the issuer's debt is referenced in a CDS at loan initiation and zero otherwise. We use *CDS Firm*, a dummy equal to one if the borrowing firm has active CDS trading at *any* point during the sample period, to account for potential unobservable differences between CDS and non-CDS firms. CDS traders could be lenders or other market participants. The existence of referenced CDS contracts indicates an opportunity for the lender to trade its borrower's CDS contracts.

Following prior studies such as Sufi (2007) and Cerqueiro, Degryse, and Ongena (2011), we include other typical determinants of loan amounts and spreads. The first set of control variables, X_{1it}, includes loan characteristics, such as maturity and syndicate size (the number of syndicate lenders), and indicators for loan security, multiple tranches, loan type, and loan purpose. The other set of control variables, X_{2jt-1}, includes firm characteristics that are measured at the end of the quarter prior to loan initiation, including the logarithm of total assets, market-to-book ratio, sales-to-total assets ratio, cash-to-total assets ratio, leverage, tangibility, S&P long-term issuer rating, and Altman's Z-score. In all the specifications, we include fixed effects for the loan issuance year and the borrower 2-digit SIC industry. Finally, all standard errors are clustered at the firm level to account for correlations among loans to the same firm.

Table VI presents the estimation results for loan amount (Panel A) and loan spreads (Panel B) based on the sample of syndicated loans.[18] The coefficient estimates of *CDS Trading* in both the amount and spread regressions are positive and statistically significant. Following Ashcraft and Santos (2009) and Saretto and Tookes (2013), we exclude *CDS Firm* in column 2 because *CDS Trading* and *CDS Firm* are correlated. The coefficient estimates from column 1 in Panel A indicate that the presence of CDS trading increases the average loan amount scaled by firm size by 14.5% (or by 36.5% relative to the mean). Column 1 of Panel B shows that the average loan spread for a CDS-referenced borrower is 15.5 basis points higher (or 9.14% higher relative to the mean) than that of similar firms not referenced with CDS.

The amount and spread of loans can be determined jointly, and we estimate the two equations simultaneously by using a two-stage least-squares regression. Note that the potential simultaneity of the amount and price occurs at the firm level, i.e., the spread charged by the lender may be associated with the loan amount to which it pertains, but it may not be affected by the loan amount of the firm's industry peers. Therefore, we include the average loan amount for the industry in the loan amount regression and average spread for the industry in the spread regression. These industry variables are used as identifications. The estimation results in Appendix Table IA5 indicate that the CDS effect remains robust in the simultaneous equations.

Our baseline results are also robust to the treatment of endogeneous CDS trading. Following Saretto and Tookes (2013), Subrahmanyam, Tang, and Wang (2014), we instrument CDS trading with lender foreign exchange hedging activities and the presence of bond market. Table IA6 of the Internet Appendix shows that the probabilities of CDS trading on the reference firms are positively associated with lender foreign exchange derivatives position and the existence of

[18] We conduct the same analysis with the full sample of syndicated loans and sole-lender loans. The results, reported in Table IA4 of the Internet Appendix, are qualitatively similar.

public bonds. The 2SLS estimation with instrumental variables (Table IA7 of the Internet Appendix) and propensity score matching results (Table IA9 of the Internet Appendix) show that CDS trading has causal effects on loan size and loan spreads. More details of the instrumental variable and estimation results are provided in the Internet Appendix.

C. CDS Lending: CDS-active Banks versus CDS-inactive Banks

To explore whether the effect of CDS on loan contract terms is related to changes in banks' lending strategies, we examine loans from CDS-active and CDS-inactive banks separately. One data limitation for our study is that we observe banks' total credit derivatives positions only, not their CDS positions on individual firms. One implicit assumption that we make is that banks trade CDS referencing their borrowers. However, when a CDS-inactive bank lends to a CDS firm, borrower CDS should not influence the bank's lending decisions.[19] Therefore, we investigate how the effects of CDS trading on loan terms depend on banks' CDS trading activities. The findings can help differentiate banks' CDS-related lending strategies from their general lending strategies.

Because CDS-active banks usually make more loans than CDS-inactive banks, we choose banks of similar size to provide a sensible comparison. Specifically, we match each CDS-active bank with the CDS-inactive bank that is most similar in total assets. Then, we extract the loans originating from each paired bank in the same quarter. To ensure the robustness of our findings, we also conduct the analysis on the entire sample of banks and on all loans without the matching requirement. Table IA10 of the Internet Appendix reports results similar to the matched sample results in Table VII.

[19] There are possible spillover effects. For example, a CDS-inactive bank changes its own lending practice because competing banks begin trading CDS and the competing banks lend to a CDS firm. We do not rule out this possibility in this paper; however, we focus on the direct effects of CDS trading on the bank's lending strategies.

Table VII shows that the incremental CDS effects on loan amounts are exclusively due to CDS-active banks: Model 2 shows that the point estimate is significant for *CDS Trading* but not for *CDS Firm*, which suggests that the effect is due to the actual availability of CDS on a borrower at the time of initiation rather than certain characteristics of CDS firms that make them CDS referenced. Model 3 in Table VII shows that the size of loans issued by CDS-inactive banks is not affected by the presence of CDS on their borrowers' debt. The results for loan spreads are also only significant for CDS-active banks. Therefore, although CDS-active banks treat CDS borrowers differently from non-CDS borrowers, CDS inactive banks do not make this distinction. The results from the subsamples of CDS-active banks and CDS-inactive banks help us identify the channel for the CDS effect, which provides additional evidence that CDS induce banks to change their lending practices.

Why do CDS-active banks differentiate CDS-referenced borrowers from non-CDS borrowers? One possibility is that banks pass on the costs associated with CDS trading along to borrowers. CDS-active lenders may reduce their screening and monitoring efforts and may simply protect themselves with higher loan rates (Parlour and Winton, 2013). To assess this possibility, we examine the lending standard measure from the Federal Reserve's Senior Loan Officer Opinion Survey on Bank Lending Practices. Lending standards are lower when banks more actively trade CDS, as shown by Figure 3.[20] Another possibility is that CDS-referenced borrowers become riskier after banks begin trading in their contracts, as documented by Subrahmanyam, Tang, and Wang (2014). Figure 4 shows a negative correlation between loan quality, as measured by Altman's Z-score, and the lender's derivatives position (the Pearson correlation is -0.74, which is significant at the 1% level). This negative correlation also holds in the multivariate regressions

[20] The tightness of lending standards is measured by the net percentage of bank officer respondents who report that the lending standard for C&I loans is tight.

reported in Table IA11 of the Internet Appendix, revealing that the credit quality of CDS-referenced borrowers, measured by the S&P long-term issuer rating, is lower at loan issuance and deteriorates thereafter.

The evidence suggests that banks that are active in the CDS market reduce their lending standards and cater to riskier borrowers. Anticipating such a change in borrower credit quality, CDS-active banks charge higher loan spreads. CDS-inactive banks may not be aware of borrower CDS status and do not price in the CDS effects. Although CDS-inactive banks may implicitly take on risk associated with CDS-referenced borrowers, one caveat is that we do not observe changes in the borrower base along the dimension of CDS availability for CDS-inactive banks. Overall, CDS-referenced borrowers receive larger loans from CDS-active banks, albeit at higher costs, and thus, they become riskier subsequently.

VI. Bank Risk, Return, and the 2007-2009 Credit Crisis

A. Lending to CDS-referenced Borrowers and Bank Risk

Thus far, we have shown that banks lend more aggressively after they begin CDS trading. Moreover, the lower capital ratio of CDS-active banks suggests that the additional risk taken by banks is not fully hedged by CDS. A further question is whether the increased risky lending translates to higher risk profiles for lending banks.

To quantify the effect, we regress bank-level risk measures on the amount of loans issued to CDS-referenced firms in the prior year. We use both accounting-based measure, *Bank Z-score*, and the market-based measure, *distance-to-default*, for bank risk.[21] To mitigate the concern that loan issuance volume to CDS firms simply captures the effect of bank size, we scale this loan

[21] As a robustness check, we employ a broader set of variables to measure bank risk, including net interest margin volatility, ROA volatility, and stock return volatility. We obtain consistent results with these measures.

volume by the aggregate loan issuance to both CDS and non-CDS firms by the same bank in the same year; essentially, we measure the relative loan size to CDS firms as a share of the bank's total loan portfolio.

Table VIII reports the estimation results. It demonstrates that banks that lend more to CDS-referenced borrowers have lower Z-scores. Lending to CDS firms increases a bank's default risk, which is indicated by the negative coefficient on distance-to-default. A one-standard-deviation increase in the loans to CDS firm ratio leads to a 0.059 decrease (or 1.69% decrease relative to the mean) in the Z-score and a 0.503 decrease (or 7.04% decrease relative to the mean) in distance-to-default when we control for bank characteristics and bank fixed effects. Therefore, the more a bank lends to CDS-referenced firms, the riskier it is.

B. Effects of Bank CDS Trading on Bank Risk and Operating Performance

Table IX presents the estimation results of the regression of the bank risk measures on bank CDS trading. The negative coefficient estimate for *CDS Active Bank* in column 1 suggests that, *ceteris paribus*, CDS-active banks are less financially sound than CDS-inactive banks. The effect of CDS trading is also economically significant: Z-scores are on average 11.2% lower for CDS-active banks than for CDS-inactive banks. Column 2 shows that, among publicly listed banks, distance-to-default is significantly shorter for CDS-active banks than for CDS-inactive banks. We control for bank fixed effects in both specifications to ensure that we capture within-bank changes over time. We apply the same model to two alternative samples: (1) all Compustat banks and (2) all sample banks excluding those largest ones (with deposits exceeding 10% of the total deposits aggregated across all banks in the same quarter). We obtain similar results, as shown in Internet Appendix Table IA12.

Overall, our findings suggest that banks become riskier—based on typical measures of bank risk—after they begin trading CDS, with other bank characteristics controlled for in the regressions. These results are contrary to the risk management role of CDS, as the proper use of CDS for risk transfer and diversification purposes would have improved banks' balance sheets.

In addition, lending of CDS-active banks becomes less sensitive to negative shocks to the loan portfolio, as Internet Appendix Table IA13 shows. Table IA13 reports the regression results of loan spread on default events in the state in which the bank is headquartered and in the bank's loan portfolio. The coefficients on the interaction terms of CDS-active bank and the default indicators are all negative. A default event, whether occurring in the same state or in the same lender portfolio, typically leads to an increase in spreads (as reflected by the positive coefficients on the standalone default indicators, consistent with Murfin (2012)), as lenders tighten their lending standards and increase the cost of loans. However, this increase in spreads associated with shocks to bank portfolio is not experienced by CDS firms. This finding further suggests that banks become more aggressive in lending once CDS are available as lending becomes less dependent on loan performance.

CDS-referenced borrowers may benefit from CDS market, which mitigates adverse effect of negative shocks to a bank's loan portfolio and improves a bank's resilience to adverse events. Therefore, financing to CDS firms is more stable and less susceptible to negative banking shocks and bank performance.

We further analyze whether CDS have any real effects on banks' operating performance. We focus on the net interest margin and ROA. We regress these operating performance measures on banks' CDS status. Table X reports the regression results. Column 1 shows that CDS-active banks have higher net interest margins than CDS-inactive banks during our sample period. The

net interest margin refers to a bank's interest income less the interest paid out to its financiers, scaled by its interest-earning assets. The higher net interest margin for CDS-active banks is consistent with the finding of higher interest rate paid by CDS-referenced firms. The ROA difference is insignificant, as shown in column 2. We examine the effects of lending to CDS firms in columns 3-6. Columns 3 and 4 show that lending to CDS firms raises net interest margins and ROA for CDS-active banks. A one-standard-deviation increase in the ratio of loans to CDS firms leads to a 2.48% increase in the net interest margin and a 0.88% increase in ROA for CDS-active banks. The results suggest that once a bank has access to a facility to trade CDS, the bank uses this facility in its loan supply to a greater extent and generates more profits. For CDS-inactive banks, more lending to CDS firms has no effect on either the net interest margin or ROA. Overall, CDS increase both bank risk and bank returns.

C. Bank Capitalization and Lending during the 2007-2009 Credit Crisis

After showing the evidence of CDS effects on bank capital, lending, and risk over the entire sample period, we examine whether banks react differently to the credit crisis depending on their CDS positions in the pre-crisis period. It is worth highlighting the interaction between bank risk taking and CDS during the 2007-2009 credit crisis. Banks' CDS positions peaked at the beginning of 2008 and subsequently declined precipitously. Banks held substantially fewer CDS positions during the crisis. During this period, several banks failed. One prominent example is Wachovia, which was an active CDS user. Shocks to the CDS market during the crisis, particularly after the bankruptcy of Lehman Brothers and the bailout of AIG, should both change banks' understandings of the function of CDS and limit their further use of CDS. We thus expect banks that previously traded CDS to rein in their risk-taking activities during the credit crisis.

C.1. Bank Capital

If banks retain lower buffer levels of regulatory capital ratios because of CDS, they may need to raise additional capital during crisis periods because CDS become less available.[22] According to data from the ISDA 2009 mid-year market survey, total outstanding CDS fell to $31.2 trillion at the end of June 2009, representing a substantial decline from the peak of $62.2 trillion at the end of 2007. CDS protection also became more expensive during the crisis. For example, investment-grade corporate credit spreads, as measured by the CDX.IG index, increased from 50 basis points in early 2007 to more than 250 basis points at the end of 2008. Even AAA-rated synthetic credit products, which were considered nearly risk free prior to the crisis, saw their spreads widen dramatically during the crisis. Simultaneously, regulators became more concerned with bank soundness and strengthened bank capital regulations.[23] Both CDS-active and CDS-inactive banks may have had to raise capital owing to the heightened downside risk during the crisis, but we expect CDS-active banks to increase capital to a greater extent than CDS-inactive banks to support their risk exposure and to fulfill regulatory requirements, as CDS-active banks begin with lower capital ratios and riskier loan portfolios than CDS-inactive banks in normal periods, and can no longer rely on CDS for capital relief.

