Negative Monetary Policy Rates: Evidence from the Credit and Securities Registers of a Crisis Country

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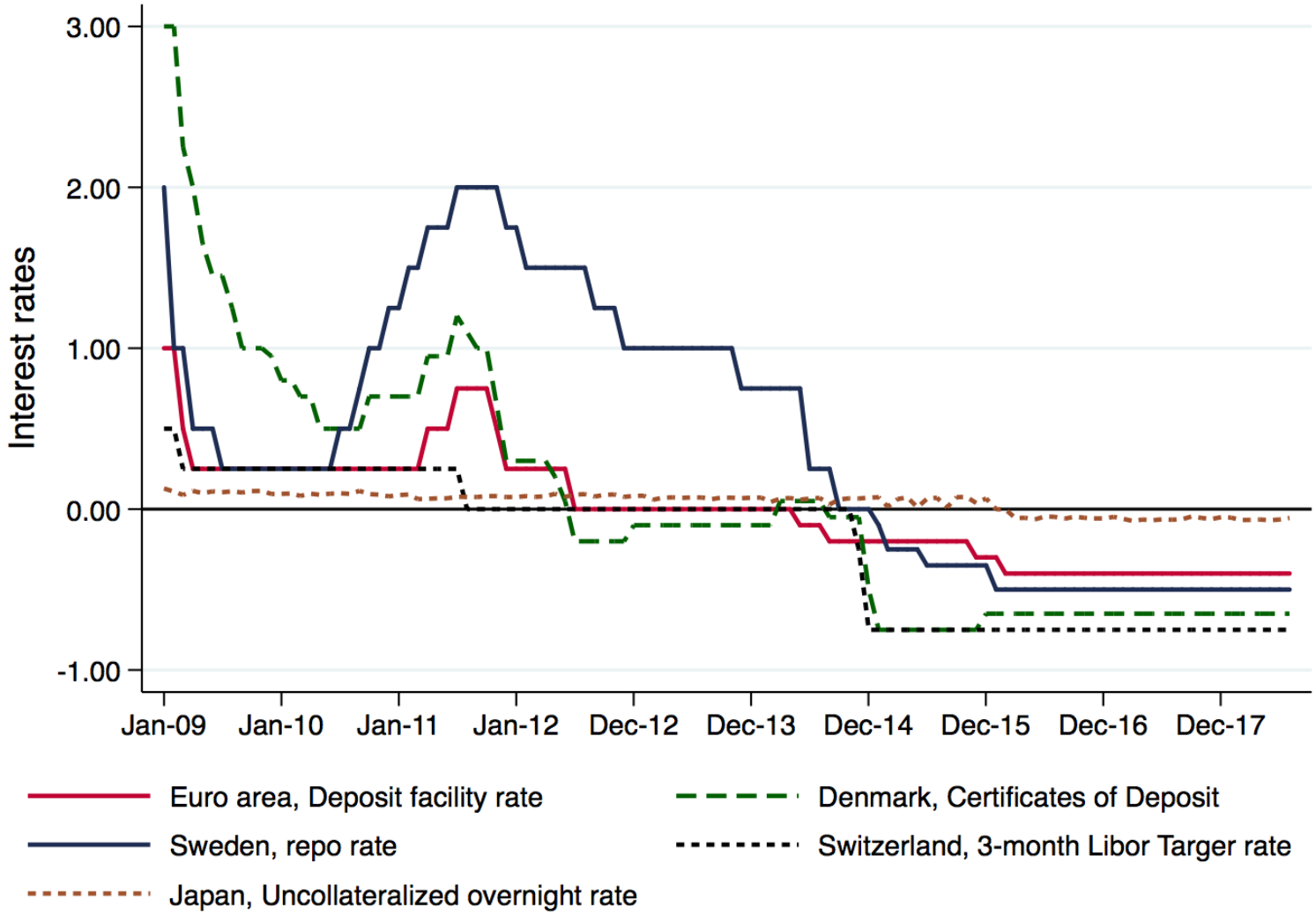
Negative Monetary Policy Rates

More than USD 8 trillion worth of traded bonds have negative yields (June 2018)



Motivation

Macroeconomic theory suggests that a cut in policy rates expands aggregate demand (thereby boosting economic growth and prices)

However:

- Brunnermeier and Koby (2018) theoretically show that there may be a "reversal" rate, at which lower rates undo the intended effects on bank lending and become **contractionary**
- Too low monetary rates have also been suggested as a driver of **reach-for-yield behavior** (Rajan, 2005; Taylor, 2009; Allen and Rogoff, 2011; Stein, 2013)

Research questions

1. What is the impact of NIRP on banks **asset allocations** and on the **real economy**?

2. Is the transmission of negative rates **different**?

What we do

- We analyze the effects of NIRP by exploiting:
  - the ECB's introduction of NIRP in June 2014
  - the Italian credit and securities registers matched with firm- and bank-level balance sheets
- Our analysis is different from existing studies:
  - We study NIRP in a country strongly affected by the crisis
  - We exploit a comprehensive and granular dataset
  - We obtain novel results

Preview of results

NIRP works through a "**portfolio rebalancing channel**". Banks that are net providers of short-term interbank liquidity:

- Reduce their net holdings of short-term interbank assets
- Expand credit supply, especially to *ex-ante* riskier firms
- Lower lending rates
- There are real effects on firm activities
- There is some rebalancing in the securities portfolio
- The transmission is stronger for liquid, well-capitalized banks

The results are robust to a broader definition of liquidity.

Related literature

- Limited (but growing) literature on NIRP:
  - Basten & Mariathasan (2017) analyze bank-level data and use excess reserves: they find that Swiss banks more exposed to NIRP ↑ credit risk (in a context of currency appreciation)
  - Heider et al. (2017) analyze syndicated loan level data and use retail deposits to show that NIRP ↓ syndicated lending and ↑ risk taking in the Euro area; similar evidence for Sweden (Eggertsson et al. 2017)
- Unconventional MP: Chakraborty et al. (2017); Di Maggio et al. (2016); McKay et al. (2016) on the US; Acharya et al. (2016; 2017); Carpinelli and Crosignani (2017); Peydro et al. (2017) on the EA
- Risk-taking channel of monetary policy: Adrian & Shin (2011); Jimenez et al. (2014); Dell'Ariccia et al. (2017)

Plan of the talk

- NIRP and the Transmission of Monetary Policy
- NIRP and Bank Asset Allocation
- Firm Level Credit and Real Effects
- Conclusions

NIRP and monetary transmission

- **Portfolio rebalacing channel**: NIRP incentivizes banks to reduce their liquid asset and increase holdings of higher yield assets, such as loans or high-yield securities (Krishnamurthy & Vissing-Jorgensen 2011; Bernanke 2016; Rostagno et al. 2016).
  - $\Rightarrow$ more exposed banks will $\downarrow$ interbank claims and $\uparrow$ loan supply
- **Retail deposit channel**: banks are reluctant to pass negative rates to depositors, NIRP may reduce banks profits and erode capital (Heider et al. 2018; Eggertsson et al. 2017)
  - $\Rightarrow$ more exposed banks will $\downarrow$ loan supply

Research design

Use loan-level bank-firm matched data, apply a DiD methodology around NIRP introduction (June 2014) in a setting à la Khwaja & Mian (2008).

