

# **Cutting Out the Middleman – The ECB as Corporate Bond Investor**

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## Motivation

- Since the start of the 2008-09 financial crisis, central banks around the world have undertaken unconventional policies to stimulate their economies, including large-scale asset purchases (LSAP)
  - Size of the programs significant, e.g.
    - ECB balance sheet (€ 4.2 trillion) more than doubled since 2008
    - ECB sovereign debt holdings under PSPP (Nov 2017): €1,829 billion
- The individual programs varied along several dimensions
- Ongoing debate about how unconventional monetary policy should be designed & effects on the real sector

## Motivation (cont'd)

- LSAP can positively affect prices of the purchased asset class (e.g. Krishnamurthy and Vissing-Jorgensen, 2013, on channels)
- But, most LSAP target sovereign debt or MBS. Impact on firms and the real sector?
  - i. Through the banking sector
    - Value of sovereign debt or MBS holdings  $\uparrow$  , lending  $\uparrow$  (e.g. Acharya et al, 2017; Ferrando et al, 2016; Rodnyansky & Darmouni, 2017)
    - Crowding-out effects: MBS purchases increase mortgage origination by banks crowding-out commercial lending (Chakraborty et al, 2017)
  - ii. Spillover effects across asset classes
    - i. Reduction in treasury bond supply can raise the prices of private sector safe bonds (Greenwood et al, 2010; Foley-Fisher et al, 2016)

## This paper

- We propose a novel (indirect) channel how central banks' asset purchases can affect the real sector.
- A direct intervention by a central bank in the *corporate* bond market decreases corporate bond yields.
- Bond financing becomes more attractive relative to bank loans for some firms, stimulating a shift from private to public debt.
- In this setting, banks are (differentially) affected because they experience a decline in loan demand by firms that switch from loan to bond financing.
- This, in turn, frees up bank capital of previously constrained banks and increases lending to firms without bond market access.

## Our setting

- Introduction of the Corporate Sector Purchase Programme (CSPP) in June 2016.
  - ECB started monthly purchases of eligible corporate debt in the Eurozone.
  - During the June 2016 to July 2017 period, total ECB purchases of eligible corporate debt from Eurozone firms exceeded €100 billion.
- Corporate debt is CSPP-eligible if it has an investment grade credit rating as well as satisfying a set of further criteria.
- Difference-in-difference framework
  - Cross-section: eligible (treated) vs. non-eligible firms (control)
  - Time: pre- versus post- CSPP announcement

## 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 GIIPS banks and banks with low Tier-1 ratio
- Lending to firms with high interest-coverage ratios
- These firms increase investments and experience an increase in sales growth post CSPP

## Related literature

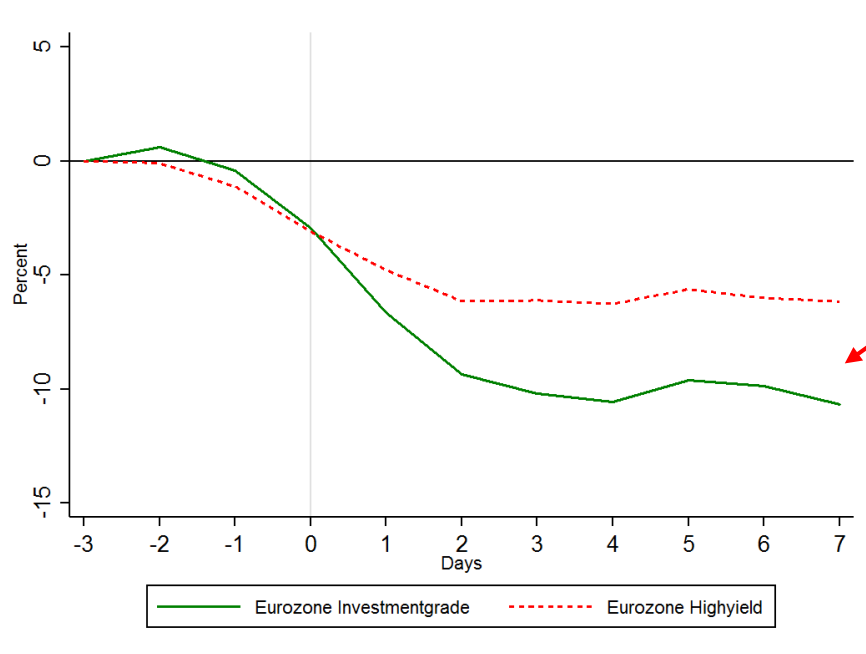
- There is a recent small but growing literature that analyzes real economic effects of QE in the U.S.
  - Chakraborty et al. (2017), Rodnyanski and Darmouni (2016), Di Maggio et al. (2016) and Kandrak and Schulsche (2016)
  
- More general literature of the effects of (unconventional) monetary policy on the economy in the euro area
  - Acharya et al., 2017a, Acharya et al., 2017b, Carpellini and Crosigniani, 2015, Daetz et al., 2016, Ferrando et al., 2017
  
