A Capital Structure Channel of Monetary Policy

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Motivation

Typical mechanism how LSAP affect real economy is through bank balance sheets:

- "Net worth channel": value of sovereign debt or MBS holdings $\uparrow$, lending $\uparrow$ (e.g. Acharya et al, 2017; Ferrando et al, 2016; Rodnyansky & Darmouni, 2017; Brunnermeier & Sannikov, 2015)
- "Liquidity channel": Increase in liquidity facilitates reallocation of funds on asset side (Rodnyansky & Darmouni, 2017)
- "Crowding-out": MBS purchases increase mortgage origination by banks crowding-out commercial lending (Chakraborty et al, 2017)

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- This, in turn, frees up bank capital of previously constrained banks and increases lending to firms without bond market access
- Channel is distinct from net worth channel. Banks (in our setting) only hold bonds of NFCs to a negligible degree [Details]

Setting

ECB's Corporate Sector Purchase Programme (CSPP)

- Monthly purchases of eligible *corporate* debt in the Eurozone
- Annouced March 2016, implemented June 2016
- Corporate debt is eligible if it has an *IG credit rating* (details)
- *Purchases exceed EUR 175 billion* as of December 2018
- CSPP purchases account for 10-30% of daily turnover of the entire investment grade bond universe

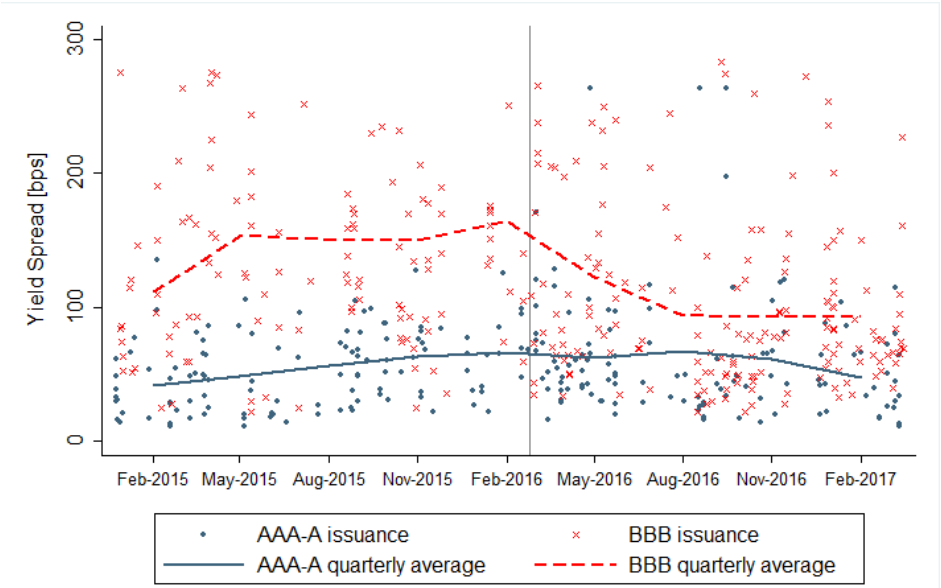
Key results

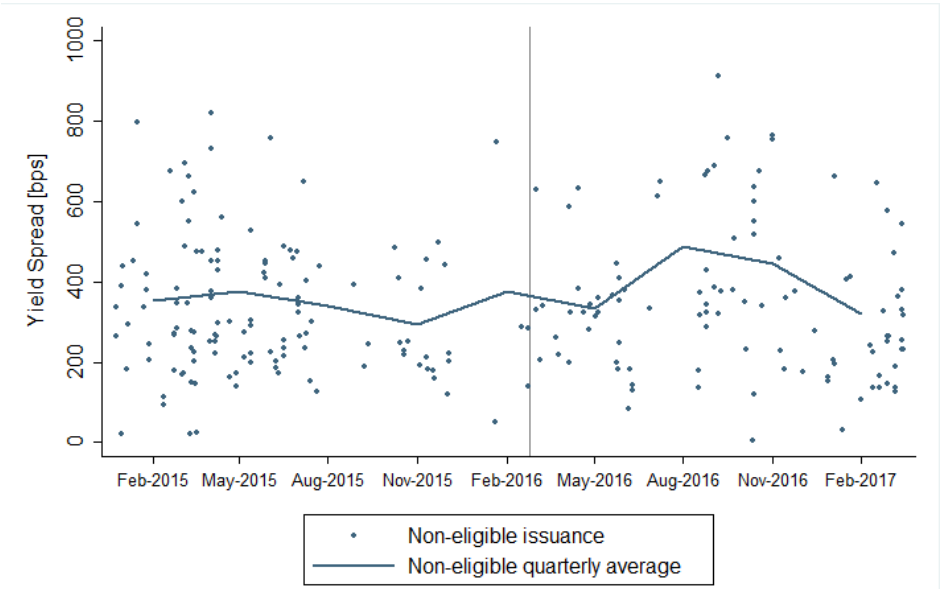
- Effects on eligible firms
  - Firms substitute bank debt (in particular term loans) with bond debt
  - Effects stronger for riskier, ex ante more bank dependent firms (BBB)
  - (Very) limited effects on investment
- Indirect effects
  - Increase in lending to *private* firms by banks with large exposures to CSPP eligible firms
  - Effect stronger for banks with low Tier-1 ratio or high NPL
  - Increase in investment for private firms borrowing from banks with large exposures to CSPP eligible firms