We average monthly data in two pre- and post-NIRP period and compare loan growth by banks with different *ex-ante* exposure to NIR to the same firm:

$$\Delta LOAN_{ib} = \beta Interbank\ position_b + \gamma' \mathbf{X}_b + \phi_i + \epsilon_{ib}$$

where:

- $\Delta LOAN_{ib}$ is loan growth at the bank-firm level, calculated as log difference between the post- and the pre-NIRP period
- We drop June 2014 and consider windows of ± 3, ± 6 (and ± 12) months
- $\mathbf{X}_b$ includes pre-NIRP bank vars: liquidity, size, Tier1 capital, and NPLs
- Unobserved firm heterogeneity is absorbed by firm FEs
- Standard errors are double clustered at the bank and firm level

Research design – Exposure to NIRP

- Rates in the interbank market immediately affected by NIRP ▸ Chart
- We define bank exposure to NIRP as net interbank position, measured by the ratio of interbank loans minus interbank deposits with maturity up to one week, divided by total assets in March 2014 ▸ Chart
- The net interbank position is:
  - persistents; ▸ Chart
  - not correlated with retail deposits; and ▸ Table
  - not correlated with firm observables ▸ Chart

Excess reserves are negligible (as in other Southern European countries)

The floor on negative retail deposit rates does not necessarily bind and profitability has not been affected as commissions & fees are sizable

Data

- Double matched bank-firm monthly panel dataset covering the lending and securities trading activities of Italian banks
- The dataset covers 2013-15 and draws on:
  - the loan-level credit register managed by the Bank of Italy, which reports the outstanding loan exposures (minimum size of EUR 30k) and rates of all banks operating in Italy vis-a-vis Italian non-financial firms;
  - the security register, managed by the Bank of Italy, with information on individual securities holdings at the ISIN level of each bank;
  - supervisory data on bank balance sheets;
  - data on firm financials from the proprietary CADS database, owned by Cerved Group S.p.a.
- Our final sample contains more than 160,000 firms with multiple banking relationships, 1,500 securities, and 95 banks.

NIRP and bank asset allocation

Impact of NIRP on fees and interbank positions

Bank-level evidence

Dependent variable:	Change in income fees			Change in the net interbank position		
	(1)	(2)	(3)	(4)	(5)	(6)
Retail Deposits	0.0031***	0.0024***	0.0024***			0.0575
	(0.0007)	(0.0007)	(0.0007)			(0.0419)
Net interbank position			-0.0003	-0.1811***	-0.2190**	-0.2215**
			(0.0012)	(0.0672)	(0.0851)	(0.0847)
Liquidity		-0.0019**	-0.0019**		-0.0419	-0.0225
		(0.0008)	(0.0008)		(0.0413)	(0.0408)
Size		-0.0020	-0.0028		-0.3237*	-0.0105
		(0.0063)	(0.0063)		(0.1843)	(0.3117)
Capital		0.0024	0.0025		-0.0892	-0.0117
		(0.0028)	(0.0029)		(0.1077)	(0.1122)
NPL		0.0069*	0.0069*		-0.0341	0.0011
		(0.0038)	(0.0038)		(0.1487)	(0.1521)
Observations	83	83	83	95	95	95
R^2	0.2077	0.3877	0.3884	0.1774	0.1994	0.2195

The dependent variable is: 1) the change in banks' income from fees between June and December 2014, or 2) the change between March and September 2014 of banks' net interbank position over assets. Retail deposits are measured as a share of total assets, as of end-March 2014. The *net* position in the interbank market is measured by the ratio of interbank loans minus interbank deposits with maturity up to one week, over total assets, as of end-March 2014

▸ Chart fees ▸ Chart net interbank position

Impact of NIRP on credit supply

Loan-level evidence

Window:	(1)	(2)	(3)	(4)	(5)	(6)
	±3 **month around June 2014**			±6 **months around June 2014**		
Net interbank position	0.1176**	0.1148*	0.1130*	0.1731**	0.1679**	0.1629**
	(0.0577)	(0.0583)	(0.0610)	(0.0718)	(0.0718)	(0.0740)
Liquidity	0.0631***	0.0712***	0.0688***	0.0827***	0.0977***	0.0908***
	(0.0195)	(0.0208)	(0.0224)	(0.0270)	(0.0300)	(0.0334)
Size	0.2582***	0.3421***	0.3339***	0.3510***	0.5072***	0.4842***
	(0.0597)	(0.1143)	(0.1162)	(0.0917)	(0.1659)	(0.1677)
Capital	-0.1137**	-0.1261**	-0.1405**	-0.0868	-0.1097	-0.1503
	(0.0558)	(0.0588)	(0.0584)	(0.0892)	(0.0921)	(0.0934)
NPL	-0.0670	-0.0669	-0.0527	-0.0747	-0.0745	-0.0344
	(0.0612)	(0.0614)	(0.0737)	(0.1043)	(0.1052)	(0.1135)
Retail Deposits		0.0144	0.0216		0.0269	0.0470
		(0.0209)	(0.0241)		(0.0290)	(0.0332)
TLTRO			-0.0148			-0.0414
			(0.0305)			(0.0428)
Observations	495942	495942	495942	498234	498234	498234
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes
R^2	0.3681	0.3681	0.3681	0.3897	0.3898	0.3898

More exposed banks expanded lending by about 0.3 pps more than less exposed banks after 6 month. This effect is about 10% of actual loan growth

The effect of liquidity is the opposite of how the bank lending channel works in normal times (Kashyap & Stein 2000)

Identification and robustness

- **Isolate supply-side effects**
  - Use firm fixed effects—identifying assumption of no bank-specific demand for credit; and look at prices
- **Correlation between NIRP exposure and bank characteristics**
  - Descriptive evidence; large set of bank controls, including funding structure and windfall gains
- **Confounding effects of other contemporaneous policies**
  - Bank-specific measure of participation to the TLTRO (implemented in September 2014), short time windows
- **Absence of pre-trend**
  - No evidence of pre-trends in the months before June 2014

Firm and bank heterogeneity

Results are stronger for **small** firms and those with **worse rating**

- NIRP favours risk-taking

Results are stronger among banks with **high capital**

- The portfolio rebalancing of NIRP hinges on the strength of the banking sector.

