

# Unintended Consequences of QE: Real Estate Prices and Financial Stability

Tobias Berg<sup>1</sup>, Rainer Haselmann<sup>2</sup>, Thomas Kick<sup>3</sup>, Sebastian  
Schreiber<sup>4</sup>

<sup>1</sup>Goethe University & CEPR

<sup>2</sup>Goethe University, CAS LawFin & CEPR

<sup>3</sup>Deutsche Bundesbank

<sup>4</sup>Goethe University Frankfurt & CAS LawFin

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The views expressed in this paper are those of the authors and do not necessarily reflect the views of Deutsche Bundesbank or its staff.

# Key messages

## CSPP / Corporate Sector Purchase Program

- ▶ CSPP increased real-estate prices in Germany
- ▶ CSPP impaired financial stability in Germany

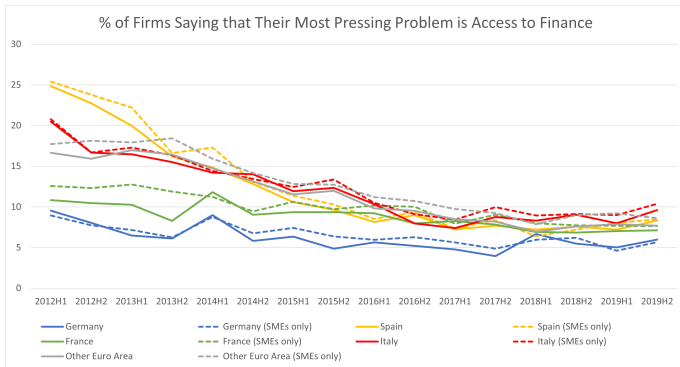
## Beyond CSPP

- ▶ Elasticities of real estate prices to credit supply can be considerably higher than prior estimates suggest

# Motivation: The Corporate Sector Purchase Programme

- ▶ Announcement in March 2016, start of purchases in June 2016. Complemented by PEPP since March 2020.
- ▶ Eurozone IG-rated non-financial corporate bonds are eligible
- ▶ Holdings amount to €350bn at peak in 2022
  - ⇒ 31% of the eligible universe
  - ⇒ 7% of Eurozone bank lending to non-financial corp.
- ▶ Rationale: Overcome credit supply frictions
- ▶ Similar programs: Japan (2011), UK (2016), and U.S. (2020)

# Motivation: Germany as Credit-Saturated Market



Source: ECB SAFE survey

No credit supply frictions in Germany in 2016  
→ credit-saturated market

# Motivation: Literature

Literature: QE positively affects bank lending

- ▶ Examples with U.S. settings: Rodnyansky and Darmouni (2017), Kandrac and Schlusche (2021)
- ▶ Exception: Chakraborty et al. (2020) document unintended side effects. Banks benefiting from MBS purchases increase mortgage lending (as intended), but reduce commercial lending (unintended crowding out).

Literature: Corporate QE with favorable effects:

- ▶ Eligible bonds' yields decrease (Zaghini (2019)) ▶ Yields
- ▶ Eligible firms substitute bank debt with bond debt (Grosse-Rueschkamp et al 2019, Arce et al 2018, Ertan et al 2020, Todorov 2020, Abidi et al 2018) ▶ Issuances
- ▶ This gives rise to spillovers to ineligible firms (Grosse-Rueschkamp et al 2019, Arce et al 2018, Ertan et al 2020)

⇒ we explore unintended adverse effects in 'credit-saturated' markets (Germany) + cross-industry effects

# Data

We combine several supervisory datasets by Deutsche Bundesbank

- ▶ The Credit Register contains all loans above €1m (before 2015: above €1.5m). We only keep Eurozone non-financial corporations and flag CSPP eligible firms by hand
- ▶ Banks report probabilities of default (PDs) for each borrower
- ▶ Bank balance sheet and P&L information
- ▶ We obtain information on firms (e.g. size) from Bundesbank and BvD Amadeus
- ▶ Sample Period: 2012-2019