Outline

1. *Effect on eligible firms*
   - Bond yields
   - Debt capital structure
   - Real effects
2. Spillovers to loan market
   - Lending to non-eligible firms
   - Real effects for non-eligible firms
   - Bank portfolio risk

Effect on eligible firms: Bond yield spreads





Effect on eligible firms: Data sources and sample selection

- Compustat Global-Capital IQ linked database
  - Quarterly firm-level information, in particular on debt structure
- Issuer credit ratings from S&P, Moody's, Fitch, and DBRS
- Sample restrictions
  - Sample period: Q1 2015 to Q1 2017
  - Non-financial firms incorporated in Eurozone countries
  - Only firms with bond market access

Effect on eligible firms: Empirical strategy

- Treatment and control firms (descriptives)
  - "Intention-to-treat": Analysis based on ex-ante eligibility (not purchases)
  - treatment group: 135 firms with investment grade rating *pre*-CSPP
  - control group: 755 non-investment grade rated firms with public debt outstanding (includes unrated firms)

$$\text{Debt Structure}_{it} = \psi_i + \theta_{kt} + \mu_{ct} + \beta \text{Treated}_i \times \text{Post}_t + \rho' Y_{it-1} + \epsilon_{it}$$

- $\text{Post}_t = 1$ after the CSPP announcement (Q2 2016 - Q1 2017)
- Y: (lagged) firm characteristics (size, profitability, tangibility, MTB)
- FEs: firm (ψ_i), industry $\times$ quarter (θ_{kt}), country $\times$ quarter (μ_{ct})

Effect on eligible firms: Effect on bond debt

Variable:	Bond Debt / Assets	Bond Debt / Assets	Bond Debt / Assets	Bond Debt / Assets
Treated × Post	0.0109***	0.0116***	0.0160***	0.0201***
	(3.61)	(2.44)	(3.21)	(3.61)
Treated	0.0411***			
	(4.01)			
Post	-0.0027			
	(-0.84)			
2-digit SIC × Quarter FE				✓
Country × Quarter FE			✓	✓
Quarter FE		✓		
Firm FE		✓	✓	✓
Controls			✓	✓
Observations	6,611	6,611	6,611	6,611

- +2 pp bond debt to assets for treated relative to control group firms and relative to the pre-CSPP announcement period
- +13% relative to the unconditional sample mean

Effect on eligible firms: Change in debt structure

Variable:	Term Loans / Assets	Revolving Credit / Assets	Total Debt / Assets	Bank Debt / Bond Debt
Treated × Post	-0.0097*	0.0027	0.0109	-0.0481***
	(-1.66)	(1.04)	(1.61)	(-2.71)
2-digit SIC × Quarter FE	✓	✓	✓	✓
Country × Quarter FE	✓	✓	✓	✓
Firm FE	✓	✓	✓	✓
Controls	✓	✓	✓	✓
Observations	6,569	6,567	6,569	6,559

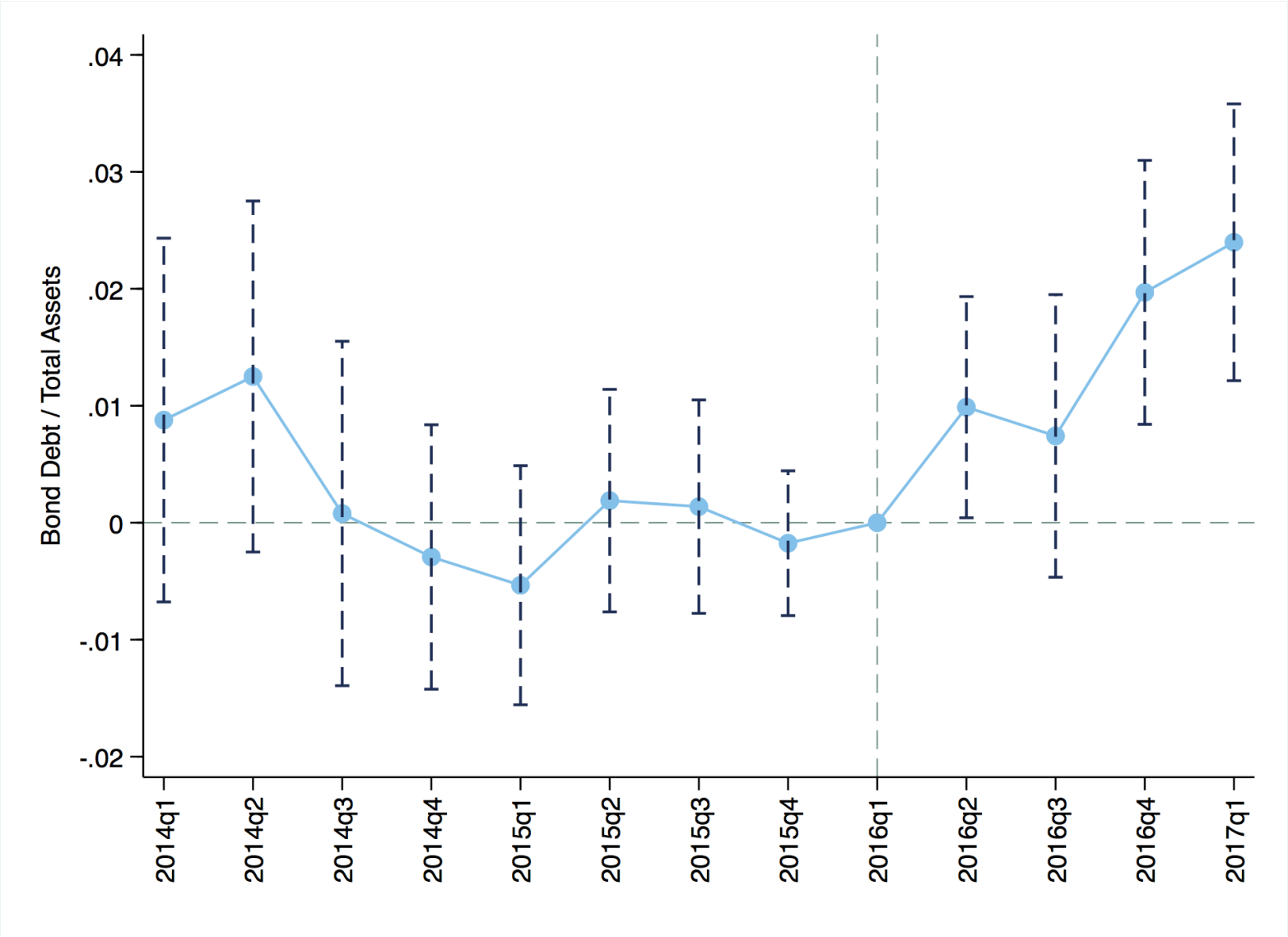
- -1pp term loan to assets for treated firms relative to control group firms and relative to the pre-CSPP announcement period (8% relative to sample mean)
- No effect on credit lines consistent with the view that credit lines and bonds are not close substitutes
- Eligible firms decrease their bank-to-bond debt ratio by about 5 percentage points following the CSPP

