Credit Default Swaps and Bank Loan Sales: Evidence from Bank Syndicated Lending

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Outline

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Motivation

- Two most important and controversial financial innovations
  - Credit default swap (CDS)
    - A CDS contract is a credit derivative contract that transfers the default risk of one or more reference entities from the protection buyer to the protection seller
    - Lehman Brothers, AIG, JP Morgan's "London Whale" trading scandal
    - CDS is the greatest financial innovation (Greenspan, 2004)
    - "Weapons of mass destruction" (Buffet, 2002)
  - Securitization
    - Explosive growth of the secondary loan market
- Do banks use CDS hedging to substitute for loan sales?
  - Loan sales and CDS hedging can both be used for transferring credit risk from one party to another party
  - Duffee and Zhou (2001) and Parlour and Winton (2013)
    - Banks can use CDS to hedge the risks of high-quality, transparent borrowers with low monitoring costs
  - Pennacchi (1988) and Allen and Carletti (2006)
    - Capital and liquidity pressures are important drivers for loan sales and credit risk transfer
- No empirical studies on bank CDS usage and loan sales at the bank-firm level
  - Lack of data on bank loan sales and CDS usage at the bank-firm level
  - Now data become available

Research question

- Three channels in the relation between bank CDS usage and loan sales
  - Substitute channel
    - A negative relation between CDS hedging and loan sales
    - If a bank buys CDS protection to hedge its loans, it would have less incentive to sell loans
  - Complementary channel
    - A positive relation between bank CDS hedging and loan sales
    - If a bank has a higher propensity to use credit-risk-mitigation tools, it can choose to use both loan sales and CDS hedging
  - Credit-enhancement channel
    - A positive relation between bank CDS selling and loan sales
    - To facilitate loan sales, banks can sell CDS protection as credit enhancements to investors unwilling to hold credit risk

Literature review: Part 1

- Theoretical models
  - Duffee and Zhou (2001) and Parlour and Winton (2013)
    - Banks can use CDS to hedge the risks of high-quality borrowers when the information asymmetry problem is less severe and when monitoring costs are low
    - Why would banks want to hedge the risks of such low-risk borrowers?
  - Pennacchi (1988) and Allen and Carletti (2006)
    - Capital and liquidity pressures are important drivers for loan sales and credit risk transfer
    - Hedging through CDS allows banks to obtain regulatory capital relief by reducing the risk weights of their loans
- Other explanations
  - Banks can use CDS to provide credit enhancements in transactions they underwrite (Minton et al. ,2009)
    - Increase the supply of credit by investors unwilling to hold credit risk
  - Market-making activities

Literature review: Part 2

- Empirical studies
  - Irani and Meisenzahl (2017): Loan sales and bank liquidity risk management: Evidence from a U.S. Credit register
    - Sample: 2002-2010, SNC and bank holding company data (FR Y-9C)
    - Finding: Banks reliant on wholesale funding were more likely to exit syndicates through sales during crisis.
  - Norden, Silva Buston, and Wagner (2014): Financial innovation and bank behavior: Evidence from credit markets
    - Sample: 1997-2009, LPC DealScan, Call Report, Compustat.
    - Finding: The pricings of syndicated loans are negatively related to lead arrangers' gross positions in credit derivatives but not their net positions.
  - Hirtle (2009): Credit derivatives and bank credit supply
    - Sample: 1997-2006, combination of several regulatory and confidential data sets
      - The Federal Reserve's Survey of Terms of Business Lending (STBL), and Senior Loan Officers Opinion Survey on Bank Lending Practices (SLOOS).
    - Findings: Only limited evidence that CDS hedging increases credit supply