NIRP is different

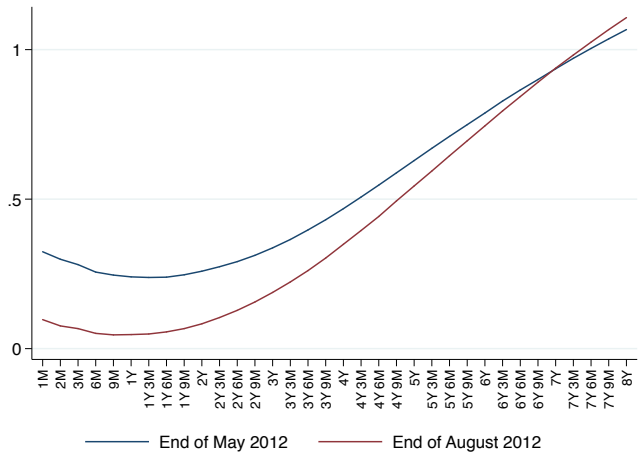
We replicate our analysis in correspondence of three other episodes:

- The last ECB interest rate cut in positive territory in July 2012
- The first forward guidance announcement in July 2013
- The forward guidance announcement in January 2014

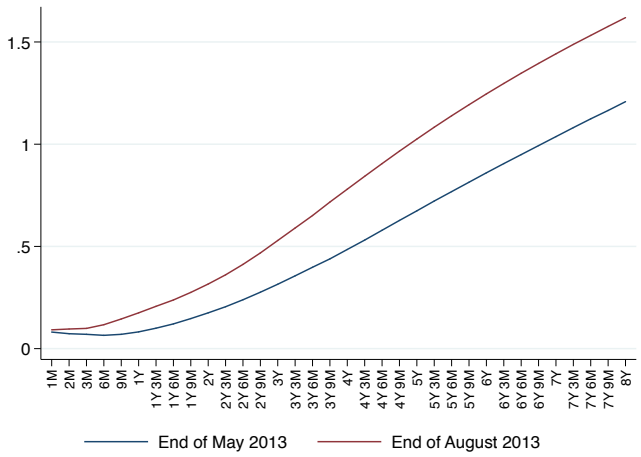
Window around:	July 2012		July 2013		January 2014	
	±3 m	±6 m	±3 m	±6 m	±3 m	±6 m
Interbank position	-0.204***	-0.271***	-0.119*	-0.099	0.094	0.046
	(0.0548)	(0.0715)	(0.0622)	(0.1359)	(0.0663)	(0.0743)
Liquidity	-0.0701*	-0.105*	0.042**	0.015	-0.052	-0.020
	(0.0396)	(0.0532)	(0.0186)	(0.0286)	(0.0338)	(0.0343)
Observations	560352	562857	527335	529914	506734	508921
Bank controls	Yes	Yes	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes
R^2	0.3699	0.3855	0.3705	0.3897	0.3699	0.3898

Sharp contrast with the traditional BLC (Kashyap & Stein, 2000)

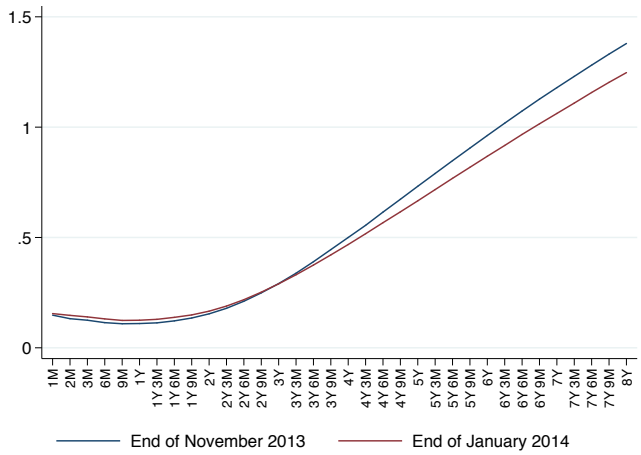
A tentative explanation: flattening of the yield curve



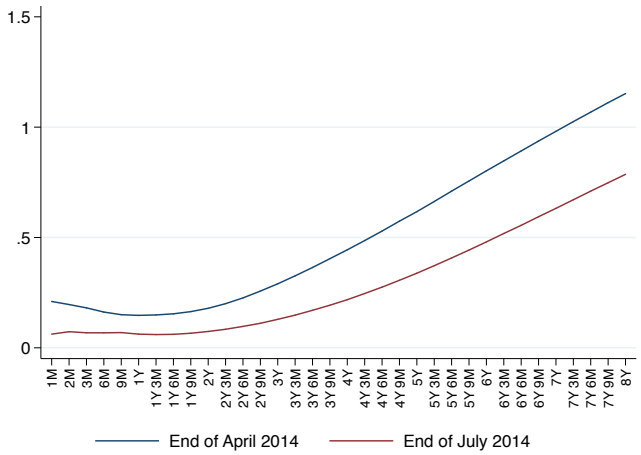
(a) July 2012 (rate cut)



(b) July 2013 (forward guidance)



(c) Jan. 2014 (forward guidance)



(d) June 2014—NIRP

Impact of NIRP on lending rates

NIRP translates into relatively lower lending rates for more exposed banks

1 SD increase in net interbank position leads to 15 bps reduction of gross lending rates over a ± 6 months window.

Window:	(1) **Gross rates**	(2)	(3) **Net rates**	(4)
Net interbank position	-0.1063***	-0.0842***	-0.0437*	-0.0298**
	(0.0361)	(0.0159)	(0.0251)	(0.0120)
Liquidity		-0.0427***		-0.0230***
		(0.0118)		(0.0082)
Observations	177017	177017	205091	205091
Bank controls	No	Yes	No	Yes
Firm FE	Yes	Yes	Yes	Yes
R^2	0.4005	0.4029	0.3769	0.3825

Firm Level Credit and Real Effects

NIRP and Total Bank Credit

1 SD increase in exposure leads to 0.3 pps lower reduction in total credit at the firm level after 6 months (18% of the actual average change)

