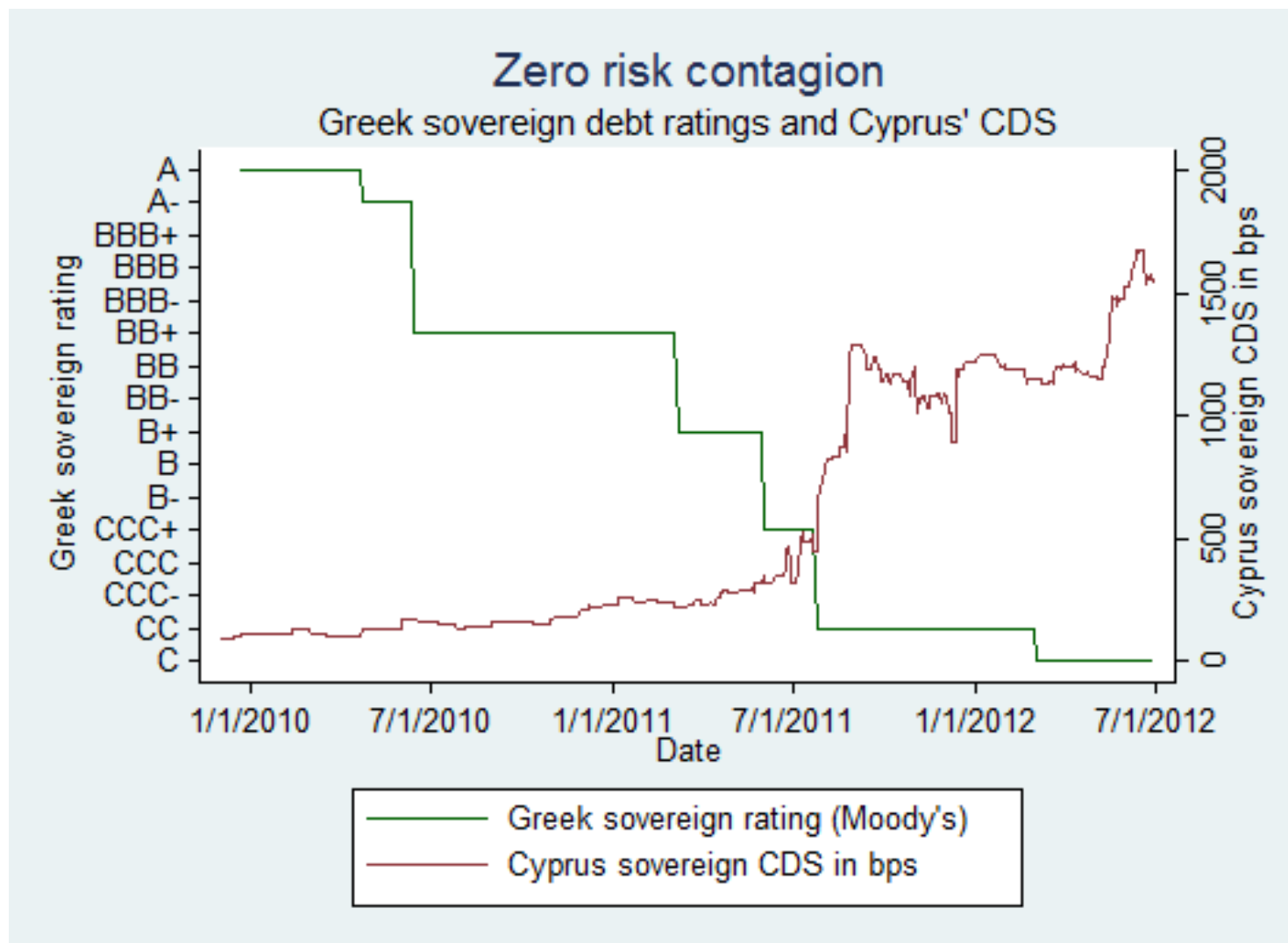


# Zero Risk Contagion

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## An example of spillover (1/2)? The deterioration of Cyprus' sovereign credit risk ...



## An example of spillover (2/2)? ... and its banks' exposure to Greek sovereign debt



## An example of spillover (2/2)? ... and its banks' exposure to Greek sovereign debt



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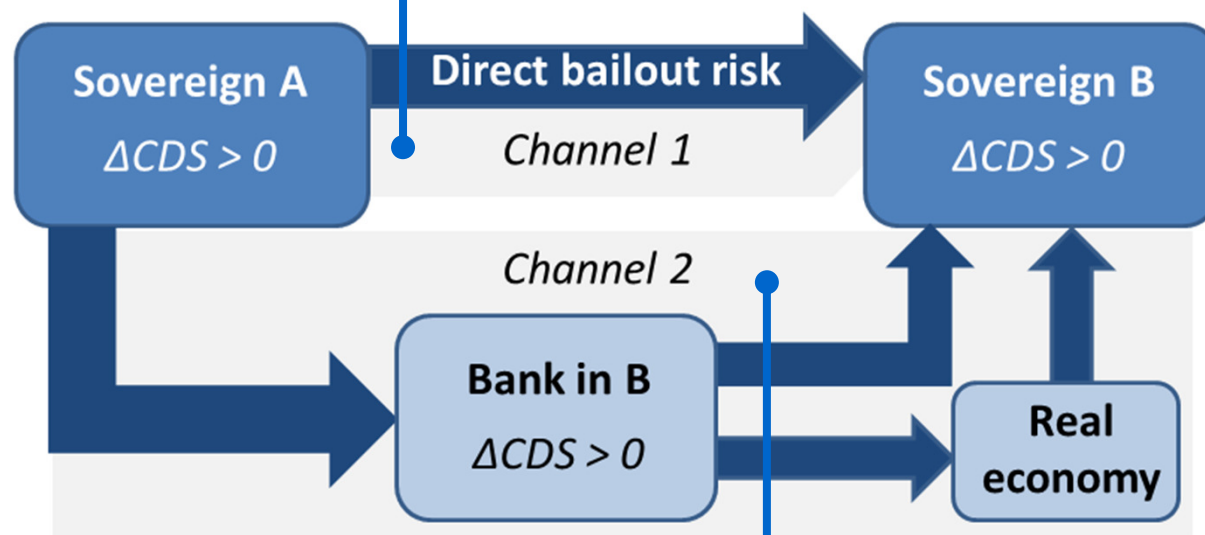
- **Theoretical and institutional background**
- Data and model
- Results, robustness, and recommendations

## Literature presents evidence on determinants of sovereign default risk – Spillover through bank balance sheets largely unexplored

- **Determinants of sovereign default risk** (e.g., Attinasi et al., 2009; Bulow/Rogoff, 1989; Dieckmann/Plank, 2012; Duffie et al., 2003; Eaton/Gersovitz, 1981)
  - Macroeconomic fundamentals
  - Fiscal situation (debt level, deficit)
  - Bank sector / bank rescues
- **Bank-sovereign and sovereign-bank risk spillovers – the “hazardous tango”** (Acharya et al., 2011; Alter/Schüler, 2012; Ejsing/Lemke, 2011; Kallestrup et al., 2013)
  - Bank bailout announcement: Increasing sovereign CDS spreads, decreasing bank CDS spreads
  - Post-bailout: Strong co-movement between bank and sovereign CDS
- **Sovereign-sovereign risk spillovers/contagion** (Arezki et al., 2011; Caporin et al., 2013; Gorea and Radev, 2012; Buchholz/Tonzer, 2014)
  - There is risk spillovers/contagion among European sovereigns
  - First evidence on channels: Economic fundamentals, public finances, interrelations (bilateral trade, banking sector)

## Channels of sovereign risk spillover – Why should domestic bank exposures be a channel for sovereign-sovereign risk spillovers?

Common bailout responsibility in a monetary union (Buiter/Kletzer, 1990)



Transmission of sovereign risk through banks' cross-border sovereign debt holdings (Bolton/Jeanne, 2011)

Does a bank balance sheet channel for sovereign risk exist and how does it work?

## Institutional framework – Treatment of non-domestic sovereign exposures under European banking regulation

- **The principle** (Basel II/III)
  - Capital buffer against risk-weighted assets



## Institutional framework – Treatment of non-domestic sovereign exposures under European banking regulation

- **The principle** (Basel II/III)
  - Capital buffer against risk-weighted assets
- **The European exemption** (CRD III/IV)
  - Standard approach: favorable treatment of EU sovereign debt (“zero risk weight” for sovereign debt in domestic currency of that sovereign)
  - IRB approach: IRB can be substituted by standardized approach for sovereign portfolio (IRB permanent partial use)
    - Effectively no capital requirement, regardless of risk

## Institutional framework – Treatment of non-domestic sovereign exposures under European banking regulation

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  - Standard approach: favorable treatment of EU sovereign debt (“zero risk weight” for sovereign debt in domestic currency of that sovereign)
  - IRB approach: IRB can be substituted by standardized approach for sovereign portfolio (IRB permanent partial use)
    - Effectively no capital requirement, regardless of risk
- **The re-establishment of risk weights** (European Banking Authority, EBA)
  - EBA capital exercise stressing sovereign debt portfolios of the 65 largest European banks in late 2011
  - Requirement to build up a capital buffer for sovereign portfolio till June 2012
    - De-facto introduction of sovereign risk-weight

▶ Does the regulatory treatment of sovereign debt influence sovereign risk spillover?

