Supranational Banking Supervision, Credit Supply and Risk-Taking: European Evidence from Multi-Country Credit Registers

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What do we do

- ☐ The role of centralised vs. country-level banking supervision
 - ✓ Impact on credit supply and risk taking
 - ✓ Associated mechanisms
 - Supervisory ability/resources
 - > Supervisory incentives: bank size, borrower employment
 - > Overall quality of institutions: governance, insolvency framework
- ☐ Using multiple credit registers
 - ✓ Crucial for identification of channels and external validity

Literature

Banking supervision: Centralized vs. local

Agarwal-Lucca-Seru-Trebbi (2014); Bonfim-Cerqueiro-Degryse-Ongena (2022); Granja-Leuz (2017); Kandrac-Schlusche (2019); Calzolari-Colliard-Loranth (2019)

➤ All questions using single credit registers

Mian, 2006; Khwaja and Mian, 2008; Paravisini, 2008; Amiti and Weinstein, 2011

Contribution

- ✓ Centralized vs. local supervision affects subsequent credit supply/risk-taking
- ✓ Underlying mechanisms: (i) Supervisory ability/resources, (ii) Supervisory incentives, (iii) institutional quality
- ✓ First findings on cross-country heterogeneity using multiple credit registers: crucial to identify channels and for external validity

The dataset

Time and Country coverage

Sample size

- ✓ T: June 2012 December 2017
- ✓ N: 15 Credit Registers

15 Credit Registers

- ✓ AT, BE, CZ, DE, ES, IE, IT, RO, SI, FR, LT, LV, MT, PT, SK
- Stressed vs. non-stressed countries
- ✓ Non euro area countries
- ✓ Important event: November 2014 ECB supervisor for some euro area banks, and not for non-euro area banks

Variables

Measures of loan exposure

Loan (bank, firm) identifiers

Type of exposure (loans, debt securities)

Credit commitment or drawn (value of the loan)

Credit lines (the value of credit undrawn)

Credit risk variables

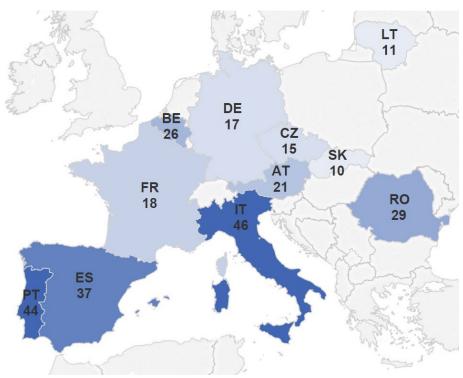
Collateral type (yes, no)
Arrears (part of the loan that is past due)
Prob. of default (between 0 and 1)
Non-performing status

Borrower attributes

Country of residence
Institutional sector
Sector of economic activity
Size

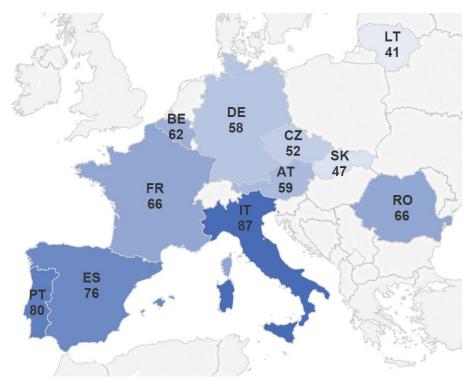
The dataset

Share of firms with multiple bank relationships (% of total borrowers)



Notes: for each country, the chart shows the share of non-financial corporations with multiple bank relationships as share of total borrowers.

Share of firms with multiple bank relationships (% of total exposure)



Notes: for each country, the chart shows the share of non-financial corporations with multiple bank relationships as share of total exposure.

- ✓ firm-time (ft), firm-bank (fb), and bank-time (bt) FE or
- ✓ sector-time (st) (or sector-country-size-time), firm-bank (fb), and bank-time (bt) FE

$$\mathsf{Loans}_{b,s,f,t} = \alpha^{\mathsf{FE}} + \delta \mathsf{Sup}_{b,t-1} + \theta \mathsf{High-Risk} \ \mathsf{Firm}_{f,t-1} + \textcolor{red}{\lambda} \Big(\mathsf{High-Risk} \ \mathsf{Firm}_{f,t-1} \times \mathsf{Sup}_{b,t-1} \Big) + \epsilon_{b,s,f,t} \\$$

$$\label{eq:high-RiskFirm} \begin{aligned} \text{High-Risk Firm}_{\text{f,t-1}} = \begin{bmatrix} & \text{Arrears}/Exposure \\ Return \ on \ assets - ROA \\ Sales - to - employee \ ratio \\ & z - score \\ & Zombie \ firms \end{aligned}$$

$$Sup_{b,t} = \begin{cases} 1 & \text{if b is centrally supervised at period t} \\ 0 & \text{otherwise} \end{cases}$$