- Two related papers investigate aspects of CSPP and complement our findings.
  - Bond yield spreads declined after the introduction of the CSPP, in particular for non-eligible bonds close to the investment grade boundary (Abidi et al. (2017))
  - Increase in bond issuance volume for eligible firms and an increase in lending to non-bond issuing firms using a sample of Spanish firms (Arce et al. (2017) )

## Contribution

- Previous research on LSAP focused on a capital gains channel through which asset purchases affect the real sector
- We document a novel mechanism how central bank interventions can affect the real economy: direct corporate debt purchases can increase the effectiveness of the bank-lending channel
- Further, we investigate the effects of the CSPP on eligible firms across the euro area and document an effect of the program on firms' capital structure decisions
- We investigate real economic effects such as investment, payout and acquisition activities of these firms



# Cumulative yield spread changes of bonds around the announcement of the CSPP program



During a 10-day window around the announcement, yield spreads of eligible firms dropped by about 11%, of spreads of non-eligible firms 6%.

Panel A. Eligible (Eurozone I-Grade) vs. non-eligible firms (Eurozone High-yield)

- Percentage yield spread change is similar for AAA-A and BBB rated firms.

## Data

- Quarterly data on Eurozone public non-financial firms from Compustat Global and debt structure from S&P's Capital IQ (2,281 firms).
  - Dealogic for bond issuances and bond/firm level ratings from all agencies
- Sample period: Q1 2015 to Q1 2017
- 115 firms with investment grade rating (treatment sample or “eligible firms”) and 775 non-investment grade rated firms with public debt outstanding (control group or “non-eligible firms”)
- Bureau van Dijk's Zephyr database for announcements of share repurchases and M&A data

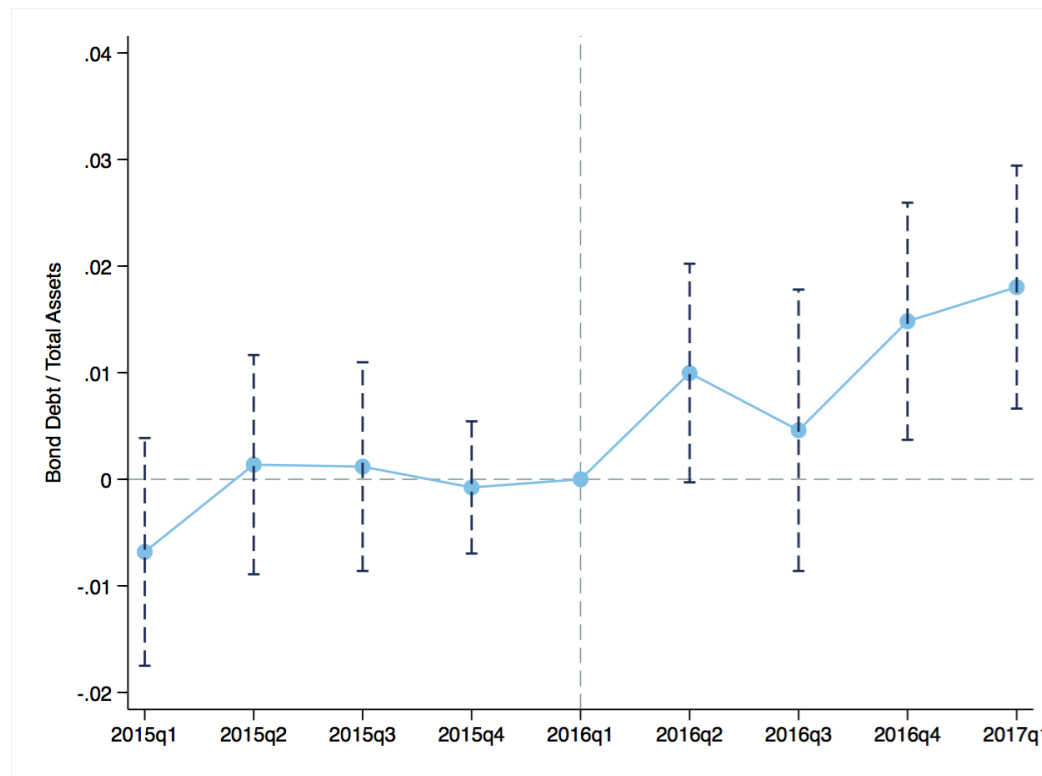
## Do eligible firms increase bond debt after the CSPP announcement? Difference-in-difference (DiD) test

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

- *Leverage*
  - Bond Debt/Assets, Term Loans/Assets, Revolving Credit/Assets, Total Debt/Assets
- *Post* = 1 in the period after the CSPP announcement (Q2 2016 – Q1 2017)
- *Treated* = 1 if the firm is part of the treatment sample, and zero otherwise.
- *Y* is a set of firm characteristics that determine a firm's demand for debt: firm size, profitability, tangible assets of the firm, and the market-to-book ratio
- We further include firm fixed effects ( $\psi_i$ ), industry x quarter fixed effects ( $\theta_{k,t}$ ), and country x quarter fixed effects ( $\mu_{c,t}$ ).