Window:	(1)	(2)	(3)	(4)	(5)	(6)
	±3 **month around June 2014**			±6 **months around June 2014**		
Firm interbank exposure	0.0806	0.1652*	0.2436***	0.1142*	0.1635**	0.2627***
	(0.0805)	(0.0833)	(0.0554)	(0.0686)	(0.0685)	(0.0408)
Liquidity		0.0044	0.0329		0.0395	0.1013***
		(0.0506)	(0.0452)		(0.0324)	(0.0199)
Observations	141801	141801	141801	142302	142302	142302
Bank controls	No	Yes	Yes	No	Yes	Yes
Credit demand	No	No	Yes	No	No	Yes
Industry & province FE	Yes	Yes	Yes	Yes	Yes	Yes
R^2	0.0202	0.0205	0.2986	0.0153	0.0155	0.6080

Firm interbank exposure is the firm-level average of the *net* interbank position, weighted by the share of total credit granted to the firm by each bank, as of March 2014. Credit demand is the vector of firm-level dummies estimated in the baseline regression

Real Effects of NIRP

1 SD increase in exposure leads to higher investment (1 pps) and the wage bill (0.6 pps); the semi-elasticities are 8% and 53%, respectively

	(1)	(2)	(3)	(4)
	Net investment		**Wage bill growth**	
Firm interbank exposure	0.5668*	0.5228*	0.3494***	0.3239***
	(0.2849)	(0.2654)	(0.1179)	(0.1213)
Liquidity	0.3428***	0.3679***	0.0110	0.0256
	(0.0766)	(0.0780)	(0.0294)	(0.0278)
Observations	48257	48257	47428	47428
Bank controls	Yes	Yes	Yes	Yes
Credit demand	No	Yes	No	Yes
Ind & prov FE	Yes	Yes	Yes	Yes
R^2	0.0157	0.0298	0.0274	0.0551

The dependent variable is, alternatively: 1) net investment, defined as the growth rate of fixed assets between 2014 and 2013; and 2) the growth rate of the wage bill between 2014 and 2013. Sample of manufacturing firms.

Conclusions

NIRP has **expansionary effects** on credit supply and the economy through a **portfolio rebalancing channel**, by which banks substitute away from low yield short-term assets (such as interbank loans and safe securities) to higher-yield longer-term assets (such as corporate loans)

- This channel is distinct from the retail deposits channel, for which we find no evidence in the Italian context
- Unlike previous cuts at low (but positive) interest rate levels and forward guidance, this channel was activated as NIRP shifted downwards and flattened the term structure of interest rates

Additional Slides

Net Interbank Position Across Banks

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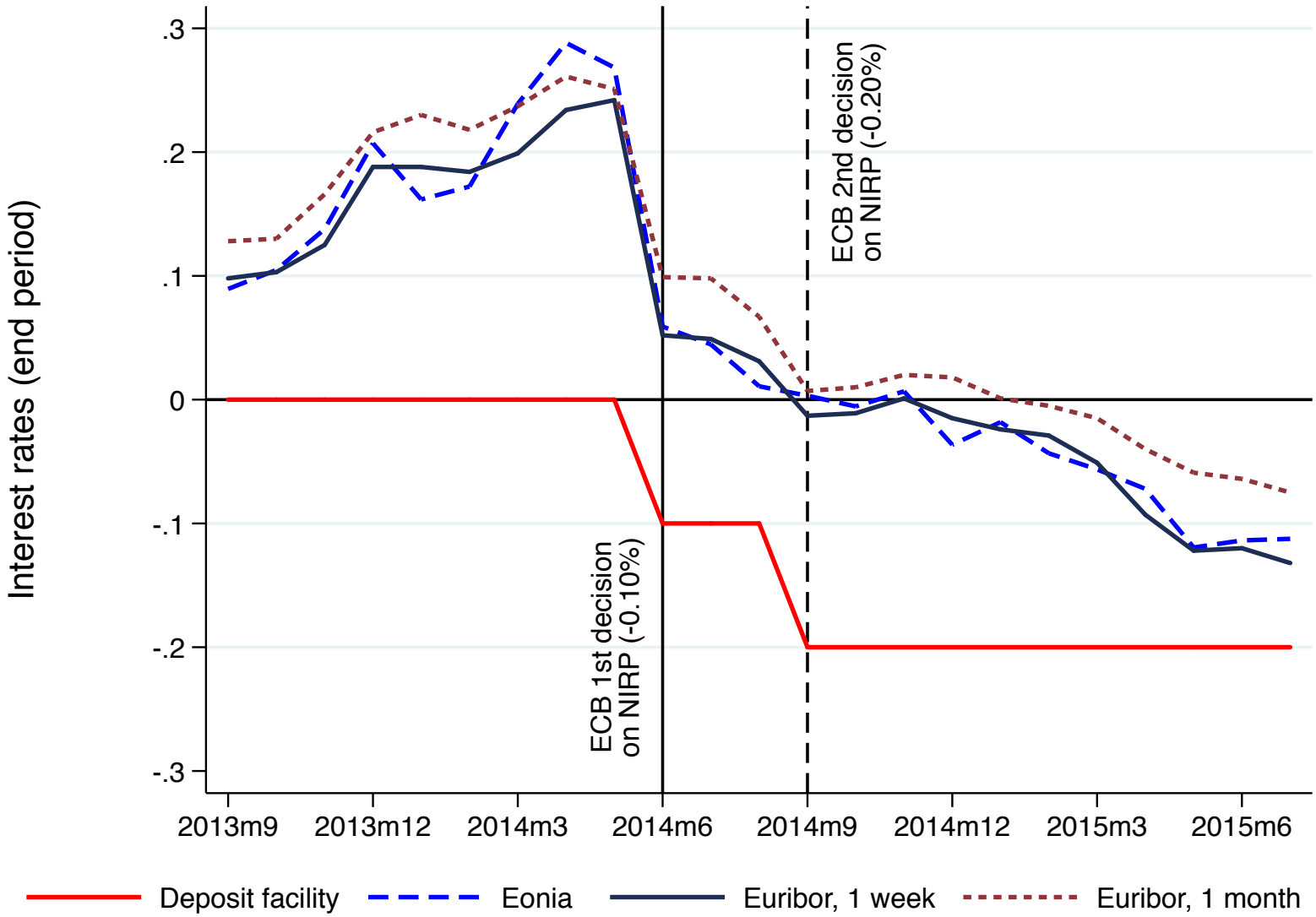

