Bank Exposures
and
Sovereign Stress Transmission

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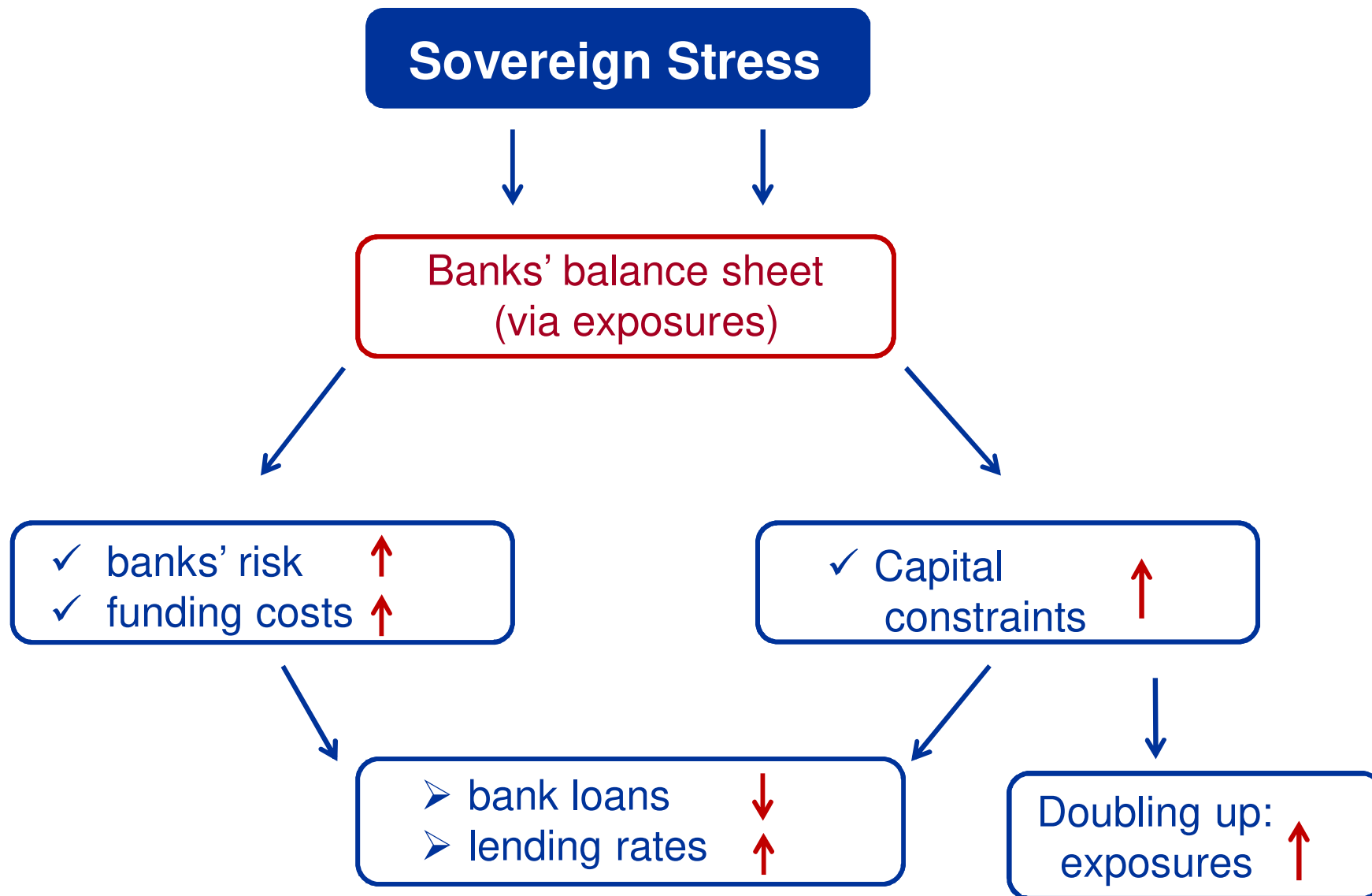Federico II, CSEF and EIEF

Saverio Simonelli

University of Naples
Federico II and CSEF

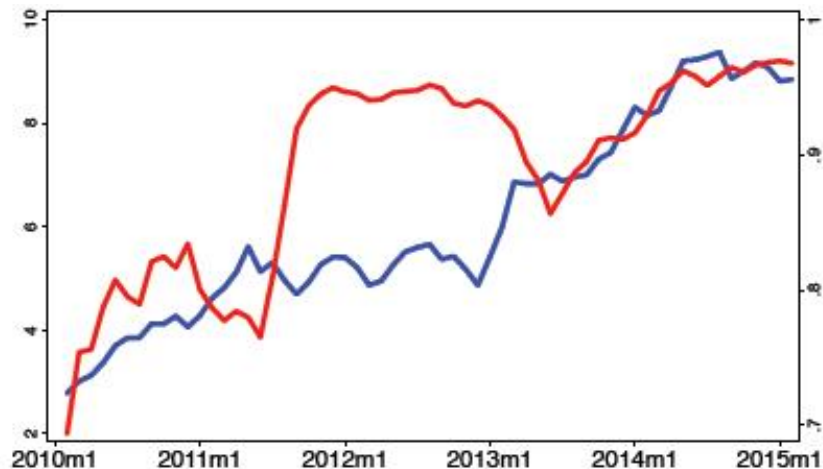**Seminar at the National Bank of Belgium**
10 September 2015

Basic idea

Sovereign Stress

Banks' balance sheet
(via exposures)

- ✓ banks' risk ↑
- ✓ funding costs ↑

- ✓ Capital constraints ↑

- ➤ bank loans ↓
- ➤ lending rates ↑

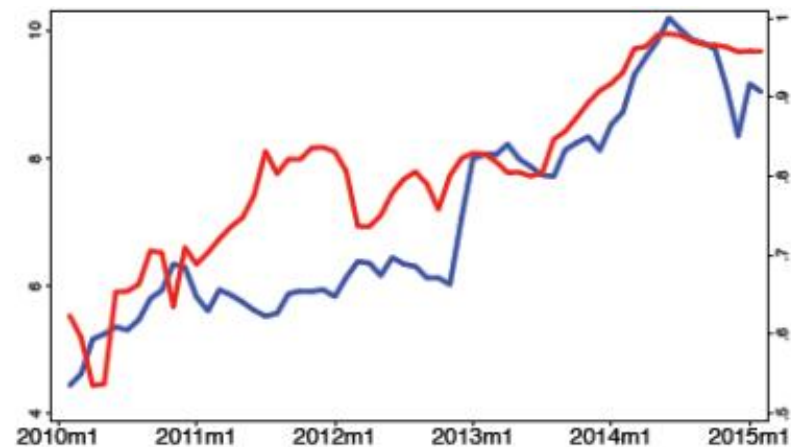Doubling up: exposures ↑

www.ecb.europa.eu ©

Motivation: bank-sovereign nexus and domestic exposures

Italy

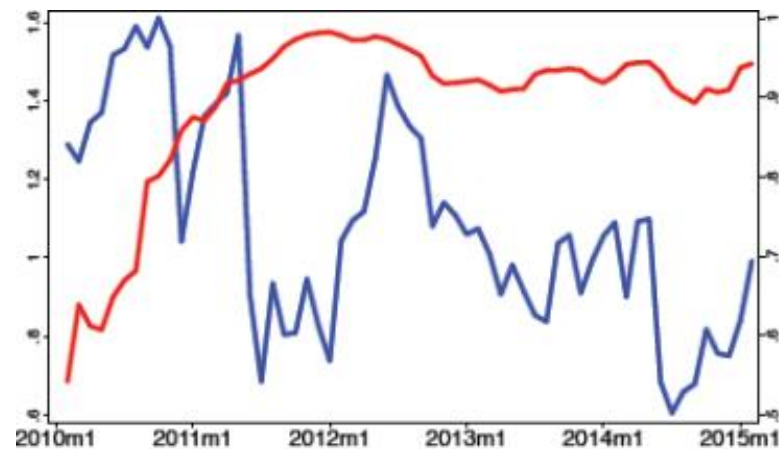

Spain

Germany
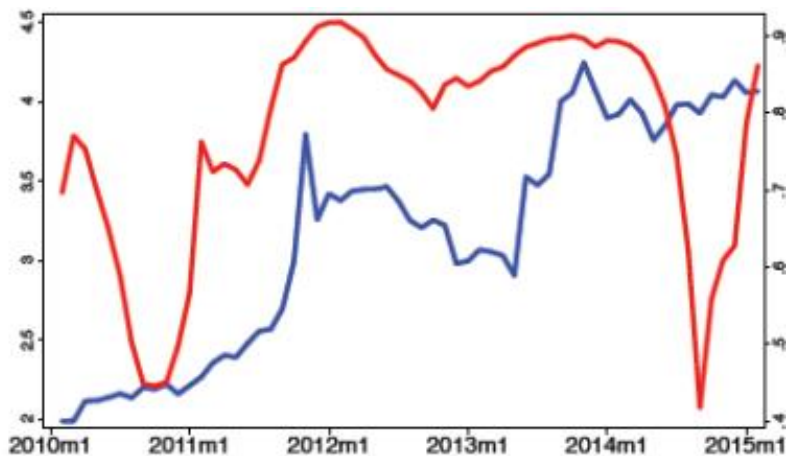
France

———— Domestic sovereign exposures, L12   **———— 24-m. correlation btw CDS**

Note: The red line is the 24-month rolling correlations between sovereign and bank. The blue line is the average domestic sovereign exposures (of domestic banks) as % of average total assets in each country. Sample: August 2007 - February 2015.