## Identification: **Parallel trend assumption**

$$\text{Bond Debt/Assets}_{i,t} = a_i + a_{kt} + a_{ct} + \beta_1 \text{Treated}_i * \text{Q1 2015} + \beta_2 \text{Treated}_i * \text{Q2 2015} + \dots + \beta_8 \text{Treated}_i * \text{Q1 2017} + \gamma' X_{i,t-1} + \varepsilon_{i,t}.$$



- All coefficients are statistically insignificant at conventional levels in the period prior to the CSPP announcement.

## Change in debt structure (I/II)

	(1)	(2)	(3)	(4)
	Bond Debt	Term Loans	Revolving Credit	Total Debt
	/ Assets	/ Assets	/ Assets	/ Assets
Treated (0/1) x Post (0/1)	0.0201***	-0.0097*	0.0027	0.0109
	(3.61)	(-1.66)	(1.04)	(1.61)
2-digit SIC x Quarter FE	Yes	Yes	Yes	Yes
Country x Quarter FE	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes
Controls	Yes	Yes	Yes	Yes
Observations	6,569	6,567	6,569	6,559

- **+2pp** bond debt to assets for treated relative to control group firms and relative to the pre-CSPP announcement period.
  - +13% relative to unconditional mean
- **-1pp** term loans to assets post CSPP suggesting that eligible firms substitute bank with bond financing.
- Effect is driven by adjustments in the treatment group.

## Change in debt structure (II/II) - Split by credit risk: AAA-A vs BBB rated firms

	(1) Bond Debt / Assets	(2) Term Loans / Assets	(3) Revol. Credit / Assets	(4) Total Debt / Assets
AAA-A Rating (0/1) x Post (0/1)	0.0141* (1.74)	0.0046 (.62)	0.0044 (1.22)	0.0180* (1.8)
BBB Rating (0/1) x Post (0/1)	0.0227*** (3.58)	-0.0160** (-2.51)	0.0019 (.75)	0.0077 (1.09)
2-digit SIC x Quarter FE	Yes	Yes	Yes	Yes
Country x Quarter FE	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes
Controls	Yes	Yes	Yes	Yes
Observations	6,569	6,567	6,569	6,559
AAA-A = BBB Rating? (p-value)	0.351	0.006***	0.4	0.278

- No difference in bond debt uptake
- BBB rated firms substitute (term-loan) bank with bond debt
  - BBB firms generally more bank dependent relative to AAA-A rated firms (Berg, Saunders, Steffen, Streit, 2017)
  - No effect on credit lines. This is consistent with the view that credit lines and bonds are not close substitutes






## Real effects

	(1)	(2)	(3)	(4)
	$\Delta\text{Cash}_t$	$\text{CAPEX}_t$	$\text{Acq.}_T$	$\text{Share}_t$
	/ $\text{Assets}_{t-1}$	/ $\text{Assets}_{t-1}$	/ $\text{Assets}_{t-1}$	$\text{Rep. (0/1)}_{t-1}$
AAA-A Rating (0/1) x Post (0/1)	0.0035	0.0007	0.0021*	0.0258
	(.92)	(1.)	(1.75)	(1.55)
BBB Rating (0/1) x Post (0/1)	0.0009	0.0005	-0.0015	-0.0033
	(.26)	(.81)	(-1.27)	(-0.26)
2-digit SIC x Quarter FE	Yes	Yes	Yes	Yes
Country x Quarter FE	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes
Controls	Yes	Yes	Yes	Yes
Observations	6,296	5,794	6,309	6,309
<i>AAA-A = BBB Rating? (p-value)</i>	0.554	0.767	0.013**	0.132

- No effect on investment for BBB rated firms
- AAA-A rated firms increase acquisition activity
  - Acquisitions annouced post-CSPP by treated firms have lower annoucement returns (relative to the pre period and realtive to non-eligible firms) (untabulated)

# Robustness

Results are robust to

- Discontinuity at eligibility threshold 
- Matching eligible to non-eligible firms on observable firm characteristics 
- Using investment-grade European firms incorporated outside of the Eurozone as control group 
- Using the PSPP announcement in January 2015 as placebo event 
- Using issue ratings instead of issuer ratings to define eligibility 



## II. Loan market spillovers

## Data and sample construction

- Loan-level data from LPC Dealscan...
- ...used to construct panel on the bank-firm-period level (*ijt*)
- Data collapsed to two periods per firm-bank pair; pre-CSPP (Jan 2015 - 9 Mar 2016) and post-CSPP (10 Mar 2016 - Dec 2016)
- Firm-pairs with zero loan volume in the pre- and the post-CSPP period excluded
- Restricted to public and private Eurozone non-financial firms