# Empirical Design: Difference-in-differences

## Bank x time level:

$$y_{bt} = \beta \times Treat_b \times After_t + Controls_{bt-1} + \gamma_b + \gamma_t + \varepsilon_{bt}$$

- ▶  $y_{bt}$ : bank portfolio composition or profitability measure
- ▶  $Treat_b$ : equal to one for banks whose share of lending to CSPP eligible firms (relative to total Eurozone corporate lending) in the two years before the CSPP is above the median
- ▶  $After_t$ : equal to one for quarters/years after 2015
- ▶  $\gamma_b$  and  $\gamma_t$ : bank and quarter/year fixed effects
- ▶ Lagged control variables are Log Total Assets, Capital Ratio, Deposit Ratio, Off-BS Ratio and Share of Fee Income

## County x time level:

$$y_{ct} = \beta \times Treat_c \times After_t + Controls_{ct-1} + \gamma_c + \gamma_t + \varepsilon_{ct} \quad (1)$$

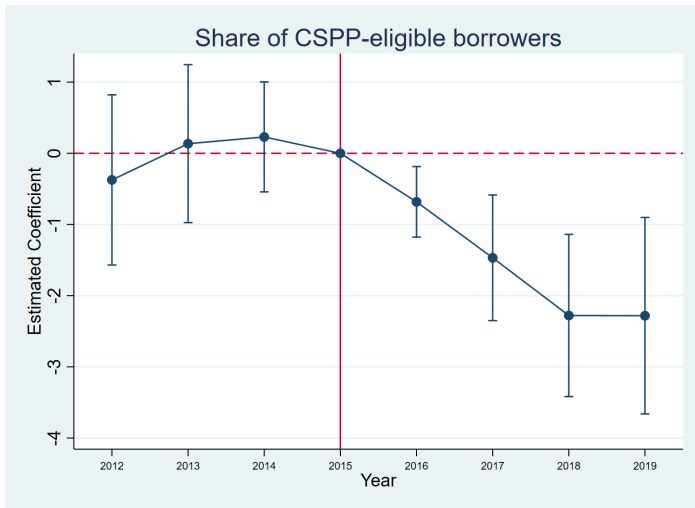
- ▶  $y_{ct}$ : Real estate prices or measures of real estate (over-)valuation
- ▶  $Treat_c$ : equal to one for counties whose firms' weighted CSPP affectedness (measured by the affectedness of their lenders) is above-median, similar to Huber (2018)
- ▶  $\gamma_c, \gamma_t$ : county and year fixed effects
- ▶ Lagged controls are Log GDP per capita, Log GDP per hour worked (plus more in revised version)