Motivation : sovereign exposures & lending in the periphery
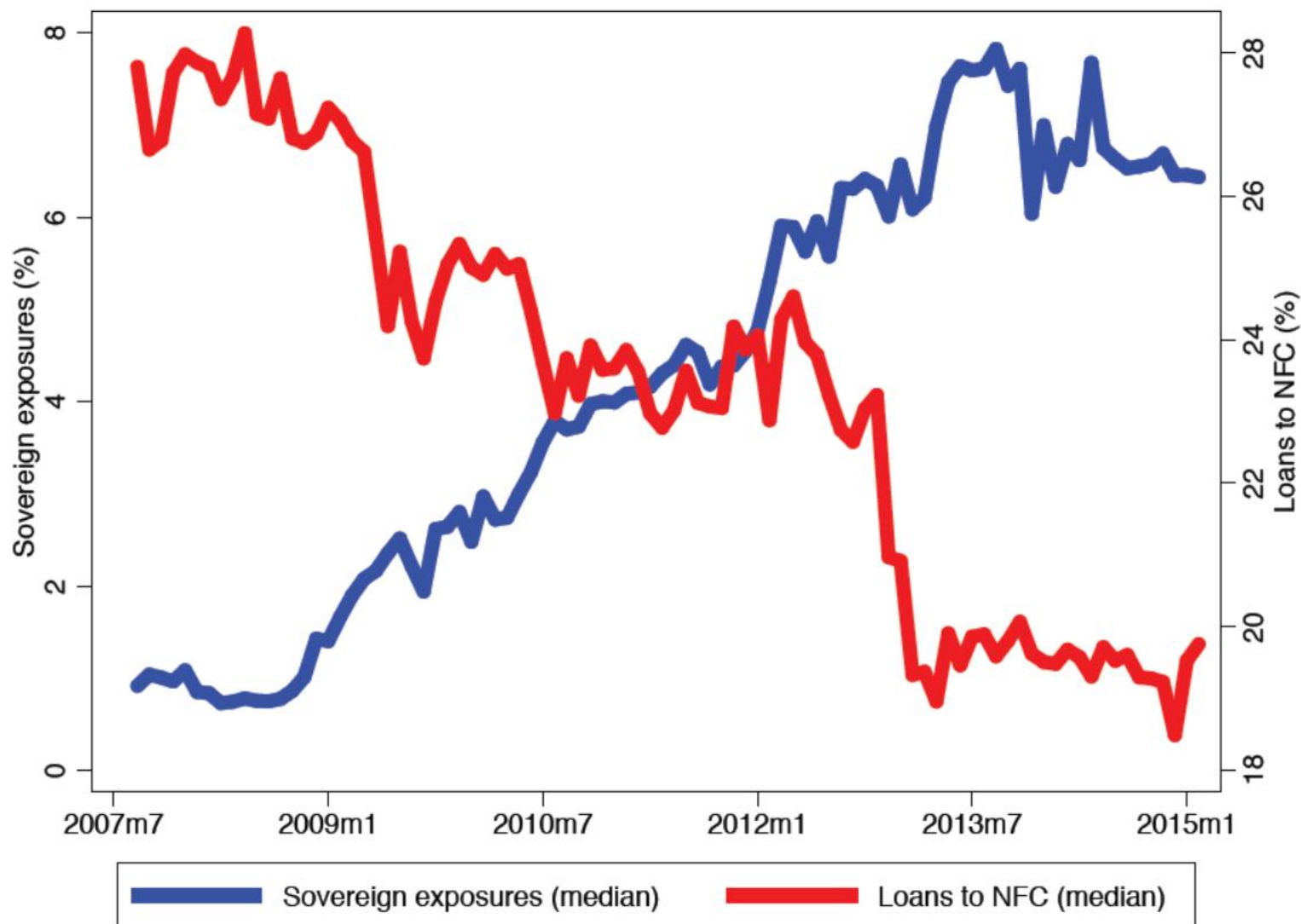
Note: **Median of periphery countries** (Greece, Ireland, Italy, Portugal and Spain)
Sample: August 2007 - February 2015.   4

Sovereign exposures and lending: median core bank
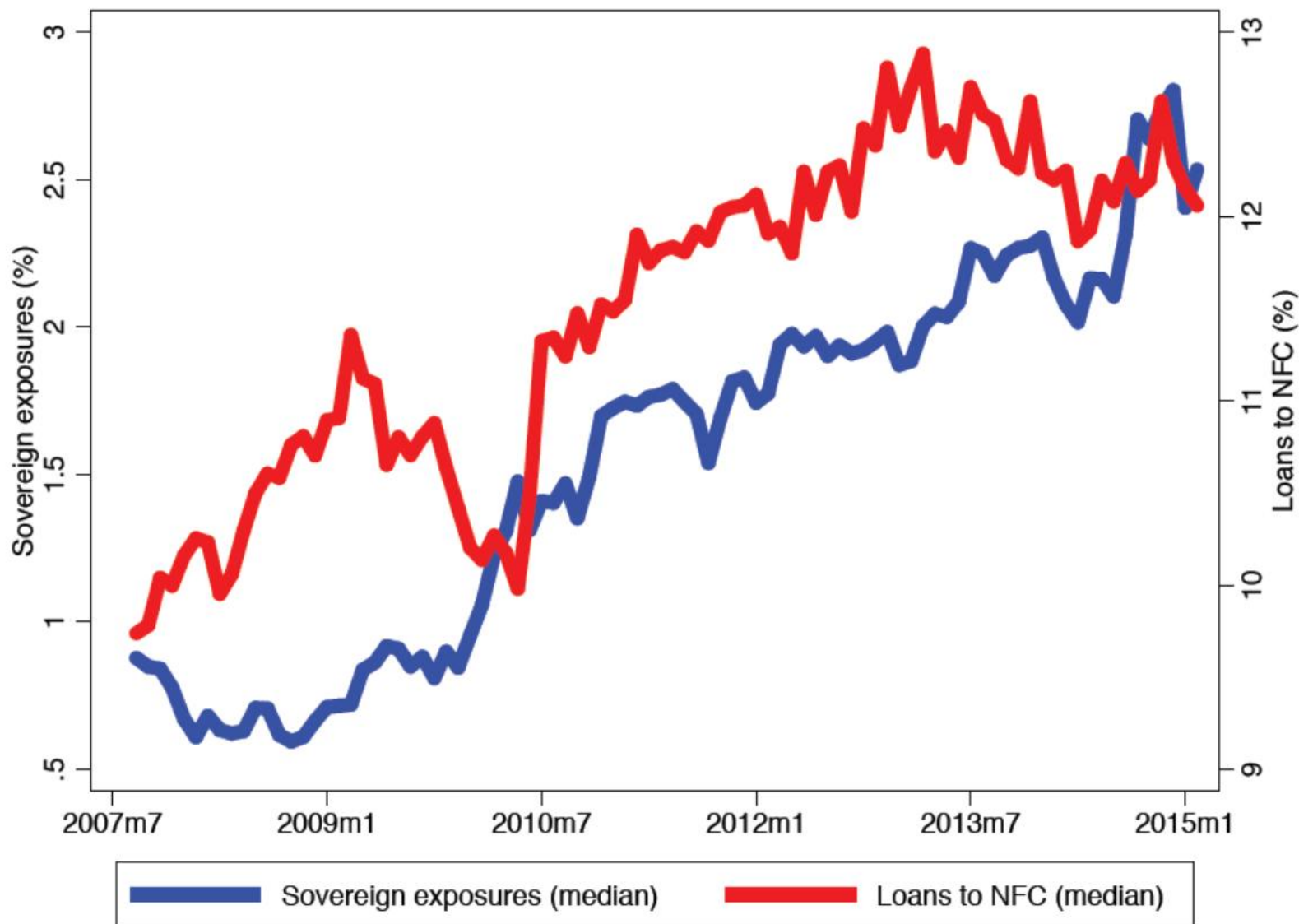
Note: The core countries are Austria, Belgium, France, Germany, Luxemburg and Netherland. Sample: August 2007 - February 2015.

Our contribution

Apply panel data estimation to euro-area **bank-level data** to assess:

➢ **how much bank exposures contributed to transmitting sovereign stress to**

         i.   bank default risk

         ii. lending to firms

➢ **how exposures themselves reacted to the return on sovereign debt**

Data are novel under three respects:

1. time-series – track effects of sovereign shocks month-by-month

2. granular   – observe 252 banks compared with approximately 90 (consolidated) banks of the EBA tests. (22 banks in 2009, 91 in 2010, 90 in 2011, 123 in 2014)

3. representative – our data for outstanding loans cover about 70% of the euro-area aggregate, while syndicated loans (used by other studies) cover less than 10%.

Preview of the results

➢ For periphery banks with **larger sovereign exposures**, increases in sovereign risk and in domestic sovereign yields translate into:

  – larger increase in bank solvency risk

  – stronger reduction of loans and a sharper increase in lending rates to firms

➢ Following **increases in sovereign risk** and **high expected returns** on domestic sovereign bonds:

  – periphery banks, especially less capitalized ones, increase domestic exposures

Literature

We add to research on sovereign-bank nexus, and on the role of banks' sovereign exposures:

➤ **Risk transmission from sovereigns to banks**

Acharya, Drechsler & Schnabl (2014) ("post-bailout changes in sovereign CDS explain changes in bank CDS")

➤ **Sovereign shock transmission to bank loans (and real activity)**

Bofondi, Carpinelli & Sette (2013), De Marco (2013), Gennaioli, Martin & Rossi (2013), Popov & van Horen (2013), Acharya, Eisert, Eufinger & Hirsch (2015), etc.

➤ **Effect of sovereign risk on banks' exposures ("carry trade", etc.)**

Battistini, Simonelli & Pagano (2014), Acharya & Steffen (2015)

Outline

➢ **Data and sample structure**

➢**Assessing the contribution of sovereign exposures on**

    ✓ **bank solvency risk**

    ✓ **loans and lending rates**

➢ **Doubling-up: effect of sovereign yields on exposures**

➢ **Conclusions**

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➢ Conclusion

Data: variables and sources

➢ **Individual bank data**

    ✓ **Bank-level balance sheet items (IBSI)**: main assets, sovereign exposures, loans to NFC & households. Source: ECB

    ✓ **Bank-level interest rates (IMIR)**: on new business volumes. Source: ECB

    ✓ **Bank-level capital ratio.** Source: SNL

    ✓ **Bank-level 5-year CDS premia**. Source: Datastream

➢ **Country data**

    ✓ **Balance sheet items (BSI)**. Source: ECB

    ✓ **Expected 10-year govt. bond yield**: 3 & 12-month horizon survey-based forecasts. Source: Consensus Economics Inc.