Panel A of Table XI reports the estimation results of a regression of banks' regulatory capital ratios during the crisis on their pre-crisis CDS statuses. Following Ivashina and Scharfstein (2010), we separate the crisis into two phases: July 2007 to August 2008 as Phase 1 ("Crisis 07-08") and September 2008 to June 2009 as Phase 2 ("Crisis 08-09"), with the collapse of Bear Stearns and the bankruptcy of Lehman Brothers as the watershed events for Phase 1 and Phase 2,

[22] Federal officials announced on May 7, 2009, that 10 of the largest banks in the U.S. would need to raise a total of $74.6 billion in capital (http://money.cnn.com/2009/05/07/news/companies/stress+test_Announcement). On June 3, 2009, FDIC Chairman Bair stated that "Banks have been able to raise capital without having to sell bad assets through the Legacy Loans Program" (http://www.fdic.gov/news/news/press/2009/pr09084.html).
[23] The news release is available at: http://www.federalreserve.gov/newsevents/press/bcreg/20081112a.htm

respectively. Table XI shows that CDS-active banks increased their capital ratios during the second phase of the crisis (i.e., post-Lehman) relative to the first phase of the crisis and the pre-crisis period. The results are consistent when we use both the total capital ratio and the Tier 1 capital ratio. The results are also robust when we recast the pre-crisis window from 2005Q3 to 2007Q2. Following Fahlenbrach and Stulz (2011) and Beltratti and Stulz (2012), we use the entire sample for columns 1 and 2 but use only the 2005-2007 data as the pre-crisis period for columns 3 and 4. Compared with the pre-crisis period of 2005Q3 to 2007Q2, the average total capital ratio for CDS-active banks increased by 0.006 during the first phase of the crisis; this increase is statistically insignificant. However, the total capital ratio significantly increased by 0.016 during the second phase of the crisis. The findings for the Tier 1 capital ratio are similar. Our findings indicate that banks that took CDS positions prior to the crisis reined in their risk taking to a greater extent than banks that were not trading CDS by bringing capital back onto their balance sheets.

C.2. Bank Lending

Raising capital may not be sufficient to maintain a bank's stability during crisis. Banks may have to reduce their risky assets. Panel B of Table XI reports the results of regressing new loan issuance on CDS-active banks during the crisis. The dependent variables are the ratio of total loan issuance in column 1 and the ratio of revolver issuance in column 2, both scaled by total assets in the previous quarter. The regression sample includes 937 observations because we restrict the sample to the period from 2005 to 2009. The coefficients of the interaction term of CDS-active bank and the crisis are negative and statistically significant. For instance, in column 2 of Panel B, the average revolver issuance by CDS-active banks is 1.1% lower during the first phase of the crisis and 1.6% lower during the second phase of the crisis relative to that during the

pre-crisis period. Overall, CDS-active banks reduced lending to a greater extent than CDS-inactive banks during the crisis.[24]

Our results reveal that CDS-active banks experienced larger declines in new loan issuance during the crisis than CDS-inactive banks. These results suggest that the availability of CDS may exacerbate the procyclicality of credit supply. The borrowers of CDS-active banks suffered more than borrowers of CDS-inactive banks because their lenders reduced lending to a greater extent. Although CDS-active banks increased their capital levels, their increased capital levels might not have been sufficient to accommodate their risk levels because they extended more risky loans prior to the crisis, which are supported by a well-functioning CDS market. The role of CDS in risk transfer and capital reduction became limited when the crisis erupted; thus, banks became more conservative by raising capital and reducing loan issuance. Moreover, the crisis impact on lenders is likely passed on to their borrowers.

D. Stock Market Reaction to Bank CDS Trading in Normal and Crisis Periods

We use the stock market reaction to examine whether the ex post remediation was sufficient to compensate for banks' risk-taking activities prior to the crisis. We follow Beltratti and Stulz (2012) in regressing bank stock returns on pre-crisis CDS positions. Table XII presents the regression results. The first column shows that banks that were active in CDS trading during the second quarter of 2008 underperformed their counterparts that were not active in CDS trading by 24.5% in terms of buy-and-hold returns in 2008Q3-Q4, after we control for other factors that may affect stock returns. The second column shows that banks that were active in the CDS

[24] The crisis dummies have negative coefficients, suggesting that all banks (including both CDS-active and CDS-inactive banks) reduced lending during the crisis. Ivashina and Scharfstein (2010) document that new loans to large borrowers during the peak period of the financial crisis (fourth quarter of 2008) fell by 79% relative to the peak of the credit boom and by 47% relative to the prior quarter. Puri, Rocholl, and Steffen (2011) find that German banks affected by U.S. subprime crisis reduced credit supply more than unaffected banks during the credit crisis.

market before the onset of the crisis in 2007Q2 experienced significantly larger stock price declines during the entire crisis period from 2007Q3 to 2009Q2. The second phase of the crisis, hallmarked by the bankruptcy of Lehman Brothers, contributes to most of the underperformance of these banks.

If CDS-active banks are ex post punished by their exposure to the CDS market, which was brought to a halt during the crisis, are there any benefits from CDS trading for banks? In other words, are banks rewarded for trading CDS during normal periods by earning more profits and higher stock returns? Column 3 of Table XII reports the estimated relationship between banks' buy-and-hold returns from mid-2006 to mid-2007 and banks' CDS activity in the second quarter of 2006. Banks that were active in CDS trading in 2006Q2 outperform CDS-inactive banks by 10% in the subsequent year. Shareholders may thus believe that CDS trading increases a bank's value and may react positively. The outperformance in the stock market provides a rationale for banks' CDS trading, and this result is consistent with our previous findings that CDS-active banks are riskier in the full sample period.

This finding indicates that participating in the CDS market may create value for bank shareholders in tranquil times but exposes them to risks during crisis periods. CDS market suddenly became illiquid when the crisis erupted, leaving banks that relied on them for lending in the pre-crisis period unable to find protection at economically sensible prices for the risky loans that they had already extended. Our findings are consistent with the view expressed in Beltratti and Stulz (2012) that bank decisions that may create more value during normal periods can be associated with negative realizations during crisis periods. Moreover, as firms become riskier after the introduction of CDS (Bolton and Oehmke, 2011; Subrahmanyam, Tang and

Wang, 2014), CDS-referenced firms are more likely to default on the loans that they obtained during a credit boom, which might diminish the performance of their lenders.

VII. Conclusion

We examine how banks' use of credit default swaps (CDS) affects their capitalization and lending. In contrast to regulators' aspiration of allowing banks to use CDS to improve capital adequacy, we find that regulatory risk-weighted capital ratios are *not* improved for CDS-active banks. In fact, the quality of capital is lower for CDS-active banks than for CDS-inactive banks. When we account for the selection of banks into CDS trading, the regulatory capital ratios of CDS-active banks are indeed lower than CDS-inactive banks. Both the bank-level and the loan-level evidence show that CDS-active banks engage in riskier lending. The loan size is larger and the loan spread is higher when a borrower's debt is referenced by CDS. Moreover, this effect of CDS on borrower loan terms is significant only if the lead lender is an active CDS user. The more aggressive lending practice ultimately translates to higher bank risk levels according to both accounting-based and market-based bank risk measures.

Banks that were active in CDS market at the onset of the crisis raised more capital and contracted their lending to a greater extent than CDS-inactive banks during the 2007-2009 financial crisis. Further, CDS-active banks showed worse stock performance than CDS-inactive banks during the crisis. However, CDS-active banks had better pre-crisis financial and operating performance than their counterparts; thus, banks may be rewarded with higher returns by using CDS to take on more risk during tranquil periods. We conclude that CDS induce banks to use lower quality capital and facilitate credit expansion through riskier bank lending.

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Appendix: Variable Definitions

Variable Name	Description
Bank-Level Variables	
Bank Z-score	$(ROA + CAR)/\sigma(ROA)$, where ROA is return-on-assets measured on quarterly basis; CAR is bank capital ratio measured at the end of the same quarter; $\sigma(ROA)$ is the standard deviation of ROA in the past four quarters
Beta	Beta calculated from the CAPM model using monthly stock return
C&I Loans/Total Assets	Commercial and industrial loans relative to the bank's total assets in the same quarter
CDS Active Bank	A dummy equal to one if the bank takes a non-zero CDS long or short position in a given quarter, and zero otherwise. The CDS data for U.S. banks are extracted from FR Y-9C report, in which CDS long position is reported by variable BHCKC969 (the bank as the beneficiary) and CDS short position is reported by variable BHCKC968 (the bank as the guarantor). The CDS data for foreign banks are extracted from OCC report, in which CDS long position is reported as "CDS bought" and CDS short position is reported as "CDS sold"
CDS Inactive Bank	Banks that hold zero CDS position in a given quarter
CDS Net Position	A bank's CDS long position (the bank as the beneficiary) – CDS short position (the bank as the guarantor)
CDS Total Position	A bank's CDS long position (the bank as the beneficiary) + CDS short position (the bank as the guarantor)
Deposits/Total Assets	The ratio of the sum of domestic deposits and foreign deposits relative to the bank's total assets
Deposits/Total Liabilities	The ratio of the sum of deposits and foreign deposits relative to the bank's total liabilities
Distance between Bank and NY	The geographic distance from the headquarter of a bank to the New York City, calculated following the Great Circle distance formula: $\text{Geographic Distance} = \text{r} \times \text{arcos}[\sin(\text{latitude(bank)}) \times \sin(\text{latitude(NY)}) + \cos(\text{latitude(bank)}) \times \cos(\text{latitude(NY)}) \times \cos(\text{longitude(bank)} - \text{longitude(NY)})]$
Distance-to-Default	Following Bharath and Shumway (2008), a naive distance-to-default is calculated from the below formula: $DD_{Naive} = \frac{\ln[(E+F)/F] + (r_{t-1} - 0.5 * Naive\sigma_v^2)T}{Naive\sigma_v\sqrt{T}}$, where E is equity value equal to shares outstanding multiplied by stock price, F is the book value of debt, r_{t-1} is the stock return over $t-1$, σ_v is asset volatility, T is the forecasting horizon, $\text{Naive}\,\sigma_V = \frac{E}{E + \text{NaiveD}}\sigma_E + \frac{\text{NaiveD}}{E + \text{NaiveD}}\sigma_D$, $\sigma_D = 0.05 + 0.25 * \sigma_E$ and $\text{NaiveD} = F$
Loan Loss Provision	The ratio of expense prepared for potential loan loss relative to total pre-tax income
Loan to CDS Firm Ratio	The issuance amount of syndicated loans to CDS firms relative to total syndicated loan issuance amount from the same bank in the same year
Total Loans /Total Assets	A bank's total outstanding loan amount relative to the bank's total assets
Loan Concentration	The sum of the squared ratio of individual loan amount out of the bank's total loan portfolio in the same quarter
Market Share	The percentage of a bank's total deposits relative to the total deposits of all bank holding companies in the same quarter
Market Value	Stock price multiplied by the number of shares outstanding
Net Interest Margin	The difference between the interest income and the amount of interest paid out to their lenders, relative to the amount of their interest-earning assets, measured on quarterly basis
Net Interest Margin Volatility	The standard deviation of quarterly net interest margin in the past four quarters prior to the bank-quarter

Non-Interest Income /Total Operating Income	The ratio of non-interest income relative to the bank's total operating income
ROA	The ratio of quarterly net income before extraordinary items to total assets
ROA Volatility	The standard deviation of quarterly ROA in the past four quarters prior to the bank-quarter
Risk-Weighted Total Capital Ratio	The ratio of total capital over risk-adjusted total assets
Tier 1 Capital Ratio	The ratio of Tier 1 capital relative to risk-weighted total assets
Sales Growth	The logarithm of the ratio of sales (revenue) at quarter *t* relative to sales at quarter *t-1*
Firm-Level Variables	
Cash/Total Assets	The ratio of the sum of cash, cash equivalents and short-term investment relative to total assets
CDS Firm	A dummy indicating that the firm ever had an active CDS market referencing its debt during the sample period
CDS Trading	A dummy indicating that the firm has an active CDS market referencing its debt in the quarter of loan initiation
Firm Age	The number of years as of the date when the firm first appeared in Compustat
FX Derivatives	The amount of foreign exchange derivatives used for hedging purpose relative to the amount of loans of the lead banks that the firm has borrowed from in the past five years
Has Other Derivative Positions for Hedging/Trading	A dummy indicating that the bank takes position in derivatives linked to equity, interest rate, foreign exchange or commodity for hedging or trading purposes
Leverage	(Short-term Debt+0.5*Long-term Debt)/Total Assets
Number of CDS Trades	The number of trades in CDS contracts referencing a borrower's debt in a given quarter
Rated	A dummy indicating whether the issuer of a loan is has a S&P long-term issuer rating at the time of loan initiation
Sales/Total Assets	The ratio of total sales relative to total assets
Tangibility	The ratio of tangible assets to total assets
Z-score	Z-score developed by Altman (1968) calculated from the formula Z=1.2*Working Capital/Total Assets+1.4*Retained Earnings/Total Assets+3.3*EBIT/Total Assets+0.6*Market Value of Equity/Book Value of Total Liabilities+0.999*Sales/Total Assets
Loan-Level Variables	
CP Backup	A dummy indicating that the purpose of loan is for commercial paper backup
Debt Refinancing	A dummy indicating that the purpose of loan is to refinance debt
Loan Amount/Total Assets	The ratio of loan issuance amount (aggregated amount across facilities/tranches) at loan (package) level relative to the borrower's total assets at the end of the quarter prior to loan initiation
Loan Spread	The loan (package) level all-in-drawn spread averaged across facilities/tranches.
Maturity	Maturity in years averaged across tranches at loan (package) level
Multiple Lead Arrangers	A dummy indicating whether there are multiple lead lenders in a loan syndicate
Number of Lenders	The number of lenders, including the lead arranger and participating banks, in a loan syndicate
Performance Pricing	A dummy indicating whether the loan has performance pricing clause
Secured	A dummy indicating whether the loan is secured by collateral
Takeover	A dummy indicating whether the purpose of a loan is for corporate takeover
Term Loan	A dummy equal to one if at least half of the tranches included in the loan are term tranches
Working Capital	A dummy indicating whether a loan is issued for the purpose of financing working capital

Figure 1. CDS and Changes in Bank on and off Balance Sheet Items

This figure illustrates changes in the composition of a bank's balance sheet before and after it started trading CDS. The yellow blocks to the left of the balance sheets are off-balance sheet items. For on balance sheet items, the height of each block represents the percentage of the amount of each component relative to the total book value of assets on the balance sheet. The width of the blocks represents the size of the balance sheet.