Literature review: Part 3

- Empirical studies
  - Minton, Stulz, and Williamson (2009): How much do banks use credit derivatives to hedge loans?
    - Sample: 1999-2005, bank holding company data (FR Y-9C)
    - Findings: Only 23 large banks out of 395 use credit derivatives and most of their derivatives positions are held for dealer activities rather than for hedging of loans
  - Beyhaghi, Massoud, and Saunders (2017): Why and how do banks lay off credit risk? The choice between retention, loan sales and credit default swaps
    - Sample: 2003-2007, DealScan, Markit CDS, Call report
    - Examine the joint choice and trade-off of CDS and loan sales as tools of hedging a loan's credit risk over 2003-2007
  - Gündüz et al. (2015): Testing the small bang theory of the financial universe from bank-firm exposures to changes in CDS trading and credit
    - Sample: 2008-2010, A sample of German banks and firms.
    - Finding: After the small bang (03/11/2009-07/31/2009) in the Europe CDS market, holding more CDS contracts of safer firms leads banks to supply relatively more credit to them.

Research summary

- Data
  - Syndicated loan share ownership data of U.S. banks
- Sample period
  - 2001–2013
- Major Findings
  - The complementary channel dominates the substitute channel
  - The credit-enhancement channel plays an important role in bank loan sales.

Data

- Data sources
  - Shared National Credit (SNC) data
    - SNC data track each bank's lending exposure to each syndicated facility over time
  - We link the SNC data with Markit CDS, Compustat, CRSP, Consolidated Financial Statements for Holding Companies (i.e., "FR Y-9C"), LPC Dealscan
- Sample period: 2001-2013
- Annual panel data at the lender-facility level

Variable definitions

Key variables: Facility-level

- Facility size
  - The facility size, also known as facility commitment, is the maximum amount that an obligor can borrow from a syndicated facility according to the credit agreement. The facility size is legally binding and changes only when the credit agreement changes (i.e., loan amendments).
- Facility balance
  - The facility balance is the current outstanding balance of a facility. It is the used portion of the facility commitment.
- Amended
  - The amended dummy captures both refinanced and amended facilities. It equals one if the facility commitment, maturity date, or origination date changes between the current year and the next year.
- Credit line
  - The credit line dummy equals one if a facility is a credit line, and it equals zero if a facility is a term loan.

Key variables: Lender-facility-level

- Agent bank
  - For a lender-facility pair, the agent bank dummy equals one if the lender is the agent bank for the facility. The agent bank is the bank that originates and/or administers a syndicated facility for the syndication of participating lenders.
  - Lead arranger of the syndicated facility
- Loan share
  - A lender's loan share, also known as share commitment or loan exposure, is the maximum amount that the lender has legally committed to the facility. It is legally binding and changes only when the credit agreement changes (i.e., loan amendments) or when the lender sells part or all of its loan share to another lender (i.e., loan sales).
- Loan sale
  - The loan sale dummy equals one if a lender's loan share is reduced from a non-zero value in the current year to zero in the next year.
- Loan share change
  - For a lender-facility pair, the loan share change is the change in loan share from the current year to the next year. In the absence of loan amendments, a negative loan share change is caused by loan sales, and a positive loan share change is caused by loan purchases.

Key variables: Lender-level

- Bank net CDS ratio
  - Bank net CDS ratio equals the net notional value of CDS protection divided by the bank's total assets.
  - The net notional value of CDS protection equals the notional value of bought CDS protection minus the notional value of sold CDS protection.
- Bank gross CDS ratio
  - Bank gross CDS ratio equals the sum of notional values of bought and sold CDS protection divided by the bank's total assets.
- CDS user
  - The CDS user dummy equals one if bank gross CDS ratio is positive.
- CDS net buyer
  - The CDS net buyer dummy equals one if bank net CDS ratio is positive
- CDS net seller
  - The CDS net seller dummy equals one if bank net CDS ratio is negative.
- CDS dealer
  - The CDS dealer dummy equals one if the bank is one of the 10 largest CDS dealers in the U.S. (i.e., seven largest U.S. banks and three U.S. branches of foreign banks)