## Identifying spillovers – Methodology

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

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

- Focus on term loans as credit lines and bonds are not close substitutes (Berg, Saunders, Steffen, and Streit, 2017)
  - We only consider loans in which a bank is lead arranger
  - Exclude non-European banks
  - Exclude small lenders ( $\sum$  loans 2010–14 < \$1,000 million)
  - Banks are aggregated to the parent level
- Further, we expect to find stronger effects for more bank dependent, i.e., private, firms (Acharya et al, 2017)

## Identifying spillovers – Methodology (cont'd)

$$\text{pr}(\text{loan})_{ijt} = a_{it} + a_{jt} + a_{ij} + \beta_1 \text{Post}_t * \text{Bank IG Share}_j * \text{Private}_i + \varepsilon_{i,t}$$

- We define an indicator variable,  $\text{pr}(\text{loan})_{ijt}$ , that equals one if a firm  $i$  obtains a bank loan from bank  $j$  in quarter  $t$ , and zero otherwise, over the sample period from Q1 2015 to Q4 2016.
- $\text{Post} = 1$  after Q1 2016, and zero otherwise.
- Bank x firm FE ( $a_{ij}$ ), bank x quarter FE ( $a_{jt}$ ), and firm x quarter FE ( $a_{it}$ ).
- We cluster standard errors on the firm level in all specifications.

## Bank lending to non-eligible firms after CSPP

Variable:	(1) pr(Loan)	(2) pr(Loan)	(3) pr(Loan)	(4) pr(Loan)
Bank IG Share x Post (0/1) x Private (0/1)		0.1538* (1.77)	0.1969** (2.17)	
High IG Share (0/1) x Post (0/1) x Private (0/1)				0.0400** (2.03)
Bank IG Share x Post (0/1)	0.0428 (.93)	-0.0609 (-0.72)		
Borrower x Period FE	Yes	Yes	Yes	Yes
Bank x Borrower FE	Yes	Yes	Yes	Yes
Bank x Period FE	No	No	Yes	Yes
Observations	12,614	12,614	12,612	12,612

- The likelihood that a private firm issues a loan is about **4 pp** higher if borrowing from a High IG Share bank post CSPP.
- Is this effect larger if banks are financially constrained?

## Banks' financial constraints

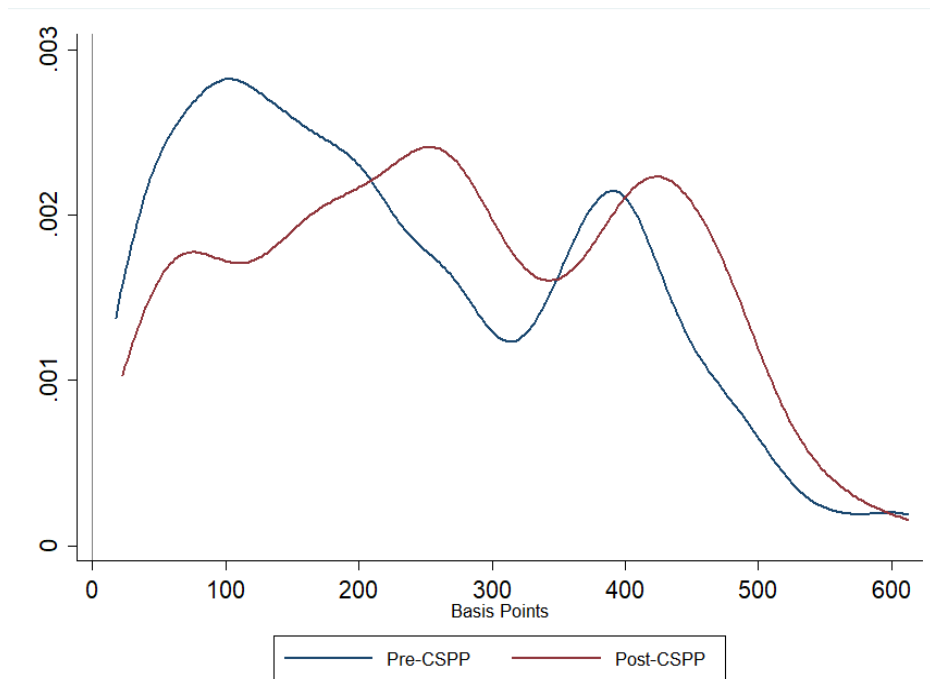
Specification:	Bank Tier 1 Ratio		Bank Country	
	< Median	> Median	GIIPS	Non-GIIPS
Variable:	(2)	(3)	(4)	(5)
	pr(Loan)	pr(Loan)	pr(Loan)	pr(Loan)
Bank IG Share x Post (0/1) x Private (0/1)	0.2341**	0.0021	0.3804***	0.1226
	(2.23)	(.01)	(2.98)	(1.21)
Borrower x Period FE	Yes	Yes	Yes	Yes
Bank x Borrower FE	Yes	Yes	Yes	Yes
Bank x Period FE	Yes	Yes	Yes	Yes
Observations	8,418	2,946	3,676	8,154

- GIIPS banks' large domestic sovereign bond holdings crowded our real-sector lending (Popov and van Horen, 2015, Acharya et al., 2017).
- Private firms have a higher likelihood of obtaining a loan post-CSPP if banks have low Tier 1 ratios or are from GIIPS countries.