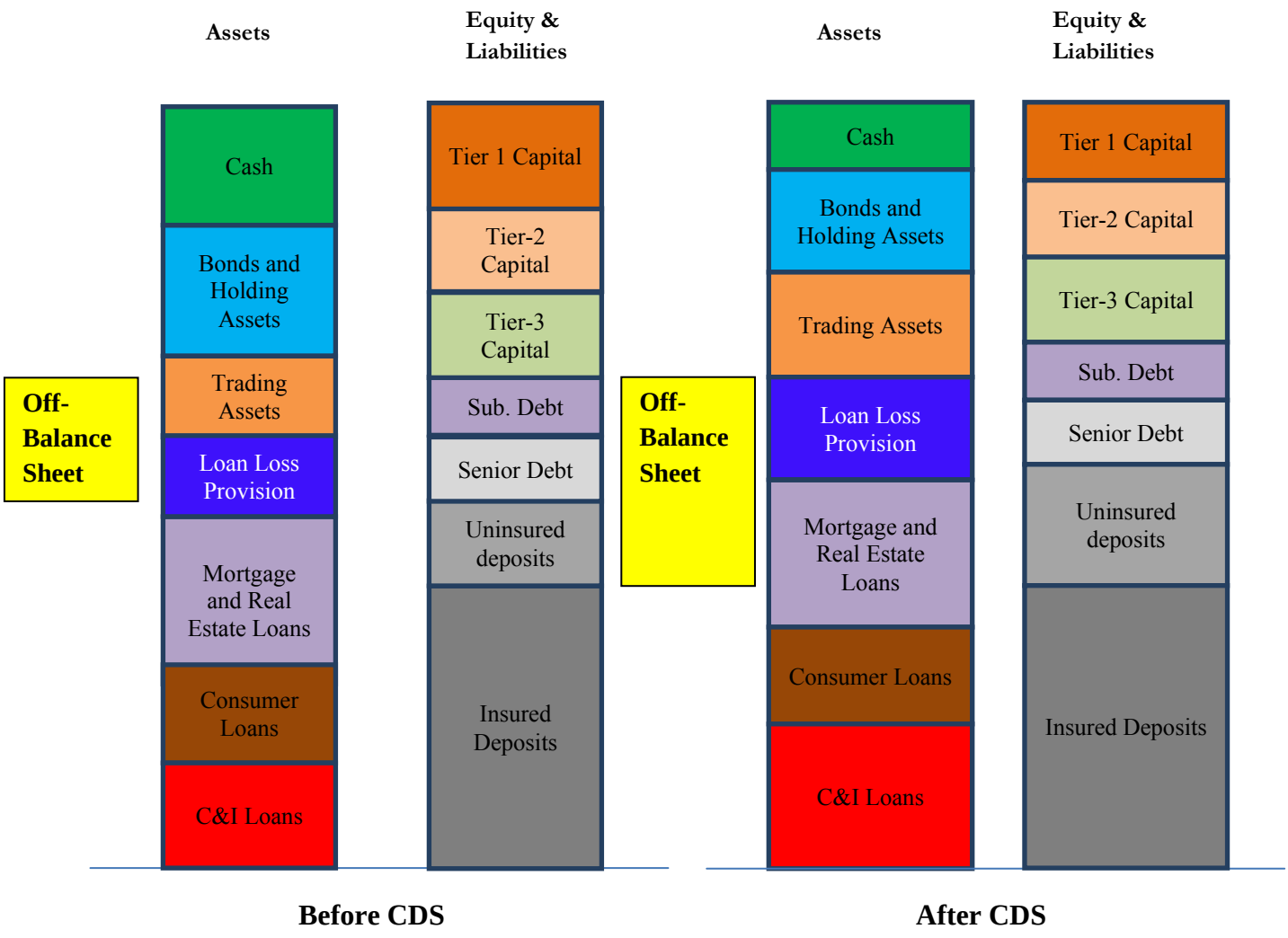
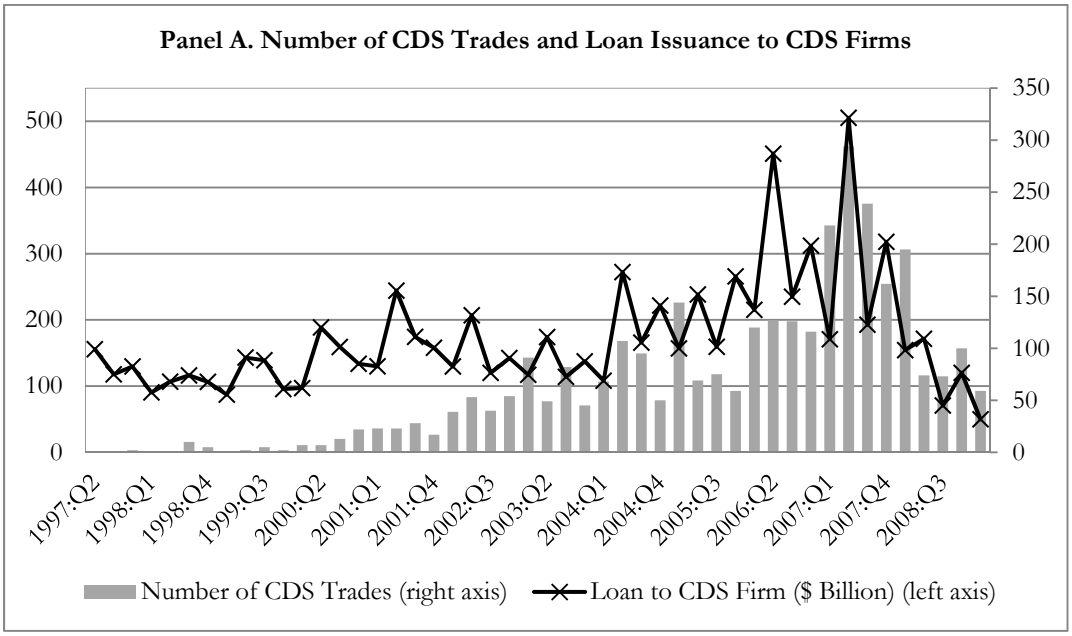


Figure 2. Number of CDS Trades and Syndicated Loan Issuance to CDS Firms

This figure plots the relation between CDS trading and syndicated loan issuance to CDS-referenced firms. Panel A plots syndicated loan issuance amount to CDS firms and the number of CDS trades referencing the borrowers' debt by quarter over the period 1997Q2-2009Q1. The line with stars represents the aggregate amount of syndicated loans to CDS firms (left y-axis). The bars represent the total number of CDS trades referencing the borrowers' debt (right y-axis). CDS firms refer to firms that have active CDS market referencing its debt in the quarter of loan initiation. Panel B plots the quantity of CDS trading referencing the borrower's debt in month [-6, +6] around loan initiation, averaged across loans to CDS firms. Bars represent the average number of outstanding CDS contracts (left axis); the line with stars represents the average number of CDS trades (right axis). Number of CDS trades data are extracted from CreditTrade and GFI database. CreditTrade data cover the period from June 1997 to March 2006. GFI data cover the period from January 2002 to April 2009. Syndicated loan amount data are extracted from Dealscan.



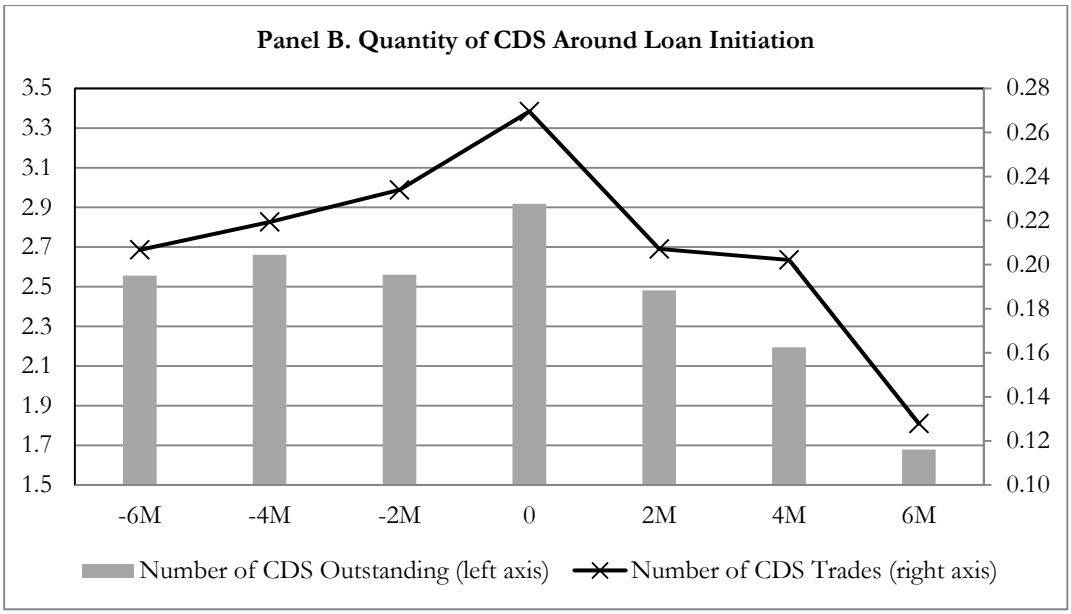
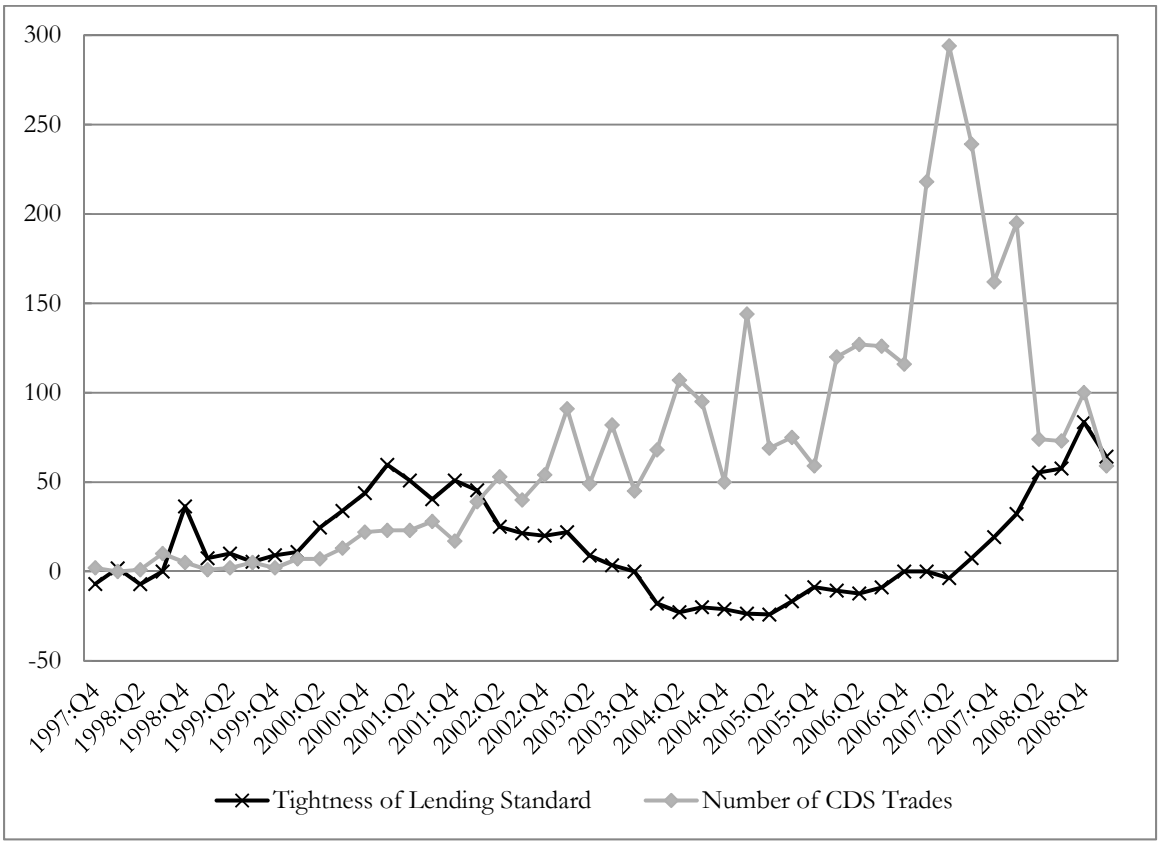


Figure 3. Number of CDS Trades and Bank Lending Standard

This figure plots the number of CDS trades and bank lending standard by quarter from 1997Q4 to 2009Q1. Lending standard information is extracted from Senior Loan Officer Opinion Survey on Bank Lending Practices reported by Federal Reserve Board. The tightness of lending standard is measured by the net percent of respondents that report the lending standard for C&I loans is tight. This number is within [-100, 100]. CDS trades data are from CreditTrade and GFI database, available from June 1997. We start the plot from the fourth quarter of 1997 since the number of CDS trades is zero for the second and third quarter of 1997.



Data source for tightness of lending standard: http://www.federalreserve.gov/boarddocs/snloansurvey/.

Figure 4. Bank CDS Position and Loan Quality

This figure plots borrowers' average Altman's Z-score at loan initiation and their lead lenders' average CDS total outstanding position by quarter over the period 1998Q3 to 2010Q1. We plot CDS position of lead lenders active in CDS trading in the quarter of loan initiation. The black line with stars represents their borrowers' average Altman's Z-score at loan initiation (left y-axis). The grey line with diamonds represents the banks' average CDS position (right y-axis). Banks' CDS position information is extracted from Federal Reserve Consolidated Financial Statements for Bank Holding Companies (FR Y-9C) and the Office of the Comptroller of the Currency (OCC) Quarterly Report on Bank Derivatives Activities.

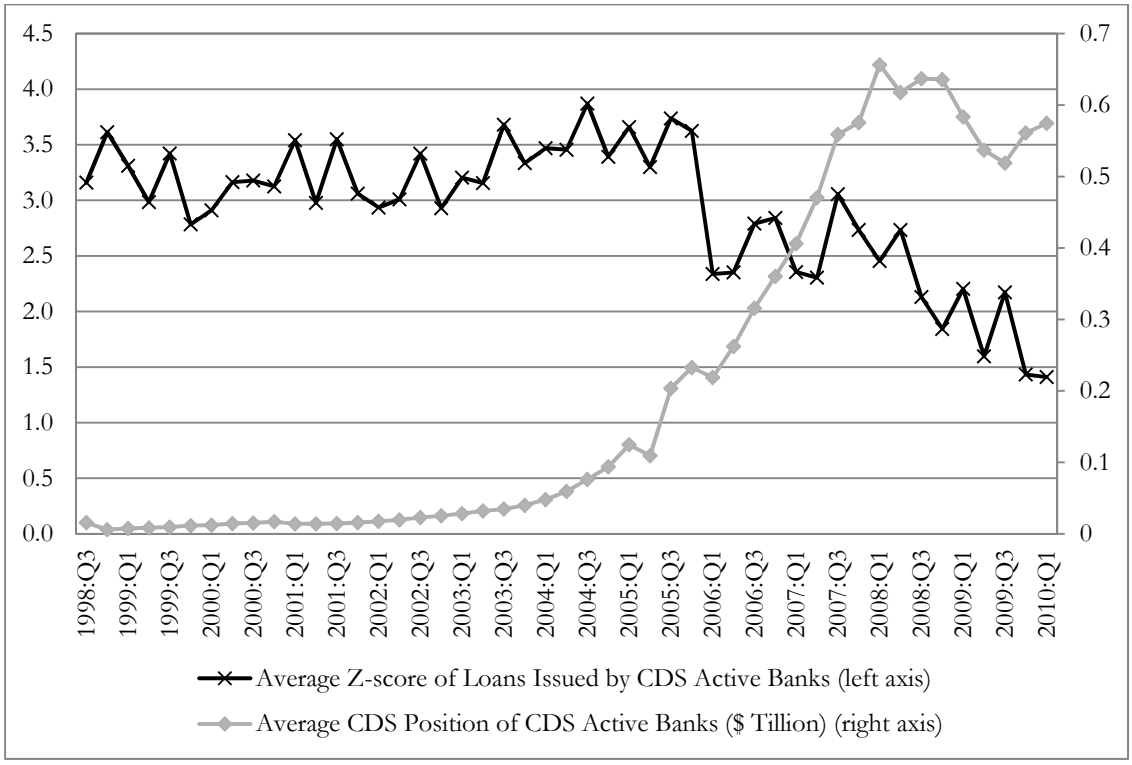


Table I

Summary Statistics of Lead Bank and Syndicated Loan

This table presents the descriptive statistics and yearly distribution for the key variables used in our analysis. Panel A presents summary statistics of lead banks in our sample. Panels B and C describe year distribution of our sample banks and syndicated loan issuance over the period 1994-2009. We restrict the bank sample to banks that can be identified as syndicate lead arrangers in Dealscan. Bank CDS position data are from Federal Reserve Consolidated Financial Statements for Bank Holding Companies (FR Y-9C) and the Office of the Comptroller of the Currency (OCC) Quarterly Report on Bank Derivatives Activities. Other bank-level variables are constructed using data from Compustat Bank. Syndicated loans are loans from Dealscan with distribution method as "Syndication". In Panel A, ROA is annualized by multiplying 4. Beta is the annual beta by estimating CAPM using monthly return. Other variables are extracted at the end of the quarter. In Panel B, column 2 reports the number of CDS active banks that are involved as syndicate lead arrangers by year. CDS active bank refers to banks that are active in CDS trading in the quarter of loan initiation. Column 3 reports the average total assets of all sample banks. Column 4 reports aggregate issuance amount of syndicated loans from our sample banks. In Panel C, column 2 presents the number of unique borrowers of our sample syndicated loans. Columns 3 to 6 report loan characteristics. Loan amount refers to the aggregated amount of all facilities (tranches) for each loan deal (package). Spread and maturity refer to the loan-level all-in-drawn spread and maturity averaged across facilities (tranches). Number of lenders refers to the number of banks (both lead and syndicate members) participating in a loan syndicate. See Appendix for detailed variable definitions.