Net Interbank Position Across Banks

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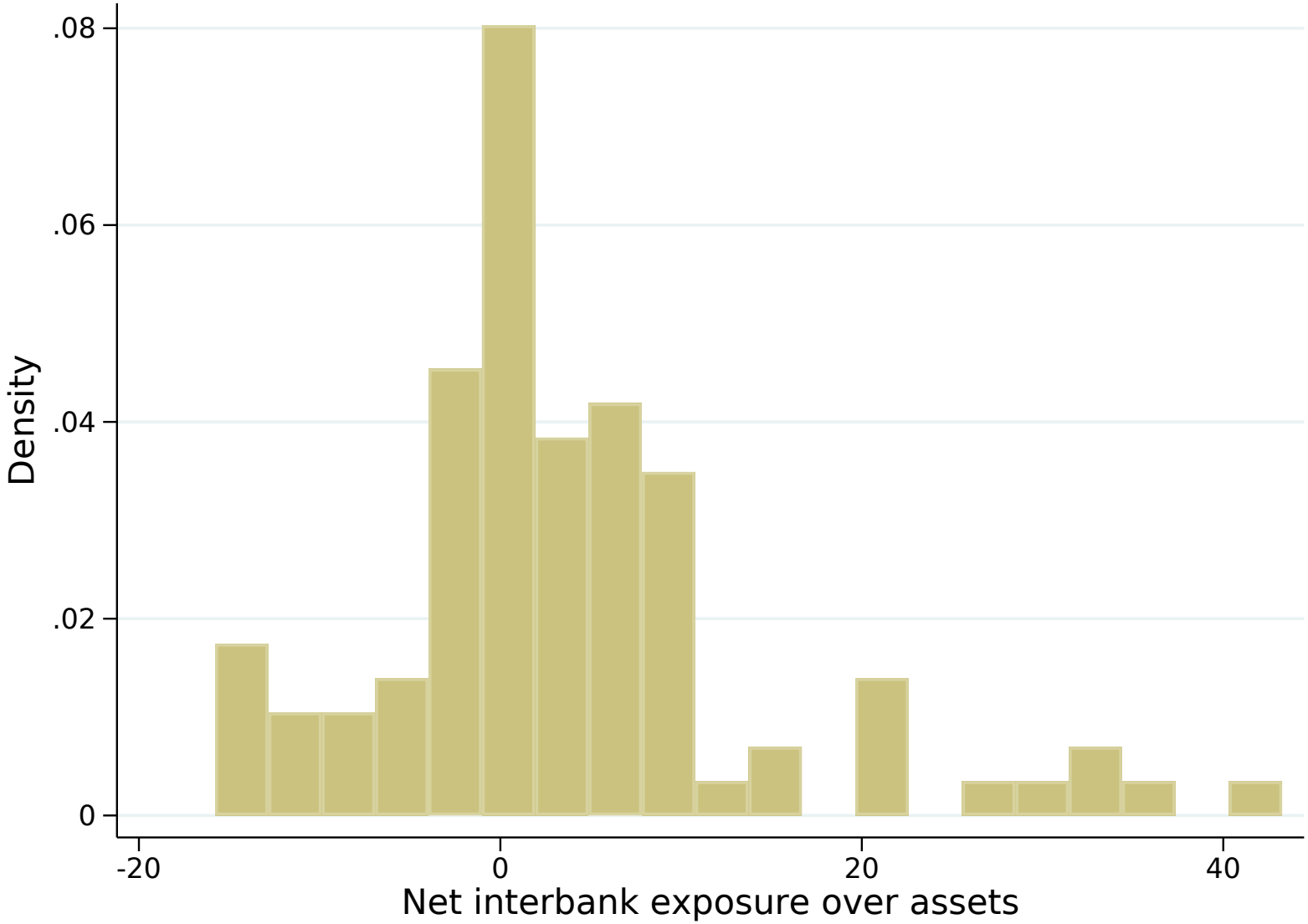

Net Interbank Position Across Banks

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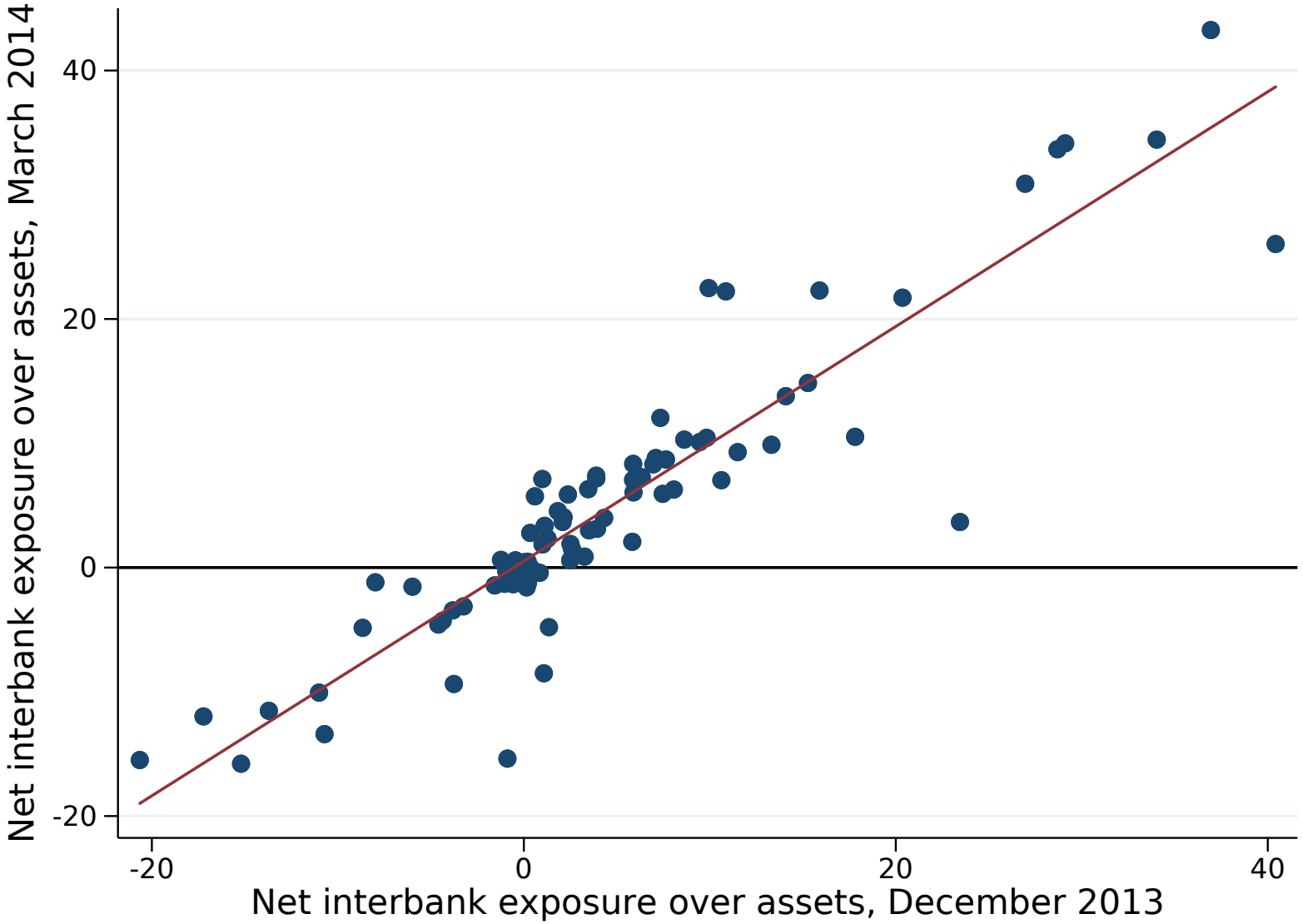