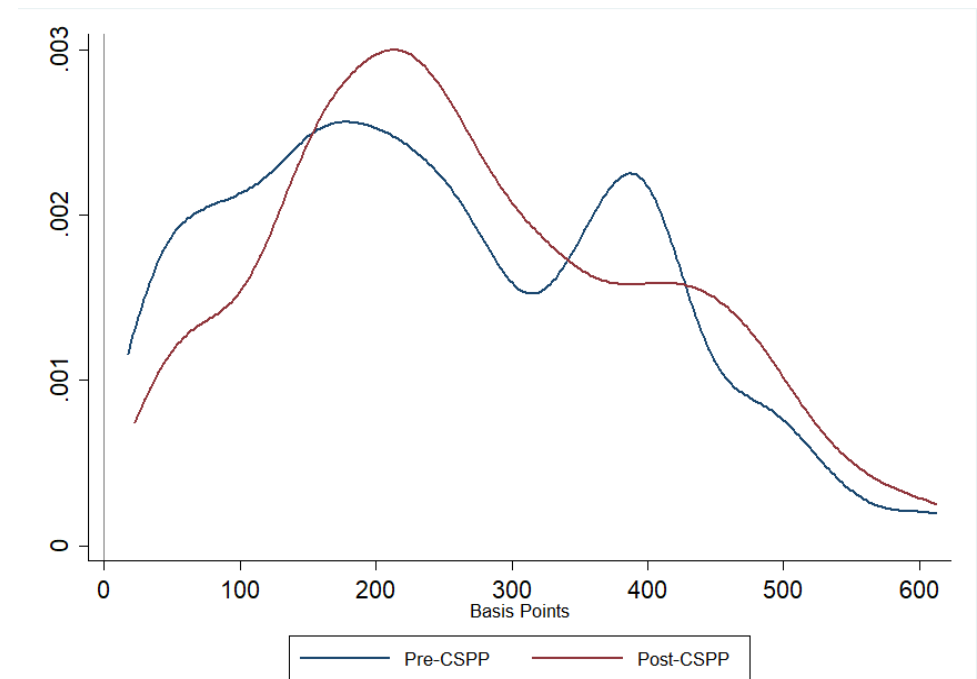
# Robustness tests

- Placebo 1: no effect if a bank's portfolio share of non-Eurozone investment grade firms is used
  - Bonds of non-Eurozone investment grade firms not eligible for CSPP and thus no decrease in demand for bank loans.
  
- Placebo 2: no effect using the PSPP announcement in Jan 2015
  - An increase in sovereign bond prices might implicitly recapitalize those banks with substantial sovereign bond holdings (Brunnermeier and Sannikov, 2015).
  
- Do bank loan portfolios become riskier?
  - Existing portfolio on average riskier if good firms substitute loans with bonds.
  - New loans likely have lower NPV and are thus riskier

# Bank loan portfolio risk – Loan spread distribution



Panel A. High IG Share Banks Pre-CSP vs. Post-CSP



Panel B. Low IG Share Banks Pre-CSP vs. Post-CSP

- Distribution of risk changes pre versus post CSP.
- The median spread of High IG Share Banks increases **45bps** relative to Low IG Share Banks and post versus pre-CSP.



## Investment decisions of non-eligible firms

- If non-eligible firms also indirectly benefit from CSPP, does this affect their investment decisions?
- Previous research highlights the negative consequences with a reduction in loan supply.
- An expansive monetary policy such as the CSPP might thus positively spill-over into the real sector.

## Bank lending to non-eligible firms

Specification:	Base: Private Firms	Base: Private Firms	Base: Private Firms	Placebo: Public Firms
	(1)	(2)	(3)	(4)
	pr(Loan)	pr(Loan)	ln(Loan Amt)	pr(Loan)
High IG Share (0/1) x Post (0/1)	0.0233** (2.24)	0.0239** (2.21)	0.1144** (1.99)	-0.0349 (-1.32)
2-digit NACE x Quarter FE	No	Yes	Yes	Yes
Country x Quarter FE	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes
Controls	Yes	Yes	Yes	Yes
Observations	7,208	7,128	7,128	3,532

- Private firms have a 2.4 pp higher likelihood of receiving a loan post CSPP announcement if they have relationships with High IG Share banks.
- We do not find the same effect for public firms.