## We formulate an explicit hypothesis to test the effect of the zero risk weight on sovereign risk spillovers

- Sovereign risk spillovers take place through bank balance sheets, i.e., the **correlation between sovereign risk** in the EU is **increasing in domestic banks' risk-weighted exposures to non-domestic sovereigns**
- The **effect should decrease** significantly (or vanish) **after the de facto change in regulatory treatment of sovereign debt** introduced by the EBA capital exercise

# Contents

- Theoretical and institutional background
- **Data and model**
- Results, robustness, and recommendations

## Our dataset is composed of three main components

- **Market data** (Bloomberg, Datastream)
  - Sovereign CDS spreads (5yr) and sovereign bond yields (10yr)
  - Sovereign ratings (3 rating agencies)
  - Financial market indicators (iTraxx, equity index, VSTOXX, EONIA, Euribor)
- **Bank / banking sector non-domestic sovereign exposures** (BIS, EBA)
  - BIS consolidated banking statistics on country level (comprehensive, quarterly since 2010-Q4, few countries)
  - EBA stress test exposure data on bank level (non-comprehensive, 5 cross-sections between 2009 and 2012, more countries)
- **Other**
  - Bank financials (SNL Financial)
  - (Macro-)economic data (OECD, ECB)

## Constructing a measure for banks' risk weighted sovereign exposure – The sovereign subsidy

$$sovereign\ subsidy_{i,p} = \sum_{j=1}^J RW_j * sovereign\ exposure_{j,i,p}$$

### Compute an adequate risk weight for each sovereign j

#### ▪ Method 1: EBA risk weights

- Ratings-implied PDs as used by EBA
- RW computed by Basel IRB formula<sup>1</sup>

#### ▪ Method 2: CDS-implied risk weights

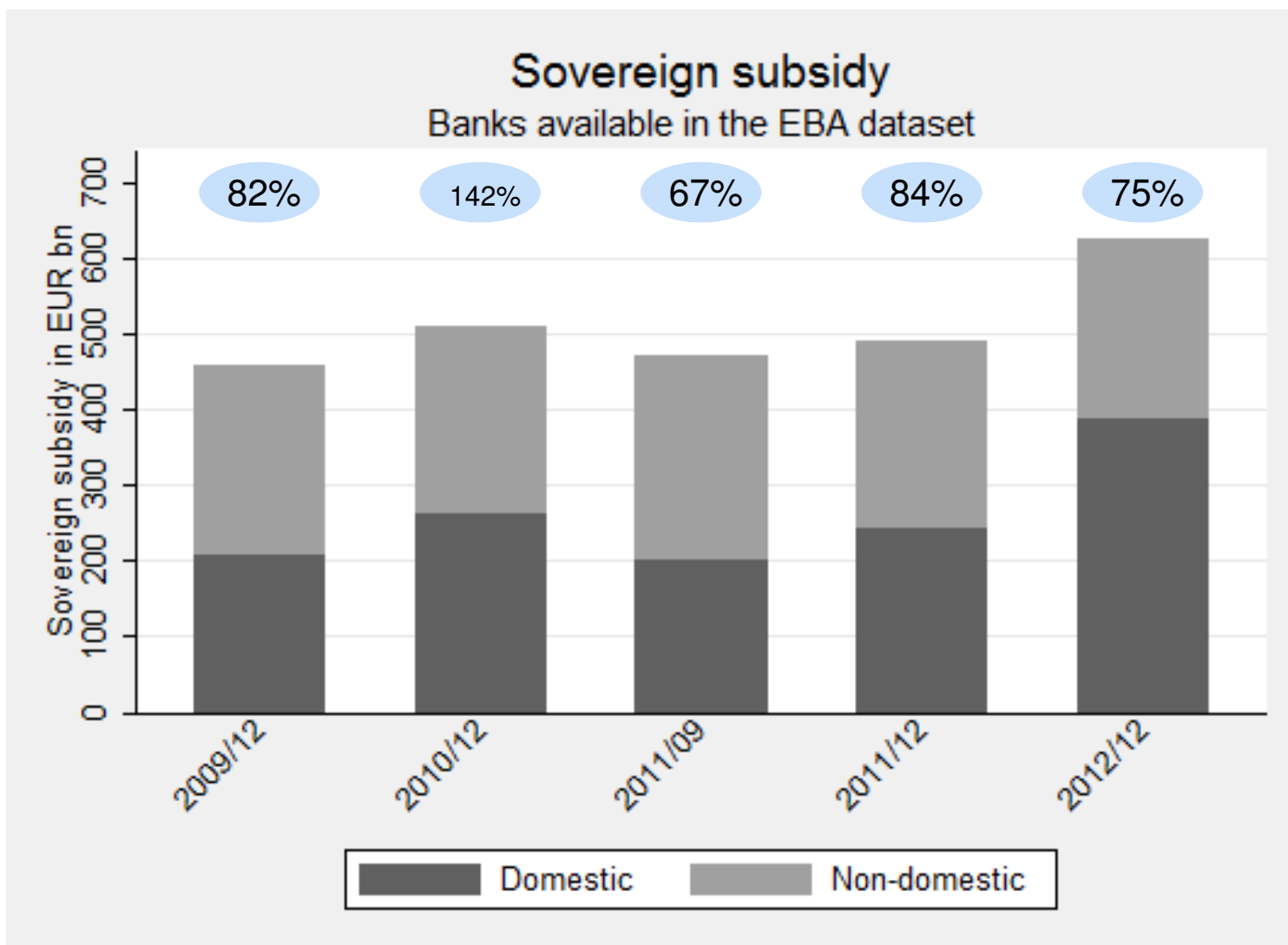
- CDS-implied PDs
- RW computed by Basel IRB formula<sup>1</sup>

Exposure of German banking sector against sovereign	Non-domestic exposure in EUR mn	Avg EBA risk weight	Non-domestic sovereign subsidy in EUR mn
Greece	10,817	1.088	11,766
Italy	37,562	0.265	9,940
Poland	10,783	0.505	5,446
Spain	20,978	0.144	3,030
Portugal	5,745	0.505	2,902
France	15,806	0.144	2,283
Austria	14,049	0.144	2,029
Ireland	2,292	0.685	1,571
Belgium	6,973	0.144	1,007
Netherlands	5,470	0.144	790
Others	7,038	0.213	1,499
<b>Total</b>	<b>137,515</b>	<b>0.307</b>	<b>42,263</b>

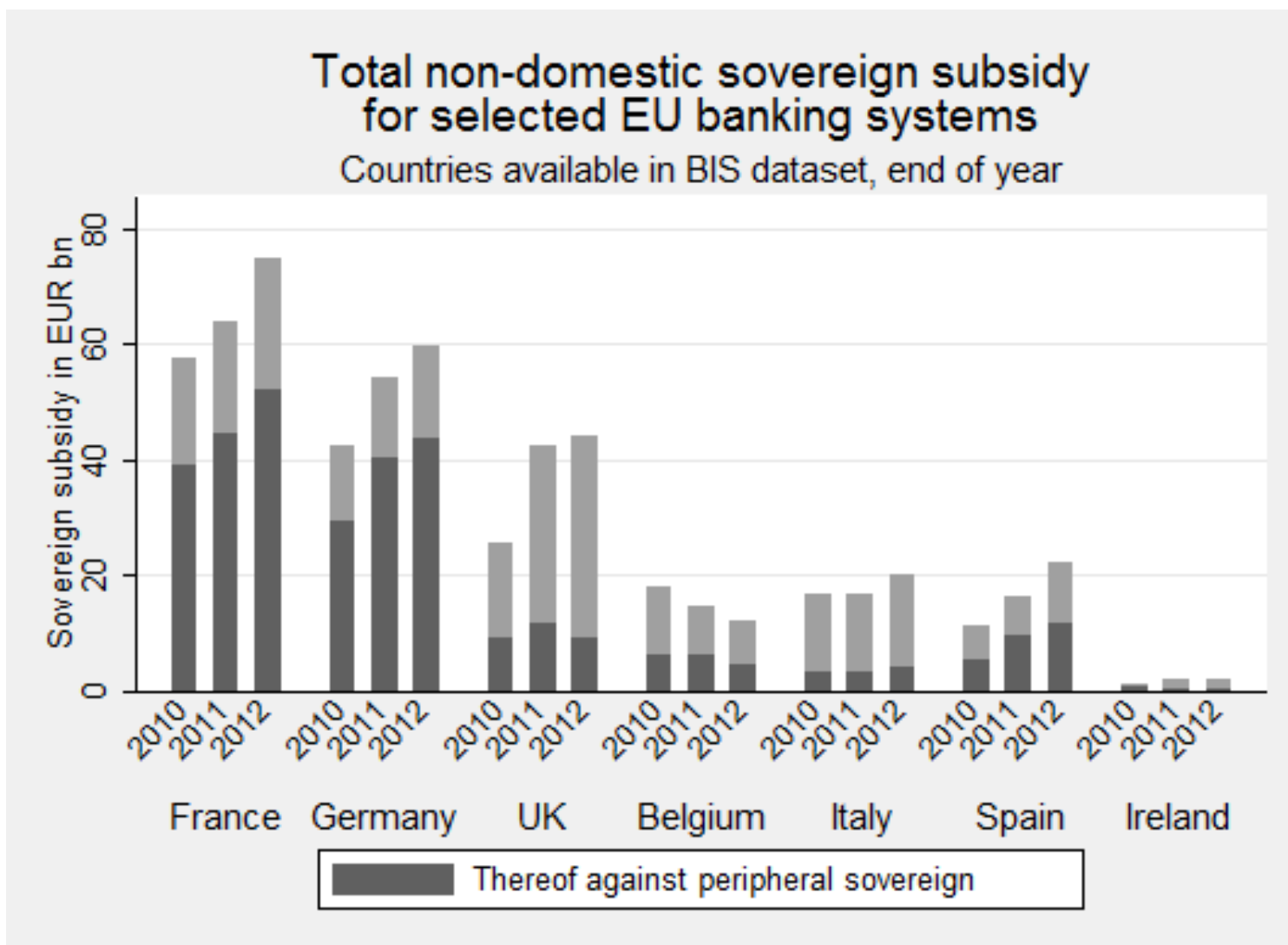
<sup>1</sup> Using standard assumptions LGD (45%) and maturity (2.5 years)