# Descriptives

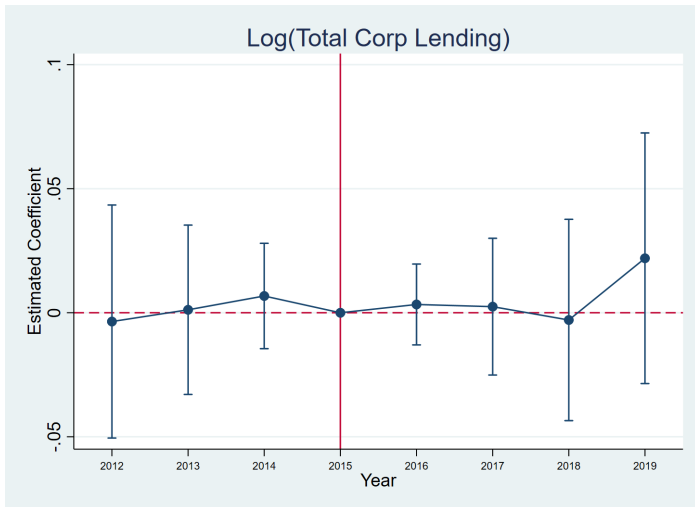
	Unit	Level	Treat				Control			
			n	Mean	SD	Median	n	Mean	SD	Median
Measure on bank affectedness										
Share Eligible (Static)	%	Bank	121	13.59	9.86	9.32	120	1.69	1.28	1.52
Quarterly measures on bank corporate loan portfolio composition										
Share Eligible	%	Bank x Quarter	3,567	13.05	9.85	9.79	3,539	2.23	2.22	1.80
Lending to Eligibles	€m	Bank x Quarter	3,567	372	1,459	75	3,539	35	98	13
Lending to Ineligibles	€m	Bank x Quarter	3,567	2,642	8,783	539	3,539	1,787	4,795	698
Total Corp. Lending	€m	Bank x Quarter	3,567	3,013	9,993	624	3,539	1,821	4,871	714
PD	%	Bank x Quarter	3,567	2.18	2.15	1.57	3,539	3.62	5.17	2.30
Share HY	%	Bank x Quarter	3,567	19.52	9.75	17.92	3,539	24.71	15.54	20.82
Share REAM	%	Bank x Quarter	3,567	17.43	9.16	17.09	3,539	22.86	11.74	21.70
RE Collateral	%	Bank x Quarter	3,528	51.27	18.89	53.84	3,524	52.88	21.05	56.12
Yearly measures on bank profitability										
NII / Toas	%	Bank x Year	910	1.82	0.45	1.90	910	1.91	0.44	1.90
Loan write-offs / Toas	%	Bank x Year	910	0.19	0.16	0.16	910	0.27	0.24	0.21
Rest / Toas	%	Bank x Year	910	-0.84	0.36	-0.88	910	-0.85	0.34	-0.86
RoA	%	Bank x Year	910	0.79	0.36	0.80	910	0.79	0.40	0.78
Yearly lagged control variables										
Capital Ratio	%	Bank x Year	910	17.14	3.81	16.65	910	16.14	3.68	15.51
Deposit Ratio	%	Bank x Year	910	48.89	12.53	48.75	910	49.88	12.44	48.79
Off-BS Ratio	%	Bank x Year	910	3.11	3.00	2.18	910	2.48	1.86	2.12
Share of Fee income	%	Bank x Year	910	18.70	9.89	17.32	910	18.37	8.65	17.58
Quarterly lagged control variables										
Total Assets	€bn	Bank x Quarter	3,567	13.38	39.55	3.38	3,539	7.41	13.16	3.67



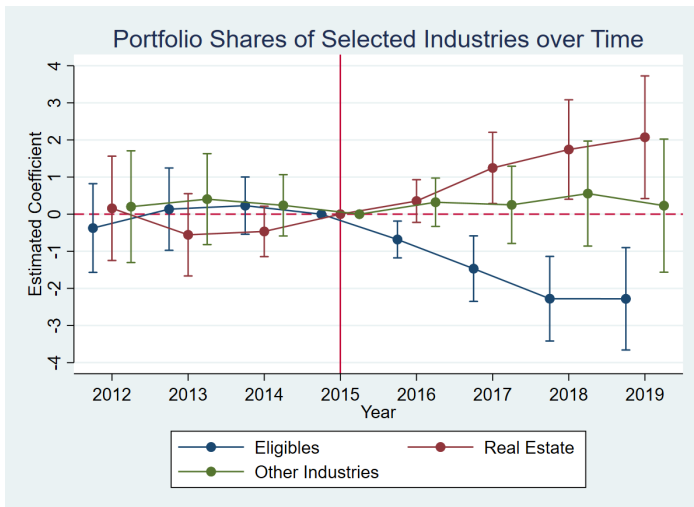
# Lending to CSPP-eligible borrowers declines



