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Abstract

We study the relationship between banks' size and risk-taking in the context of supranational banking supervision. Consistently with theoretical work on banking unions and in contrast to analyses emphasising incentives underpinned by the too-big-to-fail effect, we find an inverse relationship between banks' size and non-performing loan growth for a sample of European banks. Evidence is provided that the mechanism operates through the enhanced organisational efficiency of the supranational set-up rather than incentives alignment among the supervisors and the banks.

Keywords: Supervision, euro area, non-performing loans, banking union, too-big-to-fail

1. Introduction

During the first half of the last decade, the sovereign-bank nexus sparked a number of financial and economic crises in European countries, leading to substantial welfare costs. In most cases (Ireland, Spain, Cyprus, Portugal) the realisation of risks in the banking sector was transmitted subsequently to the sovereign creditworthiness, requiring sizeable financial assistance programmes.[1] The European Union has responded with extended institution-building to address the vulnerability posed by the interlinkages between banks and sovereigns. The Single Supervisory Mechanism (SSM) was inaugurated in 2014 and entails the centralised supervision of the largest

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[1] Greece was a case where the opposite direction of transmission was dominant.

European banks by the European Central Bank (ECB). The SSM represents the first pillar of a European banking union and aims to address the transmission channel moving from ailing banks towards their home sovereigns.

The literature on the channels through which supervision by a supranational authority could address the sovereign-bank loop within a monetary union is scarce. According to Farhi and Tirole (2018), the centralisation of banking supervision represents an optimal policy response that decouples banks' risk taking incentives from the expectation of foreign assistance towards a sovereign that will embark on the bailout of its banks. As a corollary, centralised supervision is expected to be 'tougher' compared to the supervision exercised by the national supervisors, leading to lower risk-taking on the part of banks that can have systemic impact. Altavilla et al. (2020) identify the enhanced organisational capacity and the presence of scale economies as the main reason behind the effectiveness of centralised supervision to limit banks' risk taking. According to this argument, the cause of lower risk-taking on the part of the banks does not lie with the supervisors' incentives but with the efficiency of the centralised organisational structure. Both channels however would predict that the large banks which have come under the supervision of a supranational authority exhibit lower risk-taking compared to the banks which have remained under the supervision of their national authorities.

Large banks on the other hand are assumed to enjoy implicit government subsidies when tail risk materialises, enabling these institutions to undertake more risk compared to banks that are not systemically important (Gandhi and Lustig (2015)). Therefore, contrary to the previous hypotheses, the too-big-to-fail effect predicts that larger banks would tend to undertake more risk. Higher risk-taking by larger banks could also be due to the higher liquidity of large banks' bonds which compensates for increased credit risk. Both mechanisms predict that the largest banks, which in the euro area are supervised by the ECB, would engage in riskier activities compared to smaller banks.

In this paper, we test these contradicting predictions on the relationship between banks' size and their risk-taking behaviour as reflected in the non-performing loans (NPL) ratio.[2] We utilise the setting-up of the SSM in

[2]According to the supervisory banking statistics published by the ECB, credit risk represents consistently more than 80% of the total risk exposures of euro area banks.

2014 as a natural experiment whereby the significant institutions in each euro area country came under the direct supervision of the ECB while the remaining banks continued to be supervised by the national supervisors. To this purpose, we study the growth of non-performing loans (NPLs) from 2014 to 2019 focusing on the differences between the large and the small banks, in order to assess whether the centralisation or the size effect dominate. The smaller banks in the sample, which did not undergo a change in their direct supervisor, provide a benchmark against which the risk of the larger banks, which underwent a supervisory regime change, is to be assessed.

2. Data and empirical methodology

2.1. Data

We utilise a dataset with the largest $N = 270$ banks operating in the euro area[3] and examine how banks' credit risk evolved starting from the centralisation of supervision in 2014 until 2019, i.e. the period following the severe stress which engulfed a number of euro area countries. This period mainly featured the efforts of banks to clean their balance sheets from NPLs that had been accumulated during the peak of the crisis.

Following the SSM regulation, the 'Significant institutions' (SIs),[4] of the participating member states are supervised directly by the ECB. The remaining banks are characterised as 'Less significant institutions' (LSIs) and remain under national supervision.

The data are harmonised across countries, following common risk and solvency definitions.[5] This is especially important when conducting cross-country analyses on NPLs, as the definitions generally differ across jurisdictions.