## Sovereign exposures and sovereign subsidy – High significance for banks<sup>1</sup>...

...% Avg. percent of  
core tier 1 capital

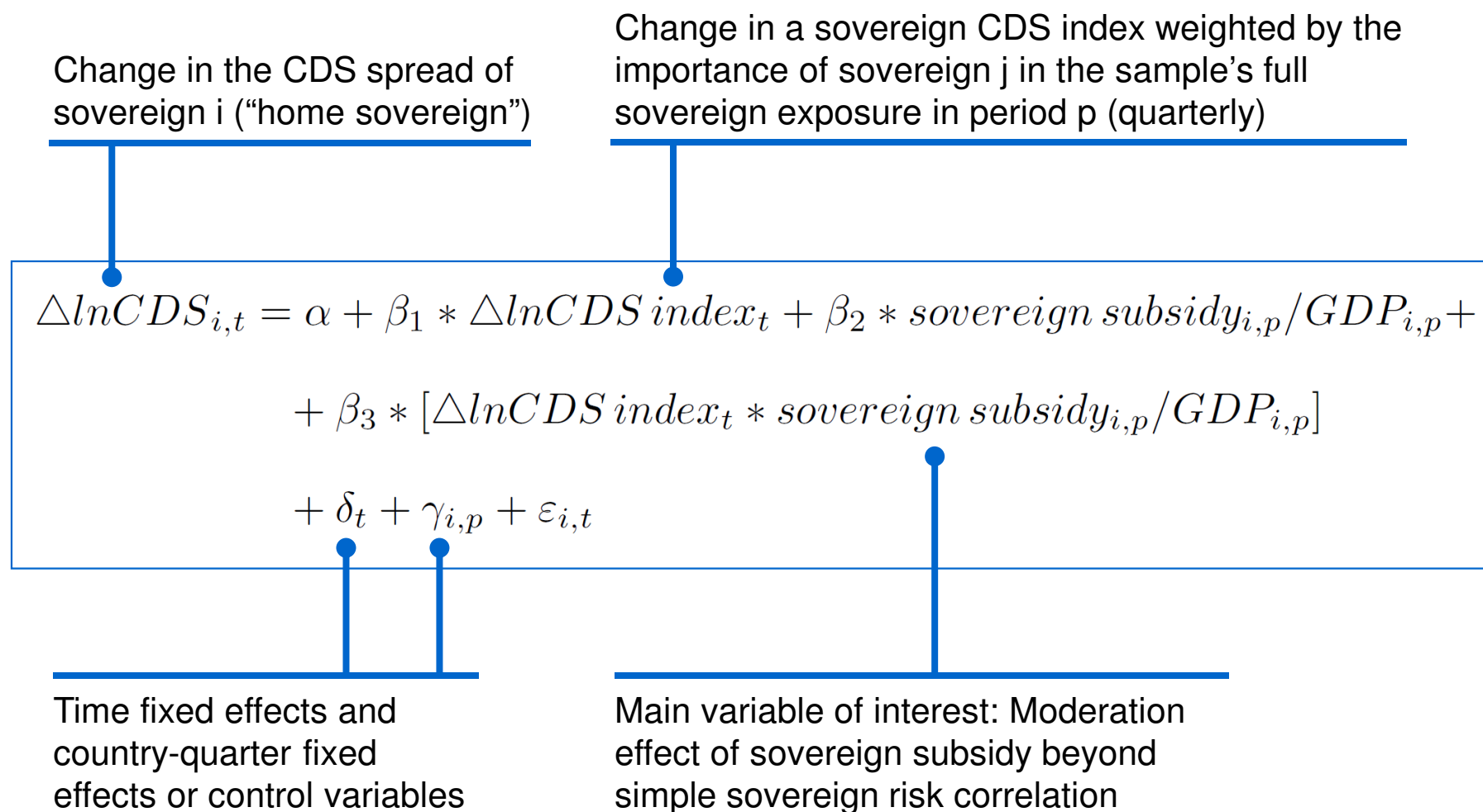


## Sovereign exposures and sovereign subsidy – .... and even high significance for sovereigns





## Modelling sovereign risk spillovers – Our baseline regression model



# Contents

- Theoretical and institutional background
- Data and model
- **Results, robustness, and recommendations**

## Baseline – Sovereign subsidy and sovereign risk spillover

Model	(1)	(2)	(3)	(4)	(5)
CDS index		Weighted by exposure for full sample			
Dep. variable	$\Delta \ln(\text{CDS})$	$\Delta \ln(\text{CDS})$	$\Delta \ln(\text{CDS})$	$\Delta \ln(\text{CDS})$	$\Delta \ln(\text{CDS})$
$\Delta \text{CDS index} \times \text{sovereign subsidy/GDP}$	3.482*** (0.998)	3.509*** (0.996)	3.472*** (0.951)	3.532*** (1.015)	3.489*** (0.962)
$\Delta \text{CDS index}$	0.897*** (0.0333)	0.882*** (0.0402)		0.884*** (0.0399)	
Sovereign subsidy/GDP	-0.0268 (0.0261)	-0.0268 (0.0261)	-0.0265 (0.0253)		
$\Delta \text{iTraxx}$		0.0748** (0.0313)		0.0726** (0.0312)	
$\Delta \text{DS equity index}$		0.0979* (0.0561)		0.0976* (0.0561)	
$\Delta \text{VSTOXX}$		-0.00324 (0.0100)		-0.00286 (0.0100)	
$\Delta \text{Term spread}$		-0.00273 (0.00314)		-0.00263 (0.00313)	
Constant	0.000327 (0.000812)	0.000305 (0.000811)	-0.000908 (0.000789)	-0.000353 (0.000376)	-0.000512 (0.00104)
Date FE	NO	NO	YES	NO	YES
Country-Quarter FE	NO	NO	NO	YES	YES
Observations	2,646	2,646	2,646	2,646	2,646
R-squared	0.744	0.745	0.771	0.751	0.777

## Robustness tests and alternative specifications

### Are our results robust to alternative specifications?

- Variation 1: Use alternative **CDS spread quotes**
- Variation 2: Use alternative proxy for credit risk, i.e., 10yr maturity adjusted **sovereign bond yields**
- Variation 3: Use alternative methodology for computing risk weights, i.e., **CDS-implied PDs**

Model	(1)	(2)	(3)	(4)	(5)	(6)
Robustness	Alternative dep var: DS CDS data		Alternative dep var: bond yields		Alternative exposure risk weight: CDS-implied	
Dep. variable	$\Delta \ln(\text{DS CDS})$	$\Delta \ln(\text{DS CDS})$	$\Delta \ln(\text{bond yield})$	$\Delta \ln(\text{bond yield})$	$\Delta \ln(\text{CDS})$	$\Delta \ln(\text{CDS})$
$\Delta \text{ DS CDS index x}$ sovereign subsidy/GDP	4.916*** (1.346)	4.729*** (1.164)				
$\Delta \text{ Bond index x}$ sovereign subsidy/GDP			15.60*** (2.861)	15.94*** (2.841)		
$\Delta \text{ CDS index x}$ sovereign subsidy/GDP (CDS-implied RW)					1.187* (0.609)	1.491** (0.615)
$\Delta \text{ DS CDS index}$	0.749*** (0.0432)					
$\Delta \text{ Bond index}$			0.455*** (0.0973)			
$\Delta \text{ CDS index}$					0.930*** (0.0368)	
Sovereign subsidy/GDP	-0.0283 (0.0449)		-0.0138 (0.0238)			
Sovereign subsidy/GDP (CDS-implied RW)					-0.0109 (0.0159)	0.738* (0.404)
Constant	0.000167 (0.00131)	-0.00234 (0.00150)	0.000341 (0.000814)	0.000775 (0.00112)	0.000140 (0.000880)	-0.0393* (0.0207)
Date FE	NO	YES	NO	YES	NO	YES
Country-Quarter FE	NO	YES	NO	YES	NO	YES
Observations	2,646	2,646	2,347	2,347	2,646	2,646
R-squared	0.507	0.585	0.276	0.334	0.743	0.777

## Falsification tests (non-EU sovereigns)

**Results should not hold for non-EU non-domestic exposures, as there is no zero risk weight applied**

- Test 1: Use US CDS spread and quasi-sovereign subsidy
- Test 2: Compute non-EU CDS index and quasi-sovereign subsidy, using CH, JP, NO, US