# No change in overall lending



# Where does lending increase? Real estate

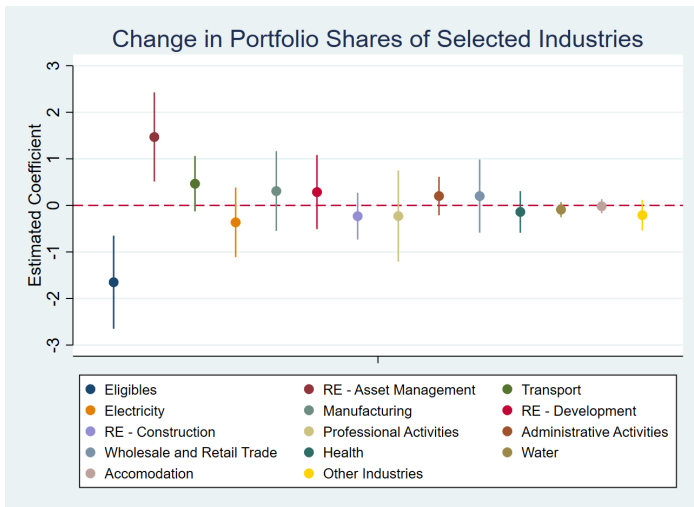


## Where does lending increase? Real estate

Dependent variable:	Portfolio Share per Industry			Portfolio Share per Real Estate Subindustry		
	Eligibles	Real Estate	Other	Construction	Development	Asset Man.
Treat x After	-1.6420*** (-3.24)	1.4822** (2.21)	0.1597 (0.24)	-0.2381 (-0.93)	0.2748 (0.68)	1.4455*** (2.97)
Controls	yes	yes	yes	yes	yes	yes
Bank FE	yes	yes	yes	yes	yes	yes
Quarter FE	yes	yes	yes	yes	yes	yes
Observations	7,106	7,106	7,106	7,106	7,106	7,106
Sample Mean in %	7.63	36.66	55.72	4.72	12.78	19.16

- ▶ Lending share of eligibles shifted to real estate sector
- ▶ Within real estate sector funds go to RE asset managers

# Where does lending increase? Real estate asset managers

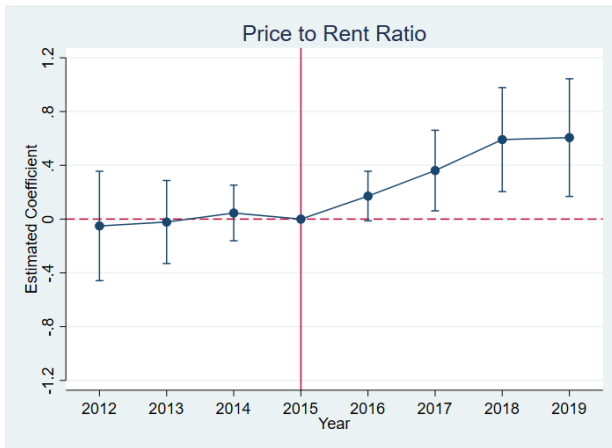


# Real estate prices increase



- increase of around 5% from 2015 to 2019  $\implies$  represents 17% ( $=5\%/29\%$ ) of growth in residential real estate in that period

# Results: Real Estate Prices and (Over-)Valuation



- ▶ Similar for price-to-income
- ▶ Small increase in rents

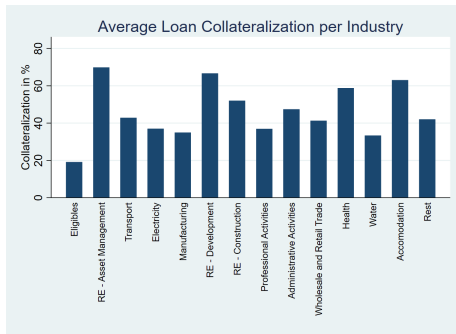
## Results: Robustness

- ▶ No pre-trends
- ▶ Robust to within-firm estimate (Khwaja-Mian or Amiti-Weinstein)
  - supply side explanation
- ▶ Robust to matching on bank size and profitability
  - not due to differences in size or profitability distribution
- ▶ Results robust to region x time fixed effects
  - not due to spatial variation in post-CSPP development
- ▶ Robust to advanced diff-in-diff estimators (De Chaisemartin & d'Haultfoeuille 2020 AER)
- ▶ Placebo tests: (1) Single-family houses, (2) Growth of non-real estate firms
- ▶ SUTVA: plausibly violated, suggesting underestimate