Panel A. Summary Statistics of Sample Banks				
Variable	Mean	StdDev	Min	Max
Bank Capital Measure				
Risk-Weighted Total Capital Ratio	0.132	0.024	0.109	0.211
Tier 1 Capital Ratio	0.102	0.024	0.073	0.162
Tier 1/Total Capital Ratio	0.752	0.107	0.096	1.000
Bank Risk Measure				
Log (Z-score)	3.475	1.228	-0.344	6.084
Distance-to-Default	7.160	2.746	-0.032	18.089
Bank Lending Practice				
C&I Loans/Total Loans	0.198	0.112	0.000	0.618
Loan Loss Provision	0.004	0.004	0.000	0.012
Bank Profitability				
ROA	0.010	0.005	0.001	0.016
Net Interest Margin	0.033	0.008	0.027	0.050
Bank Other Characteristics				
Total Assets ($ Billion)	331.573	558.091	0.060	3879.172
Sales Growth	0.103	0.155	-0.124	0.351
Beta	1.002	0.817	-2.283	4.688
Market-to-Book	1.656	0.984	0.000	6.581
Deposits/Total Assets	0.586	0.163	0.337	0.852
Total Loans/Total Assets	0.609	0.123	0.385	0.763
C&I Loans/Total Assets	0.121	0.079	0.036	0.223
Market Share	0.017	0.020	0.000	0.121
Bank CDS Position				
CDS Total Position ($ Billion)	65.085	566.022	0.000	10189.101
CDS Bought ($ Billion)	32.977	285.623	0.000	5187.211
CDS Sold ($ Billion)	32.108	279.899	0.000	5001.890
CDS Net Position	0.869	11.943	0.000	418.013

Table I — *Continued*

Panel B. Distribution of Sample Banks				
Year	Number of Banks	Number of CDS Active Banks	Average Total Assets ($ Billion)	Syndicated Loan Issuance Amount ($ Billion)
1994	55	.	56.15	491.51
1995	54	.	65.49	574.87
1996	52	.	76.09	627.76
1997	51	13	85.76	888.98
1998	53	17	118.26	666.49
1999	56	20	140.26	652.69
2000	56	19	160.62	1181.01
2001	62	19	185.87	1624.49
2002	66	18	208.91	1715.64
2003	65	20	235.72	2434.51
2004	64	19	279.30	3780.16
2005	62	20	339.52	4627.54
2006	61	18	397.04	4015.65
2007	59	18	510.02	4560.33
2008	57	16	602.79	2661.70
2009	53	15	631.33	2118.35
Total	84	43	331.573	32621.68

Panel C. Distribution of Sample Loans						
Year	Number of Syndicated Loans	Number of Unique Firms	Loan Amount ($ Million)	Spread (Basis Points)	Maturity (Years)	Number of Lenders
1994	1723	1429	326.14	139.07	5.5	7.6
1995	2082	1633	337.77	137.14	5.9	7.2
1996	2700	2049	311.70	143.69	5.9	7.3
1997	3243	2424	342.76	133.76	6.0	7.2
1998	2726	2176	338.01	145.95	5.9	6.8
1999	2868	2287	362.00	167.06	5.7	8.0
2000	3212	2499	386.62	172.77	4.8	7.6
2001	3231	2531	382.41	176.33	4.2	7.9
2002	3164	2527	340.29	195.59	4.3	8.0
2003	3266	2651	342.82	206.17	4.6	8.5
2004	3710	2958	420.55	182.16	5.3	8.6
2005	3828	2992	499.35	151.82	5.8	8.6
2006	3740	2939	492.37	148.74	6.0	7.3
2007	3487	2776	598.79	151.64	6.4	7.3
2008	2631	2103	400.99	187.99	4.9	6.2
2009	1662	1389	370.97	325.45	4.2	6.3
Total	47273	11397	400.32	169.62	5.4	7.6

Table II
Effects of Bank CDS Trading on Bank Capital

This table reports the estimation results of panel regressions that examine how a bank's CDS trading affects its regulatory capital ratios. The dependent variables in columns 1 and 2 are risk-weighted total capital ratio and tier 1 capital ratio, respectively. The risk-weighted total capital ratio is the ratio of total capital relative to the risk-weighted assets. The Tier 1 capital ratio is the ratio of Tier 1 capital relative to the risk-weighted assets. The sample is composed of quarterly observations of syndicate loan lead arrangers in Dealscan that can be matched with Compustat bank identifier from 1994 to 2009. The independent variable of interest is CDS active bank, an indicator taking one if the bank takes non-zero CDS position in the bank-quarter, and zero otherwise. CDS position data for U.S. banks are extracted from the Federal Reserve Consolidated Financial Statements for Holding Companies ("FR Y-9C"), and those for non-U.S. banks are extracted from Office of the Comptroller of the Currency (OCC) quarterly report on bank derivatives activities. Sales growth is the percentage increase in the bank's total revenue relative to the prior quarter. Market share refers to the share of deposits of the bank in the total deposits of all bank holding companies in our sample in the same quarter. All control variables are extracted one quarter prior to the bank-quarter. We control for year and bank fixed effects in both regressions. Definitions of variables are listed in Appendix. All variables are winsorized at 1% level. Standard errors clustered at bank-level are reported in parentheses. ***, ** and * denote statistical significance level at 1%, 5% and 10%, respectively.

	Risk-Weighted Total Capital Ratio	Tier 1 Capital Ratio
Variable	(1)	(2)
CDS Active Bank	-0.001	-0.005
	(0.003)	(0.003)
Total Assets	-0.018	-0.035
	(0.038)	(0.040)
Total Assets Squared	0.003**	0.003*
	(0.002)	(0.002)
Sales Growth	0.002	0.005
	(0.009)	(0.009)
Deposits/Total Assets	0.058*	0.077**
	(0.034)	(0.033)
Total Loans/Total Assets	-0.182**	-0.194***
	(0.072)	(0.075)
Market Share Squared	-6.657	-13.884*
	(7.511)	(7.562)
Deposits/Total Liabilities	0.001	0.001
	(0.001)	(0.001)
Non-Interest Income /Total Operating Income	-0.004	-0.002
	(0.025)	(0.010)
Intercept	0.237***	0.211***
	(0.057)	(0.057)
Year Fixed Effects	Yes	Yes
Bank Fixed Effects	Yes	Yes
R-squared (%)	47.47	57.95
Observations	4280	4280

Table III

Effects of Bank CDS Trading on Bank Capital: Instrumental Variable Approach

This table reports the second-stage regression results of bank regulatory capital ratios on the fitted value of CDS active bank indicator using instrumental variable approach. The fitted value is estimated from OLS regressions on three instruments: (1) the logarithm of the geographic distance between the bank's headquarter and New York City; (2) a dummy indicating whether the bank's headquarter is located in New York or Chicago; (3) a loan concentration index for each bank-quarter which is calculated as the sum of the squared ratio of individual loan amount out of the bank's total loan portfolio in the same quarter. A larger index represents a more concentrated loan portfolio by construction. The instruments are lagged one quarter in the first-stage OLS regression. To calculate the geographic distance between a bank and New York City, we extract the zipcode of the bank's headquarter from Compustat, and map it to the latitude and longitude of the bank. We applied the Great Circle distance formula to obtain the geographic distance:

$$\text{Geographic Distance} = r \times \arccos[\sin(\text{latitude(bank)}) \times \sin(\text{latitude(NY)}) + \cos(\text{latitude(bank)}) \times \cos(\text{latitude(NY)}) \times \cos(\text{longitude(bank)} - \text{longitude(NY)})]$$

We calculate the loan concentration ratio by extracting loan amount information from Dealscan. Results of the first-stage OLS regressions are reported in Internet Appendix Table IA3. Control variables in the second stage regression are the same as those in Table II. We do not report the coefficients of the control variables to conserve space. All variables are winsorized at 1% level. We control for year and bank fixed effects in all specifications. Standard errors clustered by bank are reported in parentheses. ***, ** and * denote statistical significance level at 1%, 5% and 10%, respectively. See Appendix for detailed variable definitions.

Panel A. Risk-Weighted Total Capital Ratio				
	Distance between Bank and NY	Bank Located in NY or Chicago	Loan Concentration	IV1+IV2+IV3
Variable	(1)	(2)	(3)	(4)
CDS Active Bank	-0.038**	-0.042**	-0.042***	-0.038**
	(0.016)	(0.016)	(0.016)	(0.016)
Intercept	0.196***	0.197***	0.199***	0.196***
	(0.045)	(0.045)	(0.045)	(0.045)
Year Fixed Effects	Yes	Yes	Yes	Yes
Bank Fixed Effects	Yes	Yes	Yes	Yes
Sargan-Hansen				
J-test Statistics	N/A	N/A	N/A	0.846
R-squared (%)	47.12	47.07	47.13	47.15
Observations	2396	2396	2396	2396

Panel B. Tier 1 Capital Ratio				
	Distance between Bank and NY	Bank Located in NY or Chicago	Loan Concentration	IV1+IV2+IV3
Variable	(1)	(2)	(3)	(4)
CDS Active Bank	-0.045***	-0.047***	-0.048***	-0.045***
	(0.017)	(0.018)	(0.017)	(0.017)
Intercept	0.173***	0.174***	0.176***	0.172***
	(0.046)	(0.047)	(0.047)	(0.046)
Year Fixed Effects	Yes	Yes	Yes	Yes
Bank Fixed Effects	Yes	Yes	Yes	Yes
Sargan-Hansen				
J-test Statistics	N/A	N/A	N/A	1.294
R-squared (%)	55.74	55.31	55.33	55.52
Observations	2396	2396	2396	2396

Table IV
Effects of Bank CDS Trading on Bank Capital Quality

This table reports the estimation results of panel regressions that examine the effects of bank CDS trading on the bank's capital quality. Bank capital quality is measured by the share of a bank's Tier 1 capital in its total capital at the same quarter-ends. Panel A reports the baseline regression results. Panel B reports the second-stage regression results with the fitted value of bank CDS trading estimated from the first-stage regressions on the instrumental variables. The instrumental variables are the same as we used in Table III. The sample is composed of quarterly observations of syndicate loan lead arrangers in Dealscan that can be matched with bank identifier in Compustat from 1994 to 2009. The independent variable of interest is CDS active bank, an indicator taking the value of one if the bank takes non-zero CDS position in the bank-quarter, and zero otherwise. All control variables are the same as those used in Table II and are extracted at the end of the prior quarter. The coefficients of control variables are omitted to conserve space. We control for year and bank fixed effects in all specifications. All variables are winsorized at 1% level. Standard errors clustered at bank-level are reported in parentheses. ***, ** and * denote statistical significance level at 1%, 5% and 10%, respectively. See Appendix for detailed variable definitions.

Panel A. Effects of Bank CDS Trading on Capital Quality	
Variable	(1)
CDS Active Bank	-0.032***
	(0.011)
Intercept	0.875***
	(0.044)
Year Fixed Effects	Yes
Bank Fixed Effects	Yes
R-squared (%)	70.54
Observations	4280

Panel B. Effects of Instrumented Bank CDS Trading on Capital Quality				
	Distance between Bank and NY	Bank Located in NY or Chicago	Loan Concentration	IV1+IV2+IV3
Variable	(1)	(2)	(3)	(4)
CDS Active Bank	-0.085***	-0.083***	-0.082***	-0.085***
	(0.024)	(0.029)	(0.031)	(0.025)
Intercept	0.813***	0.821***	0.824***	0.811***
	(0.042)	(0.042)	(0.042)	(0.042)
Year Fixed Effects	Yes	Yes	Yes	Yes
Bank Fixed Effects	Yes	Yes	Yes	Yes
Sargan-Hansen				
J-test Statistics	N/A	N/A	N/A	0.695
R-squared (%)	70.21	67.48	84.42	70.21
Observations	2396	2396	2396	2396

Table V

Bank CDS Trading and Bank Loan Composition and Quality: Bank-Level Evidence

This table reports the estimation results of panel regressions that examine how a bank's CDS trading affects its lending decision. The dependent variables are the outstanding amount of commercial and industrial loans scaled by the total loan amount outstanding, and the ratio of loan loss provision, which is calculated as the allowance set aside for loan losses scaled by the total amount of loans outstanding in the same quarter. The sample is composed of quarterly observations of syndicate loan lead arrangers in Dealscan that can be matched with Compustat bank identifier from 1994 to 2009. The independent variable of interest is CDS active bank, an indicator taking the value of one if the bank takes non-zero CDS position in the bank-quarter, and zero otherwise. All control variables are extracted at the end of the prior quarter. We control for year and bank fixed effects in all specifications. All variables are winsorized at 1% level. Standard errors clustered at bank-level are reported in parentheses. ***, ** and * denote statistical significance level at 1%, 5% and 10%, respectively. See Appendix for detailed variable definitions.