    ✓ **10-year sovereign debt yields and 5-year CDS**. Source: Datastream

All data are monthly, 2007-2015

**Monetary Financial Institutions (MFIs)
included in the sample, by ownership structure**
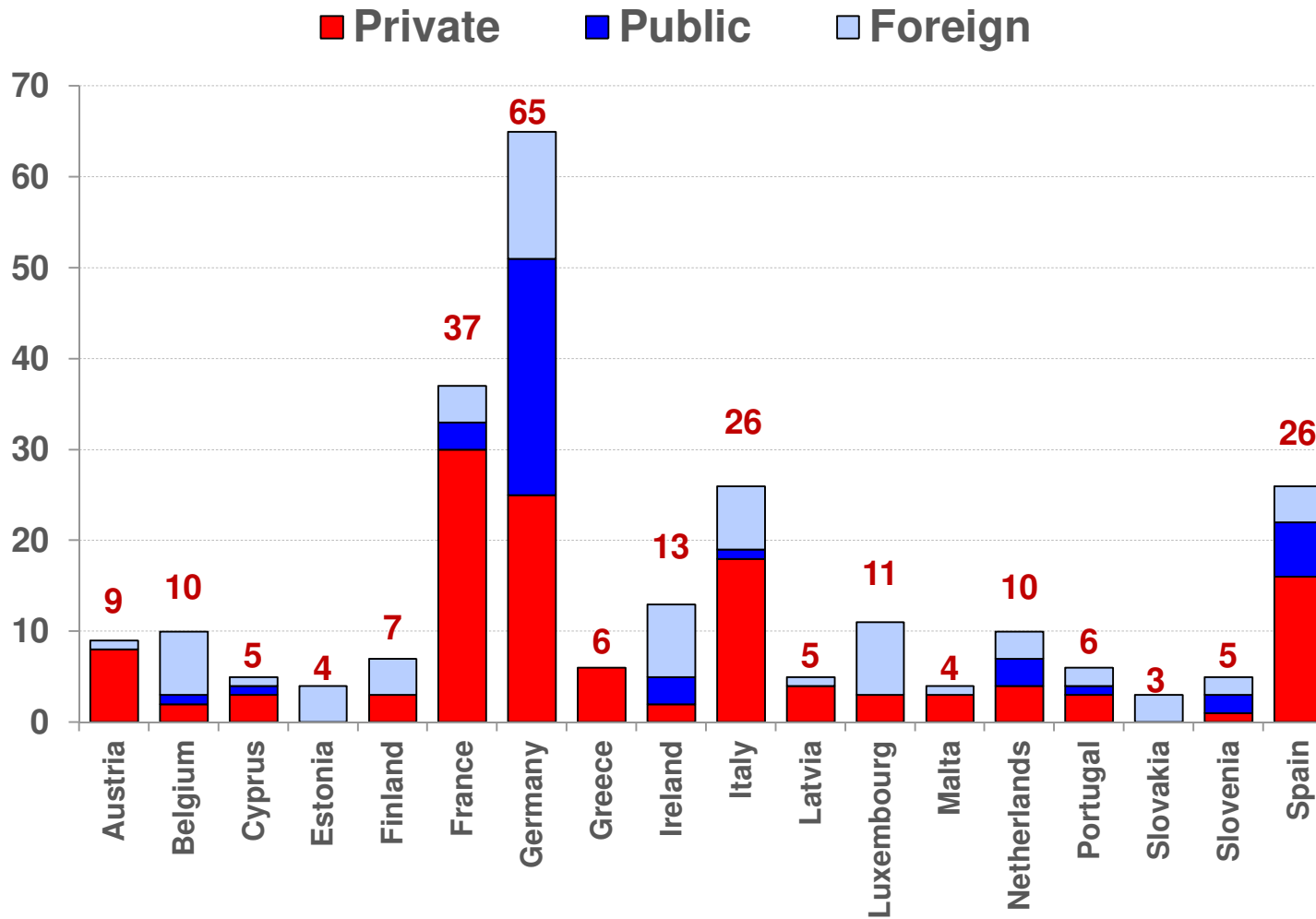
Sample structure

Sample representativeness: ratio of IBSI loans (our data) and syndicated loans to BSI (aggregate) loan data (in %), avg. 2012-15

Descriptive statistics

Panel A: Domestic Exposures, Loans and Interest Rates

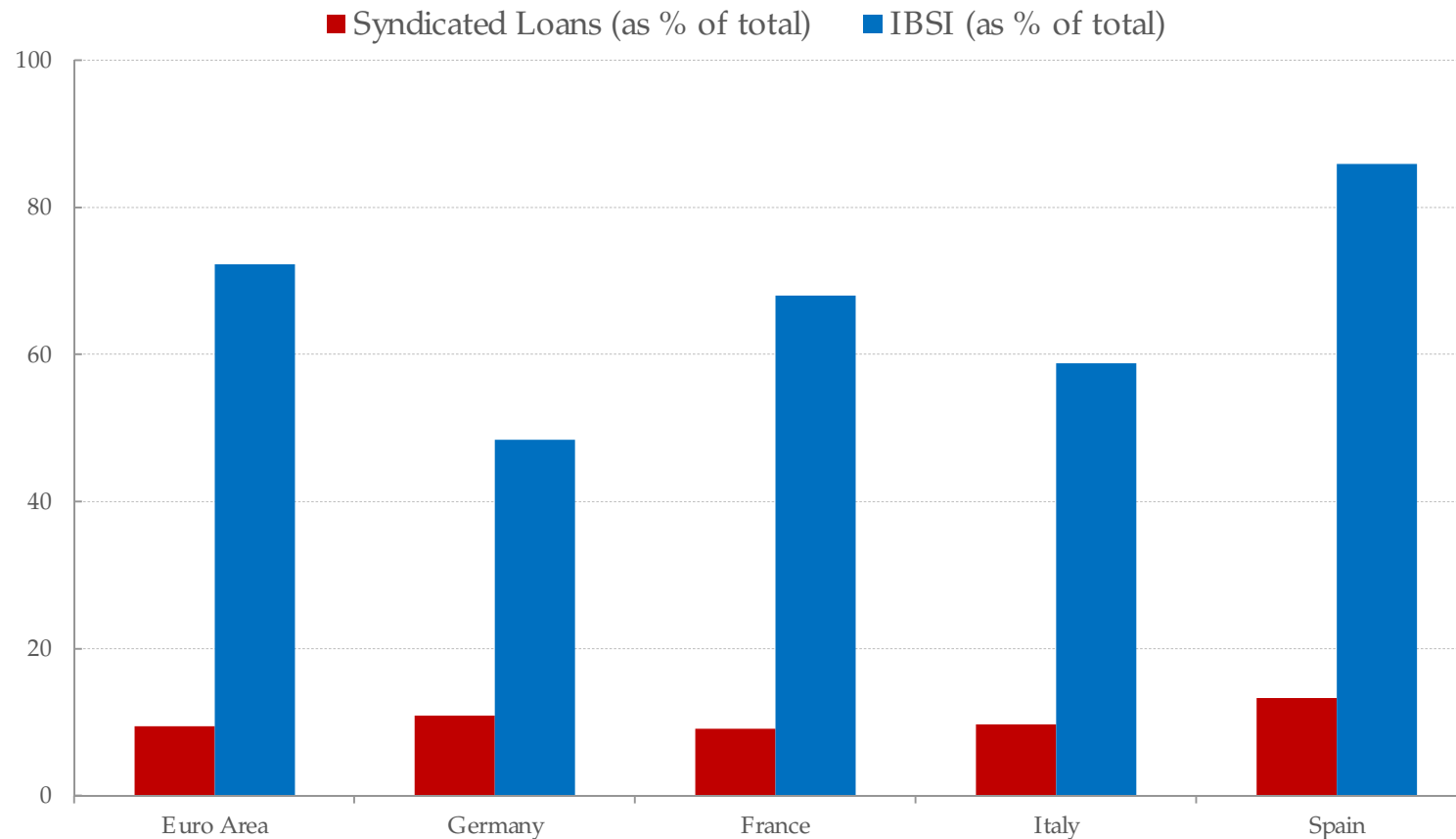|	N	mean	median	Std. Dev.	
				between	within
Dom. Gov. Bond (%)	20987	4.1	2.0	5.7	2.6
Non-Dom. Gov. Bond (%)	20839	1.8	0.3	3.1	2.1
Loans to NFC (%)	21053	18.4	16.1	13.8	4.2
Interest rate (NFC)	16203	3.6	3.3	1.1	1.2

Panel B: Bank Characteristics

	N	mean	median	Std. Dev.	
				between	within
Total Assets (bn)	21060	80	35	117	241
Leverage ratio	20745	35.6	14.5	204	221
Deposit/liabilities (%)	20902	64.3	67.7	22.2	7.0
Interbank loans/liabilities (%)	3837	-0.9	0	34.0	12.3
Borrowing from ECB/liabilities (%)	3928	4.9	1.5	5.8	4.3

Domestic sovereign holdings, by bank ownership
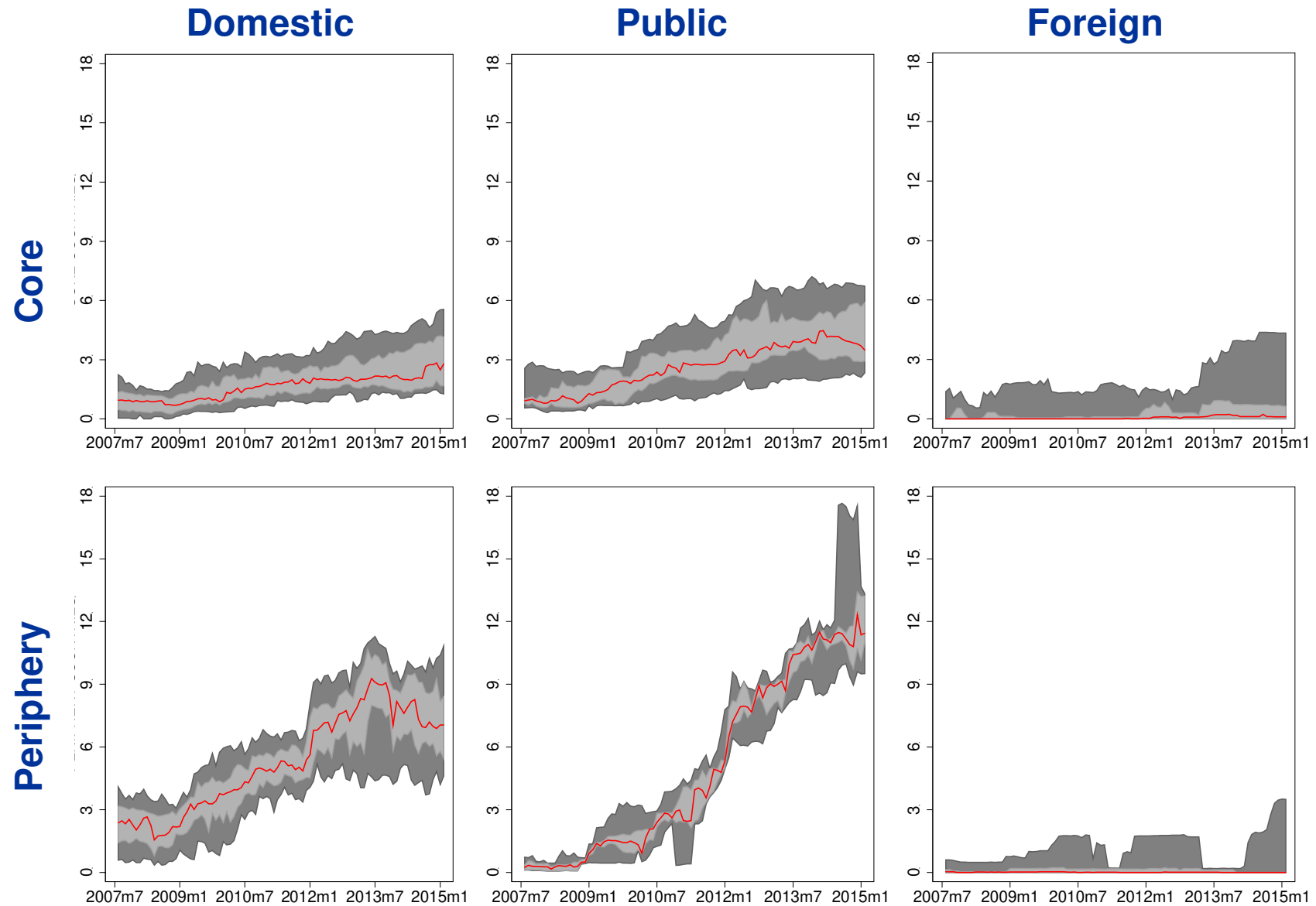
Note: The dark shaded area is the 25th -75th percentile, the light shaded area is the 40th-60th percentile. The red solid line is the median of the country-area cross-sectional distribution. The core countries are Belgium, France, Germany and Netherland. The periphery countries are Greece, Ireland, Italy, Portugal and Spain. Sample: August 2007 - February 2015.