# Mechanism: Why Real Estate Asset Managers?

- ▶ Supply side argument: Attractive for banks to lend to due to high collateralization and low risk-weight



- ▶ Demand side argument: Real Estate Asset Managers' loan demand most elastic to easing in credit supply (capital intensity, ability to scale up)

# Mechanism: Why Real Estate Asset Managers?

Industry	# of Firms	Avg. Loan Amount (€m)	Portfolio Share (%)	Date of Incorpor.	Total Assets (€m)				Empl./ Toas	Debt/ Toas
					Mean	p25	p50	p75		
Eligibles	563	99.29	7.88	1991	18,531	171	1,440	19,454	1.31	0.70
RE – Asset Management	21,387	7.20	20.25	2004	29	5	10	23	0.27	0.83
RE - Development	15,210	9.48	13.92	2005	35	5	10	21	0.24	0.86
RE – Construction	6,397	5.04	4.94	1998	18	4	7	15	1.56	0.85
Transport	5,974	12.34	3.78	2002	40	5	10	20	2.43	0.81
Electricity	9,580	8.10	8.29	2009	38	4	7	17	0.40	0.82
Manufacturing	14,707	5.99	10.99	1989	74	6	12	30	7.91	0.67
Professional Activities	7,737	16.68	11.61	2001	237	7	21	95	1.64	0.68
Administrative Activities	4,375	8.38	2.95	2001	76	5	10	26	1.94	0.76
Wholesale and Retail Trade	12,460	4.81	8.24	1991	48	4	8	17	5.86	0.76
Health	3,415	5.35	4.38	1997	54	7	17	55	11.50	0.60
Water	972	8.02	1.39	1995	44	7	14	33	2.86	0.70
Accommodation	1,316	4.75	1.20	2003	12	3	6	11	8.52	0.84
Other Industries	4,232	4.91	2.42	1994	39	4	8	16	3.56	0.69

# Elasticities of real estate prices to credit supply

Our paper:

- ▶ Elasticity of real estate prices to credit supply: 0.84  
(1% increase in debt of real estate firms increases real estate prices by 0.84%)
- ▶ Semi-elasticity of real estate prices to interest rates: between 5.1-20.4 (depending on assumptions)

→ Considerably higher than prior estimates (Adelino et al. (2024), Favara and Imbs (2015), Di Maggio and Kermani (2017))

Why?

- ▶ Credit saturated economy: increase in credit supply entirely affects demand for housing, not supply of housing
- ▶ Implications: Real estate booms can materialize in credit saturated economies even with relatively modest expansionary shocks to credit supply

# Results: Why Care?

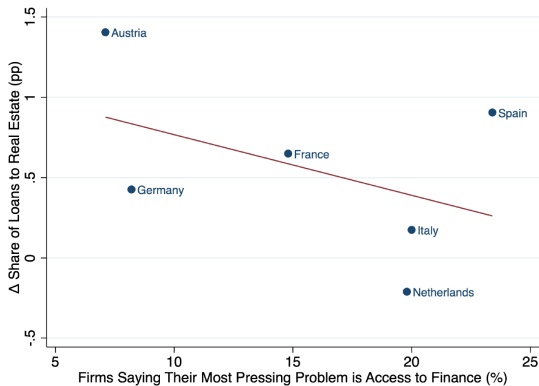
- ▶ Same issues in multiple credit-saturated Eurozone economies:

23 September 2019

**The European Systemic Risk Board (ESRB) has today published a set of country-specific warnings and recommendations on medium-term vulnerabilities in the residential real estate sector.** The ESRB has a mandate to issue warnings when significant systemic risks are identified and to provide recommendations for remedial action to address such risks. The warnings were sent to the competent ministers of the following five countries: the [Czech Republic](#), [Germany](#), [France](#), [Iceland](#) and [Norway](#)<sup>[1]</sup>. Similarly, the recommendations were sent to the competent ministers of the following six countries: [Belgium](#), [Denmark](#), [Luxembourg](#), [the Netherlands](#), [Finland](#) and [Sweden](#)<sup>[2]</sup>.