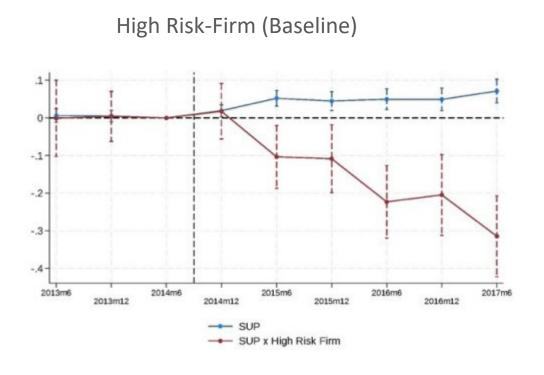
Hypothesis to test

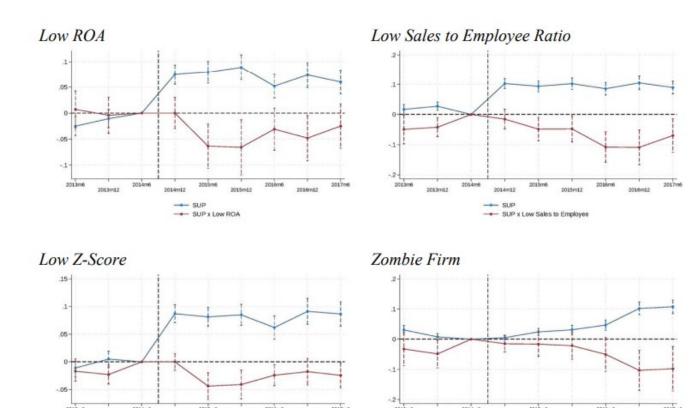
 $\lambda < 0$: once a bank becomes centrally (SSM/ECB) supervised, it provides less credit to riskier borrowers

		Cr	edit			
	Stressed	Countries	Non-Stressed Countries			
	(1)	(2)	(3)	(4)		
Sup _{b,t-1}	0.0532***	0.07956***	-0.0601***	-0.091***		
	(0.0053)	(0.0066)	(0.0071)	(0.0101)		
High-Risk Firmf,t-1	0.0591***		0.0324*			
	(0.0126)		(0.0182)			
Sup _{b,t-1} x High-	-0.2620***	-0.1337***	-0.2107***	-0.0294		
Risk Firm _{f,t-1}	(0.0151)	(0.0250)	(0.0186)	(0.0323)		
Bank-Firm FE	Yes	Yes	Yes	Yes		
Sector-Time FE	Yes	-	Yes	-		
Firm-Time FE	No	Yes	No	Yes		
N	40,621,335	30,660,006	6,788,681	3,567,331		
Pseudo R ²	0.955	0.960	0.948	0.960		

Notes: This table reports regressions that relate bank lending to firms, centralized supervision and borrower riskiness. The dependent variable is total credit granted by bank b to firm f at time t. Sup (Supranational supervision) is a dummy variable that takes the value of one for banks supervised at supranational level (i.e., directly by the ECB) after November 2014, and zero otherwise. High-risk firm indicates, for each borrower, the ratio of exposures in arrears and total exposures. Poisson regressions are used to the estimate the models. Standard errors clustered at bank and firm level in parentheses: * p<0.1, ** p<0.05, *** p<0.01.