Model	(1)	(2)	(3)	(4)
Falsification	US exposure		non-EU exposure (CH/JP/NO/US)	
Dep. variable	$\Delta \ln(\text{CDS})$	$\Delta \ln(\text{CDS})$	$\Delta \ln(\text{CDS})$	$\Delta \ln(\text{CDS})$
$\Delta \text{ US CDS x US quasi-sovereign subsidy/GDP}$	-1.842 (5.659)	-1.296 (3.004)		
$\Delta \text{ non-EU CDS index x non-EU quasi-sovereign subsidy/GDP}$			-0.622 (4.610)	-0.425 (2.428)
$\Delta \text{ US CDS}$	0.622*** (0.0489)			
$\Delta \text{ non-EU CDS index}$			0.796*** (0.0568)	
US quasi-sovereign subsidy/GDP	0.0329 (0.0962)			
Non-EU quasi-sovereign subsidy/GDP			0.0199 (0.0646)	
Constant	-0.00130 (0.000878)	-0.00132 (0.000999)	-0.00129 (0.000848)	-0.00252** (0.00109)
Date FE	NO	YES	NO	YES
Country-Quarter FE	NO	YES	NO	YES
Observations	2,597	2,597	2,646	2,646
R-squared	0.201	0.775	0.234	0.775

## Exploring the channels of sovereign risk spillover

### Are our results proxying for other channels?

- **Direct bailout responsibility** for other European sovereigns (channel 1)? → Use a country's **ECB capital share** (share of contingent liability, also in EFSF/ESM)
- **Bailout capacity** and potential to raise more debt (channel 1) → Use a country's current **debt ratio** (debt/GDP)

Model	(1)	(2)	(3)	(4)	(5)
CDS index		Weighted by exposure for full sample			
Dep. variable	$\Delta \ln(\text{CDS})$	$\Delta \ln(\text{CDS})$	$\Delta \ln(\text{CDS})$	$\Delta \ln(\text{CDS})$	$\Delta \ln(\text{CDS})$
$\Delta \text{ CDS index} \times \text{sovereign subsidy/GDP}$	4.044*** (1.011)	4.068*** (1.009)	4.034*** (0.941)	4.096*** (1.038)	4.080*** (0.967)
$\Delta \text{ CDS index} \times \text{ECB share}$	1.314*** (0.155)	1.315*** (0.155)	1.316*** (0.168)	1.330*** (0.155)	1.331*** (0.168)
$\Delta \text{ CDS index} \times \text{debt ratio}$	0.0849 (0.0813)	0.0870 (0.0810)	0.0906 (0.0739)	0.0753 (0.0807)	0.0807 (0.0730)
$\Delta \text{ CDS index}$	0.641*** (0.0841)	0.624*** (0.0861)		0.649*** (0.0841)	
Sovereign subsidy/GDP	-0.0223 (0.0264)	-0.0224 (0.0263)	-0.0222 (0.0254)		
ECB share	0.00766** (0.00370)	0.00767** (0.00371)	0.00773* (0.00410)		
Debt ratio	-0.000949 (0.00199)	-0.000925 (0.00199)	-0.000730 (0.00190)		
$\Delta \text{ iTraxx}$		0.0755** (0.0302)			
$\Delta \text{ DS equity index}$		0.0986* (0.0547)			
$\Delta \text{ VSTOXX}$		-0.00337 (0.00973)			
$\Delta \text{ Term spread}$		-0.00273 (0.00313)			
Constant	0.000280 (0.00219)	0.000234 (0.00218)	-0.000823 (0.00211)	-0.000335 (0.000365)	-0.000414 (0.00110)
Date FE	NO	NO	YES	NO	YES
Country-Quarter FE	NO	NO	NO	YES	YES
Observations	2,646	2,646	2,646	2,646	2,646
R-squared	0.757	0.758	0.784	0.762	0.789

## The September 2011 capital exercise

### EBA capital exercise in late 2011 required 65 largest European banks to build up a capital buffer against sovereign debt default

- De facto introduction of adequate sovereign risk weight
- Banks react by reducing high-risk exposure and increasing capital

Model	(2)	(3)	(4)	(5)
Dependent variable	$\Delta \ln(\text{CDS})$	$\Delta \ln(\text{CDS})$	$\Delta \ln(\text{CDS})$	$\Delta \ln(\text{CDS})$
	Before CE <sup>[a]</sup>	After CE <sup>[b]</sup>	Before CE <sup>[a]</sup>	After CE <sup>[b]</sup>
$\Delta \text{ CDS index x}$ sovereign subsidy/GDP	3.470*** (1.089)	-0.373 (3.209)	3.475*** (1.075)	-0.612 (3.049)
$\Delta \text{ CDS index}$	0.936*** (0.0447)	0.925*** (0.106)		
Sovereign subsidy/GDP	-0.0235 (0.0328)	-0.0493 (0.0619)		
Controls	YES	YES	NO	NO
Constant	YES	YES	YES	YES
Date FE	NO	NO	YES	YES
Country-Quarter FE	NO	NO	YES	YES
Observations	1,176	882	1,176	882
R-squared	0.785	0.695	0.805	0.737

**Notes:** [a] Period up to and including 2011-Q3 [b] Period from 2012-Q2 to 2012-Q4

## The September 2011 capital exercise and alternative channels

Model		(2)	(3)	(4)	(5)
Dependent variable		$\Delta \ln(\text{CDS})$	$\Delta \ln(\text{CDS})$	$\Delta \ln(\text{CDS})$	$\Delta \ln(\text{CDS})$
		Before CE <sup>[a]</sup>	After CE <sup>[b]</sup>	Before CE <sup>[a]</sup>	After CE <sup>[b]</sup>
<b>a. EBA capital exercise in late 2011 required 65 largest European banks to build up a capital buffer against sovereign debt default</b>	$\Delta \text{ CDS index x}$				
	sovereign subsidy/GDP	3.564*** (1.138)	-0.844 (3.105)	3.558*** (1.128)	-0.928 (3.019)
<b>b. Are our results proxying for other channels?</b> <ul style="list-style-type: none"> <li>▫ <b>Direct bailout responsibility</b> for other European sovereigns (channel 1)? → <b>ECB capital share</b></li> <li>▫ <b>Bailout capacity</b> and potential to raise more debt (channel 1) → <b>debt ratio</b> (debt/GDP)</li> </ul>	$\Delta \text{ CDS index x ECB share}$	1.015*** (0.183)	1.326*** (0.382)	0.973*** (0.205)	1.450*** (0.394)
	$\Delta \text{ CDS index x debt ratio}$	0.183* (0.0947)	-0.0483 (0.195)	0.187** (0.0939)	-0.0311 (0.168)
	$\Delta \text{ CDS index}$	0.625*** (0.0948)	0.831*** (0.247)		
	Sovereign subsidy/GDP	-0.0245 (0.0346)	-0.0782 (0.0605)		
	ECB share	0.00554 (0.00579)	0.00913 (0.00721)		
	Debt ratio	0.00125 (0.00283)	-0.00488 (0.00433)		
	Controls	YES	YES	NO	NO
	Constant	YES	YES	YES	YES
	Date FE	NO	NO	YES	YES
	Country-Quarter FE	NO	NO	YES	YES
Observations		1,176	882	1,176	882
R-squared		0.794	0.707	0.813	0.750



## We find banks' non-domestic EU sovereign exposures to increase sovereign risk spillovers – Channel partly closed after EBA capital exercise

### General effect

Sovereign risk spillovers take place through bank balance sheets, i.e., the **correlation between sovereign risk** in the EU is **increasing in domestic banks' exposures to non-domestic sovereigns**



### Effect after policy change

The **effect should decrease** significantly (or vanish) **after the de facto change in regulatory treatment of sovereign debt** introduced by the EBA capital exercise



## Some implications for policy making – An adequate sovereign risk weight could limit sovereign spillovers, but bears some risks

**1** A **zero sovereign risk weight** might be politically wanted, but comes at a high cost to financial stability, creating a potential **channel for sovereign risk spillovers** across countries in the European Union

**2** Attempts of closing the zero risk weight channel have been shown to be successful – The **more realistic sovereign risk weighting** introduced by the EBA should be **extended in duration and applicability** to all banks

**3** Introducing an **adequate sovereign risk weight** requires careful consideration of the potentially **large contingent capital shortage** in affected banks – and might **require additional capitalization** efforts

## Contagion banned? The regulatory thriller continues...

- **European Banking Authority**

- **Ad hoc introduction of risk weights**, no legal requirement for continuation

- **Legal framework: CRD IV**

- Unique opportunity to change the zero risk weight in the new version of the CRD, passed in July 2013
- **No change in zero risk weight** for sovereign debt in domestic currency of that sovereign → Still believe that sovereign debt is risk-free?
- Even extension of zero risk weight: “Until 31 December 2017, the **same risk weight** shall be assigned [...] to exposures to the central governments [...] in the domestic currency of **any Member State** as would be applied to such exposures [...] in their domestic currency.” → In **which case** would that be **applicable**?