Effect on eligible firms: Effect by credit quality

Variable:	Bond Debt / Assets	Term Loans / Assets	Revolving Credit / Assets	Total Debt / Assets	Bank Debt / Bond Debt
Treated (AAA-A) × Post	0.0141*	0.0046	0.0044	0.0180*	0.0083
	(1.74)	(0.62)	(1.22)	1.80)	(0.36)
Treated (BBB) × Post	0.0227***	-0.0160**	0.0019	0.0077	-0.0731***
	(3.58)	(-2.51)	(0.75)	(1.09)	(-3.66)
2-digit SIC × Quarter FE	✓	✓	✓	✓	✓
Country × Quarter FE	✓	✓	✓	✓	✓
Firm FE	✓	✓	✓	✓	✓
Controls	✓	✓	✓	✓	✓
Observations	6,569	6,567	6,569	6,559	6,490
AAA-A = BBB (p-value)	0.351	0.006***	0.400	0.278	0.002***

- Split by credit risk: AAA-A vs BBB rated firms
- No difference in bond debt uptake
- BBB rated firms substitute (term-loan) bank with bond debt
  - BBB firms generelly more bank dependent relative to AAA-A rated firms (Berg, Saunders, Steffen, Streitz, 2017)

Effect on eligible firms: Parallel trend



Effect on eligible firms: Real effects

Variable:	Asset Growth	Cash / Assets_{t-1}	ΔWorkCap / Assets_{t-1}	CAPEX / Assets_{t-1}	Cash Aqu. / Assets_{t-1}	Share Rep.(0/1)
Treated (AAA-A) × Post	0.0091*	0.0035	0.0068	0.0007	0.0021*	0.0258
	(1.96)	(0.92)	(1.21)	(1.00)	(1.75)	(1.55)
Treated (BBB) × Post	0.0056	0.0009	0.0062	0.0005	-0.0015	-0.0033
	(1.21)	(0.26)	(1.32)	(0.81)	(-1.27)	(-0.26)
2-digit SIC × Quarter FE	✓	✓	✓	✓	✓	✓
Country × Quarter FE	✓	✓	✓	✓	✓	✓
Firm FE	✓	✓	✓	✓	✓	✓
Controls	✓	✓	✓	✓	✓	✓
Observations	6,293	6,296	6,280	5,794	6,309	6,309
AAA-A = BBB (p-value)	0.506	0.554	0.922	0.767	0.013**	0.132

- No effect on investment for BBB rated firms
- AAA-A rated firms (marginally) increase cash and acquisition activity
- Results suggest that eligible firms have not been constrained pre-CSPP

Effect on eligible firms: Robustness

Results are robust to

- Absolute bank/bond debt in (log) EUR instead of ratios ✓
- Bond issues from Dealogic instead of debt structure from Cap IQ ✓
- Discontinuity at eligibility threshold ✓
- Matching eligible to non-eligible firms on observables ✓
- Investment-grade European non-Eurozone firms as control group ✓
- Placebo event: PSPP annoucement in January 2015 ✓
- Issue ratings instead of issuer ratings to define eligibility ✓

Outline

1. Effect on eligible firms
   - Bond yields
   - Debt capital structure
   - Real effects

2. *Spillovers to loan market*
   - Lending to non-eligible firms
   - Real effects for non-eligible firms
   - Bank portfolio risk

Spillovers to loan market: Data and sample construction

- Dealscan-Amadeus linked sample (Eurozone non-financial firms)
  - Loan-level data from LPC Dealscan
  - Balance sheet items from Amadeus (incl private firms)
- I. Panel on bank-firm-period level
  - Changes in bank-lending activity
  - Within firm effect across banks (Khwaja and Mian, 2008)
- II. Panel on firm-period level
  - Firm-level outcome variables such as investment