Panel (a): Stressed Countries





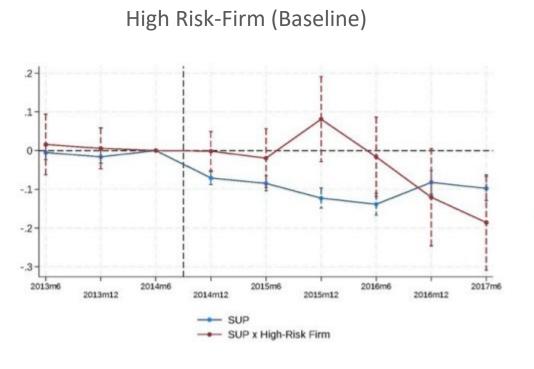
- SUP

→ SUP x low Z-score

- SUP

- SUP x Zombie Firm

Panel (b): Non-stressed Countries





- SUP x low Z-score

SUP x Zombie Firm

Robustness – maximising comparability

	Cı	redit	Credit			
	(Sample of 6 ba	(Sample of 6 banks per country)		(harmonized to the highest reporting credit register threshold)		
	Stressed	Non-Stressed	Stressed	Non-Stressed		
	Countries	Countries	Countries	Countries		
Sup _{b,t-1}	0.0656***	0.0630***	0.0528***	-0.0677***		
-	(0.0168)	(0.0222)	(0.00935)	(0.0102)		
Sup _{b,t-1} x High-Risk	-0.207***	-0.0823	-0.112***	0.0104		
Firm _{f,t-1}	(0.0395)	(0.148)	(0.0334)	(0.0250)		
Bank-Firm FE	Yes	Yes	Yes	Yes		
Firm-Time FE	Yes	Yes	Yes	Yes		
N	1,355,265	185,172	1,852,335	678,839		
Pseudo R ²	0.975	0.976	0.976	0.969		
Sample	Restricted	Restricted	Harmonized at	Harmonized at		
	for 6 banks	for 6 banks	EUR 1,000,000	EUR 1,000,000		

Notes: This table reports the results of the variants of the analysis of bank lending to firms, centralized supervision and borrower quality. The dependent variable is the total credit granted by bank b to firm f at time t. Columns (1) and (2) present the coefficients using the restricted sample of banks around the threshold of supranational supervision, i.e., for each country, it includes the three smallest centrally supervised banks and the three largest non-centrally supervised banks. Columns (3) and (4) report the coefficient estimates using only total credit above the EUR 1,000,000 threshold, which is the threshold of the credit register of most restrictive credit register (Germany). In all specifications, Sup is a dummy variable that takes the value of one for banks supervised at supranational level after November 2014, and zero otherwise. High-Risk Firm indicates, for each borrower, the ratio of exposures in arrears and total exposures. Poisson regressions are used to the estimate the models. Standard errors clustered at bank and firm level in parentheses: * p<0.1, ** p<0.05, *** p<0.01.

Mechanism: Supervisory ability/resources

_		Credit	
Low ability proxy:		cuparticant	
	Education	supervisory Training	Examiner Ratio
-	(1)	(2)	(3)
Sup _{b,t-1}	-0.0273***	0.0587***	-0.0541***
	(0.00670)	(0.00600)	(0.00859)
Sup _{b,t-1} x High-Risk Firm _{f,t-1}	-0.0640***	-0.139***	-0.0149
Supu,er a ringa rasar rami,er	(0.0213)	(0.0201)	(0.0234)
Sup _{b,t-1} x Proxy _c	0.183***	0.0674***	0.0899***
	(0.0125)	(0.00608)	(0.00727)
Sup _{b,t-1} x High-Risk Firm _{f,t-1} x Proxy _c	-0.0918*	-0.0422**	-0.0826***
	(0.0472)	(0.0170)	(0.0292)
Bank-Firm FE	Yes	Yes	Yes
Firm-Time FE	Yes	Yes	Yes
N	34,227,337	31,902,798	34,078,991
Pseudo R ²	0.968	0.968	0.968

Notes: This table reports the results of the analysis on the role of the ability of supervisory ability on the effect of supranational supervision on bank credit supply. The dependent variable is the total credit granted by bank b to firm f at time t. Sup is a dummy variable that takes the value of one for banks supervised at supranational level after November 2014, and zero otherwise. High-Risk Firm indicates, for each borrower, the ratio between exposures in arrears and total exposures. The proxies for the country-level ability and human capital of regulators are based on 2019 Bank Regulation and Supervision Survey (BRSS) which covers the period of 2011–2016 and include: a ratio of supervisors with post-graduate degrees (MBA, CPA, CFA, etc.) in Column (1), hours of training at the regulatory agency in Column (2), and the share of the number of bank supervisors to the number of banks in each country in Column (3). The proxies are standardized and inverted (higher values reflect lower ability of supervisors). Poisson regressions are used to the estimate the models. Standard errors clustered at bank and firm level in parentheses: * p<0.1, ** p<0.05, *** p<0.01.