- **European Central Bank**

- Taking over **supervision of the largest European banks** under the SSM in 2014
- Responsible director announced in an interview with financial newspaper Handelsblatt in September that ECB will stick to the “applicable rules” and **will not introduce a capital requirement for sovereign debt**

# BACKUP

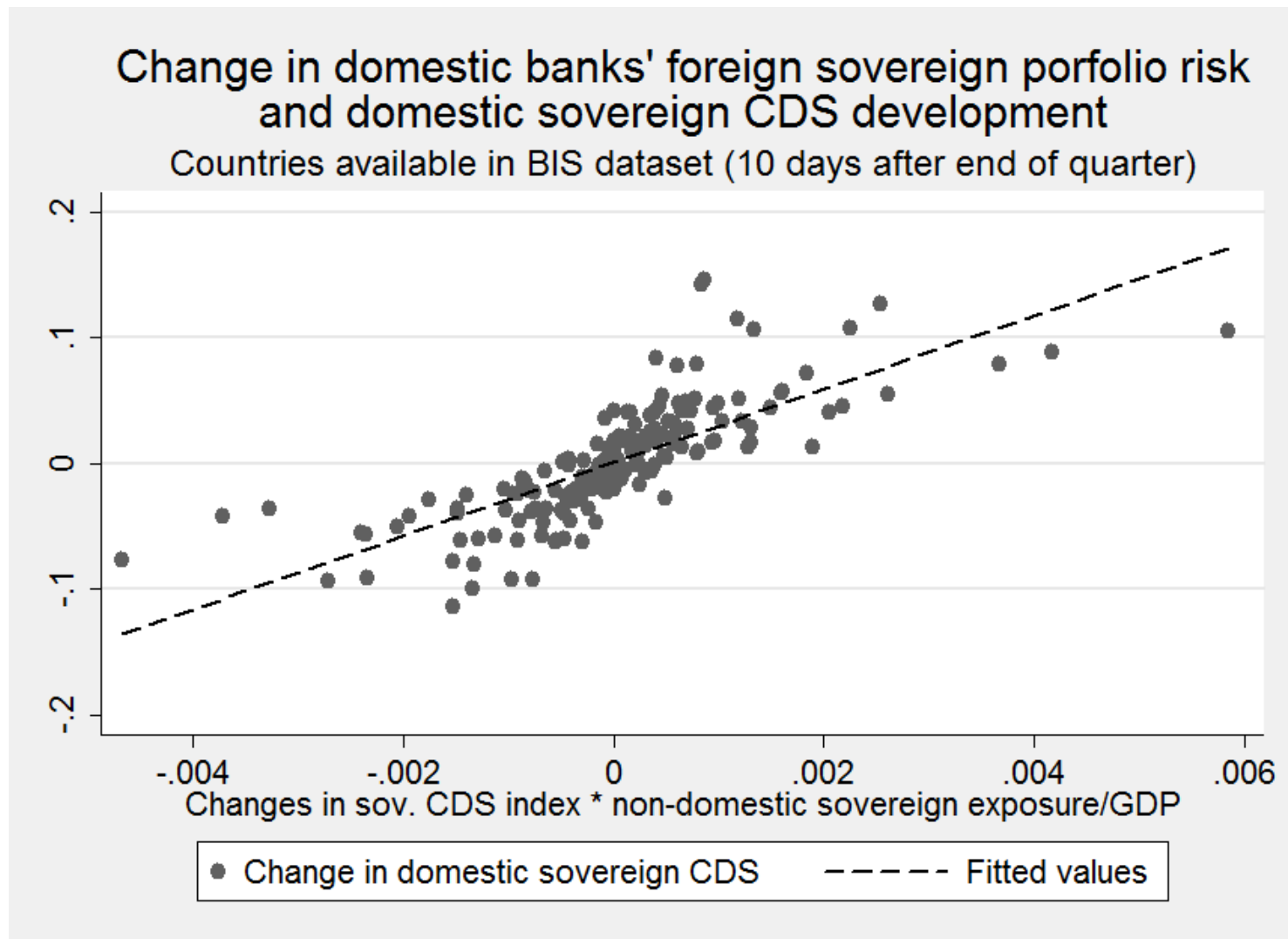
## Summary statistics

Variable	Unit	Mean	(Std. Dev.)	Min.	Max.	N
<b><i>Dependent variables</i></b>						
Sovereign CDS (BB)	bps	252	(207)	25	1,233	2,646
$\Delta \ln(\text{CDS})$ (BB)	percent	-0.17	(3.82)	-21.76	18.73	2,646
Sovereign CDS (DS)	bps	200	(189)	12	1,191	2,646
$\Delta \ln(\text{CDS})$ (DS)	percent	-0.20	(4.97)	-37.14	31.87	2,646
Sovereign bond yield	bps	402	(207)	117	1,379	2,358
$\Delta \ln(\text{bond yield})$	percent	0.04	(2.22)	-11.46	11.91	2,347
<b><i>Explanatory variables</i></b>						
$\Delta$ CDS index (sample weights, BB)	percent	-0.14	(3.35)	-15.42	12.96	2,646
$\Delta$ CDS index (sample weights, DS)	percent	-0.17	(4.05)	-17.01	14.48	2,646
$\Delta$ Bond index (sample weights)	percent	0.04	(1.29)	-3.65	4.69	2,646
Bank exposure to non-domestic sovereigns	mn EUR	104,284	(77,826)	6,550	309,002	2,646
Sovereign subsidy (bank exposure to non-domestic sovereigns, EBA risk weights)	mn EUR	29,791	(21,448)	1,237	72,231	2,646
Sovereign subsidy (bank exposure to non-domestic sovereigns, CDS implied risk weights)	mn EUR	56,063	(44,014)	2,043	153,253	2,646
Bank exposure to non-domestic sovereigns/GDP	percent	8.6	(3.75)	4.42	18.22	2,646
Sovereign subsidy/GDP (EBA risk weights)	percent	2.46	(1.37)	0.93	6.42	2,646
Sovereign subsidy/GDP (CDS implied risk weights)	percent	4.44	(2.34)	1.43	10.19	2,646
<b><i>Controls</i></b>						
iTraxx	index points	134.23	(31.23)	94.21	207.96	2,646
DS equity index	index points	1382.75	(137.99)	1129.06	1690.48	2,646
VSTOXX	index points	25.8	(7.66)	14.86	53.55	2,646
EONIA	bps	52	(39)	6	172	2,646
Euribor (12 months)	bps	150	(57)	54	220	2,646
Term spread	bps	98	(32)	41	161	2,646
ECB capital share	percent	11.77	(9.69)	0	27.1	2,646
Government debt ratio	percent	102.35	(20.52)	59.42	138.34	2,646
GDP	mn EUR	1,255,582	(746,400)	132,538	2,562,339	2,646

## Some snapshots on European sovereign debt (1/4): Sovereign default risk is highly correlated throughout Europe

Variables	Belgium	France	Germany	Ireland	Italy	Spain	UK
Belgium	1.000						
France	0.816 (0.000)	1.000					
Germany	0.746 (0.000)	0.824 (0.000)	1.000				
Ireland	0.676 (0.000)	0.645 (0.000)	0.616 (0.000)	1.000			
Italy	0.801 (0.000)	0.758 (0.000)	0.692 (0.000)	0.764 (0.000)	1.000		
Spain	0.785 (0.000)	0.739 (0.000)	0.668 (0.000)	0.793 (0.000)	0.901 (0.000)	1.000	
UK	0.740 (0.000)	0.749 (0.000)	0.734 (0.000)	0.634 (0.000)	0.717 (0.000)	0.694 (0.000)	1.000

## Higher non-domestic sovereign exposure of the domestic banking sector seems to increase sovereign risk correlation



## Sovereign subsidy – Banking sectors' non-domestic sovereign exposure (BIS 1/3)

Panel A: Total banking sector non-domestic exposure to all EU sovereigns									
Country	Total non-domestic EU sovereign exposure in EUR mn			in % of GDP			Non-domestic EU sovereign subsidy (risk-weighted) in EUR mn		
	2010	2011	2012	2010	2011	2012	2010	2011	2012
<b>Banks in peripheral countries</b>									
Italy	63,307	68,103	80,122	4.5%	4.6%	5.4%	16,729	16,623	20,231
Ireland	6,550	10,778	10,890	4.9%	7.6%	7.3%	1,266	1,814	1,764
Spain	52,220	48,892	74,115	4.8%	4.4%	6.6%	11,193	16,364	21,990
<b>Banks in other countries</b>									
Germany	137,515	125,915	133,905	6.0%	5.2%	5.3%	42,263	54,341	59,798
Belgium	47,817	34,091	32,431	15.7%	10.7%	9.8%	17,854	14,379	11,875
France	227,701	182,334	210,061	13.8%	10.6%	11.7%	57,555	63,756	74,947
UK	130,200	221,267	245,096	7.9%	13.3%	14.2%	25,664	42,333	43,950



## Sovereign subsidy – Banking sectors' non-domestic sovereign exposure (BIS 2/3)

Panel B: Total banking sector non-domestic exposure to peripheral EU sovereigns									
Country	Total non-domestic EU sovereign exposure in EUR mn			in % of GDP			Non-domestic EU sovereign subsidy (risk-weighted) in EUR mn		
	2010	2011	2012	2010	2011	2012	2010	2011	2012
<b>Banks in peripheral countries</b>									
Spain	13,619	11,899	12,140	1.3%	1.1%	1.1%	5,453	9,544	11,582
Ireland	1,528	352	277	1.1%	0.2%	0.2%	453	259	204
Italy	6,535	5,739	4,715	0.5%	0.4%	0.3%	3,004	3,269	3,914
<b>Banks in other countries</b>									
France	113,806	69,791	71,709	6.9%	4.1%	4.0%	39,169	44,424	51,993
Belgium	18,585	9,475	5,875	6.1%	3.0%	1.8%	6,320	6,160	4,229
Germany	77,395	61,619	56,705	3.4%	2.6%	2.3%	29,208	40,360	43,765
UK	22,890	15,145	11,076	1.4%	0.9%	0.6%	9,052	11,453	9,051