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➢ Data and sample structure

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✓ loans and lending rates

➢ Doubling-up: effect of sovereign yields on exposures

➢ Conclusion

Breakdown by exposures, periphery countries

Low-Exposure Banks
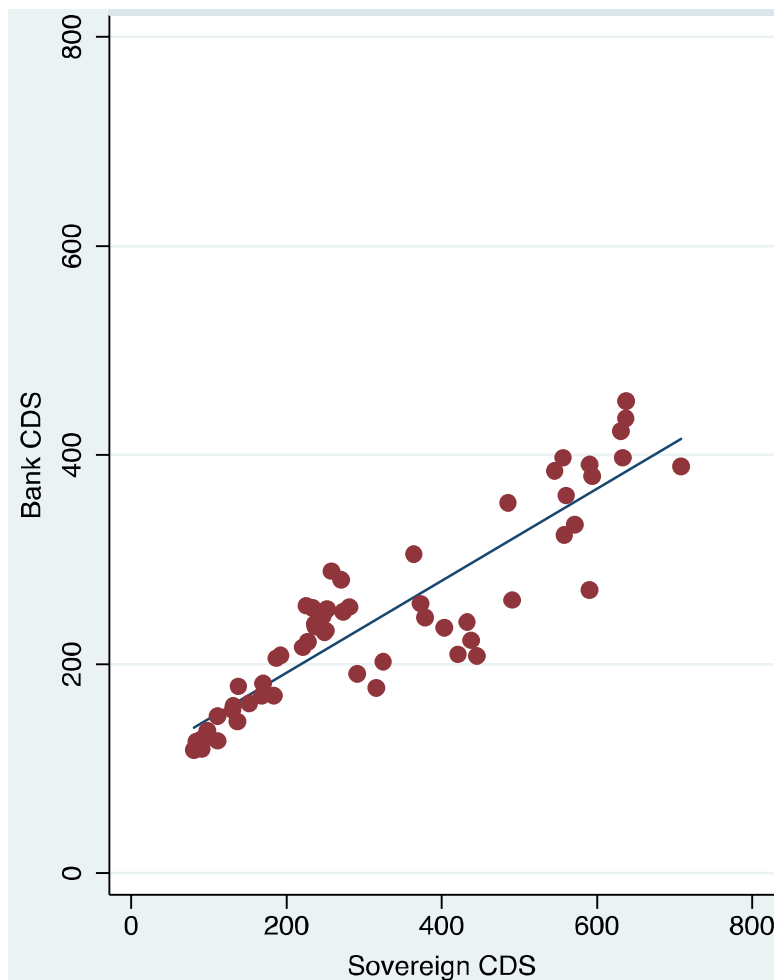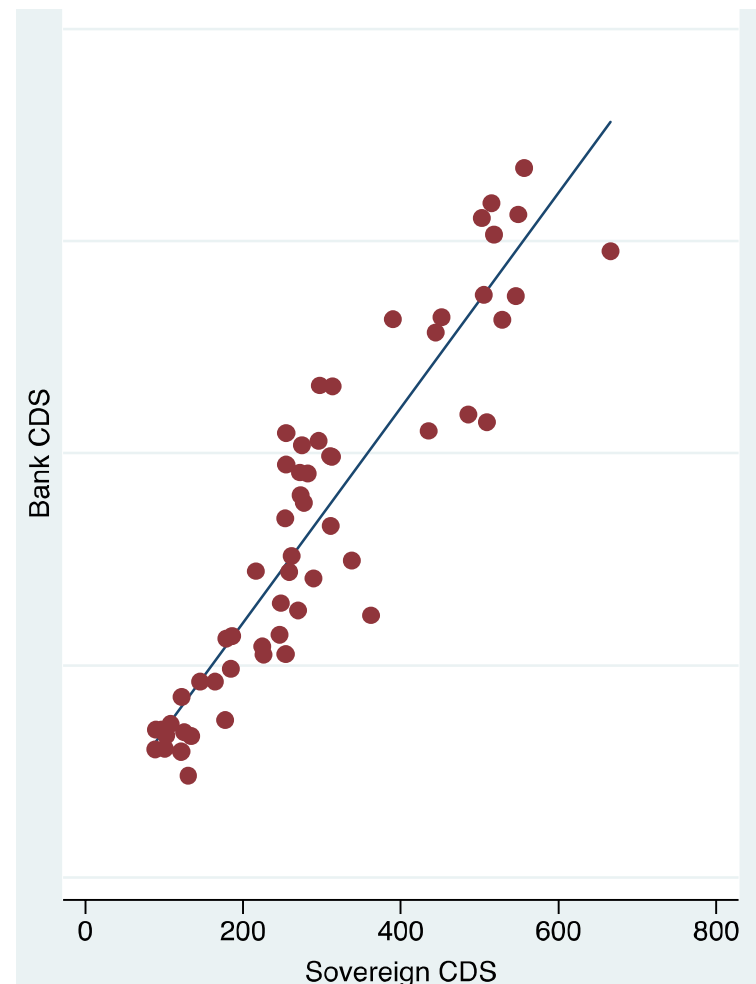
High-Exposure Banks

Note: Bank CDS are computed as the average of the CDS of the individual banks. Sovereign CDS is computed as the simple average of the sovereign CDS. The countries are Ireland, Italy, Portugal and Spain. The group "low exposure" ("high exposure") contains the banks whose 2009 exposure to domestic debt is below (above) the 25 (75) percentile. Sample: January 2010 - February 2015.

Breakdown by exposures, core countries

Low-Exposure Banks

High-Exposure Banks

Note: Bank CDS are computed as the average of the CDS of the individual banks. Sovereign CDS is computed as the simple average of the sovereign CDS. The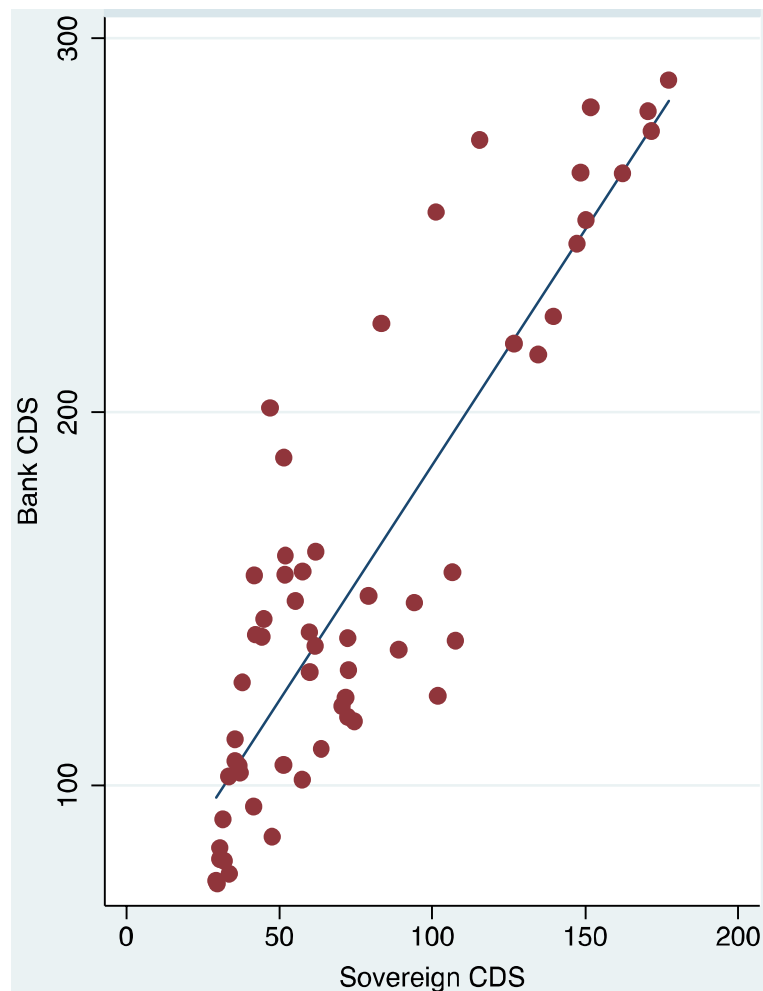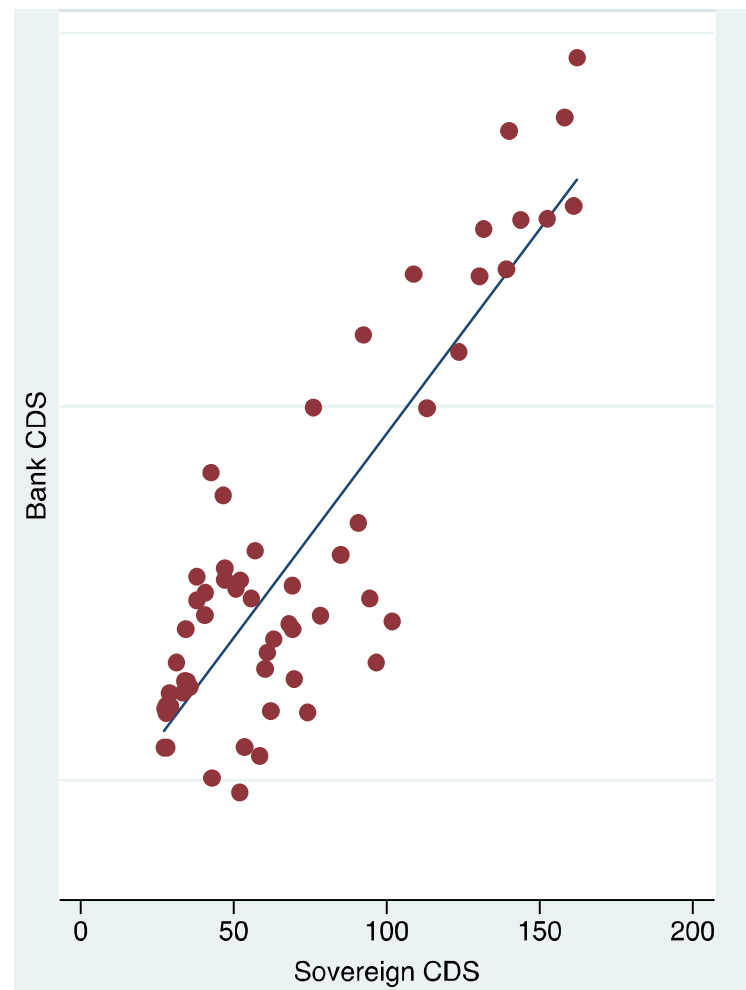 countries are Austria, France, Germany, and Netherlands. The group "low exposure" ("high exposure") contains the banks whose 2009 exposure to domestic debt is below (above) the 25 (75) percentile. Sample: January 2010 - February 2015.