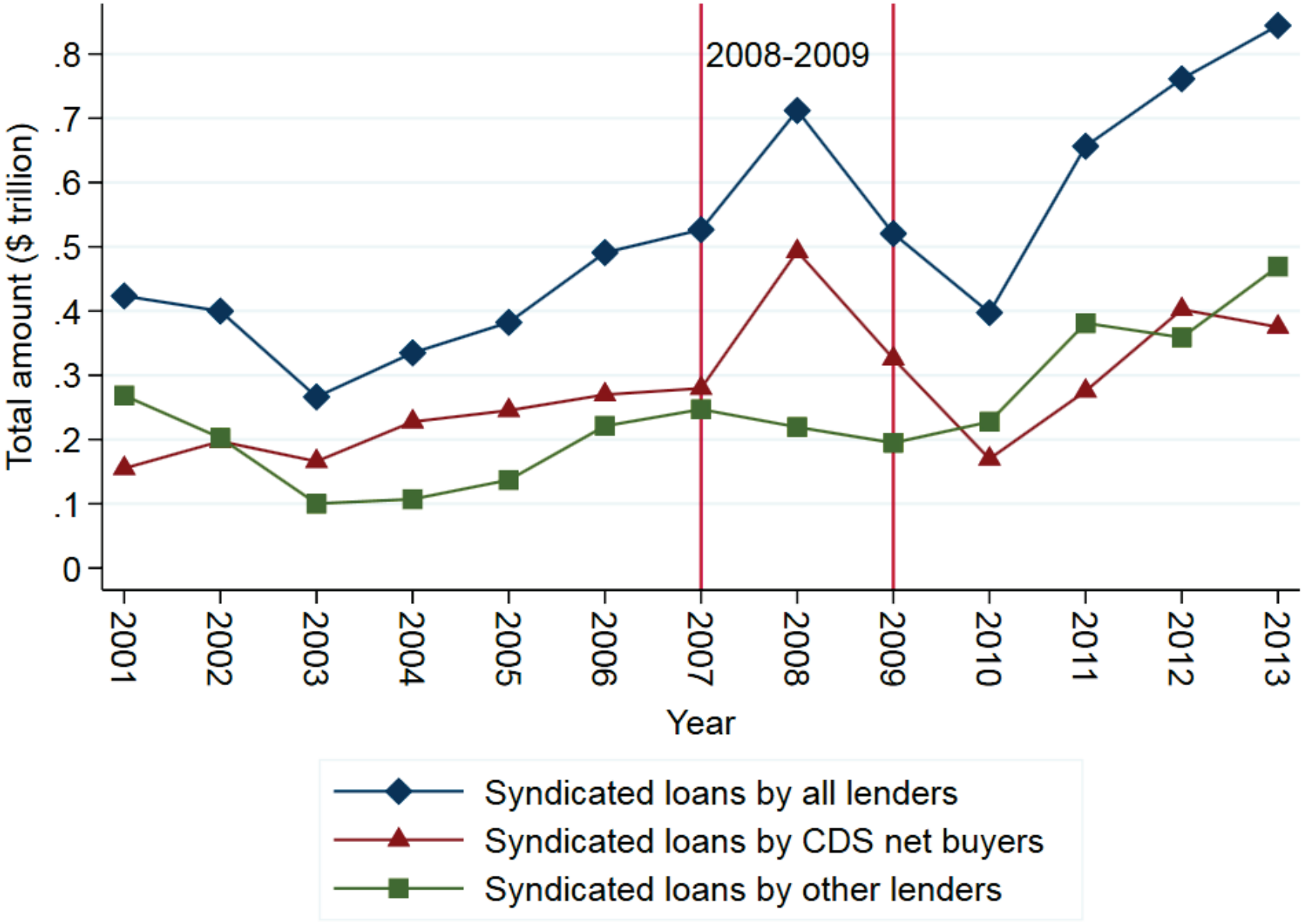
Key variables: Borrower-level

- CDS traded
  - For a firm in a given year, the CDS traded dummy equals one if the firm has ever been a CDS reference entity within the past five years.
- CDS liquid
  - For a firm in a given year, the CDS liquid dummy equals one if the CDS quote depth is greater than or equal to 3.
- CDS quote depth
  - A firm's CDS quote depth is the average number of dealers that provide CDS quotes on the firm over the trailing 12-month period.