## Sovereign subsidy – Banking sectors' non-domestic sovereign exposure (BIS 3/3)

Panel C: Total banking sector non-domestic exposure to other (non-peripheral) EU sovereigns									
Country	Total non-domestic EU sovereign exposure in EUR mn			in % of GDP			Non-domestic EU sovereign subsidy (risk-weighted) in EUR mn		
	2010	2011	2012	2010	2011	2012	2010	2011	2012
<b>Banks in peripheral countries</b>									
Ireland	5,022	10,426	10,613	3.8%	7.3%	7.1%	814	1,555	1,561
Spain	38,601	36,993	61,976	3.6%	3.4%	5.5%	5,741	6,820	10,408
Italy	56,772	62,364	75,407	4.0%	4.2%	5.0%	13,725	13,354	16,317
<b>Banks in other countries</b>									
Belgium	29,232	24,616	26,556	9.6%	7.7%	8.0%	11,534	8,220	7,646
France	113,895	112,543	138,352	6.9%	6.5%	7.7%	18,386	19,332	22,954
Germany	60,120	64,297	77,200	2.6%	2.7%	3.1%	13,054	13,981	16,034
UK	107,310	206,122	234,020	6.5%	12.4%	13.6%	16,611	30,880	34,900

## Sovereign subsidy – Banks' non-domestic sovereign exposure (EBA)

Panel A: EBA stress test banks, total <sup>a</sup> by stress test date					
Stress test	Total non-domestic EU sovereign exposure in EUR mn	in % of assets <sup>b</sup>	Non-domestic EU sovereign subsidy (risk-weighted) in EUR mn	in % of core tier 1 capital <sup>b</sup>	
Banks in all countries of EBA stress tests					
Dec 2009	923,387	3.3%	251,261	28.5%	
Dec 2010	871,829	2.8%	248,247	29.1%	
Oct 2011	828,578	3.0%	268,784	34.7%	
Dec 2011	676,431	2.7%	250,160	38.1%	
June 2012	693,583	2.3%	238,919	20.8%	
thereof banks in peripheral countries (Greece, Ireland, Italy, Portugal, Spain)					
Dec 2009	102,245	1.3%	30,914	11.4%	
Dec 2010	88,307	1.1%	28,792	12.7%	
Oct 2011	92,082	1.3%	32,537	14.6%	
Dec 2011	87,174	1.2%	33,985	12.5%	
June 2012	86,655	1.1%	32,296	8.3%	
thereof banks in other countries					
Dec 2009	821,142	4.3%	220,348	38.2%	
Dec 2010	783,522	3.7%	219,455	38.7%	
Oct 2011	736,496	3.5%	236,248	42.1%	
Dec 2011	589,257	3.3%	216,175	47.9%	
June 2012	606,928	2.7%	206,623	26.3%	

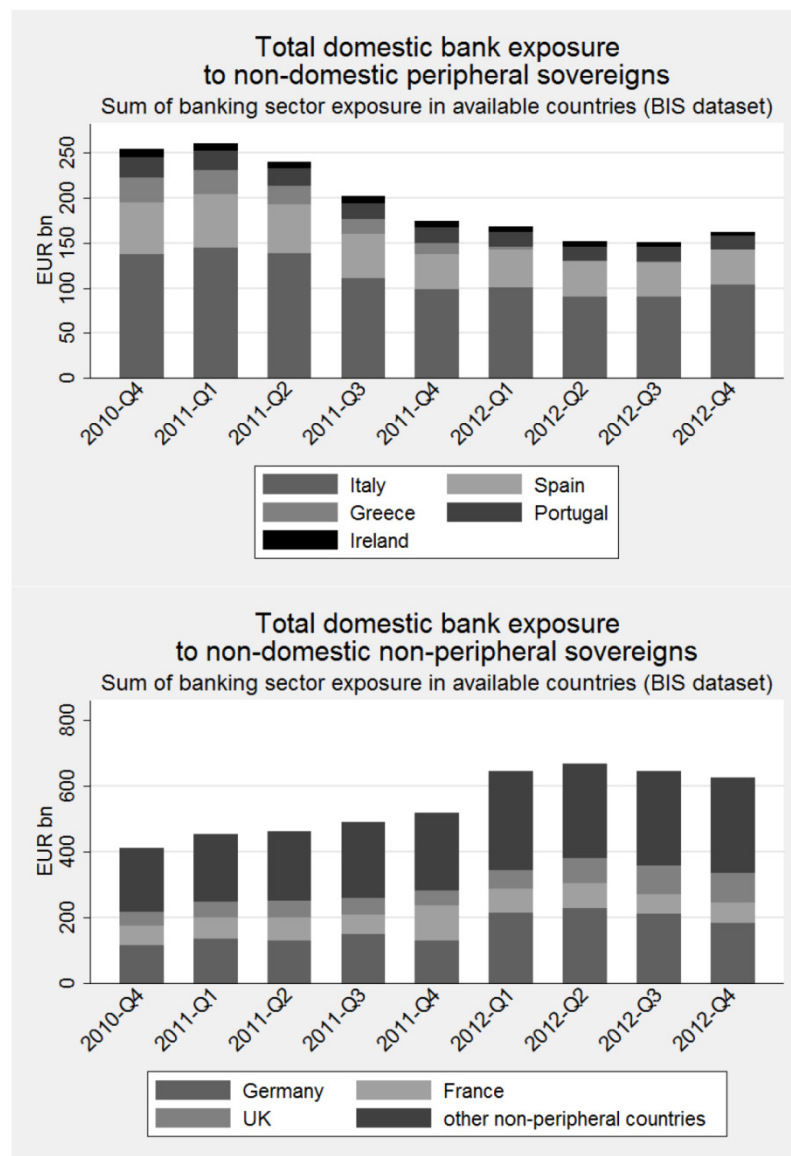
## Sovereign subsidy – Banks' domestic sovereign exposure (EBA)

Panel A: EBA stress test banks, total <sup>a</sup> by stress test date				
Stress test	Total domestic sovereign exposure in EUR mn	in % of assets <sup>b</sup>	Domestic sovereign subsidy (risk-weighted) in EUR mn	in % of core tier 1 capital <sup>b</sup>
<b>Banks in all countries of EBA stress tests</b>				
Dec 2009	1,042,408	6.9%	205,979	54.2%
Dec 2010	1,198,763	7.1%	262,524	113.3%
Oct 2011	1,050,300	5.2%	202,586	32.2%
Dec 2011	973,682	5.6%	241,541	46.1%
June 2012	1,080,462	6.3%	386,488	53.9%
<b>thereof banks in peripheral countries (Greece, Ireland, Italy, Portugal, Spain)</b>				
Dec 2009	423,343	8.9%	110,875	82.1%
Dec 2010	482,187	8.9%	153,660	251.8%
Oct 2011	358,822	6.5%	97,494	56.7%
Dec 2011	315,516	6.2%	141,602	71.7%
June 2012	374,611	8.0%	275,938	112.0%
<b>thereof banks in other countries</b>				
Dec 2009	619,066	5.4%	95,104	38.2%
Dec 2010	716,576	5.6%	108,865	32.2%
Oct 2011	691,478	4.6%	105,092	23.1%
Dec 2011	658,167	5.3%	99,939	36.2%
June 2012	705,851	5.6%	110,550	28.2%