Empirical methodology

- We estimate a **panel data model:**

$$CDS_{ijt} = \alpha_i + \gamma_t + \beta_1 Sov.CDS_{jt} + \beta_2 Sov.Exp_{ijt-1} + \beta_3 Sov.CDS \times Sov.Exp_{ijt-1}$$

$$+ \beta_4 X_{ijt-1} + \beta_5 Y_{jt-1} + \varepsilon_{ijt}$$

The **coefficient β_3** captures the association between sovereign and bank credit risk due to sovereign exposures

Controls:

✓ Time fixed effects control for aggregate determinants of credit spreads (demand for credit, govt. as ultimate backstop, etc.)

✓ Bank fixed effects control for time-invariant characteristics of banks

✓ Direct effects of sovereign CDS and banks' exposures

✓ Bank balance sheet characteristics; Leverage ratio, Deposits/Liabilities

✓ Country-specific controls: BLS (demand for loans), EDF (risk of loan pool)

$$CDS_{ijt} = \alpha_i + \gamma_t + \beta_1 Sov.CDS_{jt} + \beta_2 Sov.Exp_{ijt-1} + \textcolor{red}{\beta_3 Sov.CDS \times Sov.Exp_{ijt-1}}$$

$$+ \beta_4 X_{ijt-1} + \varepsilon_{ijt}$$

	all		non-stressed		stressed	
	(1)	(2)	(3)	(4)	(5)	(6)
Sov.CDS5y$_t$	0.55***		0.53**		0.32**	
	(0.13)		(0.22)		(0.13)	
Sov.Exposures$_{t-1}$	3.15	2.17	0.44	-0.21	3.2	0.6
	(2.32)	(2.69)	(1.12)	(1.08)	(4.72)	5.08
Sov.CDS5y$_t$ x Sov.Exposures$_{t-1}$	0.03*	0.04**	0.00	0.00	0.06***	0.08***
	(0.01)	(0.02)	(0.00)	(0.01)	(0.02)	0.02
Controls	Yes	Yes	Yes	Yes	Yes	Yes
Bank FE	Yes	Yes	Yes	Yes	Yes	Yes
Time FE	Yes	Yes	Yes	Yes	Yes	Yes
Country x Time FE	No	Yes	No	Yes	No	Yes
Adjusted R^2	0.73	0.75	0.71	0.71	0.69	0.7
Banks	121	121	63	63	44	44
Observations	9316	9316	4944	4944	3513	3513

Dependent variable: Bank CDS. The periphery countries are Cyprus, Ireland, Italy, Portugal and Spain. The core countries are Austria, Belgium, Finland, France, Germany and Netherland. Banks controls: (lagged) capital-asset ratio; (lagged) deposit-liability ratio. Standard errors in parentheses are clustered at the bank level. Sample: 2007m8-2015m12. * p<0.1, ** p<0.05, *** p<0.01

Breaking down the effect of sovereign risk

	all	stressed
$Sov.CDS5y_t$	0.55*** (0.13)	0.32** (0.13)	**Direct effect**
$Sov.Exposures_{t-1}$	3.15 (2.32)	3.2 (4.72)	
$Sov.CDS5y_t \times Sov.Exposures_{t-1}$	0.03* (0.01)	0.06*** (0.02)	**Sovereign-exposure related effect**

Direct effect

Sovereign-exposure related effect

100 bps Sov.CDS ⬆

- **Baseline effect for stressed banks: 32 bps**

- **Exposure-related effect for the median bank in stressed countries: 30 bps**

ITALY

SPAIN

PORTUGAL

IRELAND
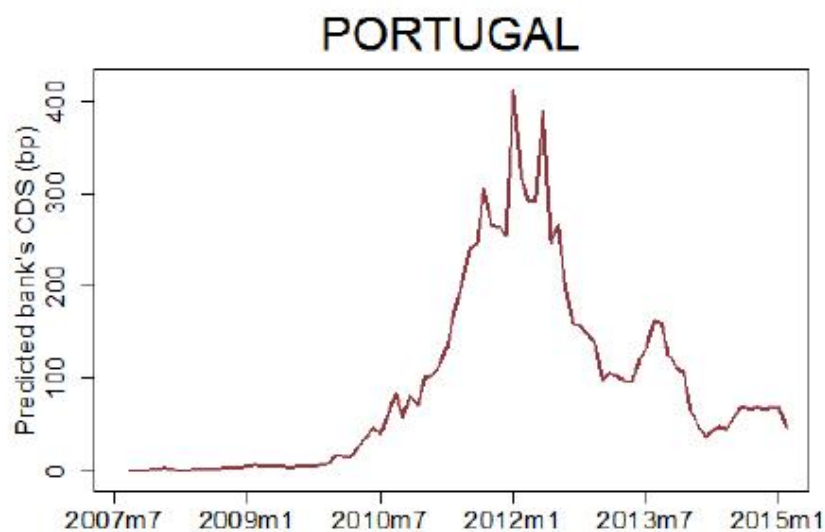
Robustness checks

➢ **Check no. 1 (potential endogeneity of government CDS):**

    ✓ Several papers argue that risk transmission can go (and actually went) both ways: Acharya et al. (2014), Cooper and Nikolov (2013) and Leonello (2014)

    ✓ Reverse causality should concern mainly SIFI, whose distress would prompt government bailout ⇒ **drop SIFI from regression: results unchanged**

➢ **Check no. 2 (potential endogeneity of bank exposures):**

    ✓ E.g., distressed bank may "bet for resurrection" by raising their exposure to high-yield government debt ⇒ **replace lagged exposures with beginning-of-sample exposures: qualitatively similar results**

➢ **Check no. 3 (CDS premium may misprice government credit risk):**

    ✓ **Replace government CDS premia with unexpected change in yields**, as alternative measure of sovereign stress. Expectations are based on consensus data for France, Germany, the Netherlands, Italy and Spain only**: results unchanged**

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  ✓ **loans and lending rates**

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➢ Conclusion

Sovereign exposures and lending: periphery banks
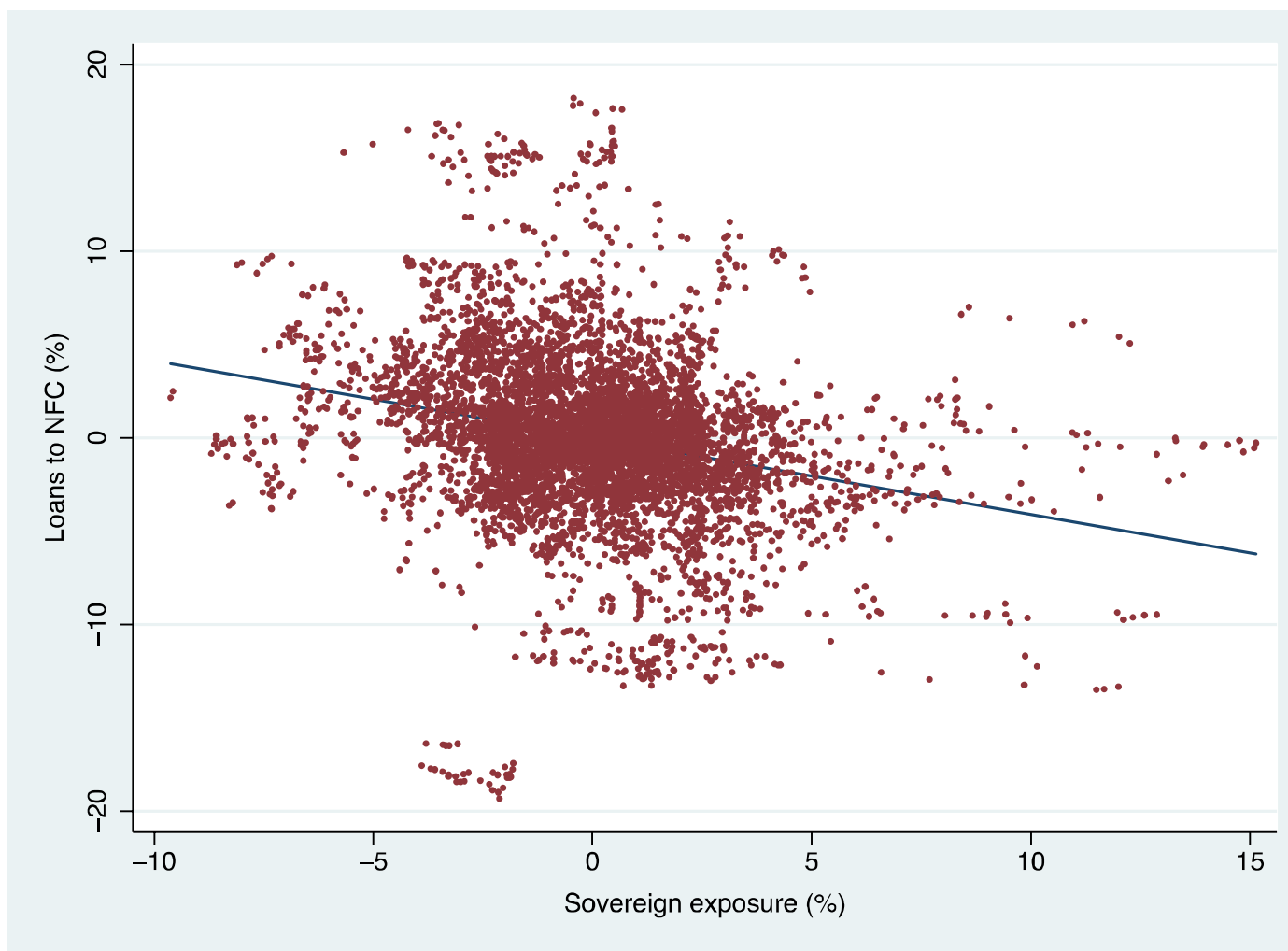
Note: Residuals of loan and sovereign exposure regressions on bank fixed effects and time dummies.
The periphery countries are Greece, Ireland, Italy, Portugal and Spain.
Sample: August 2007 - February 2015.