	C&I Loan/Total Loan	Loan Loss Provision
Variable	(1)	(2)
CDS Active Bank	0.015**	0.001***
	(0.006)	(0.000)
Total Assets	0.008	0.002
	(0.050)	(0.002)
Total Assets Squared	-0.001	0.001***
	(0.005)	(0.000)
Sales Growth	0.003	-0.000
	(0.014)	(0.000)
Deposits/Total Assets	0.014	-0.002
	(0.069)	(0.001)
Total Loans/Total Assets	0.161*	0.005***
	(0.083)	(0.001)
Deposits/Liabilities	0.001	0.004***
	(0.001)	(0.001)
Non-Interest Income /Total Operating Income	-0.001	-0.000
	(0.001)	(0.001)
Market Share Squared	38.518*	5.304
	(22.485)	(3.495)
Intercept	0.020	0.001
	(0.075)	(0.001)
Year Fixed Effects	Yes	Yes
Bank Fixed Effects	Yes	Yes
R-squared (%)	78.81	51.29
Observations	4280	4280

Table VI

Borrower CDS Market Availability and Loan Terms: Loan-Level Evidence

This table presents OLS regression results of loan amount and loan spread on CDS trading in borrower's name, controlling for loan and borrower characteristics. The loan sample is composed of all syndicated loans issued during the period from 1994 to 2009 with the distribution method as "syndication" reported in Dealscan. In Panel A, the dependent variable is the amount of the loan issued in quarter t, scaled by the firm's total assets measured at the end of quarter t-1. In Panel B, the dependent variable is the all-in-drawn spread of the loan extracted at loan initiation. The independent variable of interest is CDS trading, a dummy equal to one if the borrowing firm has quoted CDS contracts referencing its debt in the quarter of loan origination. CDS Firm is a dummy equal to one if the firm ever had a CDS market with reference to its debt at any point during the 1994-2009 sample period. Maturity is the average maturity of tranches contained in a loan package. Secured is a dummy which takes one if at least one tranche in the loan is secured by collateral. Term loan is a dummy which takes one if at least half of the tranches in the loan are term tranches. Firm-level control variables are extracted at the end of the quarter prior to loan initiation. Rated is a dummy which takes one if the borrowing firm has a S&P loan-term issuer rating at loan initiation. Prime rate is the prime lending rate in quarter *t* that banks charge each other for overnight loans. All variables are winsorized at 1% level. We control for loan initiation year, borrower industry and loan purpose fixed effects in all specifications. Standard errors clustered by firm are reported in parentheses. ***, ** and * denote statistical significance level at 1%, 5% and 10%, respectively. See Appendix for detailed variable definitions.

Table VI — *Continued*

Panel A. Loan Amount/Total Assets		
Variable	(1)	(2)
CDS Trading	0.145***	0.185***
	(0.029)	(0.031)
CDS Firm	0.064**	
	(0.026)	
Loan Characteristics		
Loan Spread	0.001*	0.001*
	(0.000)	(0.000)
Maturity	0.249***	0.248***
	(0.063)	(0.063)
Secured	-0.136***	-0.137***
	(0.045)	(0.045)
Term Loan	-0.039	-0.040
	(0.036)	(0.036)
Log (1+Number of Lenders)	3.437***	3.439***
	(0.671)	(0.672)
Firm Characteristics		
Log (Total Assets)	-0.166***	-0.162***
	(0.022)	(0.021)
Cash/Total Assets	1.351***	1.350***
	(0.389)	(0.389)
Book Leverage	0.142	0.142
	(0.136)	(0.136)
Log (1+Firm Age)	-0.008	-0.006
	(0.019)	(0.019)
Market-to-Book	-1.522	-1.348
	(5.538)	(5.538)
Sales/Total Assets	0.093	0.093
	(0.057)	(0.057)
Tangibility	0.321***	0.323***
	(0.072)	(0.072)
Z-score	-0.017***	-0.017***
	(0.006)	(0.006)
Rated	0.010	0.018
	(0.019)	(0.019)
Prime Rate	-4.718	-4.658
	(4.149)	(4.141)
Intercept	0.472	0.442
	(0.323)	(0.322)
Year Fixed Effects	Yes	Yes
Borrower Industry Fixed Effects	Yes	Yes
Loan Purpose Fixed Effects	Yes	Yes
R-squared (%)	41.14	41.12
Observations	15546	15546

Table VI — *Continued*

Panel B. Loan Spread		
Variable	(1)	(2)
CDS Trading	15.499***	7.218*
	(3.896)	(3.736)
CDS Firm	-13.204***	
	(3.408)	
Loan Characteristics		
Loan Amount/Total Assets	2.243***	2.185***
	(0.816)	(0.816)
Maturity	8.202***	8.380***
	(2.783)	(2.794)
Secured	73.631***	73.976***
	(2.565)	(2.564)
Term Loan	18.290***	18.518***
	(3.122)	(3.118)
Log (1+Number of Lenders)	-156.462***	-157.016***
	(10.040)	(10.499)
Firm Characteristics		
Log (Total Assets)	-19.104***	-19.930***
	(1.073)	(1.045)
Cash/Total Assets	60.604***	60.888***
	(13.615)	(13.637)
Leverage	161.722***	162.081***
	(9.899)	(9.874)
Log (1+Firm Age)	-5.200***	-5.503***
	(1.489)	(1.482)
Market-to-Book	-546.20	-584.06
	(519.952)	(519.425)
Sales/Total Assets	1.526	1.485
	(3.326)	(3.325)
Tangibility	-12.505**	-12.941**
	(5.776)	(5.816)
Z-score	-5.452***	-5.499***
	(0.479)	(0.480)
Rated	5.865**	4.135
	(2.898)	(2.857)
Prime Rate	-681.87***	-695.77***
	(161.772)	(161.828)
Intercept	428.997***	435.597***
	(25.967)	(25.673)
Year Fixed Effects	Yes	Yes
Borrower Industry Fixed Effects	Yes	Yes
Loan Purpose Fixed Effects	Yes	Yes
R-squared (%)	49.51	49.43
Observations	15546	15546

Table VII

Do CDS-Referenced Firms Borrow More from CDS Active Banks?

This table reports regression results of loan amount and loan spread on the lead banks' CDS activities, estimated from a matched sample of loans. CDS bank refers to lead banks that ever traded CDS during the sample period. CDS-inactive bank refers to banks that never traded CDS during the sample period. We pair each CDS-active bank with one CDS-inactive bank by selecting from the CDS-inactive bank group the one with nearest total asset value in the same quarter. Then we extract syndicated loans from each paired banks in the same quarter to form the matched loan sample. Regression results of the whole sample banks are reported in Internet Appendix Table IA10. Specifications in even columns control for CDS firm fixed effects (CDS Firm). Other control variables in the OLS regression are the same as we used in baseline regression reported in Table VI. We do not report the coefficients of control variables to conserve space. All variables are winsorized at 1% level. We control for loan initiation year, borrower industry and loan purpose fixed effects in all specifications. Standard errors clustered by firm are reported in parentheses. ***, ** and * denote statistical significance level at 1%, 5% and 10%, respectively. See Appendix for detailed variable definitions.

Panel A. Loan Amount/Total Assets				
	CDS-Active Bank		CDS-Inactive Bank	
Variable	(1)	(2)	(3)	(4)
CDS Trading	0.197***	0.149**	0.055	-0.224
	(0.068)	(0.064)	(0.076)	(0.171)
CDS Firm		0.063		0.398*
		(0.047)		(0.208)
Loan Spread	-0.001	-0.001	-0.001	-0.001
	(0.000)	(0.000)	(0.000)	(0.000)
Intercept	1.500**	1.526**	0.449	0.760
	(0.698)	(0.703)	(0.727)	(0.581)
Year Fixed Effects	Yes	Yes	Yes	Yes
Borrower Industry Fixed Effects	Yes	Yes	Yes	Yes
Loan Purpose Fixed Effects	Yes	Yes	Yes	Yes
R-squared (%)	27.52	27.54	39.35	41.19
Observations	3830	3830	734	734

Panel B. Loan Spread				
	CDS-Active Bank		CDS-Inactive Bank	
Variable	(1)	(2)	(3)	(4)
CDS Trading	17.661***	20.882***	-22.571	-10.295
	(5.366)	(6.755)	(16.055)	(18.181)
CDS Firm		-4.223		-17.580
		(7.176)		(12.342)
Loan Amount/Total Assets	-0.600	-0.579	-2.947	-1.597
	(2.234)	(2.234)	(7.699)	(7.782)
Intercept	645.806***	643.991***	558.041***	541.975***
	(23.802)	(24.732)	(43.009)	(45.242)
Year Fixed Effects	Yes	Yes	Yes	Yes
Borrower Industry Fixed Effects	Yes	Yes	Yes	Yes
Loan Purpose Fixed Effects	Yes	Yes	Yes	Yes
R-squared (%)	48.43	48.44	48.18	48.34
Observations	3830	3830	734	734

Table VIII

Effects of Lending to CDS-Referenced Firms on Bank Risk

This table reports the estimation results of panel regressions that examine how a bank's risk is affected by their lending to CDS firms. Bank risk measures are the logarithm of bank Z-score and distance-to-default. Bank Z-score is calculated as $(ROA + CAR)/\sigma(ROA)$, where ROA is return-on-assets measured on quarterly basis; CAR is bank capital ratio measured at the end of the same quarter; $\sigma(ROA)$ is the standard deviation of ROA in the past four quarters. Distance-to-default is constructed following the formula by Bharath and Shumway (2008): $DD_{Naive} = \frac{\ln[(E+F)/F] + (r_{t-1} - 0.5 * Naive\sigma_v^2)T}{Naive\sigma_v\sqrt{T}}$, where E is equity value equal to shares outstanding multiplied by stock price, F is the book value of debt, r_{t-1} is the stock return over $t-1$, σ_v is asset volatility, T is the forecasting horizon, $\text{Naive}\,\sigma_V = \frac{E}{E + \text{NaiveD}}\sigma_E + \frac{\text{NaiveD}}{E + \text{NaiveD}}\sigma_D$, $\sigma_D = 0.05 + 0.25 * \sigma_E$ and $\text{NaiveD} = F$. The independent variable of interest is loans to CDS firm ratio, which is the amount of syndicated loan issuance to CDS-referenced firms relative to the total amount of all syndicated loan issuance from the same bank in the same year. CDS-referenced firms refer to borrowers that have an active CDS market referencing its debt in the quarter of loan initiation. Loan to CDS firm ratio is lagged for one year when entering the regressions. All control variables are extracted at the end of the prior quarter. All variables are winsorized at 1% level. We control for year and bank fixed effects in all specifications. Standard errors clustered at bank-level are reported in parentheses. ***, ** and * denote statistical significance level at 1%, 5% and 10%, respectively. See Appendix for detailed variable definitions.

Variable	Log (Bank Z-score)	Distance-to-Default
	(1)	(2)
Loan to CDS Firm Ratio	-0.235**	-2.015**
	(0.112)	(0.899)
Total Assets	-0.154	1.333
	(0.276)	(1.043)
Total Assets Squared	-0.025	-1.844***
	(0.016)	(0.048)
Sales Growth	-0.627***	0.000
	(0.087)	(0.001)
Deposits/Total Assets	0.443	0.021
	(0.659)	(0.030)
Total Loans/Total Assets	-0.446	-0.005
	(0.643)	(0.028)
Market Share Squared	-397.64***	-3.008
	(104.470)	(3.504)
Deposits/Total Liabilities	-1.184***	-0.377
	(0.265)	(1.500)
Non-Interest Income/	-0.461	1.656
Total Operating Income	(0.492)	(2.261)
Intercept	3.051***	5.298***
	(0.101)	(0.724)
Year Fixed Effects	Yes	Yes
Bank Fixed Effects	Yes	Yes
R-squared (%)	30.31	29.05
Observations	2638	858

Table IX
Effects of Bank CDS Trading on Bank Risk

This table reports the estimation results of panel regressions that examine how a bank's risk is affected by its CDS trading. The bank risk measures are the same as in Table VIII: the logarithm of bank Z-score and distance-to-default. The independent variable of interest is CDS active bank, a dummy variable taking one if the bank takes non-zero CDS position in the quarterly observation, and zero otherwise. All control variables are extracted at the end of the prior qurater. All variables are winsorized at 1% level. We control for year and bank fixed effects in all specifications. Standard errors clustered at bank-level are reported in parentheses. ***, ** and * denote statistical significance level at 1%, 5% and 10%, respectively. See Appendix for detailed variable definitions.

	Log (Bank Z-score)	Distance-to-Default
Variable	(1)	(2)
CDS Active Bank	-0.397***	-1.132***
	(0.154)	(0.341)
Total Assets	1.501**	2.987
	(0.663)	(4.807)
Total Assets Squared	0.110	-1.112
	(0.146)	(4.229)
Sales Growth	-0.629**	0.708
	(0.258)	(0.670)
Deposits/Total Assets	0.097	10.994***
	(0.529)	(4.144)
Total Loans/Total Assets	-0.537	3.560
	(0.738)	(2.274)
Deposits/Total Liabilities	-0.135	0.473
	(0.307)	(0.736)
Non-Interest-Income /Total Operating Income	-0.381	4.946
	(0.582)	(4.021)
Intercept	3.468***	-5.586
	(0.542)	(4.343)
Year Fixed Effects	Yes	Yes
Bank Fixed Effects	Yes	Yes
R-squared (%)	34.36	39.51
Observations	4280	1632

Table X
Effects of Bank CDS Trading on Bank Profitability

This table reports the estimation results of regressions that examine the effects of bank CDS trading on bank profit. Bank profit is measured by the bank's net interest margin and ROA. Net interest margin is the difference between the interest income of a bank and the amount of interest paid out to its lenders, relative to the amount of its interest-earning assets. ROA is multiplied by 100 in regressions. The sample of banks used in columns 1 and 2 is all sample banks that we used in regressions in Table II. Columns 3 and 4 employ the sample of CDS-active banks, which are banks that ever traded CDS at some point during the sample period. Columns 5 and 6 employ the sample of CDS-inactive banks, which are banks that never traded CDS during the sample period. The independent variable of interest in columns 1 and 2 is CDS active bank, an indicator taking one if the lead lender takes non-zero CDS position in the quarter of loan initiation. The independent variable of interest in columns 3 to 6 is the loan to CDS firm ratio, which is calculated as the ratio of syndicated loan issuance amount to CDS firms relative to the total issuance amount of syndicated loan from the same bank in the same year. Loan to CDS firm ratio is lagged one year when entering regressions. All variables are winsorized at 1% level. We control for year and bank fixed effects in all specifications. Standard errors clustered at bank-level are reported in parentheses. ***, ** and * denote statistical significance level at 1%, 5% and 10%, respectively. See Appendix for detailed variable definitions.