Mechanism: Supervisor incentives – largest banks

			Cred	lit				
	Stressed Countries			Non-	Non-Stressed Countries			
	(1)	(2)	(3)	(4)	(5)	(6)		
Sup _{b,t-1}	0.0513***	0.0813***		-0.043***	-0.0610***			
	(0.0056)	(0.0070)		(0.0071)	(0.0101)			
High-Risk Firm _{f,t-1}	0.0457***			0.0378**				
	(0.0125)			(0.0155)				
Sup _{b,t-1} x High-	-0.2424***	-0.1242***	-0.0716***	-0.224***	-0.0740**	-0.0745**		
Risk Firm _{f,t-1}	(0.0163)	(0.0256)	(0.0234)	(0.0182)	(0.0329)	(0.0335)		
Sup _{b,t-1} x	0.0102	-0.006		-0.1725***	-0.3952***			
GSIB _{b,t-1}	(0.0136)	(0.0102)		(0.0250)	(0.0306)			
Sup _{b,t-1} x High- Risk Firm _{f,t-1} x	-0.2147*** (0.0399)	-0.2466*** (0.0394)	-0.1261*** (0.0442)	0.1363 (0.0970)	0.4060* (0.218)	0.3202 (0.2035)		
GSIB _{b,t-1}								
Bank-Firm FE	Yes	Yes	Yes	Yes	Yes	Yes		
Sector-Time FE	Yes	-	-	Yes	-	-		
Firm-Time FE	No	Yes	Yes	No	Yes	Yes		
Bank-Time FE	No	No	Yes	No	No	Yes		
N	40,621,335	30,660,006	30,660,006	6,788,681	3,567,331	3,567,327		
Pseudo R ²	0.955	0.967	0.969	0.948	0.964	0.955		

Notes: This table reports the results of the analysis on the role of the bank-level incentives on the effect of supranational supervision on bank credit supply. The dependent variable is total credit granted by bank b to firm f at time t. Sup is a dummy variable that takes the value of one for banks supervised at supranational level after November 2014, and zero otherwise. High-Risk Firm indicates, for each borrower, the ratio between exposures in arrears and total exposures. GSIB is a dummy variable that takes the value of one if the bank belongs to the globally systemically important banks, and zero otherwise. Robustness exercises show that the results are robust to different cut-offs for bank size. Poisson regressions are used to the estimate the models. Standard errors clustered at bank and firm level in parentheses: * p<0.1, ** p<0.05, *** p<0.01.

Mechanism: Supervisor incentives – borrower employment

	Credit							
	Large empl	oyment share	Small employment share		Large employment share		Small employment share	
	Stressed	Non-stressed	Stressed	Non-stressed	Stressed	Non-stressed	Stressed	Non-stressed
	Countries	Countries	Countries	Countries	Countries	Countries	Countries	Countries
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
$Sup_{b,t-1}$	0.0788***	-0.0702***	0.0831***	-0.113***	0.0868***	-0.0384***	0.0813***	-0.0880***
	(0.00595)	(0.0134)	(0.00946)	(0.0158)	(0.00635)	(0.0138)	(0.00989)	(0.0156)
Sup _{b,t-1} x High-Risk Firm _{f,t-1}	-0.215***	-0.107**	-0.110***	0.0127	-0.197***	-0.143***	-0.101***	-0.0300
	(0.0285)	(0.0464)	(0.0334)	(0.0469)	(0.0290)	(0.0473)	(0.0341)	(0.0473)
Sup _{b,t-1} x GSIB _{b,t-1}					-0.0361***	-0.316***	0.0108	-0.431***
•					(0.0117)	(0.0333)	(0.0136)	(0.0514)
GSIB b,t-1 x High-Risk Firmf,t-1					0.177***	-0.0654	0.275***	0.655
,,,,					(0.0354)	(0.154)	(0.0595)	(0.530)
Sup _{b,t-1} x GSIB _{b,t-1}					-0.353***	0.374***	-0.234***	0.401
x High-Risk Firm _{f,t-1}					(0.0421)	(0.116)	(0.0491)	(0.326)
Bank-Firm FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firm-Time FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
N	14,423,214	1,624,824	15,949,189	1,835,723	14,411,579	1,624,824	15,961,048	1,835,723
\mathbb{R}^2	0.957	0.961	0.970	0.967	0.957	0.961	0.970	0.967

Notes: This table reports the results of the analysis on the role of the supervisor incentives on the effect of supranational supervision on bank credit supply. The dependent variable is the total credit granted by bank b to firm f at time t. Sup is a dummy variable that takes the value of one for banks supervised at supranational level after November 2014, and zero otherwise. High-Risk Firm indicates, for each borrower, the ratio between exposures in arrears and total exposures. GSIB is a dummy variable that takes the value of one if the bank belongs to the globally systemically important banks, and zero otherwise. Columns (1) - (2) and (5) - (6) present the results using the sample of firms that belong to industries (NACE-2 level) with the large (above median) employment share in country c at time t. Poisson regressions are used to the estimate the models. Standard errors clustered at bank and firm level in parentheses: * p<0.1, ** p<0.05, *** p<0.01.