# Which firms receive loans? Differentiating by borrower quality

	Return on assets		Interest coverage	
	< Median	>= Median	< Median	>= Median
	(1)	(2)	(3)	(4)
	pr(Loan)	pr(Loan)	pr(Loan)	pr(Loan)
High IG Share (0/1) x Post (0/1)	0.0148 (.94)	<b>0.0251</b> (1.53)	0.016 (1.06)	<b>0.0400**</b> (2.16)
2-digit NACE x Quarter FE	Yes	Yes	Yes	Yes
Country x Quarter FE	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes
Controls	Yes	Yes	Yes	Yes
Observations	3,428	3,492	3,180	3,440

- Firms borrowing from High IG Share banks with a) high return on assets and b) high interest coverage ratios have a higher likelihood to receive credit post CSPP

## Real effects of non-eligible firms

	(1)	(2)	(3)	(4)
	CAPEX <sub>t</sub>	CAPEX <sub>t</sub>	Sales Growth <sub>t</sub>	Sales Growth <sub>t</sub>
High IG Share (0/1) x Post (0/1)	0.0438***	0.0313**	0.0340*	0.0374*
	3.35	2.03	1.68	1.69
2-digit NACE x Year FE	No	Yes	No	Yes
Country x Year FE	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes
Controls	Yes	Yes	Yes	Yes
Observations	1,040	1,040	1,040	1,040

- Private firms increase capital expenditures and sales growth after the CSPP if they borrow from High IG Share banks.

# Conclusion

- Previous research on LSAP focused on a capital gains channel through which asset purchases affect the real sector
- We propose a novel mechanism how central bank interventions can affect the real economy: direct corporate debt purchases can increase the effectiveness of the bank-lending channel
- We test this in the context of the ECB's Corporate Sector Purchase Programme (CSPP) and document that
  - Eligible firms substituted bank term loans with bond debt
  - Banks with a high share of CSPP-eligible firms increase lending to private but not public firms after the announcement of the CSPP
  - The increase in lending is driven by previously weakly capitalized banks (low Tier 1 ratios) and banks from GIIPS countries, consistent with an easing of bank capital constraints through the CSPP

# Appendix

# Institutional details

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## ➤ Eligibility criteria

- 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
- The ECB purchases are sizable. Outstanding issuance volume of EUR denominated bonds of non-financial corporations of about €3,550 billion in June 2016 suggests that the **ECB holds about 2.8% of the total market volume**.

# Institutional details

- ECB introduced the APP in 2009 purchasing limited amounts of covered bonds
  - Starting in 2014 also asset-backed securities.
  - In early 2015, large-scale purchases of Eurozone government bonds with a combined monthly purchase volume of €60 billion.
  - March 10th, 2016, increase monthly purchase volume to €80 billion, include corporate bonds as a new asset class that can be purchased under the APP.
  - Implemented on June 8<sup>th</sup> 2016, with a minimum duration until March 2017.
  - On October 26, 2017, the ECB decided to extend the APP until September 2018 (or beyond) but reducing its monthly purchase volume to €30 billion.
- Eligibility criteria
  - 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



## Bond-financing at the investment-grade boundary

- A second concern is related to our treatment group definition, which is along the investment grade boundary.
- An increase in bond issuances for investment-grade relative to non-investment grade rated firms could occur because the former are less risky and need less monitoring, and, consequently, are more likely to issue bonds also after the announcement of the CSPP.
  - Diamond (1991), Rajan (1992), Chemmanur and Fulghieri (1994), and Bolton and Freixas (2000)
- If borrower risk is driving our results, we would expect to observe a gradual decline in bond-to-total asset ratios across the rating categories.
- However, if treated firms increase bond debt relative to non-eligible firms, we expect to see a discontinuity as to the effect on bond-to-total asset ratios at the investment-grade boundary.

# Robustness test: **Discontinuity** at the investment grade threshold

	(1) Bond Debt / Assets	(2) Bond Debt / Assets
AAA-A Rating (0/1) x Post (0/1)	0.0114* (1.68)	0.0143* (1.74)
BBB Rating (0/1) x Post (0/1)	0.0181*** (2.93)	0.0228*** (3.56)
BB Rating (0/1) x Post (0/1)	-0.0041 (-0.37)	-0.0027 (-0.23)
B Rating (0/1) x Post (0/1)	0.0100 (0.77)	0.0092 (0.64)
Not Rated (0/1) x Post (0/1)	(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
<i>BBB = BB Rating? (p-value)</i>	0.045**	0.039**

- We find that the coefficient drops significantly when we move from a BBB to a BB or B rated firms and the difference between the BBB and the BB coefficient is highly statistically significant.