- ▶ ECB very concerned about real estate prices (e.g. TLTRO series did not allow for lending to real estate sector)

## Results: Why Care?



Source: Julia Selgrad (Discussion EFA)

Share of lending to real estate sector increases more post-CSPP in countries that were more credit-saturated before CSPP

# Results: Financial Stability

Dependent variable:	Ln(PD)		Ln(HHI)		Fraction RE Collateral	
	(1)	(2)	(3)	(4)	(5)	(6)
Treat x After	0.2531*** (4.11)	0.2520*** (4.11)	0.0310 (1.53)	0.0341* (1.73)	2.1179*** (2.71)	2.2927*** (3.09)
Controls	no	yes	no	yes	no	yes
Quarter FE	yes	yes	yes	yes	yes	yes
Bank FE	yes	yes	yes	yes	yes	yes
Observations	7,106	7,106	7,106	7,106	7,052	7,052

## Results: Financial Stability

Dependent variable:	Loan Write-offs / Toas		NII / Toas		Rest / Toas		RoA	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Treat x After	0.0504*** (3.03)	0.0478*** (2.95)	0.0202 (0.82)	0.0172 (0.75)	-0.0190 (-0.79)	-0.0224 (-1.02)	-0.0492* (-1.94)	-0.0530** (-2.12)
Controls	no	yes	no	yes	no	yes	no	yes
Bank FE	yes	yes	yes	yes	yes	yes	yes	yes
Quarter FE	yes	yes	yes	yes	yes	yes	yes	yes
Observations	1,819	1,819	1,819	1,819	1,819	1,819	1,819	1,819

- ▶ "Rest" sums up fee income, trading income and operational income
- ▶ ROA decreases by 6-7% of sample mean

# Key messages

## CSPP / Corporate Sector Purchase Program

- ▶ CSPP increased real-estate prices in Germany
- ▶ CSPP impaired financial stability in Germany

## Beyond CSPP

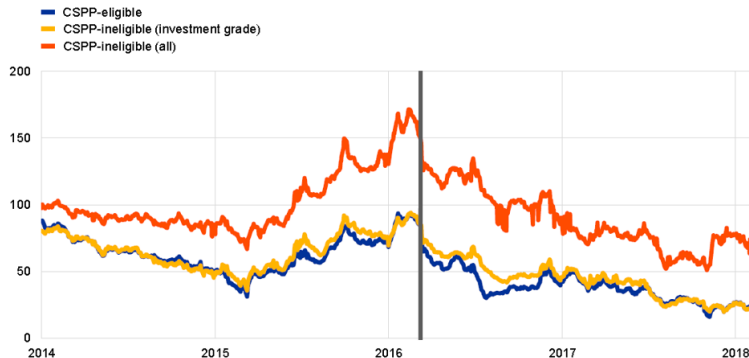
- ▶ Elasticities of real estate prices to credit supply can be considerably higher than prior estimates suggest



## Appendix

# First Order Effects: Eligible Bonds' Spreads

(basis points)

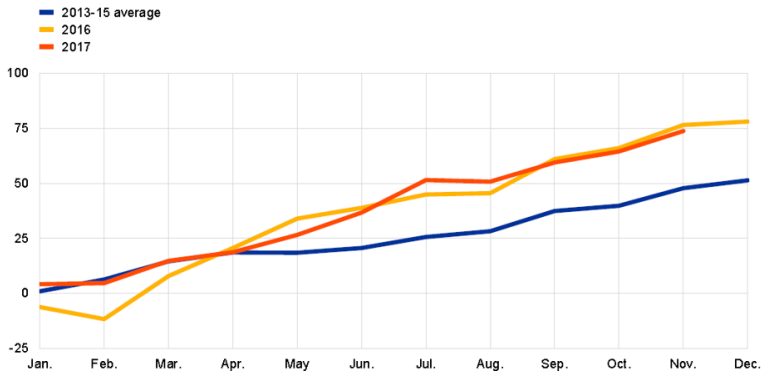


(Source: ECB Economic Bulletin 3/2018)