Empirical design

- Logit regressions of bank loan sales
  - All regressions include year fixed effects and control variables at lender, lender-facility, facility, and firm levels
- Regressions of bank loan sales with facility*year fixed effects
  - OLS with facility*year fixed effects
    - Compare loan sales by different lenders to the same facility in the same year
    - Control for borrower-side factors (i.e., firm-level and facility-level variables) and macroeconomic factors.
  - All regressions include control variables at lender and lender-facility levels.
- Regressions of bank loan share change at lender-facility level
  - Address the possibility of partial loan share sale and loan share purchase
- Regressions of bank loan share change at lender-borrower level
  - Address the possibility that a lender cuts its loan share in one facility but increases its loan share in another facility of the same obligor

Summary statistics


2008-2009
Total amount ($ trillion)
0
.1
.2
.3
.4
.5
.6
.7
.8
2001
2002
2003
2004
2005
2006
2007
2008
2009
2010
2011
2012
2013
Year
Syndicated loans by all lenders
Syndicated loans by CDS net buyers
Syndicated loans by other lenders

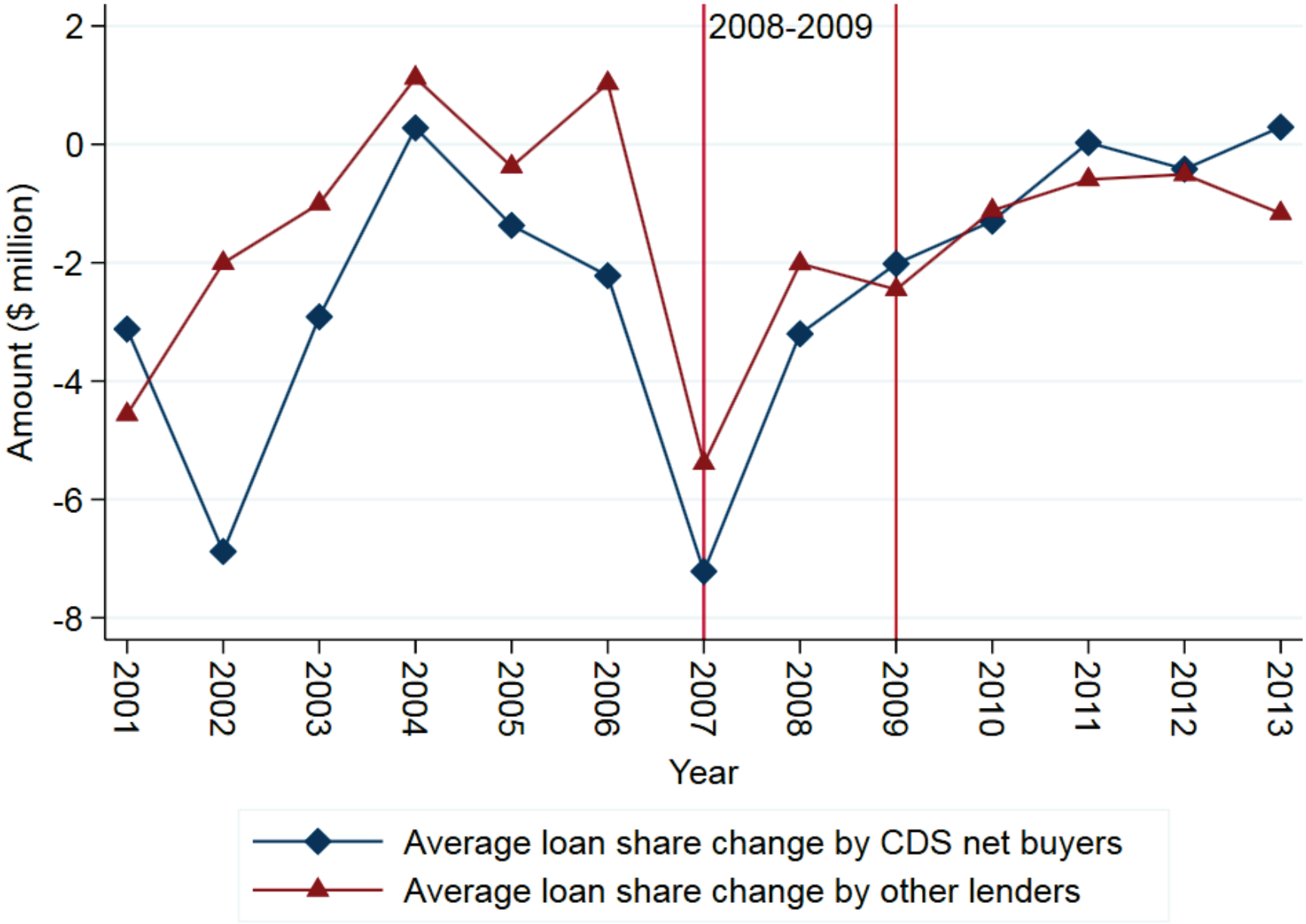

2008-2009
Amount ($ million)
2
0
-2
-4
-6
-8
2001
2002
2003
2004
2005
2006
2007
2008
2009
2010
2011
2012
2013
Year