	All Banks		CDS-Active Bank		CDS-Inactive Bank	
Variable	Net Interest Margin	ROA	Net Interest Margin	ROA	Net Interest Margin	ROA
	(1)	(2)	(3)	(4)	(5)	(6)
CDS Active Bank	0.001***	-0.007				
	(0.000)	(0.018)				
Loan to CDS Firm Ratio			0.003***	0.099**	-0.001	0.023
			(0.001)	(0.049)	(0.001)	(0.037)
Total Assets	-0.023***	-0.105*	-0.009***	-0.053	-0.031***	-0.346***
	(0.002)	(0.063)	(0.003)	(0.114)	(0.002)	(0.092)
Total Assets Squared	0.001***	-0.015***	-0.000***	-0.001	0.003***	-0.032***
	(0.000)	(0.005)	(0.000)	(0.007)	(0.001)	(0.009)
Sales Growth	0.002***	0.018	0.003***	0.007	0.003*	0.021
	(0.001)	(0.023)	(0.001)	(0.027)	(0.001)	(0.040)
Deposits/Total Assets	0.016***	0.098	0.017***	0.519***	0.006	-0.180***
	(0.005)	(0.152)	(0.005)	(0.140)	(0.009)	(0.070)
Total Loans/Total Assets	-0.009**	-0.111	-0.009**	-0.472***	-0.009	0.044
	(0.005)	(0.152)	(0.004)	(0.143)	(0.009)	(0.078)
Market Share Squared	2.707***	37.109*	1.761	-22.364	-3.317***	98.157***
	(0.756)	(21.879)	(1.315)	(39.188)	(0.869)	(32.241)
Deposits/Total Liabilities	-0.743***	-0.116**	-0.377	-0.140**	-0.272	-0.068
	(0.128)	(0.050)	(1.500)	(0.062)	(0.249)	(0.256)
Non-Interest Income/	-0.231	1.005***	1.656	1.128***	-0.549	-0.071
Total Operating Income	(0.234)	(0.251)	(2.261)	(0.239)	(0.571)	(0.165)
Intercept	0.032***	0.225***	0.030***	0.206***	0.037***	0.306***
	(0.001)	(0.025)	(0.001)	(0.027)	(0.001)	(0.048)
Year Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Bank Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
R-squared (%)	63.99	9.57	23.53	32.40	81.37	17.21
Observations	4280	4280	2638	2638	1642	1642

Table XI

Effects of CDS Trading during the 2007-2009 Credit Crisis

This table reports the regression results of bank risk-taking on bank CDS trading activities over the 2007-2009 credit crisis. Regression estimates for banks' capital ratio and new loan issuance volume are reported in Panel A and B, respectively. In Panel A, regressions are employed to both the whole sample period 1994 to 2009 and the restricted sample period 2005 to 2009. In Panel B, the sample is restricted to 2005 to 2009. We define credit crisis as the period July 2007 to June 2009. We split the crisis into two sub-periods: phase 1 from July 2007 to August 2008 and phase 2 from September 2008 to June 2009. The independent variables of interest are the interactions of bank CDS trading measures and crisis dummies. In Panel B, we aggregate new syndicated loan issuance from Dealscan by the lead bank-quarter. New loan issuance is composed of term loan and revolver. The dependent variables are total loan issuance amount and revolving loan issuance amount, both scaled by bank total assets at the end of prior quarter. We employ the same control variables as in Table II but do not report them to conserve space. All variables are winsorized at 1% level. Standard errors clustered at bank-level are reported in parentheses. ***, ** and * denote statistical significance level at 1%, 5% and 10%, respectively. See Appendix for detailed variable definitions.

Panel A. Bank Capital				
	Full Sample		2005-2009 Sample	
Variable	Risk-Weighted Total Capital Ratio	Tier 1 Capital Ratio	Risk-Weighted Total Capital Ratio	Tier 1 Capital Ratio
	(1)	(2)	(3)	(4)
CDS Active Bank*Crisis 07-08	0.007*	-0.003	0.006	-0.003
	(0.004)	(0.004)	(0.004)	(0.005)
CDS Active Bank*Crisis 08-09	0.020***	0.012**	0.016***	0.009*
	(0.004)	(0.005)	(0.005)	(0.005)
CDS Active Bank	-0.001	-0.002	-0.001	-0.001
	(0.003)	(0.002)	(0.002)	(0.001)
Crisis 07-08	-0.009**	-0.002	-0.007*	-0.001
	(0.004)	(0.004)	(0.004)	(0.004)
Crisis 08-09	-0.008*	-0.004	-0.004	-0.000
	(0.005)	(0.005)	(0.005)	(0.005)
Intercept	0.187***	0.152***	0.160***	0.133***
	(0.007)	(0.004)	(0.005)	(0.005)
R-squared (%)	31.16	42.77	46.13	50.18
Observations	4280	4280	1150	1150

Panel B. Bank Lending		
Variable	Total Loan Issuance /Total Assets	Revolver Issuance /Total Assets
	(1)	(2)
CDS Active Bank*Crisis 07-08	-0.008	-0.011**
	(0.007)	(0.005)
CDS Active Bank*Crisis 08-09	-0.021***	-0.016***
	(0.006)	(0.005)
CDS Active Bank	0.024***	0.019***
	(0.005)	(0.004)
Crisis 07-08	-0.009***	-0.005*
	(0.003)	(0.003)
Crisis 08-09	-0.013***	-0.010***
	(0.003)	(0.003)
Intercept	0.015***	0.006**
	(0.003)	(0.003)
R-squared (%)	31.26	8.12
Observations	937	937

Table XII

Stock Market Reaction to Bank CDS Trading: Crisis vs. Normal Period

This table reports estimation results of regressions that examine how banks' buy-and-hold stock returns are affected by bank CDS trading in the previous quarter. We examine stock returns over the crisis period July 2007 to June 2009 and the pre-crisis period July 2006 to June 2007. The regression model we estimate is:

$$\text{Bank Buy - and - Hold Return}_{i[t,t+k]} = \alpha + \beta \text{Bank CDS Trading}_{it\text{-}1} + \gamma_1 \text{Current Return}_{i[t-4,t-1]}$$
$$+ \gamma_2 \text{Bank Characteristics}_{it-1} + \varepsilon_{it}$$

where *k* is the period over which the buy-and-hold returns are calculated. From columns 1 to 3, the independent variables of interest are banks' CDS trading activities in the second quarter of 2008, 2007 and 2006, respectively. Bank characteristics are lagged one quarter when entering the regressions. The sample includes 61 banks in Compustat which can be identified as lead arrangers in Dealscan with returns available in CRSP. We control for current stock returns, measured as the cumulative returns in the past four quarters, in all specifications. All variables are winsorized at 1% level. Standard errors are reported in parentheses. ***, ** and * denote statistical significance level at 1%, 5% and 10%, respectively. See Appendix for detailed variable definitions.

Variable	Buy-and-Hold Return 2008 Q3-2008 Q4	Buy-and-Hold Return 2007 Q3-2009 Q2	Buy-and-Hold Return 2006 Q3-2007 Q2
	(1)	(2)	(3)
CDS Active Bank in 2008:Q2	-0.245**		
	(0.106)		
CDS Active Bank in 2007:Q2		-0.292**	
		(0.136)	
CDS Active Bank in 2006:Q2			0.100***
			(0.039)
Return in Current Year	1.493	0.774	-0.237*
	(0.920)	(0.659)	(0.127)
Total Assets	0.253	0.803**	-0.038
	(0.391)	(0.371)	(0.078)
Market-to-Book	1.048	2.824*	0.450*
	(0.915)	(1.676)	(0.262)
Leverage	-1.945***	-0.033	0.289
	(0.653)	(1.368)	(0.292)
Deposits/Total Assets	-0.520	0.832	0.079
	(0.597)	(0.753)	(0.124)
Total Loans/Total Assets	0.396	0.462	-0.483***
	(0.631)	(0.575)	(0.154)
Log (Market Value)	0.035	0.017	-0.015
	(0.050)	(0.029)	(0.009)
Tier 1 Capital Ratio	3.147	-3.413	-2.253***
	(3.009)	(3.775)	(0.557)
Intercept	-1.068	-0.741*	0.548***
	(0.729)	(0.398)	(0.165)
R-squared (%)	73.87	75.38	77.77
Observations	59	57	61

Internet Appendix for Additional Results

Table IA1. Comparison of CDS-active Bank and CDS-inactive Bank

This table compares bank capital, risk and other characteristics of CDS-active banks and CDS-inactive banks. CDS-active bank refers to banks that ever traded CDS during the sample period. CDS-inactive bank refers to banks that never traded CDS during the sample period. ***, ** and * denote statistical significance level at 1%, 5% and 10%, respectively. See Appendix for detailed variable definitions.

Variable	CDS-inactive Bank	CDS-active Bank	Difference
Bank Capital			
Risk-Weighted Total Capital Ratio	0.142	0.126	-0.016***
Tier 1 Capital Ratio	0.105	0.100	-0.006***
Tier 1/Total Capital Ratio	0.784	0.738	-0.046***
Bank Risk Measure			
Log (Z-score)	3.534	3.450	-0.084*
Distance-to-Default	6.807	7.312	0.505*
Bank Profitability			
Net Interest Margin	0.032	0.035	0.003***
ROA	0.009	0.011	0.002***
Bank Lending Practice			
C&I Loans/Total Loans	0.119	0.214	0.095**
Loan Loss Provision	0.004	0.006	0.002***
Bank Other Characteristics			
Total Assets ($ Billion)	341.964	325.547	-16.417
Sales Growth	0.089	0.127	0.038***
Market-to-Book	1.371	1.764	0.393***
Deposits/Total Assets	0.668	0.570	-0.098*
Total Loans/Total Assets	0.688	0.580	-0.108*
C&I Loans/Total Assets	0.081	0.130	0.050***
Deposits/Total Liabilities	0.742	0.685	-0.057
Non-Interest Income /Total Operating Income	0.158	0.225	0.067**
Market Share	0.017	0.017	0.001
Beta	1.032	0.964	-0.067**

Table IA2. Effects of Bank CDS Trading on Bank Capital: Alternative Sample of Banks

This table reports the estimation results of panel regressions that examine how a bank's CDS trading affects its regulatory capital, using alternative sample of banks. In Panel A, the sample is all Compustat banks; in Panel B, the sample is the base sample excluding banks with deposits exceeding 10% of the total deposits aggregated across banks in the same quarter. The dependent variables are total capital to risk-weighted assets ratio and tier 1 capital to risk-weighted assets ratio. The independent variable of interest is CDS active bank, an indicator taking one if the bank is taking non-zero CDS position in the bank-quarter, and zero otherwise. We control for year and bank fixed effects in all specifications. Definitions of variables are listed in Appendix. All control variables are the same as we used in Table II and extracted one quarter prior to the bank-quarter. All variables are winsorized at 1% level. Standard errors clustered at bank-level are reported in parentheses. ***, ** and * denote statistical significance level at 1%, 5% and 10%, respectively.

Panel A. All Compustat Banks		
	Risk-Weighted Total Capital Ratio	Tier 1 Capital Ratio
Variable	(1)	(2)
CDS Active Bank	-0.004*	-0.007***
	(0.004)	(0.004)
Intercept	0.227***	0.209***
	(0.032)	(0.034)
Year Fixed Effects	Yes	Yes
Bank Fixed Effects	Yes	Yes
R-squared (%)	78.53	76.33
Observations	38557	38557

Panel B. Dealscan Sample Excluding Big Banks		
	Risk-Weighted Total Capital Ratio	Tier 1 Capital Ratio
Variable	(1)	(2)
CDS Active Bank	-0.003	-0.006*
	(0.003)	(0.004)
Intercept	0.244***	0.222***
	(0.063)	(0.063)
Year Fixed Effects	Yes	Yes
Bank Fixed Effects	Yes	Yes
R-squared (%)	46.63	56.58
Observations	4099	4099

Table IA3. First-Stage Regression of the Bank CDS Trading on Instrumental Variables

This table reports estimation results of the first-stage OLS regression of banks trading CDS on the instrumental variables. The dependent variable is an indicator equal to one if the bank is active in CDS trading in the bank-quarter. The instrumental variables are: (1) the logarithm of the geographic distance between the bank's headquarter and New York City; (2) a dummy indicating whether the bank's headquarter is located in New York or Chicago; (3) a loan concentration index for each bank-quarter which is calculated as the sum of the squared ratio of individual loan amount out of the bank's total loan portfolio in the same quarter. A larger index represents a more concentrated loan portfolio by construction. The instruments are lagged one quarter in the first-stage OLS regression. The loan concentration index is lagged one quarter in regression. Controls include variables that describe bank characteristics, capital, risk, and trading in other derivatives linked to foreign exchange, interest rate, equity and commodity. Control variables are extracted at the end of the quarter prior to the bank-quarter. ROA volatility and net interest margin volatility are calculated with the quarterly ROA and net interest margin in the past four quarters. All variables are winsorized at 1% level. We control for year fixed effects in all specifications. Standard errors are reported in parentheses. ***, ** and * denote statistical significance level at 1%, 5% and 10%, respectively. See Appendix for detailed variable definitions.

Table IA3 — *Continued*

Variable	(1)	(2)	(3)	(4)
Instruments				
Log (1+Distance to NY)	-0.040***			-0.129***
	(0.015)			(0.045)
Bank Headquartered in NY or Chicago		0.138***		0.474**
		(0.030)		(0.223)
Loan Concentration			0.709***	0.782***
			(0.198)	(0.183)
Bank Characteristics				
Total Assets	1.210***	1.394***	8.667***	6.670***
	(0.248)	(0.081)	(1.591)	(0.796)
Total Assets Squared	-0.181***	-0.178***	-2.363***	-1.246***
	(0.039)	(0.015)	(0.514)	(0.247)
Sales Growth	-0.108*	-0.112***	-0.845***	-0.528***
	(0.060)	(0.037)	(0.281)	(0.194)
Market Share Squared	-0.000	-0.000	0.266***	0.002
	(0.001)	(0.001)	(0.066)	(0.010)
Market-to-Book	-0.419**	-0.442***	-0.165	0.220
	(0.213)	(0.105)	(0.886)	(0.715)
Leverage	0.342	0.017	-7.538***	-1.379
	(0.390)	(0.101)	(1.626)	(1.123)
Beta	0.002	0.007	-0.192	-0.610***
	(0.023)	(0.011)	(0.160)	(0.096)
ROA	0.012	0.013	-0.027	0.328*
	(0.029)	(0.017)	(0.189)	(0.183)
Net Interest Margin	4.127	1.873	-22.479*	3.568
	(3.466)	(1.364)	(11.630)	(8.951)
Deposits/Total Assets	-0.275	-0.318***	-1.650**	-1.801***
	(0.289)	(0.095)	(0.647)	(0.635)
Total Loans/Total Assets	0.406**	0.366***	3.816***	1.904***
	(0.183)	(0.085)	(0.707)	(0.596)
ROA Volatility	-0.019	0.016	-0.069	0.023
	(0.042)	(0.021)	(0.341)	(0.278)
Net Interest Margin Volatility	0.089	0.203**	1.404**	0.915*
	(0.137)	(0.083)	(0.708)	(0.543)
Bank Other Derivatives Position				
Has Derivatives for Hedging	0.013	0.013	-0.220	-0.212
	(0.069)	(0.020)	(0.230)	(0.181)
Has Derivatives for Trading Purposes	0.255***	0.217***	0.362*	0.778***
	(0.061)	(0.022)	(0.219)	(0.187)
Intercept	-0.043	-0.181**	-19.959	3.012***
	(0.197)	(0.085)	(163.338)	(0.663)
Fixed Year Controls	Yes	Yes	Yes	Yes
F-statistic	35.83***	42.45***	42.46***	33.67***
R-squared (%)	59.71	56.16	51.65	62.24
Observations	2396	2396	4280	2396

Table IA4. Effects of Borrower CDS Availability on Loan Terms: Syndicated Loans and Sole Lender Loans

This table presents estimation results of regressions that examine how loan amount and loan spread are affected by CDS trading in the borrower's name, using an alternative sample. The sample includes both syndicated loans and loans from sole lenders reported in Dealscan from 1994 to 2009. Loan and borrower characteristics are the same as we used in baseline regressions reported in Table VI. Firm-level control variables are lagged one quarter in regressions. We do not report coefficients of control variables to conserve space. Columns 1 and 3 control for CDS firm fixed effects (CDS Firm). We control for loan initiation year, borrower industry and loan purpose fixed effects in all specifications. All variables are winsorized at 1% level. Standard errors clustered by firm are reported in parentheses. ***, ** and * denote statistical significance level at 1%, 5% and 10%, respectively. See Appendix for detailed variable definitions.