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# First Order Effects: Issuances

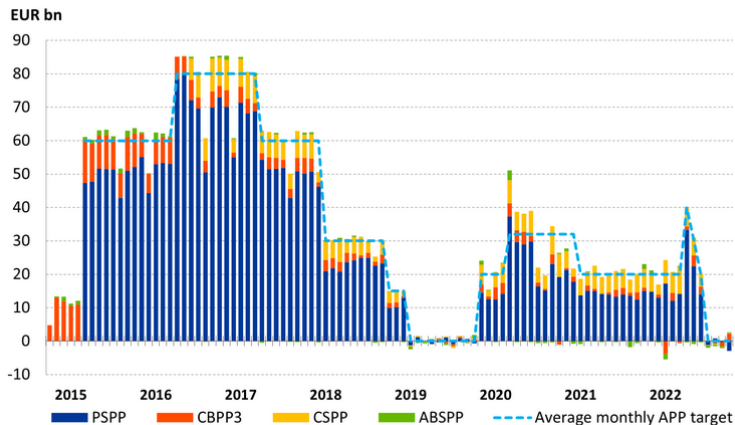
(EUR billions; cumulative monthly flows)



(Source: ECB Economic Bulletin 3/2018)

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# Appendix: The ECB's Asset Holdings



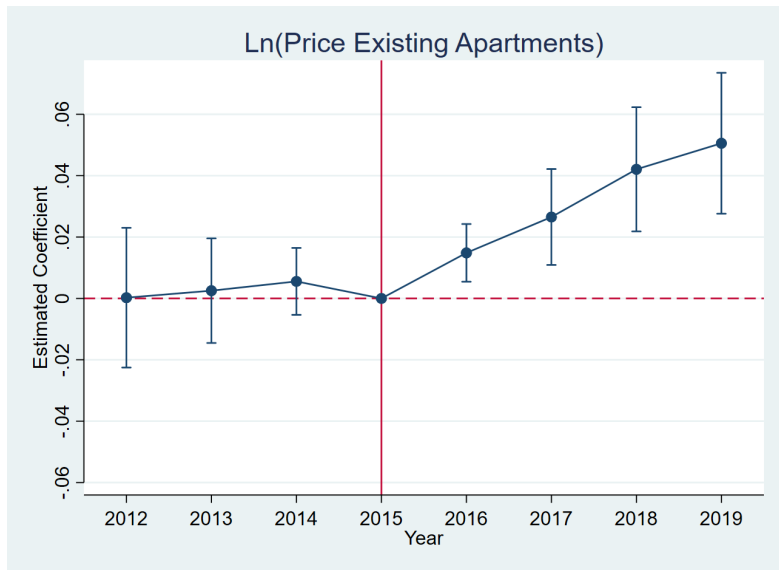
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## Results: Substitution

Dependent variable:	Share Eligible		Ln(Total Corp Lending)	
	(1)	(2)	(3)	(4)
Treat x After	-1.5608*** (-3.00)	-1.6420*** (-3.24)	0.0075 (0.27)	0.0014 (0.06)
Controls	no	yes	no	yes
Quarter FE	yes	yes	yes	yes
Bank FE	yes	yes	yes	yes
Observations	7,106	7,106	7,106	7,106

- ▶ Fraction of lending to eligible firms decreases by 1.64 pp (represents 12% of the pre-event share of eligible lending at treated banks)
- ▶ No impact on total lending (i.e. banks fully substituted)

## Appendix: Price Coefficient Mapped Out



## Loan Level Results: Amiti/Weinstein (2018 JPE) Setup

- ▶ Aggregate firm level to location  $\times$  size clusters, then estimate bank-specific supply shock