Spillovers to loan market: Methodology

- Proxy for bank j's exposure to CSPP eligible firms:

$$\text{IG Share}_j = \frac{\sum \text{Term Loans (\$) to EZ Inv. Grade Borrowers (2010-2014)}}{\sum \text{Term Loans (\$) to all European Borrowers (2010-2014)}}$$

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- Banks with High (Low) IG Share are not different based on bank characteristics (univariate tests)

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- Banks with High (Low) IG Share are not different based on bank characteristics (univariate tests)
- Bank-firm-period level (ijt):

$$pr(loan)_{ijt} = \mu_{it} + \psi_{ij} + \beta \text{IG Share}_j \times \text{Post}_t + \epsilon_{ijt}$$

- Within firm effect across banks (Khwaja and Mian, 2008): control for loan demand via firm $\times$ period fixed effects (μ_{it})

Spillovers to loan market: Baseline results (within firm)

Sample restriction:					Private firms only
Variable:	pr(Loan)	pr(Loan)	pr(Loan)	pr(Loan)	pr(Loan)
IG Share × Post × Private		0.2160*	0.2899**		
		(1.74)	(2.28)		
High IG Share × Post × Private				0.0717**	
				(2.29)	
IG Share × Post	-0.0184	-0.1148			
	(-0.32)	(-1.41)			
High IG Share × Post					0.0396**
					(2.33)
Borrower ×Period FE	✓	✓	✓	✓	✓
Bank × Borrower FE	✓	✓	✓	✓	✓
Bank × Period FE			✓	✓	
Observations	7,524	7,524	7,518	7,518	3,730

- 4% higher likelihood of receiving a loan in the post period for private firms that borrow from banks with a high CSPP exposure
- Similar results for loan amount (untabulated)

Spillovers to loan market: Effect by bank constraints

	Tier-1 Ratio		Non-Performing Loans / Total Loans	
	Constrained	Unconstrained	Constrained	Unconstrained
Variable:	pr(Loan)	pr(Loan)	pr(Loan)	pr(Loan)
High IG Share × Post	0.0805***	0.0228	0.1619*	0.0258
	(3.68)	(0.85)	(2.03)	(1.28)
Borrower ×Period FE	✓	✓	✓	✓
Bank × Borrower FE	✓	✓	✓	✓
Observations	1,524	1,840	1,050	2,298
Coefficients equal? (p-value)		0.047**		0.036**

- Private firms have a higher likelihood of obtaining a loan post-CSPP, if banks were ex-ante more constrained.

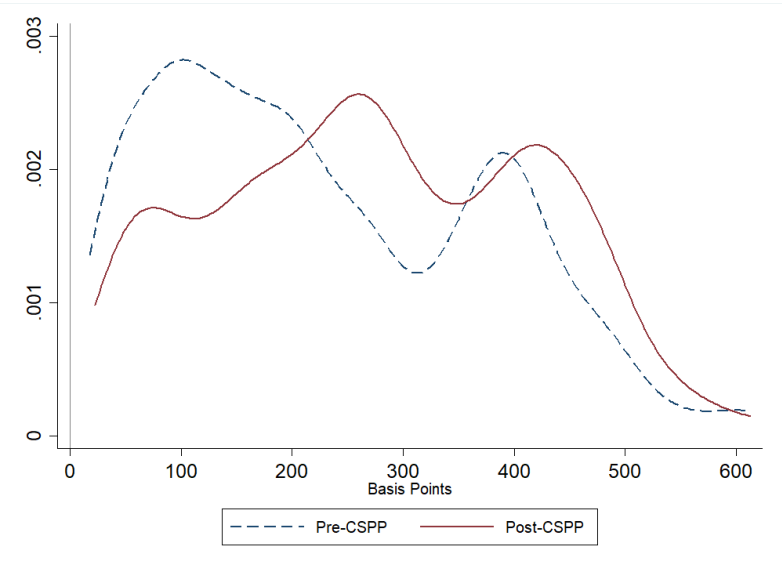
Spillovers to loan market: Investment and asset growth of non-eligible firms (firm-year level)

Variable:	pr(Loan)	ln(Loan Amount)	CAPEX	Asset Growth
High IG Share × Post	0.0880**	0.4616**	0.0379***	0.0646***
	(2.09)	(2.08)	(2.67)	(2.72)
2-digit NACE × Period FE	✓	✓	✓	✓
Country × Period FE	✓	✓	✓	✓
Firm FE	✓	✓	✓	✓
Observations	1,732	1,732	1,306	1,306

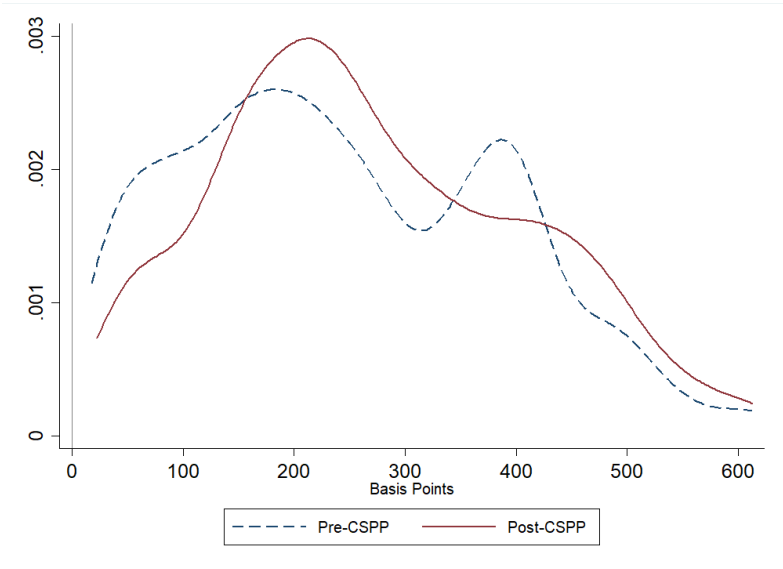
- Results are consistent with the conjecture that the increase in lending to private firms alleviates financial constraints with positive real effects.
- No indication for increased lending to low quality firms (low ROA, low interst coverage).
- Private firms borrowing from banks with High IG Share (relative to Low IG Share) have similar pre-CSPP trends in key firm characteristics. (Figures)
- The results are not driven by higher GDP growth in countries with high share of treated firms. (Test)