## EBA risk weights for computation of sovereign subsidy

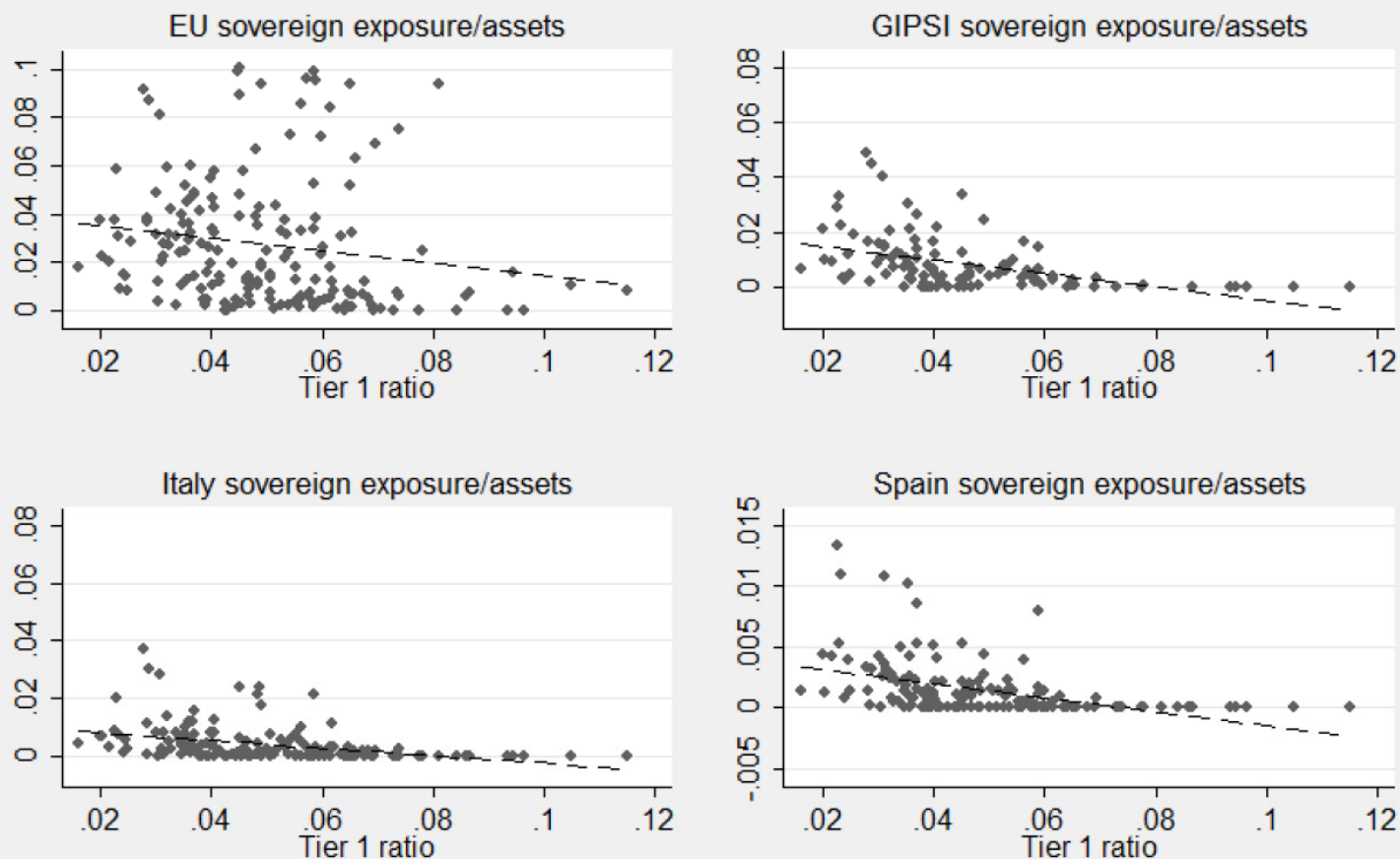
S&P rating	Moody's rating	Fitch rating	EBA PD	Adequate risk weight
AAA	Aaa	AAA	0.03%	0.144
AA+	Aa1	AA+	0.03%	0.144
AA	Aa2	AA	0.03%	0.144
AA-	Aa3	AA-	0.03%	0.144
A+	A1	A+	0.26%	0.505
A	A2	A	0.26%	0.505
A-	A3	A-	0.26%	0.505
BBB+	Baa1	BBB+	0.64%	0.776
BBB	Baa2	BBB	0.64%	0.776
BBB-	Baa3	BBB-	0.64%	0.776
BB+	Ba1	BB+	2.67%	1.244
BB	Ba2	BB	2.67%	1.244
BB-	Ba3	BB-	2.67%	1.244
B+	B1	B+	9.71%	1.910
B	B2	B	9.71%	1.910
B-	B3	B-	9.71%	1.910
CCC+	Caa1	CCC+	36.15%	2.451
CCC	Caa2	CCC	36.15%	2.451
CCC-	Caa3	CCC-	36.15%	2.451
CC	Ca	CC	36.15%	2.451
C	C	C	36.15%	2.451
D	C	D	100.00%	2.451