Determinants of Net Interbank Positions

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Dependent variable:	Net interbank position, March 2014		
Size	-2.3804***	-2.2521***	-2.1517***
	(0.4236)	(0.5024)	(0.5347)
Capital	0.0584	0.0894	-0.1094
	(0.2157)	(0.1948)	(0.2296)
Liquidity	-0.2531***	-0.2450***	-0.2788***
	(0.0842)	(0.0820)	(0.0892)
NPL	-0.3956	-0.3811	-0.5569
	(0.3589)	(0.3551)	(0.3731)
Retail deposits		0.0231	-0.1702
		(0.0683)	(0.1969)
Secured Repo			-0.1305
			(0.2244)
Liabilities vis-a-vis non-resident			-0.2768
			(0.5933)
Securities issued			-0.2987
			(0.2263)
Interbank deposits			-0.1848
			(0.1816)
Observations	95	95	95
R^2	0.4130	0.4136	0.4309

Balancing of observable firm characteristics

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	1^{st} Quartile	2^{nd} Quartile	3^{rd} Quartile	4^{th} Quartile
Firm size	7.639 (0.004)	7.721 (0.071)	7.547 (-0.075)	7.642 (0.006)
Sales growth	-5.093 (0.003)	-5.323 (-0.005)	-4.871 (0.010)	-5.467 (-0.009)
Z-score	5.118 (-0.048)	5.188 (0.001)	5.142 (-0.031)	5.315 (0.086)
Equity/Debt	0.528 (0.053)	0.487 (-0.009)	0.498 (0.008)	0.453 (-0.060)
EBITDA/Interest expenses	11.020 (0.034)	10.061 (-0.009)	10.623 (0.016)	9.209 (-0.048)
Profitability	5.959 (0.005)	5.726 (-0.020)	6.144 (0.026)	5.792 (-0.013)

The table report, for each variable, the average values computed by quartile of bank exposure to NIRP. Figures in parentheses are the normalized differences (the difference between the quartile average and the average of the other three quartiles, normalized by the square root of the sum of the corresponding variances). Imbens and Wooldridge (2009) propose as a rule of thumb a 0.25 threshold in absolute terms, i.e. two variables have "similar" means when the normalized difference does not exceed one quarter.

Negative Interest Rates and Net Interbank Position

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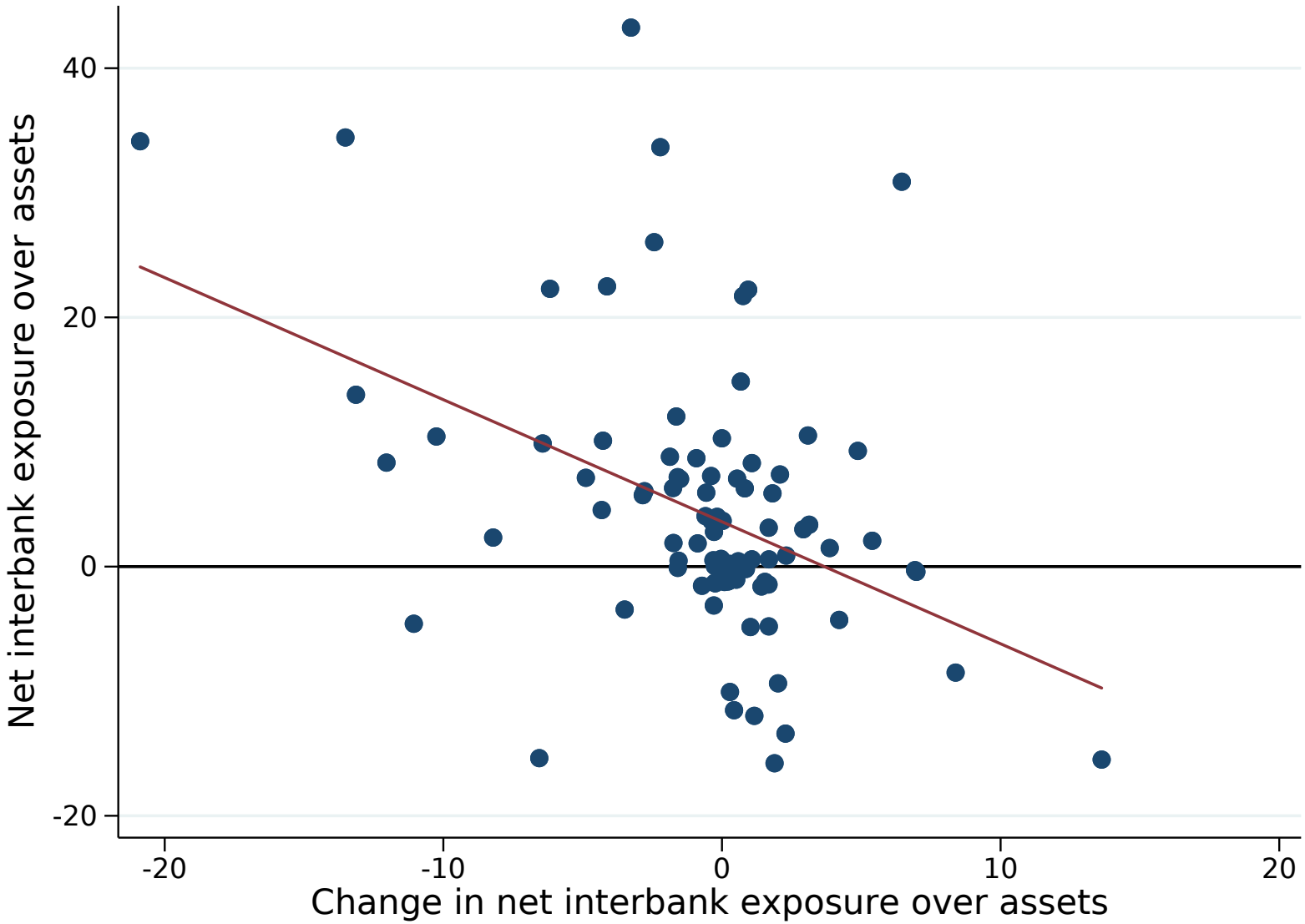