Sovereign exposures and lending: core banks
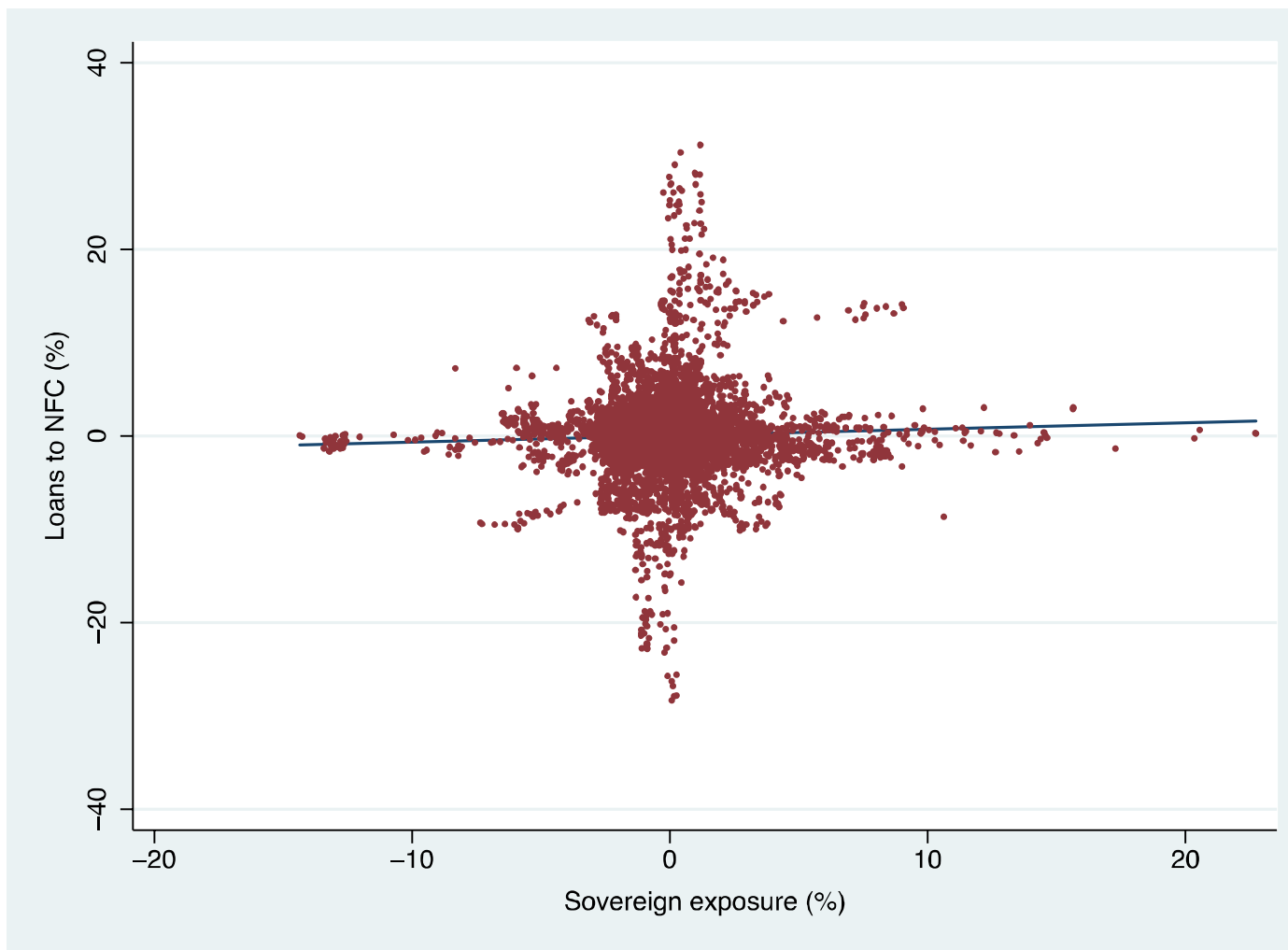
Note: Residuals of loan and sovereign exposure regressions on bank fixed effects and time dummies.
The core countries are Austria, Belgium, France, Germany, Luxemburg and Netherland.
Sample: August 2007 - February 2015.

Sovereign stress and bank lending to firms

$$Loans_{ijt} = \alpha_i + \gamma_t + \varphi_1 Sov.Yield_{jt-2} + \varphi_2 Sov.Exp_{ijt-3}$$

$$+\varphi_3 Sov.Yield_{jt-2} \times Sov.Exp_{ijt-3} + \varphi_4 X_{ijt-2} + \varepsilon_{ijt}.$$
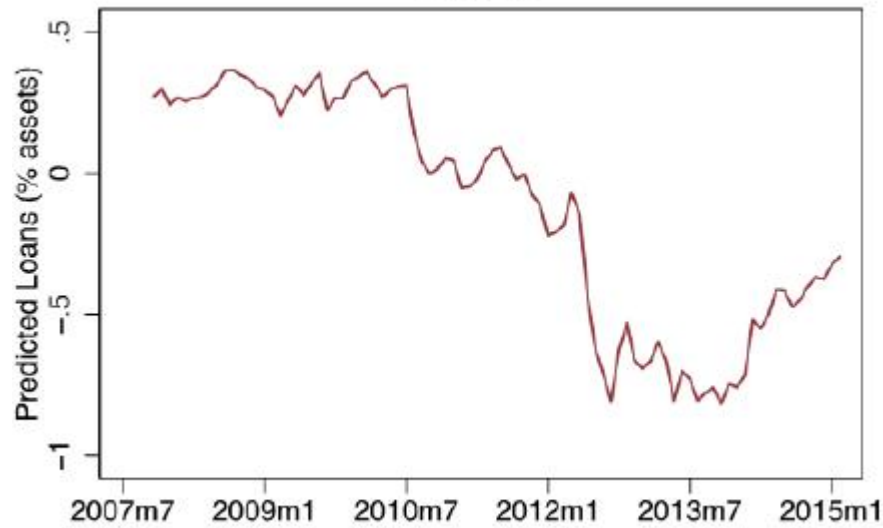
	all		non-stressed		stressed	
	(1)	(2)	(3)	(4)	(5)	(6)
Sov.Yield10y$_{t-2}$	0.099		-1.558*		0.097	
	(0.13)		(0.81)		(0.186)	
Sov.Exposures$_{t-3}$	-0.174**	0.023	0.087	0.147	-0.13	-0.046
	(0.078)	(0.07)	(0.073)	(0.091)	(0.103)	(0.122)
Sov.Yield10y$_{t-2}$ x Sov.Exposures$_{t-3}$	-0.014	-0.038***	-0.001	-0.031	-0.042**	-0.055**
	(0.012)	(0.012)	(0.028)	(0.034)	(0.02)	(0.023)
Controls	Yes	Yes	Yes	Yes	Yes	Yes
Bank FE	Yes	Yes	Yes	Yes	Yes	Yes
Time FE	Yes	Yes	Yes	Yes	Yes	Yes
Country x Time FE	No	Yes	No	Yes	No	Yes
Adjusted R^2	0.93	0.94	0.92	0.93	0.94	0.95
Banks	245	245	129	129	67	67
Observations	19946	19946	10837	10837	5464	5464

Dependent variable: Total loans to NFC (% of asset). The periphery countries are Ireland, Italy, Portugal and Spain. The core countries are Austria, Belgium, Finland, France, Germany, Netherland. Banks controls: (lagged) capital-asset ratio; (lagged) deposit-liability ratio. Standard errors in parentheses are clustered at the bank level. Sample: 2007m8-2015m2.
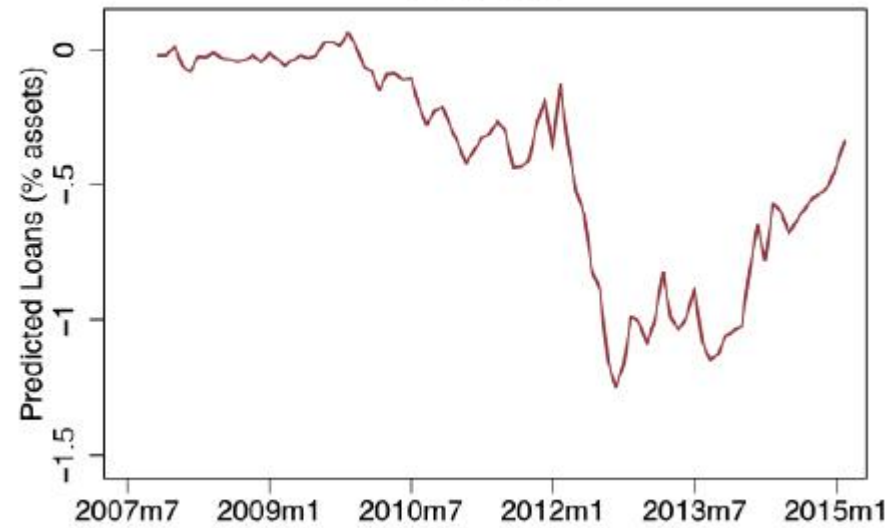* $p<0.1$, ** $p<0.05$, *** $p<0.01$

In-sample contribution of median banks' dom. exposure to its lending
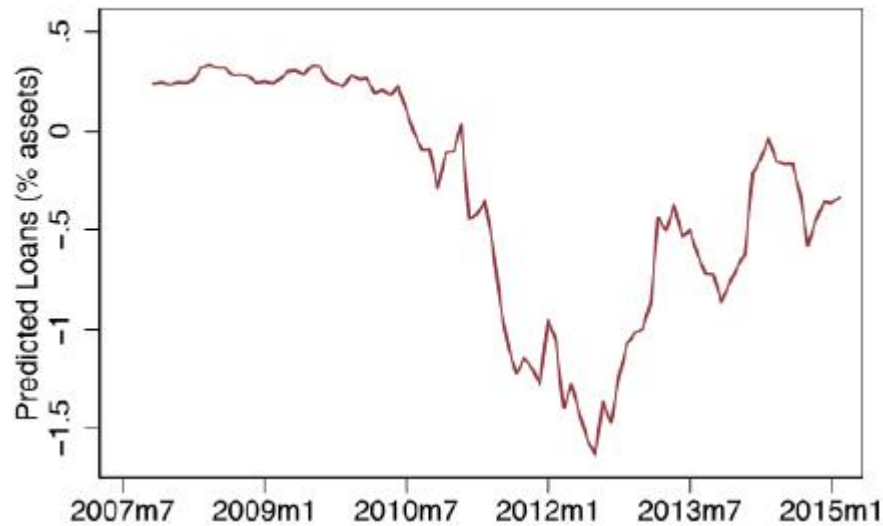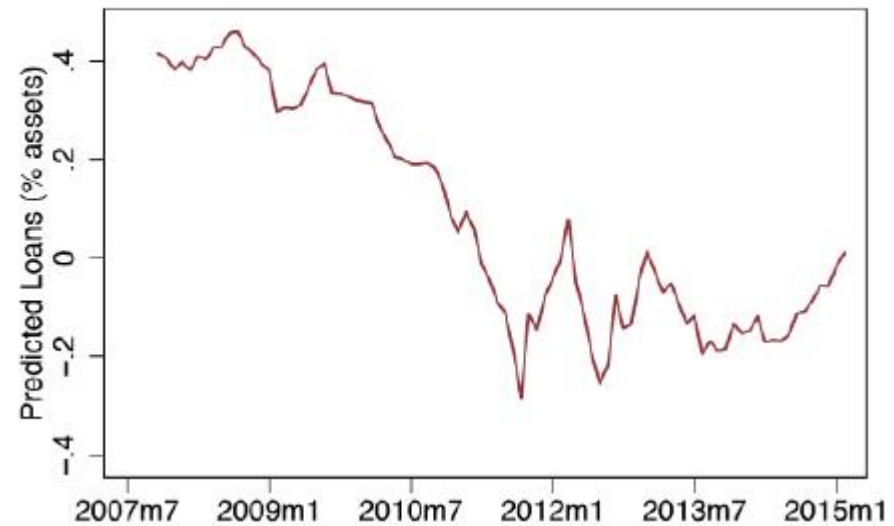
Alternative measure of sovereign stress: surprises in yields

	all		non-stressed		stressed	
	(1)	(2)	(3)	(4)	(5)	(6)
12m.NewsYield$_{t-2}$	0.60***		1.26**		0.55	
	(0.2)		(0.52)		(0.38)	
Sov.Exposures$_{t-3}$	-0.23***	-0.18**	0.04	0.01	-0.32***	-0.32***
	(0.09)	(0.09)	(0.14)	(0.13)	(0.1)	(0.1)
12m.NewsYield$_{t-2}$ X Sov.Exposures$_{t-3}$	-0.05*	-0.05	0	0.02	-0.06*	-0.07*
	(0.03)	(0.03)	(0.06)	(0.06)	(0.03)	(0.04)
Controls	Yes	Yes	Yes	Yes	Yes	Yes
Bank FE	Yes	Yes	Yes	Yes	Yes	Yes
Time FE	Yes	Yes	Yes	Yes	Yes	Yes
Country X Time FE	No	Yes	No	Yes	No	Yes
Adjusted R^2	0.95	0.95	0.94	0.94	0.95	0.95
Banks	158	158	109	109	49	49
Observations	11787	11787	8193	8193	3594	3594