## Flight to quality? Banking sectors' non-domestic exposure over time (BIS)

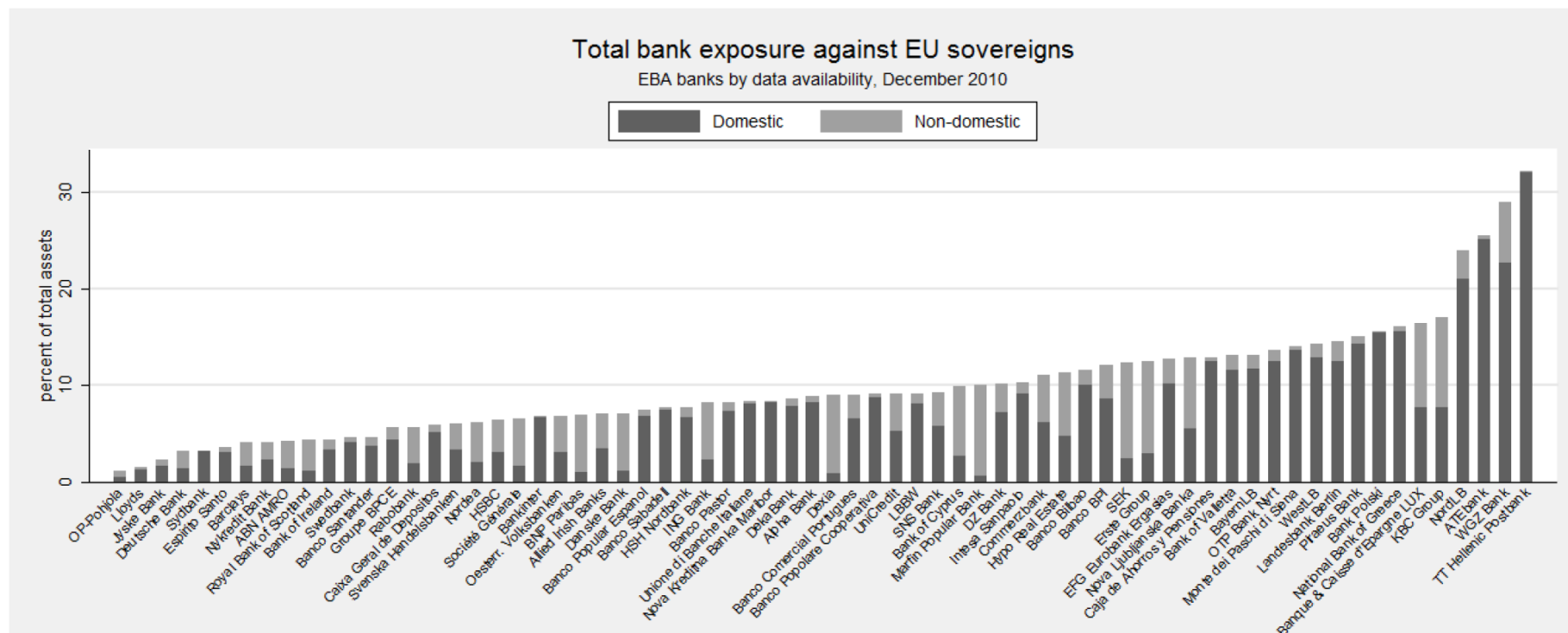


## Who holds the risky sovereign debt? Bank capitalization and non-domestic sovereign exposure (EBA)

### Non-domestic sovereign exposure by bank capitalization EBA banks, 2009-2011



## Banks' sovereign exposure (EBA)

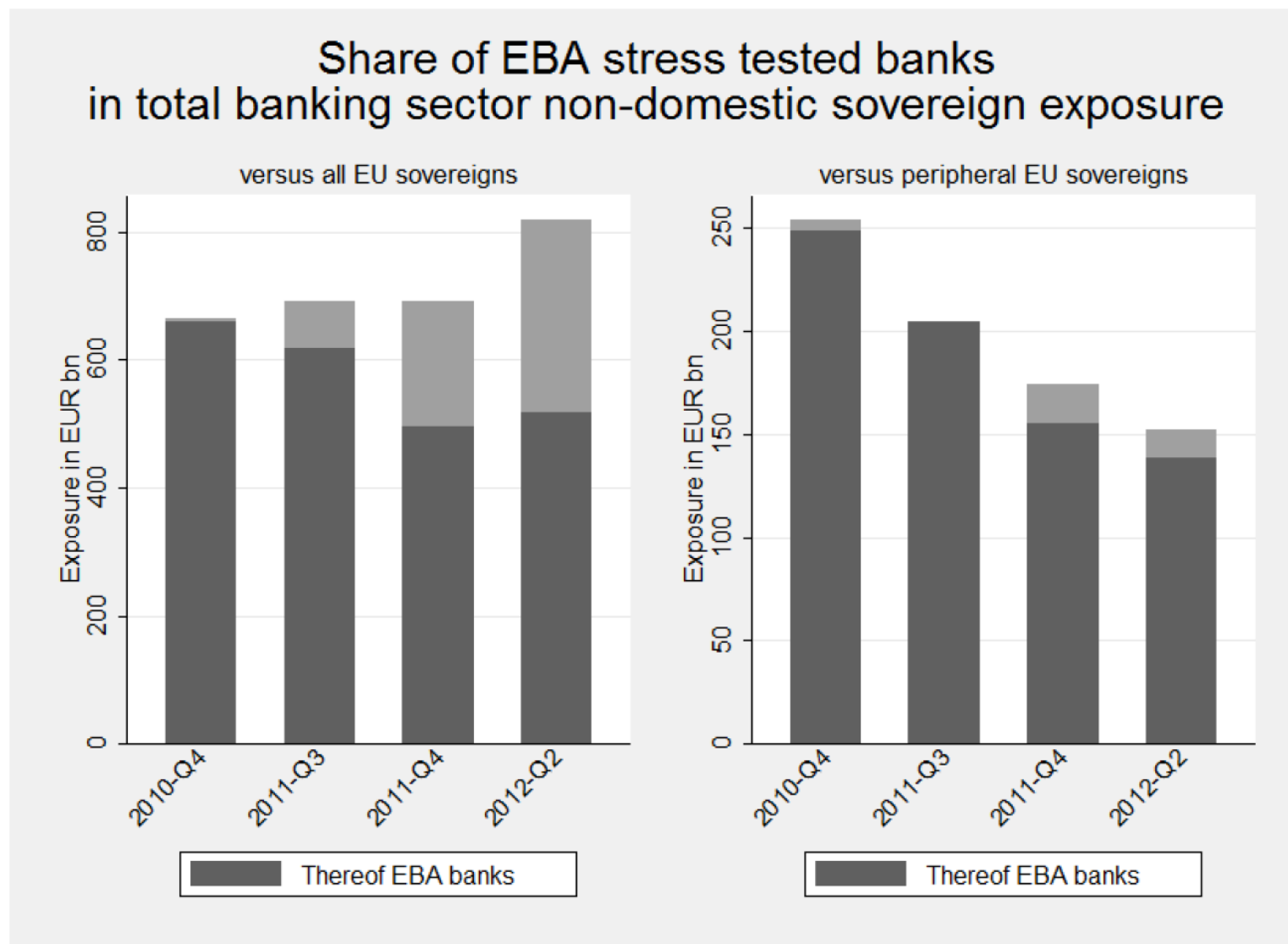




## Appendix: The EBA stress tests and capital exercise

Test	Release date and reporting date	Number of banks included	Countries included
Stress test 2010	23.07.2010, 31.12.2009	91	AT, BE, CY, DE, DK, ES, FI, FR, GR, HU, IE, IT, LU, MT, NL, PL, PT, SE, SI, UK
Stress test 2011	15.07.2011, 31.12.2010	90	AT, BE, CY, DE, DK, ES, FI, FR, GR, HU, IE, IT, LU, MT, NL, PL, PT, SE, SI, UK
Capital exercise	08.12.2011, 30.09.2011	65	AT, BE, CY, DE, DK, ES, FI, FR, HU, IE, IT, LU, MT, NL, PL, PT, SE, SI, UK
Capital exercise implementation report (1/2)	03.09.2012, 31.12.2011	62	AT, BE, CY, DE, DK, ES, FI, FR, HU, IE, IT, LU, MT, NL, PL, PT, SE, SI, UK
Capital exercise implementation report (2/2)	03.09.2012, 30.06.2012	62	AT, BE, CY, DE, DK, ES, FI, FR, HU, IE, IT, LU, MT, NL, PL, PT, SE, SI, UK

## Appendix: Relevance of EBA stress tested banks for total non-domestic sovereign exposure



## Appendix: Sovereign exposure and sovereign subsidy by bank (EBA)

Bank name	Domestic		Non-domestic	
	Sovereign exposure	Sovereign subsidy	Sovereign exposure	Sovereign subsidy
BNP Paribas	20,741	2,995	118,808	28,683
Societe Generale	19,272	2,783	55,366	18,465
Dexia	4,980	719	45,788	15,142
Commerzbank	46,930	6,777	36,546	12,993
KBC Group	24,617	3,555	30,099	12,972
Erste Group Bank	5,964	861	19,739	12,841
HSBC	56,417	8,147	60,679	12,752
ING Bank	22,210	3,207	53,995	12,597
Royal Bank of Scotland	19,575	2,827	54,149	10,768
UniCredit	49,071	12,902	36,243	10,263
Barclays	29,022	4,191	42,109	8,420
Deutsche Bank	26,861	3,879	33,862	8,323
Credit Agricole	32,176	4,646	25,054	6,331
Raiffeisen Bank International	7,165	1,035	10,248	6,035
Hypo Real Estate	15,788	2,280	21,208	5,150
SEB	6,044	873	23,890	4,627
Groupe BPCE	46,073	6,653	13,173	4,562
Rabobank	12,974	1,873	24,041	4,345
Danske Bank	4,971	718	25,783	4,145
Nordea	12,333	1,781	23,231	3,969
Marfin Popular Bank	285	75	4,003	3,928
Intesa Sanpaolo	60,152	15,816	7,326	3,641
DZ Bank	27,511	3,973	11,650	3,391
Banco Santander	46,019	6,645	10,510	3,079
Bank of Cyprus	1,156	304	3,063	2,948
Bayerische Landesbank	36,969	5,338	4,572	2,226
BBVA	55,726	8,047	8,122	2,128

...

## We find banks' non-domestic EU sovereign exposures to increase sovereign risk spillovers – Channel partly closed after EBA capital exercise

### Hypothesis I: General effect

Sovereign risk spillovers take place through bank balance sheets, i.e., the **correlation between sovereign risk** in the EU is **increasing in domestic banks' exposures to non-domestic sovereigns**



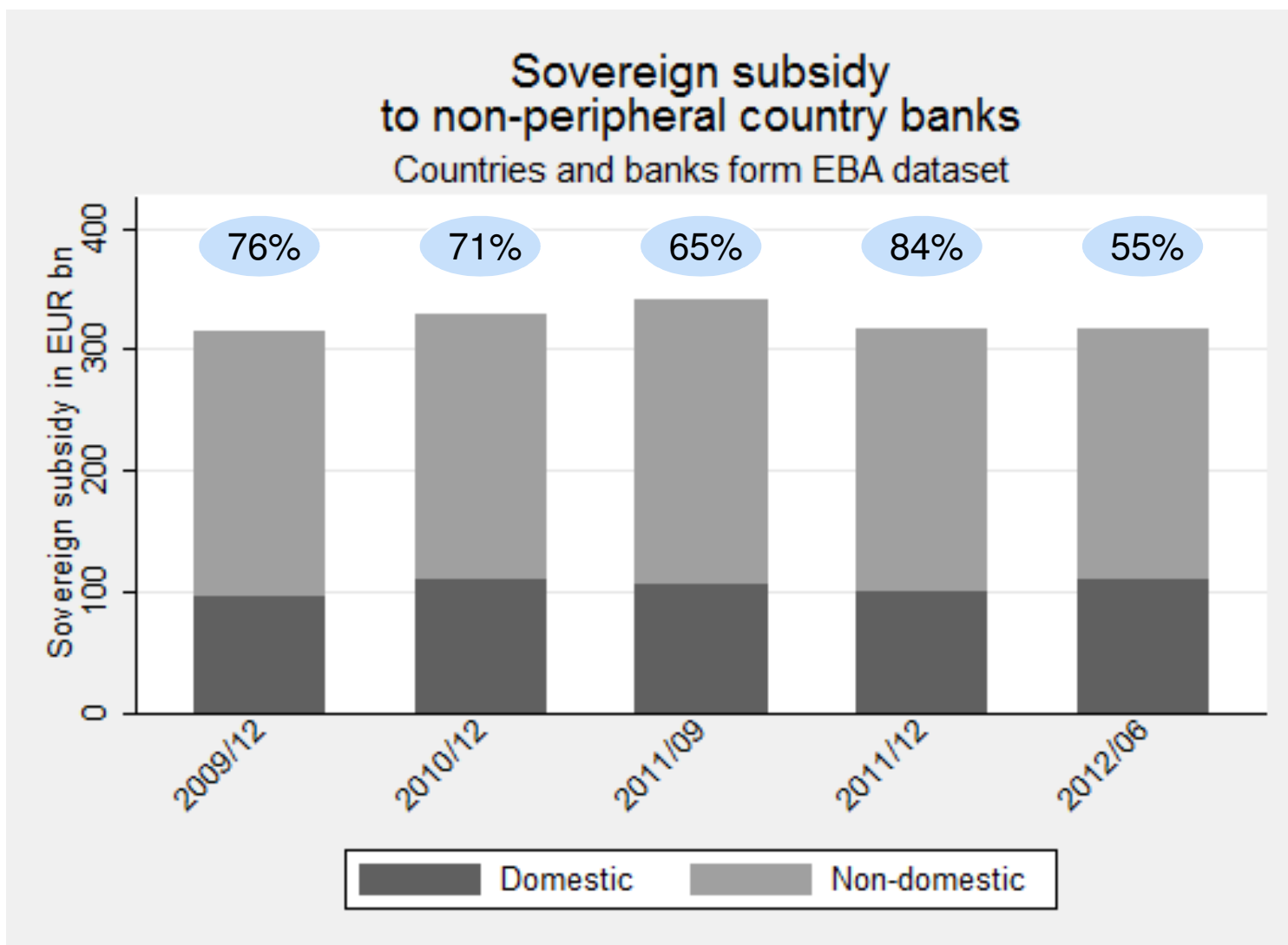
### Hypothesis II: Effect after policy change

The **effect should decrease** significantly (or vanish) **after the de facto change in regulatory treatment of sovereign debt** introduced by the EBA capital exercise



## Sovereign exposures and sovereign subsidy – High significance for banks<sup>1</sup> ...

...% Avg. percent of  
core tier 1 capital



<sup>1</sup> Here: Only EBA banks from non-peripheral countries (ex ES, GR, IE, IT, PT)

## Sovereign exposures and sovereign subsidy – .... high significance for banks in peripheral countries<sup>1</sup> ...

...% Avg. percent of  
core tier 1 capital