Bank Exposure to Retail Deposits and Income Fees

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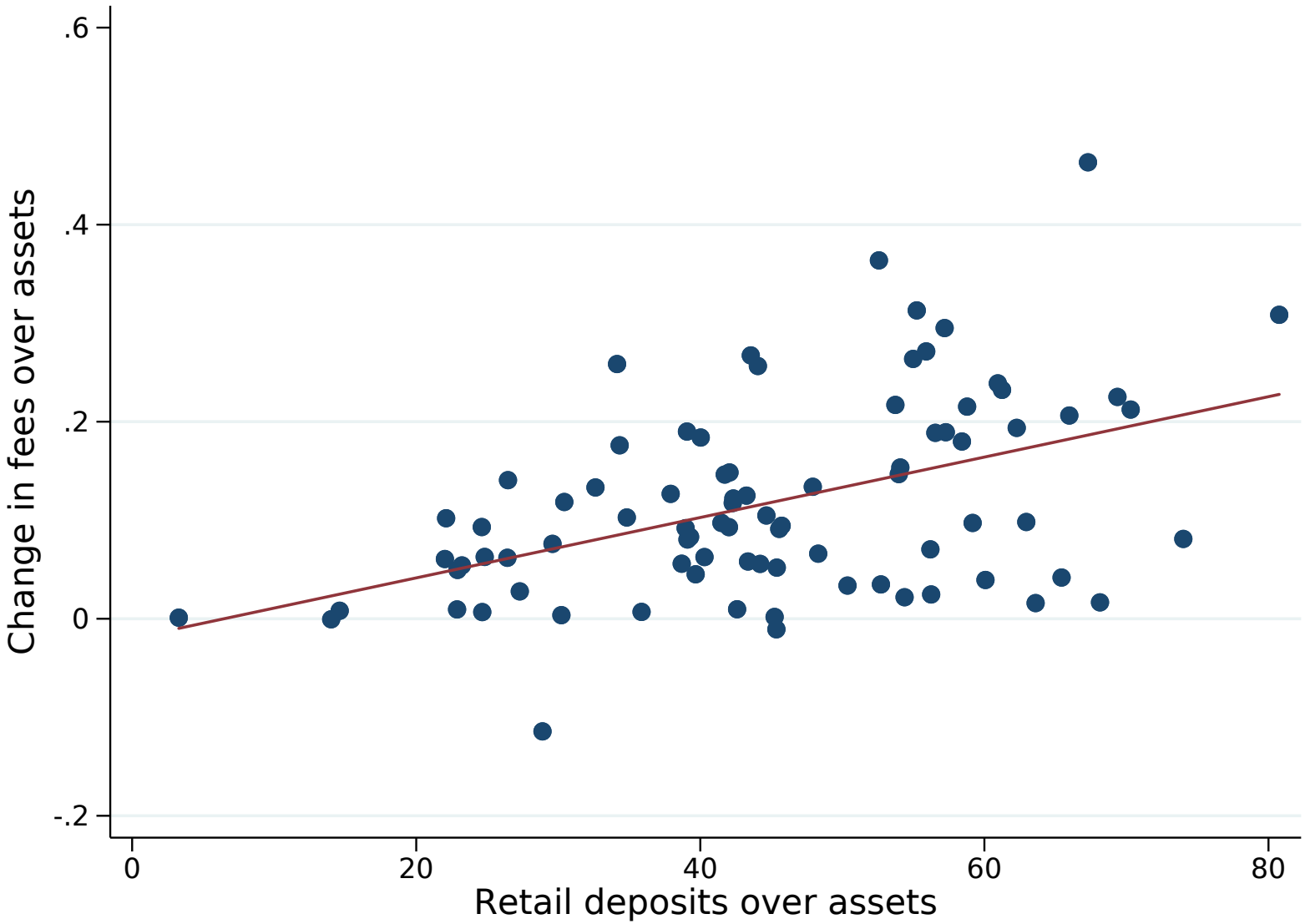

Robustness Checks

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- Control for overall funding structure (retail deposits, secured repo funding, foreign funding, bank-issued securities, and interbank deposits, all expressed as share of total assets) and windfall gains
- Fix the share of retail deposits over total assets as of March 2014 and focus on a sample of relatively large firms
- Alternative timing of the bank-exposure variable (June 2014)
- Drop the period June-August 2014 when the EONIA was still positive
- Centering the NIRP in May 2014, to account for anticipation effects
- Weighted least squares by loan size