## Robustness test: Treatment based on **bond issue ratings**

	(1) Bond Debt / Assets	(2) Bond Debt / Assets
AAA-A Rating (0/1) x Post (0/1)	0.0107 (1.28)	0.0035 (0.25)
BBB Rating (0/1) x Post (0/1)	0.0183* (1.86)	0.0266* (1.67)
BB Rating (0/1) x Post (0/1)	-0.0071 (-0.55)	-0.0207 (-0.76)
B Rating (0/1) x Post (0/1)	-0.0370 (-0.83)	-0.0730 (-1.09)
Not Rated (0/1) x Post (0/1)	(omitted)	(omitted)
2-digit SIC x Quarter FE	No	Yes
Country x Quarter FE	No	Yes
Quarter FE	Yes	No
Firm FE	Yes	Yes
Controls	Yes	Yes
→ Observations	974	814
Number of Firms	117	99
<i>BBB = BB Rating? (p-value)</i>	0.058*	0.088*
<i>AAA-A = BBB Rating? (p-value)</i>	0.403	0.108

- We obtain information on all bonds issued by European firms in the pre-CSSP period (Q1 2015 – 10 March 2016) from the Dealogic database
- Our results hold if we use *issue* level rating information from the three main rating agencies (S&P, Moody's, and Fitch).

## Robustness test: **Non-Eurozone I-Grade** firms

### Panel C. European non-Eurozone investment-grade firms as control group

	(5) Bond Debt / Assets	(6) Bond Debt / Assets
Treated (0/1) x Post (0/1)	0.0152* (1.93)	0.0243** (2.49)
2-digit SIC x Quarter FE	No	Yes
Country x Quarter FE	No	No
Firm FE	Yes	Yes
Controls	Yes	Yes
Observations	1,130	1,022

- We construct an **alternative control group**, which is comprised of **European investment grade-rated firms** that are incorporated in countries outside of the Eurozone.
- We match firms based on size, profitability, bond debt, and bank debt and get similar results.

## Robustness test: Matched Control Group

### Panel B. Matched control group

	(3) Bond Debt / Assets	(4) Bond Debt / Assets
Treated (0/1) x Post (0/1)	0.0232*** (2.73)	0.0220** (2.17)
2-digit SIC x Quarter FE	No	Yes
Country x Quarter FE	Yes	Yes
Firm FE	Yes	Yes
Controls	Yes	Yes
Observations	1,113	1,028

- Treated firms are larger, more profitable, and generally have a higher share of bond debt-to-total assets compared to non-eligible firms.
- For robustness, we run our regression specification using a matched control group (PP Matching). The results are economically even stronger.

# Robustness test: **Placebo test** around announcement of PSPP

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## Panel D. Placebo test (PSPP announcement in January 2015)

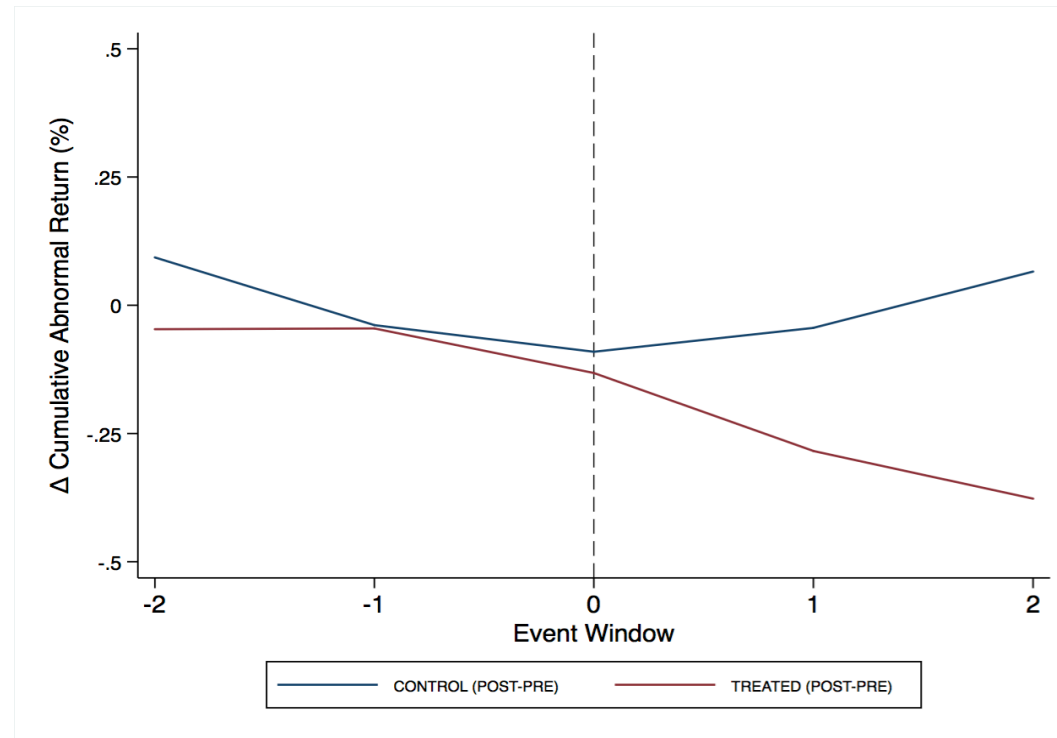
	(7) Bond Debt / Assets	(8) Bond Debt / Assets
Treated (0/1) x Post (0/1)	0.0036 (0.80)	0.0062 (1.12)
2-digit SIC x Quarter FE	No	Yes
Country x Quarter FE	Yes	Yes
Firm FE	Yes	Yes
Controls	Yes	Yes
Observations	6,304	6,266