Average loan share change by CDS net buyers
Average loan share change by other lenders

Table 1: Summary statistics of selected variables (2001–2013)

	N	Mean	Median	STD	P5	P95
Facility commitment ($ millions)	167,145	$715.4	$425.0	$834.6	$65.0	$2,268.6
Facility balance ($ millions)	167,145	$196.5	$45.0	$451.9	$0.0	$850.0
Loan share ($ millions)	167,145	$40.2	$25.0	$43.8	$3.2	$125.0
Used loan share ($ millions)	167,145	$9.4	$2.7	$20.3	$0.0	$38.2
Loan share change ($ millions)	167,145	$-1.9	$0.0	$14.3	$-25.0	$13.9
Loan share change (%)	165,135	-6.2%	0.0%	42.8%	-100.0%	51.4%
Bank bought CDS ratio	122,704	32.0%	1.6%	58.0%	0.0%	168.2%
Bank sold CDS ratio	122,704	30.5%	0.9%	56.5%	0.0%	168.7%
Bank net CDS ratio	122,704	1.5%	0.2%	4.9%	-2.6%	8.3%
Bank gross CDS ratio	122,704	62.5%	2.7%	114.3%	0.1%	336.9%
Bank capital ratio	167,145	10.0%	9.6%	3.5%	4.8%	16.3%
Bank wholesale funding ratio	167,145	32.1%	32.4%	14.4%	7.5%	49.5%
Bank total assets ($ billions)	167,145	$495.6	$157.1	$677.7	$3.5	$2,136.6
Bank ROA	167,145	0.7%	0.9%	0.9%	-0.9%	1.8%
Bank NPA ratio	167,145	1.3%	0.9%	1.1%	0.1%	3.8%
Bank real estate loan ratio	167,145	46.1%	49.2%	17.9%	8.8%	70.8%
Bank commercial loan ratio	167,145	23.7%	21.6%	11.2%	8.8%	48.4%
Bank subordinated debt ratio	167,145	2.3%	2.3%	1.5%	0.0%	4.8%
Bank risk-weighted assets ratio	167,145	73.1%	75.1%	18.6%	41.0%	101.2%