Falsification tests

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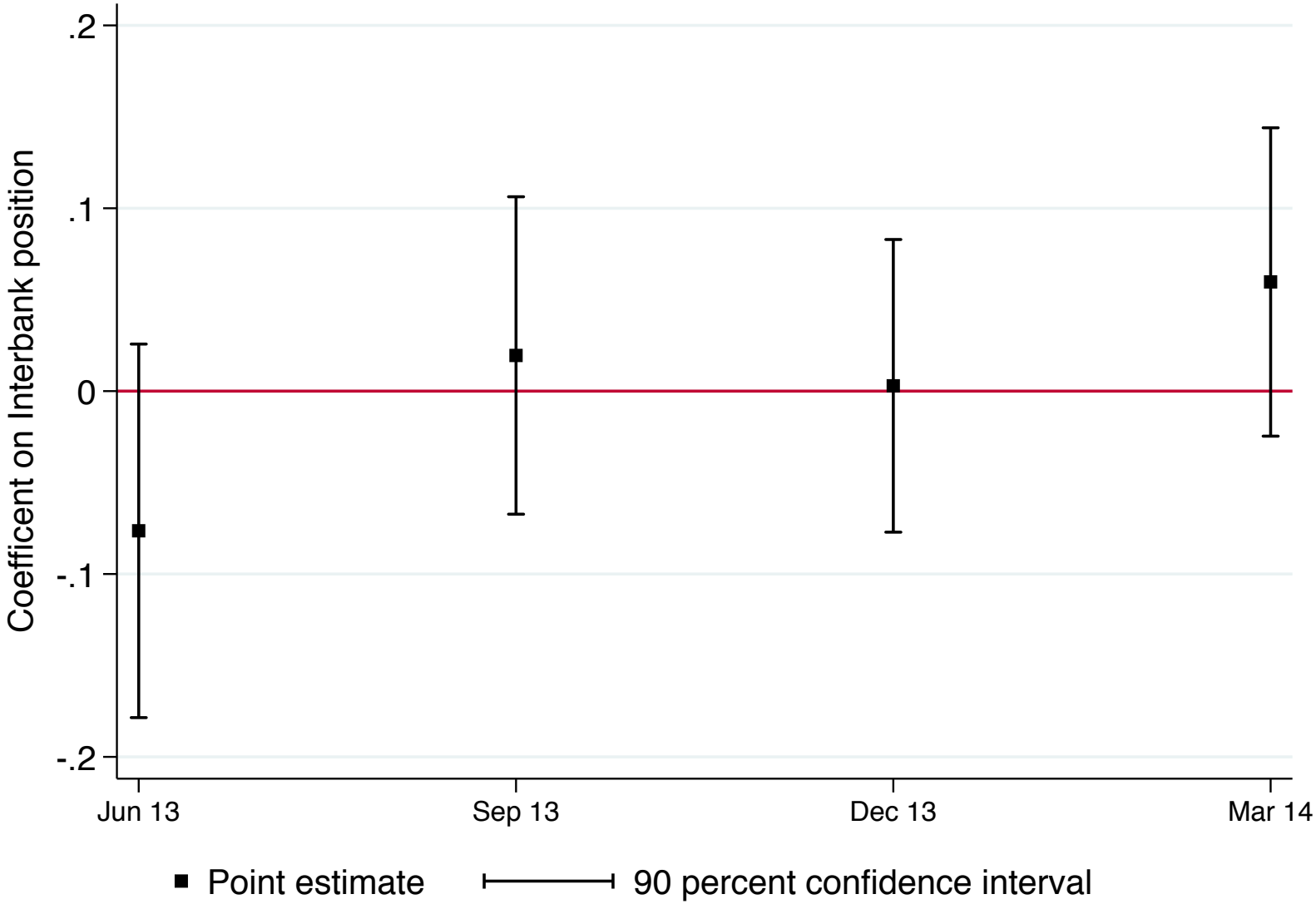

Negative Rates and Securities Holdings

	(1)	(2)	(3)
Net interbank position	0.1888	0.0628	0.0563
	(0.1355)	(0.1538)	(0.1573)
Size		-1.1489*	-1.2240*
		(0.5865)	(0.6978)
Capital		-0.3495	-0.3599
		(0.3041)	(0.3169)
Liquidity		0.0144	0.0123
		(0.0711)	(0.0711)
NPL		-0.4195	-0.4173
		(0.3746)	(0.3638)
Retail deposits			-0.0177
			(0.0742)
Observations	34881	34881	34881
Bank FE	Yes	Yes	Yes
Bank controls	Yes	Yes	Yes
Security x Month FE	Yes	Yes	Yes
R^2	0.2602	0.2604	0.2604

Each bank variable is multiplied by a dummy equal to one for the 3 months following the introduction of NIRP (July-September 2014), and zero for the 3 months before (March-May 2014). Standard errors are clustered at the bank and security level.

Negative Rates, Securities, and Search for Yield

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	Yield		Rating	
	High	Low	Low	High
			All banks	
Interbank position	0.1961	-0.4992**	0.1165	-4.9086***
	(0.2045)	(0.2189)	(0.1752)	(1.7251)
			Low capital banks	
Interbank position	1.9558	-3.9582**	0.8898	-7.2286
	(1.4340)	(1.6796)	(1.0037)	(20.4103)
			High capital banks	
Interbank position	0.2311	-0.2518	0.2332	-0.8485
	(0.2549)	(0.2669)	(0.1929)	(3.4600)
Bank controls	Yes	Yes	Yes	Yes
Bank controls x NIR	Yes	Yes	Yes	Yes
Bank FE	Yes	Yes	Yes	Yes
Security x Month FE	Yes	Yes	Yes	Yes

Each bank variable is multiplied by a dummy equal to one for the 3 months following the introduction of NIRP (July-September 2014), and zero for the 3 months before (March-May 2014). Standard errors are clustered at the bank and security level.

Descriptive Statistics

	Mean	St.Dev.	Median	Obs.
Panel A: Bank-level variables				
Net interbank position, March 2014	4.200	1.862	10.810	95
Net interbank position, June 2014	3.135	0.919	10.720	95
Liquidity, March 2014	28.670	25.940	13.950	95
Liquidity, June 2014	28.640	25.940	13.790	95
Size	7.668	7.598	2.308	95
Capital	8.531	7.079	5.740	95
NPL	4.348	3.868	3.555	95
Retail deposits, March 2014	45.260	44.650	16.120	95
Retail deposits, June 2014	45.480	44.710	16.140	95
TLTRO	35.670	12.560	36.370	95
Secured Repo	2.889	0.000	8.011	95
Liabilities vis-a-vis non-resident	1.390	0.245	2.240	95
Securities issued	14.490	14.560	10.130	95
Interbank deposits	13.780	12.760	9.785	95
Windfall gain	1.366	1.477	0.919	95
Change in net interbank position	-0.610	0.003	4.647	95
Change in interbank loans	-0.856	-0.177	4.485	95
Change in interbank deposits	-0.247	-0.023	3.043	95
Change in fees over assets	0.119	0.0972	0.0992	83
Income fees over assets (%)	0.124	0.0986	0.107	83

Descriptive Statistics

	Mean	St.Dev.	Median	Obs.
Panel B: Loan-level variables				
Δ *Loan*	-1.945	20.086	0.000	495942
Δ *Rate*, net	-0.039	2.094	-0.014	228285
Δ *Rate*, gross	1.867	62.478	0.000	228285
Panel C: Firm-level variables				
Δ *Loan*	-1.667	21.840	-0.784	142302
Net investment	11.318	75.497	-2.532	127101
Wage bill growth	-1.045	32.162	1.272	127621
Sales growth	-1.878	34.604	0.742	127219
Panel D: Security-level variables				
Δ *Security*	-0.038	72.655	0.003	34881
Yield-to-redemption	1.618	1.64	1.136	29300
High rating	0.113	0.317	0	20796