Spillovers to loan market: Bank loan portfolio risk

IG Share >= Median



IG Share < Median



Conclusion

- We study transmission channels from QE programs via the banking sector when central banks purchase corporate bonds
  - Eligible firms substituted bank term loans with bond debt
  - Banks with a high share of eligible firms increase lending to private but not public firms. Affected firms increase investment and sales
  - Increase in lending is driven by previously weakly capitalized banks
- This "Capital Structure Channel" is distinct from other mechanisms such as the "Net Worth Channel"
- Highlights importance of *indirect* effects of monetary policy
  - Increased lending to constraint (private) firms
  - But, potentially negative effects on bank loan portfolio risk (Japan in 1980s; Balloch (2018), Hoshi and Kashyap (2004))

Appendix

Appendix: Eligibility criteria (detailed)

- The issuer has to be *incorporated in the Eurozone* and itself or its ultimate parent *cannot be a credit institution* or investment firm and the issuer cannot be a public undertaking
- The security has to have a *minimum maturity of 6 months and a maximum maturity of less than 31 years* at the time of purchase (HTM, principal reinvested)
- An *issue* has to have a *minimum credit rating of BBB-/Baa3/BBBL*, i.e., investment grade, from at least one of the four agencies, Standard & Poor's, Moody's, Fitch Ratings or DBRS
- *Denominated in EUR* and has to have a yield to maturity larger than the ECB's deposit facility rate
- Securities can be purchased both in *primary* as well as in *secondary* markets (back to setting)

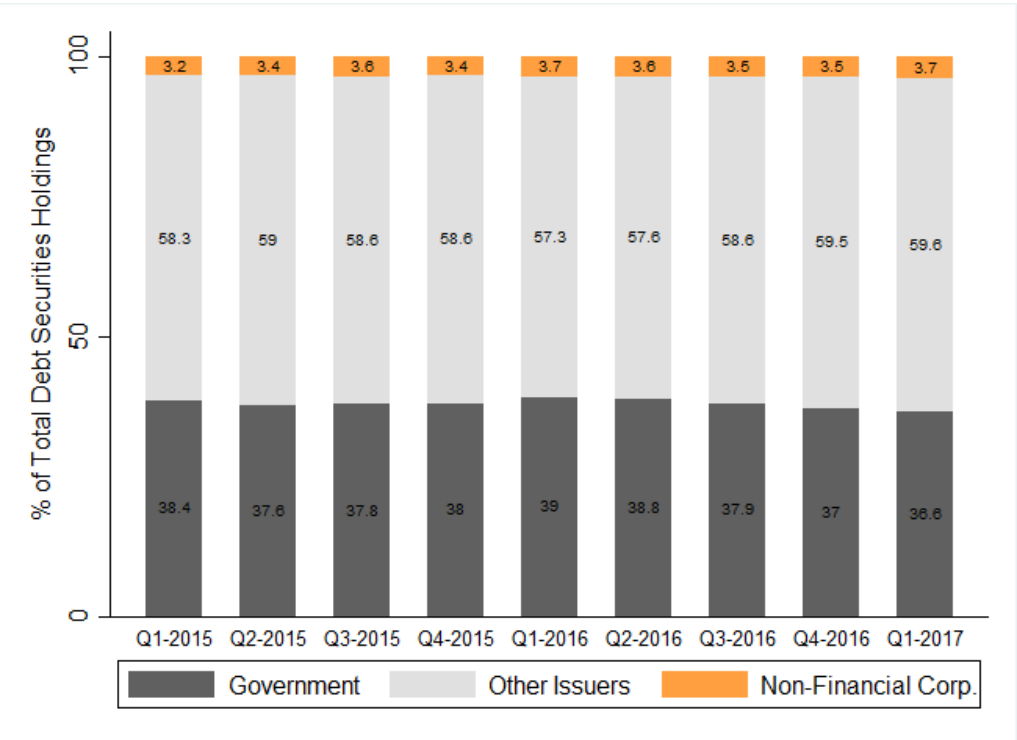
Appendix: Descriptive statistics

	TREATED					CONTROL			
	Mean	Median	Std. D.	N		Mean	Median	Std. D.	N
Leverage	0.301	0.280	0.141	647		0.362	0.315	0.242	3,507
Bond Debt / Assets	0.196	0.193	0.106	647		0.152	0.116	0.147	3,511
Term Loans / Assets	0.062	0.038	0.084	647		0.145	0.090	0.171	3,510
Revol. Credit / Assets	0.009	0.000	0.018	647		0.030	0.000	0.066	3,511
ln(Assets)	9.857	9.783	1.177	647		6.165	6.273	2.221	3,511
Profitability	0.027	0.026	0.014	639		0.014	0.019	0.034	3,445
Tangibility	0.290	0.266	0.202	644		0.262	0.218	0.220	3,481
MtB	1.456	1.334	0.512	617	1.527	1.178	1.490	3,368	
Cash / Assets	0.097	0.078	0.078	647		0.114	0.076	0.123	3,505
CAPEX / Assets	0.011	0.008	0.008	602		0.010	0.007	0.011	3,144
Acq. / Assets	0.004	0.000	0.012	646		0.002	0.000	0.009	3,510
Share Rep. (0/1)	0.036	0.000	0.185	647		0.008	0.000	0.087	3,511