Mechanism: Institutional quality – governance

	Credit					
Proxy:	Weaker	Lower	Lower rule	Higher		
	control of	regulatory	of law	regional		
	corruption	quality		corruption		
	(1)	(2)	(3)	(4)		
Sup _{b,t-1}	-0.00423	-0.000404	-0.0145**	0.0492***		
	(0.00593)	(0.00588)	(0.00616)	(0.00460)		
Sup _{b,t-1} x High-Risk Firm _{f,t-1}	-0.0577***	-0.0776***	-0.0513***	-0.0741***		
1 -	(0.0198)	(0.0200)	(0.0199)	(0.0259)		
Sup _{b,t-1} x Proxy _{c/i}	0.0695***	0.0632***	0.0670***	-0.00535		
	(0.00498)	(0.00441)	(0.00480)	(0.00479)		
Sup _{b,t-1} x High-Risk Firm _{f,t-1}	-0.0451**	-0.0415***	-0.0425**	-0.0742**		
x Proxy _{c/i}	(0.0205)	(0.0152)	(0.0201)	(0.0331)		
Bank-Firm FE	Yes	Yes	Yes	Yes		
Firm-Time FE	Yes	Yes	Yes	Yes		
N	34,227,337	34,227,337	34,227,337	3,997,120		
Pseudo R ²	0.968	0.968	0.968	0.933		

Notes: This table reports the results of the analysis on the role of governance on the effect of centralized supervision on bank credit supply. The dependent variable is the total credit granted by bank b to firm f at time t. Sup is a dummy variable that takes the value of one for banks supervised at supranational level after November 2014, and zero otherwise. High-risk firm indicates, for each borrower, the ratio between exposures in arrears and total exposures. Columns (1) – (3) present the results of ex-ante country-level corruption and governance variables based on 2012 World Bank WGI report. Regional corruption is based on 2013 EQI dataset and is reported at NUTS-2 region. The variables are standardized and inverted (higher values reflect lower quality of governance). Poisson regressions are used to the estimate the models. Standard errors clustered at bank and firm level in parentheses: * p<0.1, ** p<0.05, *** p<0.05.

Mechanism: Institutional quality – Insolvency regime

			Cre	dit		
	High-Risk Firm		Zombi	e Firm	Zombie Firm (firms without loans in arrears)	
Insolvency proxy: (worse for higher value)	Insolvency score	Recovery rate score	Insolvency score	Recovery rate score	Insolvency score	Recovery rate score
,	(1)	(2)	(3)	(4)	(5)	(6)
Sup _{b,t-1}	0.0996*** (0.00736)	0.0446*** (0.00570)	0.0624*** (0.0109)	0.0264*** (0.00954)	0.0714*** (0.0141)	0.0326*** (0.00970)
Sup _{b,t-1} x Insolvency Proxy _{c,t-1}	0.143*** (0.0101)	0.122*** (0.00884)	0.103*** (0.0278)	0.0890*** (0.0233)	0.113*** (0.0344)	0.105*** (0.0295)
Sup _{b,t-1} x High-Risk Firm _{f,t-1}	-0.126*** (0.0315)	-0.107*** (0.0225)				
Sup _{b,t-1} x High-Risk Firm _{f,t-1} x Insolvency Proxy	-0.0680* (0.0357)	-0.0972*** (0.0321)				
Sup _{b,t-1} x Zombie Firm _{f,t-1}			-0.0433*** (0.0160)	0.00375 (0.0151)	-0.0540*** (0.0178)	-0.00189 (0.0150)
Sup _{b,t-1} x Zombie Firm _{f,t-1} x Insolvency Proxy _{c,t-1}			-0.123*** (0.0436)	-0.104*** (0.0391)	-0.135*** (0.0506)	-0.120*** (0.0457)
Bank-Firm FE	Yes	Yes	Yes	Yes	Yes	Yes
Firm-Time FE	Yes	Yes	Yes	Yes	Yes	Yes
N Pseudo R ²	34,227,337 0.968	34,227,337 0.968	2,3029,06 0.958	2,302,906 0.958	1,902,932 0.958	1,902,932 0.958

Conclusions

☐ Centralised supervision tends to reduce bank-risk taking

- ☐ Associated mechanisms
 - Supervisory ability/resources
 - > Supervisory incentives: bank size, borrower employment
 - > Overall quality of institutions: governance, insolvency framework