- We find no evidence that CSPP eligible firms reacted to the PSPP announcement in 2015.
- Consistent with Krishnamurthy and Vissing-Jorgensen (2013) who show that Fed purchases of U.S. treasury bonds significantly raised treasury bond prices, but had limited spillover effects for private sector bond yields.

# Do acquisitions increase shareholder value?

- (AAA-A rated) treated firms increase their acquisition activity post CSPP announcement.
- It is a natural question whether these acquisitions increase shareholder value.
  - An alleviation of financial constraints and/or a reduction in the cost of capital due to the CSPP could enable firms to invest in (additional) positive NPV deals.
  - A further increase in the availability of cheap debt for firms that already faced only limited financial constraints could induce managers squander corporate resources (e.g. Jensen, 1986, Harford, 1999).
- We investigate announcement returns around acquisitions of treated vs. control group firms.
- We obtain announcement dates from the Bureau van Dijk's Zephyr database for the Q1 2015 to Q1 2017 period.

## Figure 4. CARs around M&A announcements



- AAA-A rated firm are about 3.7 pp more likely to announce a share repurchase program post CSPP (unconditional probability pre-CSPP: 1.2%).
- Treated firms experience significantly lower announcement returns for acquisitions announced in the post-CSPP period relative to the pre-event period and relative to the control group.



# Increased acquisition activity fueled by the CSPP is unlikely to have benefitted the acquiring firms' shareholders.

	(1) CAR[0,2]	(2) CAR[0,2]
Treated (0/1) x Post (0/1)	-0.0070*	-0.0096*
	(-1.74)	(-1.65)
Treated (0/1)	0.0038	0.0091
	(1.28)	(0.52)
Post (0/1)	0.0049	0.0045
	(1.31)	(0.92)
2-digit NACE x Quarter FE	No	Yes
Country x Quarter FE	No	Yes
YesControls	Yes	Yes
Observations	1,205	1,077

## ➤ Controls

- Deal characteristics comprise Public Target (0/1), Same 2-Digit SIC (0/1), Cross Border (0/1), Buyer Controls (0/1), Stock Payment (0/1), Cash Payment (0/1), and Debt Payment (0/1).
- Acquirer characteristics comprise:  $Size_{i,t-1}$ ,  $Leverage_{i,t-1}$ ,  $Profitability_{i,t-1}$ ,  $Tangibility_{i,t-1}$ , and  $MTB_{i,t-1}$ .

## Robustness test: Alternative definition for *Bank IG Share*.

	Placebo 1: Bank IG Share = Lending to IG non-EZ firms
Bank IG Share x Post (0/1) x Private (0/1)	pr(Loan) -0.1209 (-0.86)
High IG Share (0/1) x Post (0/1) x Private (0/1)	
Bank IG Share x Post (0/1)	
Borrower x Period FE	Yes
Bank x Borrower FE	Yes
Bank x Period FE	Yes
Observations	12,612

- We calculate the share of European *non-Eurozone* investment-grade borrowers that a bank has in its loan portfolio pre-CSPP.
- We would not expect to find significant results using this alternative proxy given that non-Eurozone investment-grade firms are not CSPP eligible.
- The results support this conjecture.

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## Sovereign bond purchases and bank lending

- Sovereign bond purchases might increase sovereign bond prices and **implicitly recapitalize** those banks with substantial sovereign bond holdings, thereby increasing their capacity to lend (Brunnermeier and Sannikov, 2016).
- The balance **sheet** effect on banks **has to be larger for treated** relative to control group banks, which seems unlikely.
- We run the same specification during the Q1 2014 to Q4-2015 period, where the post-treatment period starts after the PSPP has been announced in Q1 2015.

## Robustness test: ECB's sovereign bond purchases

Placebo 2:	
	Period = 2014-15;
	Post = after 01/2015
	pr(Loan)
Bank IG Share x Post (0/1) x Private (0/1)	-0.0977 (-0.90)
High IG Share (0/1) x Post (0/1) x Private (0/1)	
Bank IG Share x Post (0/1)	
Borrower x Period FE	Yes
Bank x Borrower FE	Yes
Bank x Period FE	Yes
Observations	13,394

- We do not find a statistically significant increase in bank lending to private firms during the Q1 2014 to Q4-2015 period.
- Consistent with important spillover effects from the ECB's CSPP to bank lending.
- Sovereign bond purchases insufficient to recapitalize banks up to a point that they start lending to private firms.

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