(back)

A Capital Structure Channel of Monetary Policy (II/II)

- This "Capital Structure Channel" is distinct from net worth channel
- European banks only hold corporate bonds of non-financial corporations (NFC) on their balance sheet to a negligible degree



(back)

Appendix: Related literature (I/II)

- Monetary policy and the bank lending channel depends on bank balance sheet strength (e.g. Kashyap and Stein, 1994/1995/2000; Kishan and Opiela, 2000)
  - We show that monetary policy that relaxes banks' contraints affects their lending behavior.

- Monetary policy increases search-for-yield of weak banks (Jimenez et al., 2014; Ioannidou et al., 2015) or risk-shifting by strong banks (Dell'Ariccia et al., 2017). In our paper:
  - Monetary policy indirectly affects the bank lending channel.
  - Private firms are no "zombie firms", more risk-taking but not riskless lending
  - Consistent with constrained banks shifting resources to respond to most attractive investment opportunity (Stein, 1997; Scharfstein and Stein, 2000)

(back)

Appendix: Related literature (II/II)

- QE in the U.S. that directly affects banks' balance sheets (Chakraborty et al., 2017; Rodnyanski & Darmouni, 2016; Di Maggio et al., 2016; Kandrac & Schulsche, 2016)
  - We show that corporate bond purchases affect non-financial firms directly and indirectly bank lending.

- Research on asset purchase programs in Europe
  - Foreign investors, mutual funds and banks sell sovereign bonds in response to the introduction of APP (Koijen et al., 2016)
  - Sovereign yields decline (Altavilla et al., 2016; Andrade et al., 2017)
  - Two related papers investigate aspects of CSPP and complement our findings (Abidi et al, 2017; Arce et al., 2017)

(back)

Appendix: Why do banks not decrease loan rates?

- If yields go down, eligible firms should look financially more solid. Why do banks not internalize this decrease in default risk and decrease loan spreads?
- CSPP also affects other components of bond spreads: market liquidity
  - Bond market liquidity might increase following LSAP (De Pooter et al., 2018; Eser and Schwab, 2015) (ECB)
- Average daily high minus low spread of CSPP eligible bonds decreased by about 11% more compared to non-eligible bonds in the 6-months window around the CSPP announcement .
- Bank loans are usually illiquid, particularly in Europe due to less developed secondary markets for loans.

(back)

Appendix: Absolute bank and bond debt

Variable:	(9) ln(1+Bond Debt)	(10) ln(1+Bond Debt)	(11) ln(1+ Term Loans)	(12) ln(1+ Term Loans)
Treated x Post	0.2651***	0.2758**	-0.3222**	-0.3403**
	(2.89)	(2.53)	(-2.20)	(-1.99)
2-digit SIC x Quarter FE	No	Yes	No	Yes
Country x Quarter FE	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes
Controls	Yes	Yes	Yes	Yes
Observations	6,611	6,569	6,609	6,567

(back)

Appendix: Bond issue data

	(1) Bond Issue	(2) Bond Issue	(3) ln(1 + #Bond Issues)	(4) ln(1 + #Bond Issues)
Treated x Post	0.0400**	0.0421**	0.0545**	0.0589**
	(2.11)	(2.15)	(2.11)	(2.20)
2-digit SIC x Quarter FE	No	Yes	No	Yes
Country x Quarter FE	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes
Controls	Yes	Yes	Yes	Yes
Observations	6,611	6,569	6,611	6,569

	(5) ln(1 + Bond Issue Amt $)	(6) ln(1 + Bond Issue Amt $)	(7) Bond Issue Amt $) / Assets	(8) Bond Issue Amt $) / Assets
Treated x Post	0.3395**	0.3511**	0.0031**	0.0033***
	(2.51)	(2.52)	(2.93)	(2.82)
2-digit SIC x Quarter FE	No	Yes	No	Yes
Country x Quarter FE	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes
Controls	Yes	Yes	Yes	Yes
Observations	6,611	6,569	6,611	6,569

(back)

Appendix: Discontinuity

Panel A. Discontinuity at the eligibility threshold

Variable:	(1) Bond Debt / Assets	(2) Bond Debt / Assets
AAA-A Rating x Post	0.0114*	0.0143*
	(1.68)	(1.74)
BBB Rating x Post	0.0181***	0.0228***
	(2.93)	(3.56)
BB Rating x Post	-0.0041	-0.0027
	(-0.37)	(-0.23)
B Rating x Post	0.0100	0.0092
	(0.77)	(0.64)
Not Rated x Post	(omitted)	(omitted)
2-digit SIC x Quarter FE	No	Yes
Country x Quarter FE	Yes	Yes
Firm FE	Yes	Yes
Controls	Yes	Yes
Observations	6,611	6,569
BBB = BB? (p-value)	0.045**	0.039**

(back)