	Loan Amount/Total Assets		Loan Spread	
Variable	(1)	(2)	(3)	(4)
CDS Trading	0.089***	0.107***	16.356***	9.075***
	(0.034)	(0.027)	(3.118)	(2.548)
CDS Firm	0.029		-11.218***	
	(0.030)		(2.772)	
All-in-Drawn Spread	-0.001	-0.001		
	(0.000)	(0.000)		
Loan Amount/Total Assets			-2.670	-2.703
			(2.091)	(2.086)
Intercept	0.436***	0.434***	267.686***	268.943***
	(0.071)	(0.071)	(14.975)	(14.888)
Loan Characteristics Controls	Yes	Yes	Yes	Yes
Borrower Characteristics Controls	Yes	Yes	Yes	Yes
Year Fixed Effects	Yes	Yes	Yes	Yes
Borrower Industry Fixed Effects	Yes	Yes	Yes	Yes
Loan Purpose Fixed Effects	Yes	Yes	Yes	Yes
R-squared (%)	9.22	9.21	49.09	49.02
Observations	17268	17268	17268	17268

Table IA5. Effects of CDS Trading on Loan Terms: Simultaneous Equations

This table reports simultaneous regression results of loan amount and loan spread on CDS trading in borrower's name, estimated by two-stage-least-square. In the loan amount regressions we incorporate industry loan amount/total assets, which refers to the mean of loan amounts/total assets of all syndicated loans to firms in the same 2-SIC industry in the same quarter; in the loan spread regressions we include industry loan spread, which is the mean of all-in-drawn spreads of all syndicated loans to firms in the same 2-SIC industry in the same quarter. Loan and borrower characteristics are the same as we used in baseline regressions reported in Table VI. Firm-level control variables are lagged one quarter in regressions. Coefficients of control variables are not reported to conserve space. Columns 1 and 3 control for CDS firm fixed effects (CDS Firm). We control for loan initiation year, borrower industry and loan purpose fixed effects in all specifications. All variables are winsorized at 1% level. Standard errors clustered by firm are reported in parentheses. ***, ** and * denote statistical significance level at 1%, 5% and 10%, respectively. See Appendix for detailed variable definitions.

	Loan Amount/Total Assets		Loan Spread	
Variable	(1)	(2)	(3)	(4)
CDS Trading	0.149***	0.187***	15.877***	7.811***
	(0.033)	(0.028)	(3.410)	(2.833)
CDS Firm	0.060**		-12.849***	
	(0.030)		(3.049)	
Loan Spread	-0.001	-0.001		
	(0.001)	(0.001)		
Industry Loan Amount/Total Assets	0.013	0.014		
	(0.018)	(0.018)		
Loan Amount/Total Assets			-35.468***	-36.010***
			(7.950)	(7.977)
Industry Loan Spread			0.297***	0.300***
			(0.042)	(0.042)
Intercept	0.737***	0.710***	421.783***	428.034***
	(0.262)	(0.262)	(24.854)	(24.897)
Year Fixed Effects	Yes	Yes	Yes	Yes
Borrower Industry Fixed Effects	Yes	Yes	Yes	Yes
Loan Purpose Fixed Effects	Yes	Yes	Yes	Yes
R-squared (%)	40.91	40.88	43.61	43.39
Observations	15546	15546	15546	15546

Robustness of Loan-Level Evidence: Instrumental Variable (IV) Approach and Propensity Score Matching

A potential concern with the difference-in-differences approach (*CDS Trading* versus *CDS Firm*) is that the treatment effect may be confounded by the endogenous selection of a firm into CDS trading. To make causal inferences, we employ both an IV approach and a propensity score matching approach.

Instrumental Variables for Firms' CDS Trading

Our first instrument, *Lender Foreign Exchange Derivatives*, is the amount of foreign exchange derivatives used for hedging—not trading—purposes relative to the total loans of the syndicate banks that a firm has borrowed from over the past five years. The ratio is lagged by one quarter when it is included in the first-stage probit regression. Data on lenders' foreign exchange derivatives are available from the FR Y-9C reports filed by bank holding companies, which track the derivatives use of lending banks and the composition of their loan portfolios. The intuition is that banks that hedge the foreign exchange exposures of their loan portfolios are likely to be active risk managers in general. Moreover, this variable is more likely to capture the hedging demand from lending banks rather than that from other CDS market participants, such as hedge funds. Having been used by Saretto and Tookes (2013) and Subrahmanyam, Tang, and Wang (2014), this instrument captures the hedging demand of firms' creditors and can predict the existence of CDS for firms' debt.

Our second instrument is the pre-existence of public bonds for the borrowing firm. In our sample, all CDS-referenced firms had public bonds prior to the introduction of their CDS. The presence of public bonds signals that a firm has better information transparency and that it may reduce the lemons problem in risk transfer, which facilitates the initiation of a CDS market on the firm's debt (Minton, Stulz and Williamson, 2009). Therefore, the pre-existence of public bonds is positively correlated with the possibility of the introduction of CDS on the firm's debt.

We believe that these two instruments satisfy the exclusion restriction. First, we use the foreign exchange derivatives position of *past* lenders, which may not be the current lender in our loan sample; second, the lender's foreign exchange derivatives position is a macro hedge and characterizes the lender's global risk management strategy, which is unlikely to affect the individual loan contract terms in its domestic lending (the borrowing firms in our sample are all U.S. based).

Similarly, apart from affecting the possibility of the introduction of CDS on the borrower's debt, the presence of public bonds is unlikely to independently affect the firm's syndicated loan size and spread at initiation. One may argue that firms' access to the bond market affects firm leverage (see Faulkender and Petersen, 2006, for example) and that such access thus may affect loan terms. However, the primary reason that the presence of a bond market is linked to firm leverage is that the availability of a public debt market can make firms less financially constrained because firms have more choices regarding the source of debt capital. Thus, the channel at work is the alternative source of financing provided by the public debt market rather than any changes induced by the presence of the public debt market on banks' lending strategies. Even if the presence of the bond market represents better information on borrowing firms, as a company with publicly traded debt always has a bond rating, such additional information provided by rating agencies may not provide a substantial amount of increased value to lending banks, which are usually considered to have a private information advantage and to be specialized in screening and

monitoring. Thus, we do not expect a firm's access to the bond market to have a direct effect on its loan terms set by lending banks, other than via the CDS channel.

We use a two-stage least-squares estimation to account for the selection into CDS trading. For the first-stage analysis, we estimate the OLS regression model for firms' CDS trading:

$$\begin{aligned} \text{CDSTrading}_{it} &= \alpha + \beta \text{FX Derivatives}_{it\text{-}1} (\text{or Presence of Bond Market}_{it-1}) \\ &\quad + \gamma_1 X_{it\text{-}1} + \gamma_2 \text{Year Fixed Effects}_t + \gamma_3 \text{Industry Fixed Effects}_j + u_{it} \end{aligned}$$

where $X_{it\text{-}1}$ refers to other firm-level determinants of CDS trading. The estimation results (provided in Table IA6 of the Internet Appendix) reveal that a larger past lender foreign exchange derivatives position and the pre-existence of public bonds are associated with greater probabilities of available CDS referencing the borrower's debt. The partial correlation between the IVs and CDS trading is both economically and statistically significant.

We report the second-stage estimation results using the instrumented CDS trading probability in Internet Appendix Table IA7. The results for the loan amount and spread are presented in panels A and B, respectively. Both panels consistently show positive and significant coefficient estimates for instrumented CDS trading. These results suggest that the impact of CDS trading on syndicated loan financing is robust to the potential endogeneity of CDS trading.

Propensity Score Matching

Endogeneity bias may arise if the observed loan terms depend on characteristics that affect whether a firm is linked to CDS rather than the effect of the introduction of CDS. We use propensity score matching to address potential endogeneity bias. We measure the marginal impact of CDS by forming groups of treatment and control firms that have an equal propensity of having CDS before their loan is issued. Using the same explanatory variables as in Table IA6 of the Internet Appendix, we estimate a probit model to obtain the CDS trading propensity score for each firm. We select from non-CDS firms within the same 2-digit SIC industry with the propensity score nearest to that of the treatment firm, which has CDS trading at the time of loan initiation, and obtain one-to-one matching firms for 432 CDS firms. We identify syndicated loans issued to the matching firms in the same year as the treatment firm to form the control group. The average distance in the propensity scores between the treatment and matching firms is significantly reduced from 0.063 before matching to 0.007 after matching. The matched sample diagnostics are reported in Table IA8 of the Internet Appendix. The regression results estimated with the matched sample are reported in Internet Appendix Table IA9. We observe a statistically significant increase in loan amount and spread for treatment firms relative to control firms.

Table IA6. Instrumental Variable of Borrower CDS Market Availability: First-Stage Regression

This table presents results of OLS regression of the availability of CDS trading referencing the borrower's debt on instrumental variables. The sample is composed of loans issued before CDS introduction and loans issued in the first quarter when CDS start trading for CDS firms, and all loans to non-CDS firms. In column 1, the instrument is FX derivatives for hedging, which is calculated as the amount of foreign exchange derivatives used for hedging purposes (not trading) relative to the amount of loans of the lead syndicate banks that the firm has borrowed money from in the past five years; in column 2, the instrument is the presence of bond trading, a dummy indicating whether the firm has a bond market by the time it issues the loan; in column 3, both instruments enter regression. Control variables are mainly from Ashcraft and Santos (2009), Saretto and Tookes (2013) and Subrahmanyam, Tang and Wang (2013). Instruments and control variables are lagged one quarter when entering the regressions. All variables are winsorized at 1% level. We control for year and industry fixed effects in all specifications. Standard errors are reported in parentheses. ***, ** and * denote statistical significance level at 1%, 5% and 10%, respectively. See Appendix for detailed variable definitions.

Variable	(1)	(2)	(3)
FX Derivatives for Hedging	42.069***		31.574***
	(7.185)		(6.976)
Presence of Bond Trading		2.384***	2.371***
		(0.172)	(0.172)
Log (Total Assets)	1.107***		1.102***
	(0.026)	(0.024)	(0.026)
Leverage	0.221	1.521***	0.082
	(0.339)	(0.303)	(0.341)
Market-to-Book	155.743***	149.841***	152.318***
	(17.382)	(14.625)	(17.425)
Profitability	-2.124*	-2.272**	-2.171*
	(1.140)	(1.012)	(1.145)
Tangibility	-0.141	0.140	-0.111
	(0.148)	(0.139)	(0.149)
Z-score	-0.063***	-0.107***	-0.060***
	(0.021)	(0.019)	(0.021)
Excess Return	-0.291***	-0.239***	-0.291***
	(0.063)	(0.059)	(0.063)
Stock Return Volatility	-0.514	-1.710***	-0.501
	(0.548)	(0.510)	(0.550)
Intercept	-11.782***	-10.992***	-11.774***
	(0.343)	(0.303)	(0.344)
Year Fixed Effects	Yes	Yes	Yes
Borrower Industry Fixed Effects	Yes	Yes	Yes
F-statistic	302.28***	345.47***	342.78***
R-squared (%)	38.05	34.41	38.65
Observations	21640	21640	21640

Table IA7. Instrumental Variable of Borrower CDS Market Availability: Second-Stage Regression

This table presents regression results of loan amount and loan spread on instrumented CDS trading. In the first stage we estimate an OLS model to obtain the fitted value of the independent variable, CDS trading, using two instrumental variables: (1) past lender foreign exchange derivatives position for hedging; (2) The presence of bond market for the borrowing firm before it issues the loan. The first instrument is the amount of foreign exchange derivatives used for hedging purposes (not trading) relative to the amount of loans of the lead syndicate banks that the firm has borrowed money from in the past five years. Past lender's foreign exchange derivatives position data are extracted from FR Y-9C. The presence of bond market is a dummy indicating whether the firm has a bond market prior to its issuance of loan. Bond issuance information is from Mergent Fixed Income Securities Database (FISD). In the second-stage regressions we regress loan amount relative to total assets and loan spread on the fitted value of CDS trading from the first stage, with the same controls as we used in the baseline regression in Table VI. We do not report the coefficients of the controls to conserve space. Columns 1 to 3 report estimation results of regressions of loan terms on the fitted value of CDS trading in borrowers' name obtained from first-stage OLS regressions 1 to 3, respectively. All variables are winsorized at 1% level. We control for loan initiation year, borrower industry and loan purpose fixed effects in all specifications. Standard errors clustered by firm are reported in parentheses. ***, ** and * denote statistical significance level at 1%, 5% and 10%, respectively. See Appendix for detailed variable definitions.

Panel A. Loan Amount/Total Assets			
Variable	(1)	(2)	(3)
Instrument1 (FX Derivatives)	0.781***		
	(0.110)		
Instrument2 (Presence of Bond Trading)		0.260***	
		(0.037)	
Instrument3 (FX Derivatives and Presence of Bond Trading)			0.513***
			(0.071)
Loan Spread	0.001	0.001	0.001
	(0.000)	(0.000)	(0.000)
Intercept	1.346***	1.082***	1.215***
	(0.321)	(0.308)	(0.313)
Fixed Year, Industry, Loan Purpose Controls	Yes	Yes	Yes
R-squared (%)	28.25	29.29	28.74
Observations	14416	14416	14416

Panel B. Loan Spread			
Variable	(1)	(2)	(3)
Instrument1 (FX Derivatives)	15.841***		
	(4.437)		
Instrument2 (Presence of Bond Trading)		14.612**	
		(7.179)	
Instrument3 (FX Derivatives and Presence of Bond Trading)			21.427***
			(6.104)
Loan Amount/Total Assets	-5.666***	-5.568***	-5.769***
	(1.459)	(1.452)	(1.471)
Intercept	253.952***	251.399***	256.268***
	(11.837)	(12.260)	(12.082)
Fixed Year, Industry and Loan Purpose Controls	Yes	Yes	Yes
R-squared (%)	48.97	48.91	48.96
Observations	14416	14416	14416

Table IA8. Firm Characteristics before and after Propensity Score Matching

This table presents matched sample diagnostics for CDS firms and non-CDS firms. We estimate a probit model of CDS trading on the explanatory variables, which are lagged by one quarter, to obtain scores that measure firms' propensity to have CDS market referenced its debt. For each CDS firm, we choose one non-CDS firm that is the closest match in the same 2-digit SIC industry, based on its propensity score. 432 CDS firms are paired with one matching firm each. The first column shows difference in propensity scores and other key variables that describe loan and borrower characteristics between CDS and non-CDS firms of the full sample before matching; the second column shows difference in the same variables between CDS firms and their one-to-one matched non-CDS firms. ***, ** and * represent statistical significance by which a number is different from zero at 1%, 5% and 10% level, respectively. See Appendix for detailed variable definitions.