Table 2: Average loan share change and loan sale rate: CDS net buyers versus other lenders (2001–2013)

	Average loan share change ($ million)		Loan sale rate (%)	
	CDS net buyers	Other lenders	CDS net buyers	Other lenders
All	$-2.2	$-1.6	9.0%	8.7%
Amended				
No	$-2.1	$-1.5	7.6%	6.3%
Yes	$-2.4	$-1.8	11.4%	12.1%
Credit line				
No	$-3.7	$-2.7	13.0%	11.7%
Yes	$-2.0	$-1.4	8.3%	8.1%
Agent bank				
No	$-2.4	$-1.7	9.9%	9.1%
Yes	$-1.3	$-0.7	3.9%	2.6%
Investment grade				
No	$-1.9	$-1.4	10.2%	10.0%
Yes	$-2.6	$-1.9	7.7%	7.0%
Criticized rating				
No	$-2.0	$-1.4	8.6%	8.1%
Yes	$-5.7	$-5.5	15.7%	20.4%
CDS traded				
No	$-1.5	$-1.2	9.4%	8.9%
Yes	$-3.1	$-2.2	8.7%	8.3%
CDS liquid				
No	$-1.6	$-1.3	9.1%	8.9%
Yes	$-3.6	$-2.4	8.9%	8.0%

Estimation results

Table 3: Logit regressions of bank loan sales (2001–2013)

Subsample	(1) CDS net buyers	(2) CDS net sellers
	AME	AME
Bank net CDS ratio	0.133***	-0.913***
	[0.021]	[0.157]
Bank gross CDS ratio	0.000	-0.039***
	[0.002]	[0.004]
Agent bank	-0.052***	-0.032***
	[0.004]	[0.006]
Log (loan share)	-0.026***	-0.021***
	[0.001]	[0.001]
Bank capital ratio	-0.418***	0.449***
	[0.061]	[0.081]
Bank wholesale funding ratio	0.116***	-0.172***
	[0.013]	[0.026]
Bank liquid asset ratio	-0.346***	0.080***
	[0.012]	[0.023]
Log (bank total assets)	0.000	0.006***
	[0.002]	[0.002]
Bank ROA	-2.647***	-0.562***
	[0.194]	[0.197]
Bank risk-weighted assets ratio	-0.124***	-0.057***
	[0.014]	[0.022]
Bank NPA ratio	1.255***	-2.177***
	[0.175]	[0.234]

Table 3 (continued): Logit regressions of bank loan sales (2001–2013)

Criticized rating	0.030***	0.022***
	[0.005]	[0.005]
Investment grade	-0.007***	-0.006**
	[0.003]	[0.003]
Log (firm total assets)	0.006***	0.006***
	[0.001]	[0.001]
Earnings disagreement	0.335***	0.216***
	[0.059]	[0.063]
Firm distance-to-default	-0.000	-0.000
	[0.000]	[0.000]
Firm stock return	0.009***	-0.006*
	[0.003]	[0.003]
Firm profitability	0.006	0.010
	[0.007]	[0.008]
Firm current ratio	0.003***	-0.000
	[0.001]	[0.001]
Firm accounts payable	0.005	-0.038***
	[0.010]	[0.013]
Firm tangibility	-0.006	-0.004
	[0.004]	[0.004]
Year fixed effects	Yes	Yes
N	69,707	36,617
Pseudo R^2	0.239	0.278
Log likelihood	-15521.3	-5767.5
AUC statistic	0.827	0.825

Table 4: Regressions of bank loan sales with facility*year fixed effects (2001–2013)