Appendix: Alternative control groups and placebo event

Panel B. Alternative control groups and placebo test

	Matched control group		non-eurozone IG firms as control group		Placebo test (PSPP: January 2015)	
Variable:	(3) Bond Debt / Assets	(4) Bond Debt / Assets	(5) Bond Debt / Assets	(6) Bond Debt / Assets	(7) Bond Debt / Assets	(8) Bond Debt / Assets
Treated x Post	0.0232***	0.0220**	0.0152*	0.0243**	0.0036	0.0062
	(2.73)	(2.17)	(1.93)	(2.49)	(0.80)	(1.12)
2-digit SIC x Quarter FE	No	Yes	No	Yes	No	Yes
Country x Quarter FE	Yes	Yes	No	No	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes
Controls	Yes	Yes	Yes	Yes	Yes	Yes
Observations	1,113	1,028	1,130	1,022	6,304	6,266

(back)

Appendix: Eligibility based on issue rating

	(1) Bond Debt / Assets
AAA-A Rating x Post	0.0035
	(0.25)
BBB Rating x Post	0.0266*
	(1.67)
BB Rating x Post	-0.0207
	(-0.76)
B Rating x Post	-0.0730
	(-1.09)
Not Rated x Post	(omitted)
2-digit SIC x Quarter FE	Yes
Country x Quarter FE	Yes
Quarter FE	No
Firm FE	Yes
Controls	Yes
Observations	814
Number of Firms	99
BBB = BB Rating? (p-value)	0.088*
AAA-A = BBB Rating? (p-value)	0.108

(back)

Appendix: Bank characteristics

	Low IG Share		High IG Share		
	Mean	N	Mean	N	Diff. in means (p-val.)
Total Assets	397.98	29	610.74	29	0.118
Retail Loans/ Assets (%)	31.13	17	25.69	14	0.247
Corp Loans/ Assets (%)	26.26	17	28.38	14	0.615
Tier 1 Ratio (%)	16.64	26	15.68	29	0.461
Tier 1 Common Ratio (%)	15.42	27	14.55	29	0.497
Total Capital Ratio (%)	19.41	27	18.55	29	0.516
Equity/ Assets (%)	6.45	29	6.35	29	0.874
RWA/ Assets (%)	35.25	26	35.27	29	0.993
NPL/ Total Loans (%)	6.22	28	5.77	26	0.777
Loan Loss Reserves/ Loans (%)	3.66	28	2.83	28	0.322
ROAA (%)	0.24	29	0.35	29	0.241
ROAE (%)	4.74	29	6.27	29	0.305
Loans/ Deposits (%)	258.37	29	170.41	29	0.311

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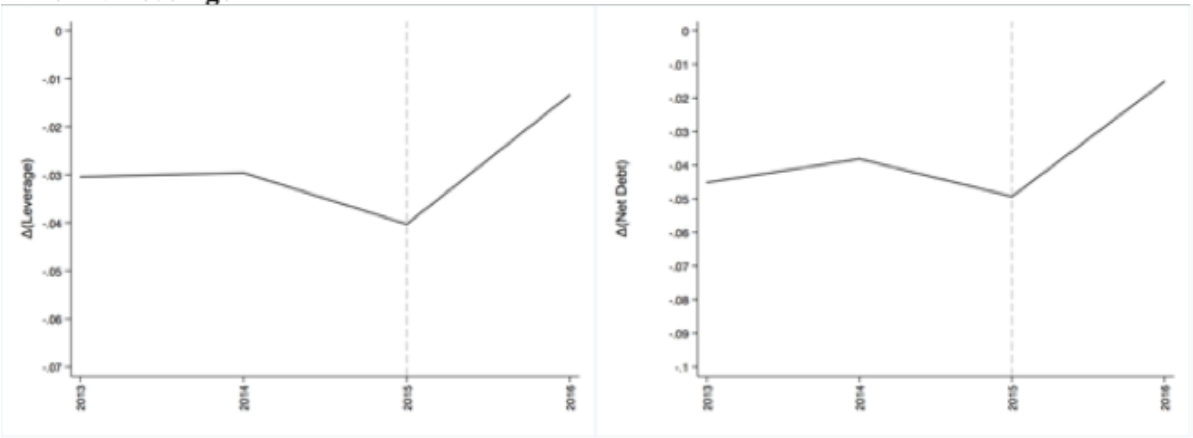
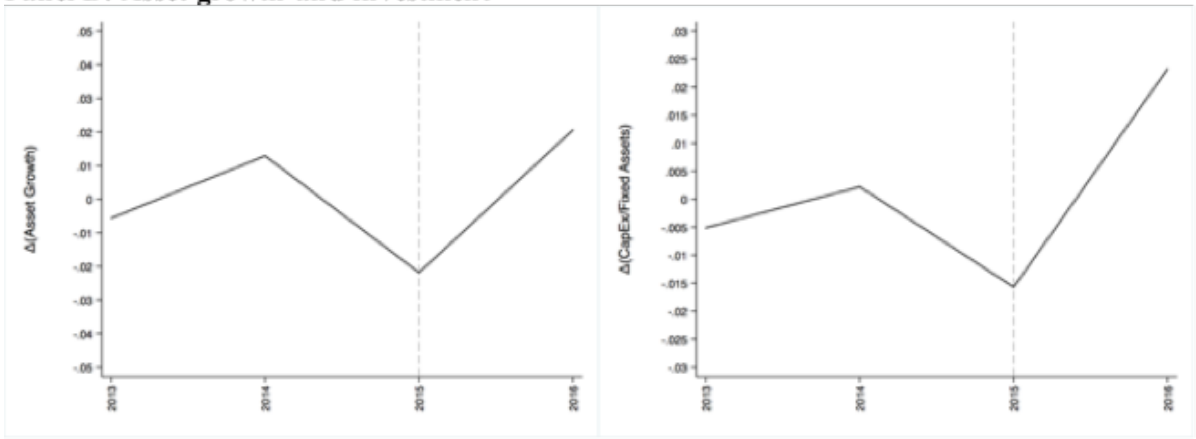
Appendix: Firm parallel trends