Dependent variable: proxy of bank-level demand for loans = BLS data on loan demand $\times$ bank-level maturity composition of loans

	all (1)	non-stressed (2)	stressed (3)
Sov.Exposures$_{t-3}$	0.03	-0.14	0.04
	(0.05)	(0.1)	(0.13)
Sov.Yield10y$_{t-2}$ x Sov.Exposures$_{t-3}$	0.00	0.09*	-0.01
	(0.01)	(0.05)	(0.02)
Controls	Yes	Yes	Yes
Bank FE	Yes	Yes	Yes
Time FE	Yes	Yes	Yes
Country x Time FE	Yes	Yes	Yes
Adjusted R^2	0.98	0.97	0.99
Banks	234	126	65
Observations	18517	10320	5163

Dependent variable: bank-level non-performing loans / gross loans

	all		non-stressed		stressed	
	(1)	(2)	(3)	(4)	(5)	(6)
Sov.Yield10y$_{t-2}$	0.89***		0.21		0.47**	
	(0.17)		(0.34)		(0.20)	
Sov.Exposures$_{t-3}$	0.21*	0.15*	0.07	0.06	0.29**	0.35**
	(0.13)	(0.07)	(0.06)	(0.08)	(0.13)	(0.16)
Sov.Yield10y$_{t-2}$ x Sov.Exposures$_{t-3}$	-0.03	0.01	0.00	0.00	-0.01	-0.04
	(0.03)	(0.01)	(0.01)	(0.01)	(0.03)	(0.03)
Time FE	Yes	Yes	Yes	Yes	Yes	Yes
Bank FE	Yes	Yes	Yes	Yes	Yes	Yes
Country x Time FE	No	Yes	No	Yes	No	Yes
Adjusted R-squ~d	0.8	0.93	0.86	0.86	0.84	0.86
Banks	105	105	39	39	36	36
Observations	3266	3266	1316	1316	1120	1120

Dependent variable: Non performing Loans. The periphery countries are Ireland, Italy, Ireland, Portugal and Spain. The core countries are Austria, Belgium, Finland, France, Germany, Netherland. Banks controls: (lagged) capital-asset ratio; (lagged) deposit-liability ratio. Standard errors in parentheses are clustered at the bank level. Sample: 2007m8-2015m2.
* $p<0.1$, ** $p<0.05$, *** $p<0.01$

$$Lending.Rate_{ijt} = \alpha_i + \gamma_t + \lambda_1 Sov.Yield_{jt} + \lambda_2 Sov.Exp_{ijt-1}$$

$$+ \lambda_3 Sov.Yield_{jt} \times Sov.Exp_{ijt-1} + \lambda_4 X_{ijt-1} + \varepsilon_{ijt}.$$

	all		non-stressed		stressed	
	(1)	(2)	(3)	(4)	(5)	(6)
Sov.Yield10y$_t$	0.15***		-0.09		0.11***	
	(0.02)		(0.09)		(0.04)	
Sov.Exposures$_{t-1}$	0.02	0.00	-0.02	0.00	-0.03*	-0.02
	(0.01)	(0.01)	(0.02)	(0.03)	(0.02)	(0.02)
Sov.Yield10y$_t$ x Sov.Exposures$_{t-1}$	0.00	0.00	0.00	-0.01	0.01**	0.01**
	(0.00)	(0.00)	(0.01)	(0.01)	(0.00)	(0.00)
Controls	Yes	Yes	Yes	Yes	Yes	Yes
Time FE	Yes	Yes	Yes	Yes	Yes	Yes
Bank FE	Yes	Yes	Yes	Yes	Yes	Yes
Country x Time FE	No	Yes	No	Yes	No	Yes
Adjusted R^2	0.82	0.86	0.85	0.85	0.8	0.82
Banks	179	179	81	81	54	54
Observations	14314	14314	6682	6682	4460	4460

Dependent variables: Lending rates to NFCs. The periphery countries are Ireland, Italy, Portugal and Spain. The core countries are Austria, Belgium, Finland, Germany, Netherland. Banks controls: capital-asset ratio; deposit-liability ratio. Standard errors in parentheses are clustered at the bank level. Sample: 2007m8-2015m2. * p<0.1, ** p<0.05, *** p<0.01

$$Lending.Rate_{ijt} = \alpha_i + \gamma_t + \lambda_1 Sov.Yield_{jt} + \lambda_2 Sov.Exp_{ijt-1}$$

$$+ \lambda_3 Sov.Yield_{jt} \times Sov.Exp_{ijt-1} + \lambda_4 X_{ijt-1} + \lambda_5 Y_{jt-1} + \varepsilon_{ijt}.$$
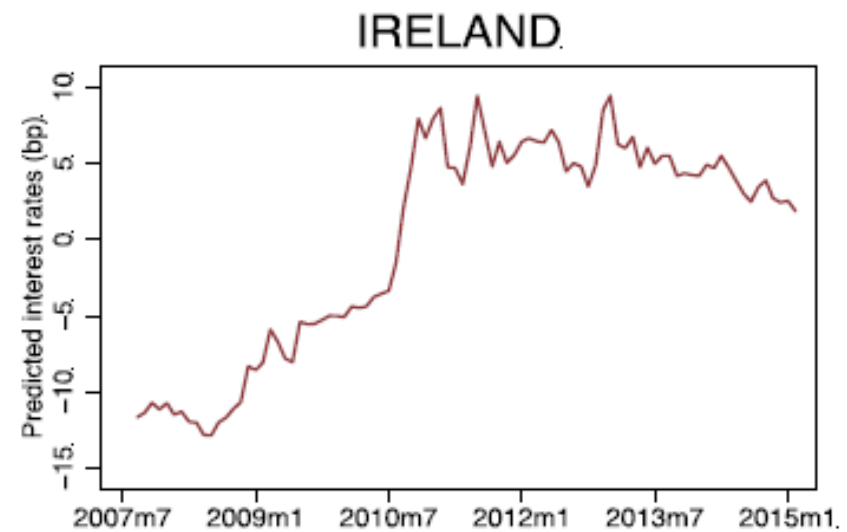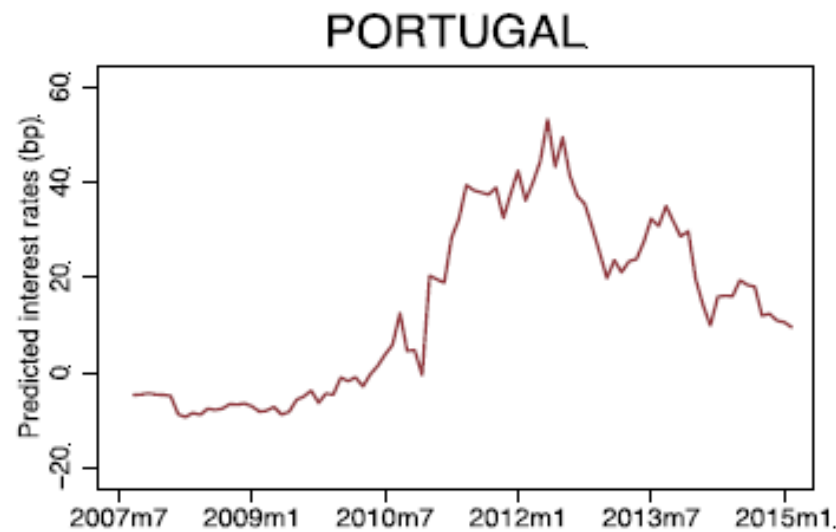
	all		non-stressed		stressed	
	(1)	(2)	(3)	(4)	(5)	(6)
Sov.Yield10y$_t$	0.15***		-0.09		0.11***	
	(0.02)		(0.09)		(0.04)	
Sov.Exposures$_{t-1}$	0.02	0.00	-0.02	0.00	-0.03*	-0.02
	(0.01)	(0.01)	(0.02)	(0.03)	(0.02)	(0.02)
Sov.Yield10y$_t$ x Sov.Exposures$_{t-1}$	0.00	0.00	0.00	-0.01	0.01**	0.01**
	(0.00)	(0.00)	(0.01)	(0.01)	(0.00)	(0.00)

100 bps Sov.Yields ⬆

- **Baseline effect for all banks: 11 bps**

- **Additional exposure-related effect for the median bank: 7 bps**
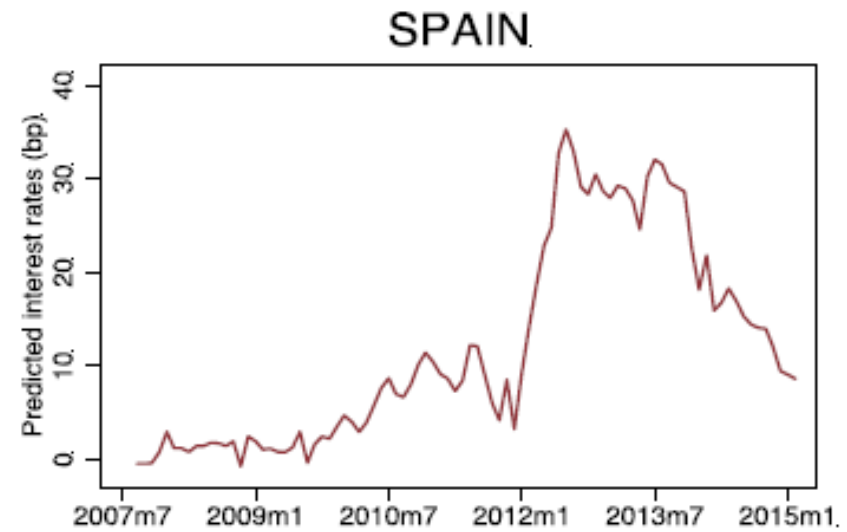
Outline