	(1)	(2)	(3)	(4)	(5)
Bank net CDS ratio	0.242***	0.242***	0.373***	0.541***	0.516***
	[0.019]	[0.020]	[0.021]	[0.072]	[0.072]
CDS net seller	-0.024***	-0.024***	-0.050***	-0.050***	-0.049***
	[0.002]	[0.002]	[0.002]	[0.002]	[0.002]
Bank gross CDS ratio		0.000	-0.004***	-0.003***	-0.005***
		[0.001]	[0.001]	[0.001]	[0.001]
CDS net seller*bank net CDS ratio			-2.871***	-2.793***	-2.479***
			[0.130]	[0.130]	[0.128]
Agent bank*bank net CDS ratio				-0.578***	-0.558***
				[0.034]	[0.034]
Amended*bank net CDS ratio				-0.181***	-0.180***
				[0.039]	[0.039]
Credit line*bank net CDS ratio				-0.004	0.007
				[0.069]	[0.069]
TARP funding ratio					-3.399***
					[0.160]
DW funding ratio					-1.336***
					[0.138]
TAF funding ratio					-0.135***
					[0.016]
Agent bank	-0.025***	-0.025***	-0.026***	-0.015***	-0.015***
	[0.002]	[0.002]	[0.002]	[0.002]	[0.002]
Log (loan share)	-0.030***	-0.030***	-0.031***	-0.031***	-0.032***
	[0.002]	[0.002]	[0.002]	[0.002]	[0.002]

Table 4 (continued): Regressions of bank loan sales with facility*year fixed effects (2001–2013)

Bank capital ratio	-0.485***	-0.486***	-0.477***	-0.464***	-0.346***
	[0.030]	[0.031]	[0.031]	[0.031]	[0.034]
Bank wholesale funding ratio	0.040***	0.040***	0.030***	0.037***	0.053***
	[0.008]	[0.008]	[0.008]	[0.008]	[0.008]
Bank liquid asset ratio	-0.231***	-0.231***	-0.252***	-0.262***	-0.267***
	[0.009]	[0.009]	[0.009]	[0.009]	[0.009]
Log (bank total assets)	-0.007***	-0.007***	-0.005***	-0.006***	-0.006***
	[0.001]	[0.001]	[0.001]	[0.001]	[0.001]
Bank ROA	-4.395***	-4.395***	-4.128***	-4.105***	-4.206***
	[0.125]	[0.125]	[0.126]	[0.125]	[0.126]
Bank risk-weighted assets ratio	-0.120***	-0.120***	-0.129***	-0.139***	-0.147***
	[0.009]	[0.009]	[0.009]	[0.009]	[0.009]
Bank NPA ratio	1.173***	1.174***	1.322***	1.337***	1.431***
	[0.102]	[0.103]	[0.103]	[0.103]	[0.103]

Table 4 (continued): Regressions of bank loan sales with facility*year fixed effects (2001–2013)

Bank real estate loan ratio	-0.117***	-0.117***	-0.128***	-0.125***	-0.137***
	[0.006]	[0.006]	[0.006]	[0.006]	[0.006]
Bank commercial loan ratio	0.101***	0.101***	0.112***	0.113***	0.113***
	[0.010]	[0.010]	[0.010]	[0.010]	[0.010]
Bank securitized assets ratio	-0.611***	-0.615***	-0.918***	-0.936***	-0.828***
	[0.115]	[0.118]	[0.117]	[0.117]	[0.118]
Bank subordinated debt ratio	-0.137**	-0.137**	-0.093	-0.071	0.246***
	[0.069]	[0.069]	[0.069]	[0.069]	[0.074]
Bank unused commitment ratio	0.033***	0.033***	0.015	0.018*	0.034***
	[0.010]	[0.010]	[0.010]	[0.010]	[0.010]
Bank hedging derivatives ratio	-0.042*	-0.042*	-0.066***	-0.068***	-0.024
	[0.024]	[0.024]	[0.024]	[0.024]	[0.024]
Bank merger	-0.027***	-0.027***	-0.028***	-0.028***	-0.026***
	[0.002]	[0.002]	[0.002]	[0.002]	[0.002]
Facility*year fixed effects	Yes	Yes	Yes	Yes	Yes
N	167,145	167,145	167,145	167,145	167,145
Adjusted R^2	0.141	0.141	0.144	0.145	0.149