Panel A: Leverage



Panel B: Asset growth and investment



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Appendix: Differential economic growth

	(1) pr(Loan)	(2) pr(Loan)	(3) CapEx / Fixed Assets	(4) CapEx / Fixed Assets
High IG Share x Post	0.0880**	0.0976*	0.0379***	0.0344*
	(2.09)	(1.89)	(2.67)	(1.93)
High IG Share x Post x High GDP growth		-0.0269		0.0094
		(-0.30)		(0.34)
2-digit NACE x Year FE	Yes	Yes	Yes	Yes
Country x Year FE	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes
Controls	Yes	Yes	Yes	Yes
Observations	1,732	1,732	1,306	1,306

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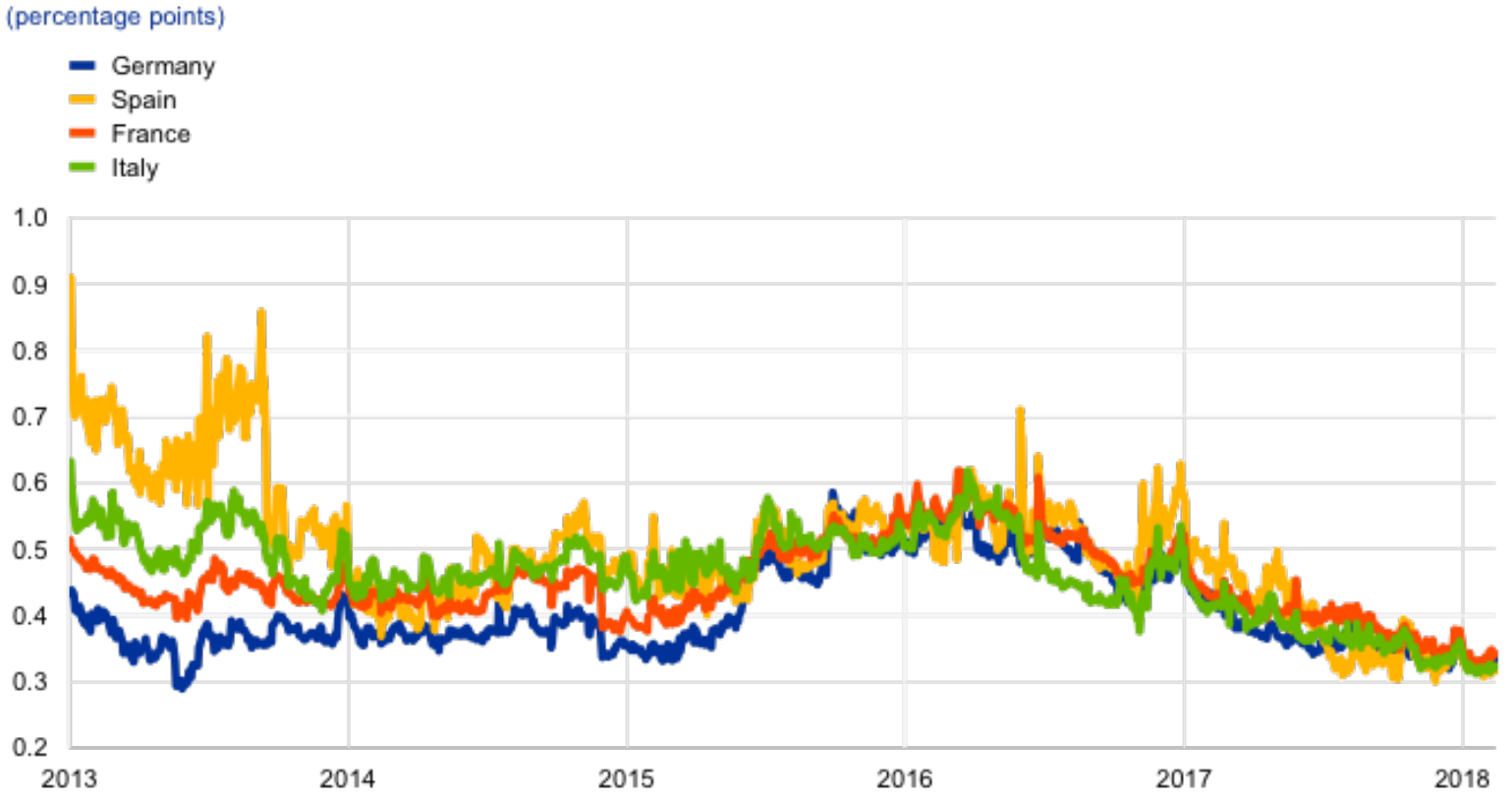
Appendix: Bid-ask spreads of IG corporate bonds

Bid-ask spreads of investment-grade NFC bonds in selected euro area countries



Sources: iBoxx and ECB calculations.
Notes: The country indices are computed as the weighted average of the spread between the ask and the bid price as a percentage of the mid-price of individual securities. The latest observations are for 13 February 2018.

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