➢ **Data and sample structure**

➢**Assessing the contribution of sovereign exposures on**

    ✓ **bank solvency risk**

    ✓ **loans and lending rates**

➢ **Doubling-up: effect of sovereign yields on exposures**

➢ **Conclusion**

Nexus between sovereign yields and exposures

➢ **"Carry trade" hypothesis**: banks increase exposures when they expect high returns on sovereign debt

 ✓ especially if they are undercapitalized: "betting for resurrection"

➢ **"Moral suasion" hypothesis**: at times of sovereign stress banks should be more willing than private-owned ones to surrender to (implicit or explicit) government influence to purchase domestic debt

 ✓ especially if they are (i) domestically and (ii) publicly owned

 ✓ … and at times of high need for the sovereign

Determinants of growth in domestic sovereign exposures

$$\Delta Sov.Exp_{ijt} = \alpha_i + \gamma_t + \mu_{jt} + \pi_1 Public_i \times Sov.Yield_{jt} + \pi_2 Foreign_i \times Sov.Yield_{jt}$$

$$+\pi_3 Exp.Ret_{jt} \times Lev_{ijt-1} + \pi_4 X_{ijt-1} + \varepsilon_{ijt}.$$

	non-stressed			stressed			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Public x Sov.Yield10y$_t$	0.56*	0.62**		1.59***	1.07***	1.06***	
	(0.30)	(0.31)		(0.42)	(0.39)	(0.39)	
Public x H.needs$_{t-1}$			0.49				1.30**
			(0.7)				(0.65)
Foreign x Sov.Yield10y$_t$		-0.19	0.02		-1.70***	-2.05***	-2.62***
		(0.35)	(0.35)		(0.44)	(0.38)	(0.37)
High.Lev$_{t-1}$ x Exp.Ret12$_t$						0.02***	0.02***
						(0.01)	(0.01)
Controls	Yes	Yes		Yes	Yes	Yes	Yes
Time FE	Yes	Yes		Yes	Yes	Yes	Yes
Bank FE	Yes	Yes		Yes	Yes	Yes	Yes
Country x Time FE	Yes	Yes		Yes	Yes	Yes	Yes
Adjusted R^2	0.02	0.02	0.02	0.05	0.05	0.05	0.05
Banks	106	106	106	50	50	50	50
Observations	8418	8418	8418	3898	3898	3898	3898

Dependent variable: percentage change of domestic sovereign bond holdings (change in month t divided by the end-of-period stock in month t-1). The non-stressed countries are France, Germany and Netherlands. The stressed countries are Italy and Spain. Bank-level controls: capital-asset ratio; deposit-liability ratio. Standard errors in parentheses are clustered at the bank level. Sample: 2008m1-2015m2. * p<0.1, ** p<0.05, *** p<0.01.

Outline

> Data and Sample structure

> Identifying the banks' balance sheet channel

> ✓ Effects on bank solvency risk

> ✓ Effects on Loans and Lending rates

> Doubling-up: Effect of sovereign yields on exposures

> **Conclusions**

Conclusions

➢ During and after the euro area debt crisis, the exposures of banks to domestic sovereign debt in periphery countries:

  ✓ amplified the impact of sovereign credit risk on the credit risk of those banks

  ✓ amplified the impact of sovereign stress on lending and loan rates

➢ High yields and expected returns on domestic sovereign debt are associated with increases in the domestic sovereign exposures in:

  ✓ less capitalized banks in stressed countries, consistently with the "carry trade" hypothesis

  ✓ public-owned and domestic banks, and at times of high need for the sovereign in stressed countries, consistently with the "moral suasion" hypothesis

Thank you!

Background slides

Sample structure

	Total	Domestic		Foreign
		Private	Public	
Austria	9	8	0	1
Belgium	10	2	1	7
Cyprus	5	3	1	1
Estonia	4	0	0	4
Finland	7	3	0	4
France	37	30	3	4
Germany	65	25	26	14
Greece	6	6	0	0
Ireland	13	2	3	8
Italy	26	18	1	7
Latvia	5	4	0	1
Luxembourg	11	3	0	8
Malta	4	3	0	1
Netherlands	10	4	3	3
Portugal	6	3	1	2
Slovakia	3	0	0	3
Slovenia	5	1	2	2
Spain	26	16	6	4
Total	**252**	**131**	**47**	**74**

Note: For each country, the table shows the main assets, loans to NFCs and holdings of government debt securities covered by our individual bank dataset in Jan-2015 as percentage of the of aggregate data as reported in BSI statistics of the ECB.

Domestic sovereign holdings as % of main assets
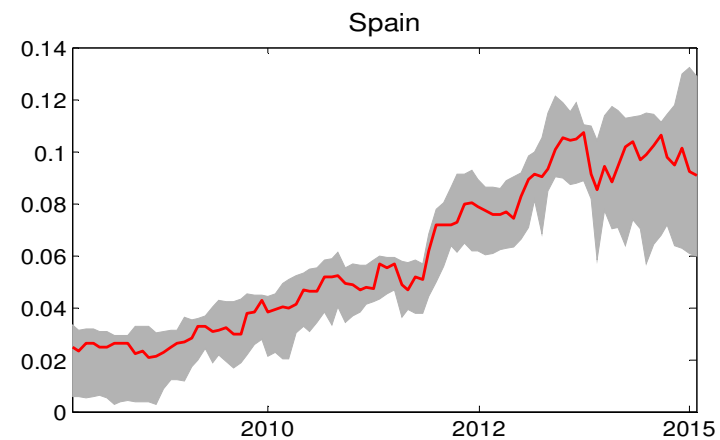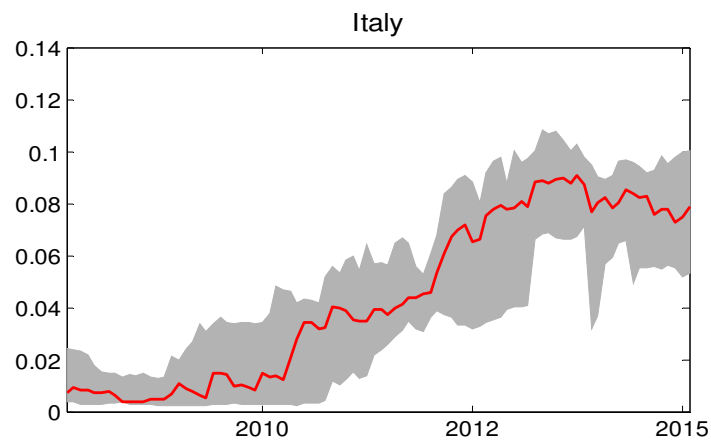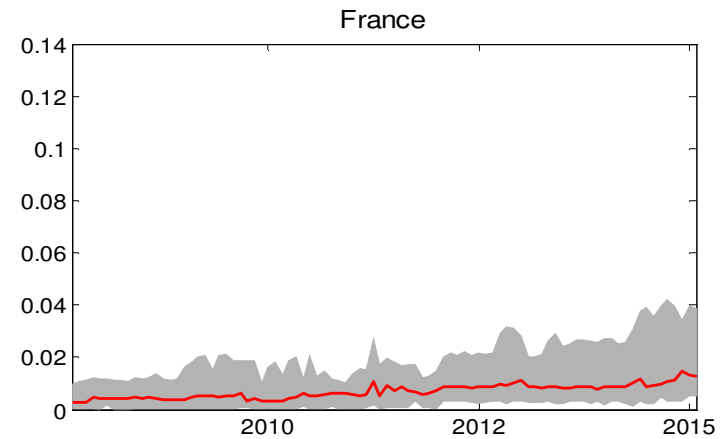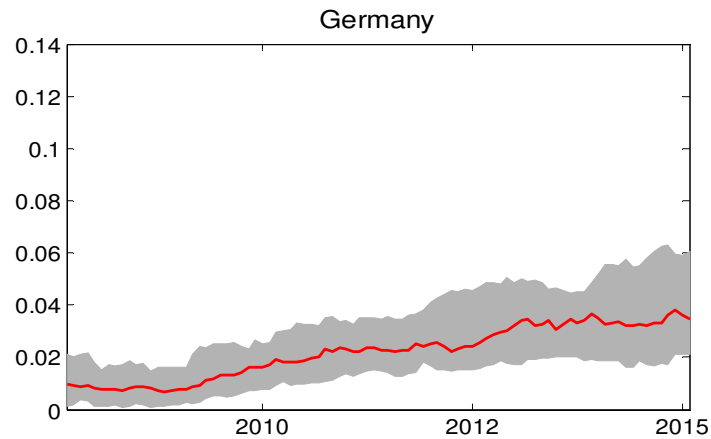
Note: The shaded area is the 25th -75th percentile. The red solid line is the median of the country-specific cross-sectional distribution. Sample: August 2007 - February 2015.

$$Sov.Exposures_{i,j,t} = \alpha_i + \gamma_t + \beta_1 \cdot \Delta Sov.Yield_{j,t} +$$

$$\beta_2 \cdot \Delta Sov.Yield_{j,t} \times T1cer_{i,j,08} + \beta_3 \cdot X_{i,j,t} + \epsilon_{i,j,t}$$

	(1)	(2)
	(core)	(periph.)
$\Delta Sov.Yield10y_t$	-0.66	1.17*
	(1.78)	(0.68)
$\Delta Sov.Yield10y_t \times t1cer_{08}$	-0.11	-0.18*
	(0.29)	(0.11)
Time FE	Yes	Yes
Bank FE	Yes	Yes
Adjusted R^2	0.94	0.76
Banks	48	29
Observations	3376	2016

Dependent variable: domestic exposures. The variable "$t1cer_{08}$" is the Tier1 capital ratio at the end of 2008. The periphery countries are Ireland, Italy, Portugal and Spain. The core countries are Austria, Belgium, Estonia, Finland, France, Germany, Netherland, Slovenia, Slovakia. Banks controls: (lagged) deposit-liability ratio.
Standard errors in parentheses are clustered at the bank level. Sample: 2009m1-2015m2. * $p<0.1$, ** $p<0.05$, *** $p<0.01$

Empirical methodology

- **We estimate a panel data model:**

$$CDS_{i,j,t} = \alpha_i + \gamma_t + \beta_1 \cdot Sov.CDS_{j,t} + \beta_2 \cdot Sov.Exposures_{i,j,t-1} +$$

$$\beta_3 \cdot Sov.CDS_{j,t} \times Sov.Exposures_{i,j,t-1} + \beta_4 \cdot X_{i,j,t-1} + \epsilon_{i,j,t}$$

Our coefficient of interest, β_3, captures the association between sovereign and bank credit risk due to the banks balance sheet channel

Controls:

Time fixed effect control for aggregate determinants of credit spreads (demand channel, ultimate backstop, etc.)

Bank fixed effects control for time-invariant characteristic of banks

Direct effects of sovereign CDS and banks' exposures

Bank balance sheet characteristic (Leverage ratio, Dep./Liab.)