	Bank Supply Shock (%-Change in Lending)	
	Treated Banks	Control Banks
Constant	0.0701*** (2.77)	0.0243 (1.02)
Observations	115	118

# Loan Level Results: Khwaja/Mian (AER 2008) Setup

Dependent variable:	$\Delta \ln(\text{Loan Amount})$			Entry			Exit		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Treat	0.0854** (2.03)	0.0679** (2.03)	0.0994* (1.79)	0.0599*** (4.44)	0.0646*** (4.71)	0.0532** (2.57)	-0.0359 (-1.07)	-0.0347 (-1.20)	-0.0222 (-0.70)
Controls	yes	yes	yes	yes	yes	yes	yes	yes	yes
Size x Location FE	no	yes	-	no	yes	-	no	yes	-
Firm FE	no	no	yes	no	no	yes	no	no	yes
Observations	7,424	7,395	1,950	22,595	22,548	6,705	20,167	20,126	5,675

- ▶ Treated banks increase loan supply to real estate asset managers
- ▶ Both intensive and extensive margin matter



# Descriptives on the County (x Year) Level

	Unit	Level	Treat				Control			
			n	Mean	SD	Median	n	Mean	SD	Median
Measure on county affectedness										
Share County (Static)	%	County	200	10.23	2.35	9.45	201	6.01	1.24	6.18
Yearly measures on county real estate firms										
Toas RE	€bn	County x Year	1,594	1.35	5.26	0.33	1,545	1.38	6.16	0.46
Toas Non-RE	€bn	County x Year	1,594	14.28	32.97	4.68	1,545	10.39	32.32	3.81
Frac Toas RE	%	County x Year	1,594	8.18	8.07	5.96	1,545	11.91	8.23	9.89
Yearly measures on county real estate prices and economic strength indicators										
Price Existing Apartments	€/m <sup>2</sup>	County x Year	1,594	1,845	845	1,650	1,545	1,660	732	1,488
Rent Existing Apartments	€/m <sup>2</sup>	County x Year	1,594	6.82	1.81	6.50	1,545	6.59	1.62	6.20
Price to Rent Ratio		County x Year	1,594	21.72	4.55	21.16	1,545	20.30	4.46	19.67
Price to Income Ratio		County x Year	1,594	5.16	2.11	4.68	1,545	5.24	1.92	4.77
GDP per Cap.	€	County x Year	1,594	37,819	16,366	33,003	1,545	33,031	14,658	29,313
GDP per Hour	€	County x Year	1,594	49.21	8.47	47.84	1,545	45.95	8.61	44.90

## Results: Real Estate Debt Growth in Treated Districts

	Ln(Debt RE)		Ln(Debt Non-RE)	
	(1)	(2)	(3)	(4)
Treat x After	0.0670** (2.49)	0.0605** (2.33)	0.0009 (0.04)	-0.0039 (-0.20)
Controls	no	yes	no	yes
County FE	yes	yes	yes	yes
Year FE	yes	yes	yes	yes
Observations	3,139	3,139	3,139	3,139

- ▶ Real estate firms' debt increase by 6.05%
- ▶ Not associated with districts whose firms experience higher debt growth as such

## Results: Real Estate Prices and (Over-)Valuation

	Ln(Price Exist. Apartments) (1)	Ln(Rent Exist. Apartments) (2)	Price to Rent Ratio (3)	Price to In- come Ratio (4)
Treat x After	0.0313*** (2.74)	0.0166*** (3.29)	0.4370** (2.09)	0.1480** (2.02)
Controls	yes	yes	yes	yes
County FE	yes	yes	yes	yes
Year FE	yes	yes	yes	yes
Observations	3,139	3,139	3,139	3,139

- ▶ Control for GDP/capita and GDP/hour worked
- ▶ In CSPP-affected counties apartment prices increase relative to control counties by 3.13% following CSPP
- ▶ Real estate purchasers have to invest an additional 14.8% of annual income compared to unaffected counties