Table 5: Lender's CDS-using status and loan sales: Subsample analysis (2001–2013)

Subsample	(1) CDS users	(2) CDS net buyers	(3) CDS net sellers	(4) Non-CDS dealers	(5) CDS dealers
Bank net CDS ratio	0.271***	0.350***	-4.845***	0.567***	0.189**
	[0.075]	[0.085]	[0.426]	[0.174]	[0.075]
CDS net seller	-0.068***			-0.080***	0.003
	[0.002]			[0.003]	[0.003]
Bank gross CDS ratio	-0.012***	0.005***	-0.073***	0.413***	0.012***
	[0.001]	[0.001]	[0.005]	[0.021]	[0.001]
CDS net seller*bank net CDS ratio	-2.527***			-10.466***	-0.226*
	[0.124]			[0.453]	[0.121]
Lender controls	Yes	Yes	Yes	Yes	Yes
Lender-facility controls	Yes	Yes	Yes	Yes	Yes
Facility*year fixed effects	Yes	Yes	Yes	Yes	Yes
N	122,704	80,516	41,640	102,642	64,503
Adjusted R^2	0.176	0.182	0.275	0.201	0.184

Table 6: The effects of obligors' CDS liquidity on bank loan sales: Subsample analysis (2001–2013)

Subsample	(1) Non-CDS Obligors	(2) CDS-traded obligors	(3) CDS-liquid obligors
Bank net CDS ratio	0.592***	0.398***	0.491***
	[0.100]	[0.105]	[0.134]
CDS net seller	-0.044***	-0.055***	-0.063***
	[0.003]	[0.003]	[0.003]
Bank gross CDS ratio	-0.001	-0.009***	-0.010***
	[0.001]	[0.001]	[0.001]
CDS net seller*bank net CDS ratio	-1.999***	-3.000***	-3.203***
	[0.174]	[0.190]	[0.219]
Lender controls	Yes	Yes	Yes
Lender-facility controls	Yes	Yes	Yes
Facility*year fixed effects	Yes	Yes	Yes
N	91,491	75,654	53,102
Adjusted R^2	0.151	0.148	0.147

Table 7: The effects of obligors' CDS liquidity on bank loan sales: Interaction analysis (2001–2013)

	(1)	(2)
Bank net CDS ratio	0.475***	0.479***
	[0.075]	[0.073]
CDS net seller	-0.049***	-0.049***
	[0.002]	[0.002]
Bank gross CDS ratio	-0.005***	-0.005***
	[0.001]	[0.001]
CDS net seller*bank net CDS ratio	-2.174***	-2.306***
	[0.156]	[0.146]
CDS traded*bank net CDS ratio	0.079**	
	[0.037]	
CDS traded*CDS net seller*bank net CDS ratio	-0.649***	
	[0.208]	
CDS liquid*bank net CDS ratio		0.106***
		[0.037]
CDS liquid*CDS net seller*bank net CDS ratio		-0.481**
		[0.223]
Lender controls	Yes	Yes
Lender-facility controls	Yes	Yes
Facility*year fixed effects	Yes	Yes
N	167,145	167,145
Adjusted R^2	0.149	0.149

Additional tests

- Subsample analysis based on loan amendment status
- Subsamples analysis based on facility type
- Subsamples analysis based on obligors' credit quality
- Regressions of bank loan share change at the lender-facility level
- Regressions of loan share change at the lender-borrower level

Conclusions

- Data
  - Syndicated loan share ownership data of U.S. banks
- Sample period
  - 2001–2013
- Major findings
  - The complementary channel dominates the substitute channel
  - The credit-enhancement channel plays an important role in bank loan sales.