Variable	Before Matching	After Matching
Propensity Score	0.063***	0.007
Loan Characteristics		
Loan Amount/Total Assets	0.034***	0.005
All-in-Drawn Spread	-82.142***	-0.183
Maturity (Years)	-0.371***	-0.042***
Secured	-0.128***	0.010
Total Number of Lenders	4.940***	-0.049
Borrower Characteristics		
Log (Total Assets)	2.536***	0.492***
Leverage	0.016***	0.001
Profitability	0.008***	0.000
Market-to-Book	-0.185	0.135
Tangibility	-0.043	-0.039
Current Ratio	-0.537***	-0.005
Cash/Total Assets	-0.018***	0.001
Log (1+Fixed Charge Coverage)	-0.001***	0.000
Z-score	-0.544***	-0.145*

Table IA9. Effects of CDS Trading on Loan Terms: Propensity Score Matching

This table presents regression results of loan amount and loan spread on CDS trading in borrower's name, with a matched sample, based on the propensity scores estimated from a probit model of the likelihood of CDS trading. The treatment group is confined to CDS firms that borrow both before and after their CDS started to be traded. To form the sample for the probit regression, we keep firm-quarters only from the first quarter of 1994 until the first quarter that CDS trading begins. We add firms that remain untraded through the end of our sample period (non-CDS firm). Then we obtain propensity scores by estimating a probit model where the dependent variable is one if the firm has active CDS trading in the current quarter. The explanatory variables for the probit regressions are the same as we used in Internet Appendix Table IA6. We pair each treatment firm with a matching by selecting from the control group the one with nearest propensity score from the same 2-digit SIC industry. The control group of loans for the matched sample is formed of syndicated loans issued by matching firms in the same year. The control variables in the OLS regression are the same as we used in baseline regressions in Table VI. We do not report the coefficients of control variables to conserve space. All variables are winsorized at 1% level. We control for loan initiation year, borrower industry and loan purpose fixed effects in all specifications. Standard errors clustered by firm are reported in parentheses. ***, ** and * denote statistical significance level at 1%, 5% and 10%, respectively. See Appendix for detailed variable definitions.

Panel A. Loan Amount/Total Assets		
Variable	(1)	(2)
CDS Trading	0.032*	0.044***
	(0.018)	(0.016)
CDS Firm	0.019	
	(0.022)	
Loan Spread	0.023	0.023
	(0.015)	(0.015)
Intercept	0.391***	0.396***
	(0.123)	(0.123)
Year Fixed Effects	Yes	Yes
Borrower Industry Fixed Effects	Yes	Yes
Loan Purpose Fixed Effects	Yes	Yes
R-squared (%)	40.09	40.07
Observations	6740	6740

Panel B. Loan Spread		
Variable	(1)	(2)
CDS Trading	10.299**	8.498*
	(5.216)	(5.172)
CDS Firm	-2.901	
	(5.243)	
Loan Amount/Total Assets	-0.777	-0.823
	(2.956)	(2.943)
Intercept	307.970***	307.352***
	(37.120)	(36.872)
Year Fixed Effects	Yes	Yes
Borrower Industry Fixed Effects	Yes	Yes
Loan Purpose Fixed Effects	Yes	Yes
R-squared (%)	51.73	51.72
Observations	6740	6740

Table IA10. Effects of CDS Trading on Bank Lending Practice: Full Sample Results

This table reports estimation results of regressions that examine how loan amount and spread are affected by lead banks' CDS activities for the full sample of syndicated loans. CDS-active bank refers to lead banks that ever traded CDS in the sample period. CDS-inactive bank refers to banks that never traded CDS during the sample period. The control variables in the OLS regression are the same as we used in baseline regression in Table VI. We do not report the coefficients of control variables to conserve space. All variables are winsorized at 1% level. We control for loan initiation year, borrower industry and loan purpose fixed effects in all specifications. Standard errors clustered by firm are reported in parentheses. ***, ** and * denote statistical significance level at 1%, 5% and 10%, respectively. See Appendix for detailed variable definitions.

Panel A. Loan Amount/Total Assets				
	CDS-Active Bank		CDS-Inactive Bank	
Variable	(1)	(2)	(3)	(4)
CDS Trading	0.145***	0.124***	0.309*	0.159
	(0.026)	(0.028)	(0.177)	(0.176)
CDS Firm		0.034		0.232*
		(0.022)		(0.130)
Loan Spread	0.001	0.001	0.001	-0.001
	(0.000)	(0.000)	(0.000)	(0.000)
Intercept	0.724	0.709	0.891*	0.761
	(0.450)	(0.448)	(0.509)	(0.547)
Year Fixed Effects	Yes	Yes	Yes	Yes
Industry Fixed Effects	Yes	Yes	Yes	Yes
Loan Purpose Fixed Effects	Yes	Yes	Yes	Yes
R-squared (%)	34.19	34.18	41.34	41.14
Observations	10624	10624	938	938

Panel B. Loan Spread				
	CDS-Active Bank		CDS-Inactive Bank	
Variable	(1)	(2)	(3)	(4)
CDS Trading	7.837***	13.971***	-4.822	5.177
	(3.698)	(3.813)	(14.375)	(14.425)
CDS Firm		-9.879***		-15.573**
		(3.564)		(7.724)
Loan Amount/Total Assets	0.537	0.583	-0.099	0.126
	(1.229)	(1.233)	(1.948)	(1.918)
Intercept	485.548***	490.697***	418.286***	428.440***
	(17.115)	(16.839)	(53.039)	(50.773)
Year Fixed Effects	Yes	Yes	Yes	Yes
Industry Fixed Effects	Yes	Yes	Yes	Yes
Loan Purpose Fixed Effects	Yes	Yes	Yes	Yes
R-squared (%)	52.87	52.81	49.72	49.56
Observations	10624	10624	938	938

Table IA11. Effects of CDS Trading on Loan Quality

This table presents estimation results of regressions that examine how loan quality is affected by CDS trading in borrowers' name. Panel A examines results of loan quality at loan initiation. Panel B examines results of subsequent changes in loan quality after the loan is issued. The sample is composed of CDS firms that ever borrowed both before and after CDS introduction, and the whole non-CDS sample. Loan quality is measured by S&P long-term issuer rating. Letter ratings have been converted into a number scale (1=AAA, 2=AA+, 3=AA, …, 25=D). In panel A, the independent variable of interest is CDS trading, a dummy equal to one if the borrower is referenced by CDS at loan initiation. Column 2 controls for CDS firm fixed effects (CDS Firm). In Panel B, we calculate changes in issuer credit rating in one year, two years and three years after loan initiation, relative to the issuer's initial credit rating. In even columns of Panel B, another independent variable in interest is the interaction of CDS trading and CDS active bank. CDS active bank is a dummy equal to one if the lead arranger is active in CDS trading at loan initiation. We do not report all control variables to conserve space. All variables are winsorized at 1% level. We control for year, borrower industry and loan purpose fixed effects in all specifications. Standard errors clustered by firm are reported in parentheses. ***, ** and * denote statistical significance level at 1%, 5% and 10%, respectively. See Appendix for detailed variable definitions.

Table IA11 — *Continued*

Panel A. Loan Quality at Initiation		
Variable	(1)	(2)
CDS Trading	0.305***	0.541***
	(0.104)	(0.096)
CDS Firm		-0.385***
		(0.119)
Log (Loan Amount)	0.060	0.061
	(0.039)	(0.039)
All-in-Drawn Spread	0.011***	0.011***
	(0.000)	(0.000)
Intercept	14.103***	15.119***
	(0.548)	(0.548)
Loan and Borrower Characteristics	Yes	Yes
Year and Borrower Industry Fixed Effects	Yes	Yes
Loan Purpose Fixed Effects	Yes	Yes
R-squared (%)	68.86	68.98
Observations	8110	8110

Panel B. Changes in Loan Quality						
	Δ in 1 Year		Δ in 2 Years		Δ in 3 Years	
Variable	(1)	(2)	(3)	(4)	(5)	(6)
CDS Trading	0.167***	0.127**	0.336***	0.268***	0.467***	0.393***
	(0.056)	(0.058)	(0.090)	(0.091)	(0.120)	(0.126)
CDS Firm	-0.096*	-0.095*	-0.179**	-0.177**	-0.265***	-0.263***
	(0.050)	(0.050)	(0.083)	(0.083)	(0.104)	(0.103)
CDS Trading*		0.173**		0.303***		0.323**
CDS Active Bank		(0.080)		(0.109)		(0.133)
CDS Active Bank		-0.095*		-0.187**		-0.168*
		(0.055)		(0.086)		(0.095)
Initial Rating at	-0.221***	-0.222***	-0.282***	-0.282***	-0.333***	-0.333***
Loan Issuance	(0.024)	(0.024)	(0.028)	(0.028)	(0.029)	(0.029)
Log (Loan Amount)	0.070***	0.069***	0.038	0.037	0.018	0.016
	(0.021)	(0.021)	(0.029)	(0.029)	(0.036)	(0.036)
All-in-Drawn Spread	0.003***	0.003***	0.004***	0.004***	0.003***	0.003***
	(0.000)	(0.000)	(0.001)	(0.001)	(0.001)	(0.001)
Intercept	3.386***	3.393***	4.698***	4.709***	5.439***	5.450***
	(0.428)	(0.428)	(0.547)	(0.547)	(0.641)	(0.642)
Loan and Borrower Characteristics	Yes	Yes	Yes	Yes	Yes	Yes
Year and Borrower Industry Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Loan Purpose Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
R-squared (%)	15.39	15.45	16.01	16.11	16.62	16.71
Observations	7808	7808	7356	7356	6928	6928

Table IA12. Effects of CDS Trading on Bank Risk: Alternative Sample of Banks

This table reports the estimation results of regressions that examine how bank risk is affected by bank CDS trading, using alternative samples. In Panel A, the sample is composed of all Compustat bank-quarters from 1994 to 2009. In Panel B, the sample banks are restricted to the baseline sample which includes Dealscan syndicate lead arrangers which can be matched with Compustat identifier, excluding banks with deposits exceeding 10% of the total deposits aggregated across banks in the same quarter. CDS active bank is an indicator taking the value of one if the bank takes non-zero CDS position in the quarter of observation. All control variables are extracted one quarter prior to the observation and are the same as in Table II. We do not report coefficients of control variables to conserve space. All variables are winsorized at 1% level. We control for year and bank fixed effects in all specifications. Standard errors are reported in parentheses. ***, ** and * denote statistical significance level at 1%, 5% and 10%, respectively. See Appendix for detailed variable definitions.

Panel A. All Compustat Banks		
Variable	Log(Bank Z-score)	Distance-to-Default
	(1)	(2)
CDS Active Bank	-0.185***	-0.472*
	(0.071)	(0.259)
Intercept	2.996***	5.746***
	(0.205)	(0.276)
Year Fixed Effects	Yes	Yes
Bank Fixed Effects	Yes	Yes
R-squared (%)	9.03	10.29
Observations	36696	17383

Panel B. Dealscan Sample Excluding Big Banks		
Variable	Log(Bank Z-score)	Distance-to-Default
	(1)	(2)
CDS Active Bank	-0.394***	-1.280***
	(0.052)	(0.357)
Intercept	2.325***	6.923***
	(0.102)	(1.128)
Year Fixed Effects	Yes	Yes
Bank Fixed Effects	Yes	Yes
R-squared (%)	27.12	16.97
Observations	4099	1410

Table IA13. CDS Trading and Bank Resilience: Effects of Negative Banking Shocks

This table reports estimation results of regressions that examine how the effects of CDS trading on loan spread is impacted by negative banking shocks. Banking shocks are measured by state-level default and lender portfolio default. In columns 1 and 2, the independent variable of interest is the interaction of CDS trading and state-level default. Default in same state is a dummy taking one if any firms in the state whether the lead bank is headquartered filed for bankruptcy. Percent of default in same state is the percentage of firms filing for bankruptcy out of all firms in the lender's state. In columns 3 and 4, the independent variable of interest is the interaction of CDS trading and lender portfolio default. Default in lender portfolio is a dummy equal to one if any firm in the lender's portfolio filed for bankruptcy. Percent of default in lender portfolio is the percentage of borrowers filing for bankruptcy out of all borrowers of the lender. All default measures are lagged one quarter when entering regressions. All specifications control for CDS firm fixed effects (CDS Firm). The other control variables in the OLS regression are the same as we used in baseline regression. We do not report the coefficients of control variables to conserve space. All variables are winsorized at 1% level. We control for loan initiation year, borrower industry and loan purpose fixed effects in all specifications. Standard errors clustered by firm are reported in parentheses. ***, ** and * denote statistical significance level at 1%, 5% and 10%, respectively. See Appendix for detailed variable definitions.

Dependent Variable: Loan Spread				
Variable	(1)	(2)	(3)	(4)
CDS Trading*Default in Same State	-12.805**			
	(5.531)			
Default in Same State	4.855			
	(5.597)			
CDS Trading*Fraction of Default in Same State		-4.079*		
		(2.414)		
Fraction of Default in Same State		3.714***		
		(1.270)		
CDS Trading*Default in Lender Portfolio			-10.494**	
			(4.714)	
Default in Lender Portfolio			12.096***	
			(3.110)	
CDS Trading*Fraction of Default in Lender Portfolio				-11.345***
				(2.865)
Fraction of Default in Lender Portfolio				8.309***
				(1.896)
CDS Trading	21.877***	16.765***	18.014***	16.414***
	(5.680)	(4.260)	(4.892)	(4.426)
CDS Firm	-14.413***	-14.316***	-5.330	-5.205
	(3.141)	(3.150)	(4.405)	(4.397)
Intercept	451.520***	453.137***	366.934***	366.766***
	(21.003)	(20.835)	(27.558)	(27.733)
Year Fixed Effects	Yes	Yes	Yes	Yes
Borrower Industry Fixed Effects	Yes	Yes	Yes	Yes
Loan Purpose Fixed Effects	Yes	Yes	Yes	Yes
R-squared (%)	51.15	51.13	55.62	55.73
Observations	15546	15546	7057	7057