During the period examined, the NPL ratio of the euro area banks exhibits overall a clear downward trend. According to ECB data, the NPL ratio for the total euro area stood at 8.1% in end-2014 and stood equal to 3.3% at the end of our sample in 2019. The same trend can be observed in our sample of banks, both for the SIs and the LSIs (Table 1), however the downward

[3]During the period examined the euro area coincided with the countries participating in the SSM.

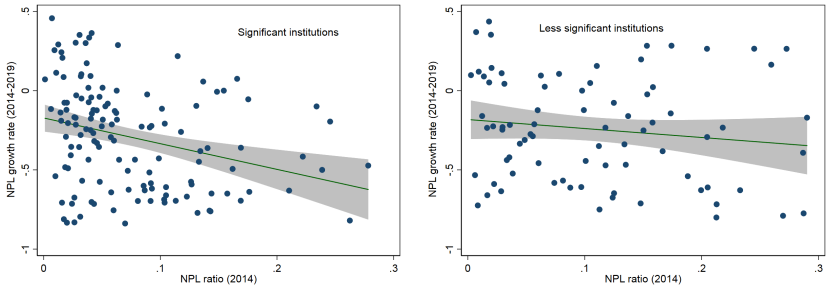
[4]Based on features such as their size and interconnectedness.

[5]Due to the EU-wide regulation framework, this applies also to the smaller banks whose supervision remains a national responsibility.

trend is visibly stronger for the SIs. Fig. 1 plots NPL growth rate over the 2014-19 period with the NPL ratio of 2014. The SIs that started in 2014 with a high NPL ratio exhibited the largest risk reduction, while this relationship is weaker for the LSIs.

Table 1: Descriptive statistics. Reference date is end-2014 except where mentioned otherwise.

Variable	mean	st. dev	median	25th perc.	75th perc.
		SIs			
NPL ratio	0.07	0.06	0.05	0.03	0.10
NPL growth (2014-19)	-0.27	0.35	-0.25	-0.59	-0.05
Total assets (bn euros)	150.49	298.22	42.64	12.43	144.93
Observations	151				
		LSIs			
NPL ratio	0.09	0.08	0.06	0.02	0.14
NPL growth (2014-19)	-0.17	0.41	-0.23	-0.52	0.10
Total assets (bn euros)	5.76	6.99	2.63	1.15	8.04
Observations	119				



(a) Significant institutions (b) Less significant institutions

Figure 1: NPL growth (2014-2019) versus NPL ratio at 2014 for systemically important banks. 95% confidence intervals are shown.

2.2. Model specification

We model the growth rate of NPLs between 2014 and 2019 as a function of bank- and country-specific variables. The specification takes the following form:

$$y_j = \alpha + \beta X_{i(j)} + \gamma Y_j + \delta I(j) + \epsilon_j \quad (1)$$

where $X_{j(i)}$ refers to country-specific variables for bank j residing in country i, Y_j to bank-specific credit risk determinants, I(j) is an indicator for SI banks and ϵ_j is an error term. Macroeconomic developments are accounted for by the average GDP growth rate over the examined period (source: Eurostat). Country-specific fixed effects are used to account for institutional features of a country which may affect the NPL growth, such as borrower's protection. Leverage is used to account for the banks' loss-absorbing capacity. Relative size is measured by dividing the logarithm of a bank's total assets with the logarithm of the total assets of the largest bank in that country. We also use the logarithm of the total assets of each bank to refer to the absolute size of a bank.

3. Results

Table 2 presents the estimation results. The SI dummy is statistically significant and negative in Models 1 and 2, consistently with the centralisation hypothesis. When running the relative size (a variable which is correlated with the SI indicator) against the SI indicator, the effect is absorbed by the size variable (Model 3). The marginal effect of the supranational supervision in this specification is not statistically significant, as shown by the interaction term between the SI indicator and the relative size variable. The fact that the relative size rather than the SI indicator seems to be the critical variable, related negatively with risk reduction, seems to suggest that the effectiveness of supranational supervision works through the more efficient organisation of the supranational supervisor, rather than through incentives for tougher supervision compared to the national supervisors. This result is consistent with the findings of Altavilla et al. (2020). According to this estimation, a bank having total assets equal to 88% of the largest bank in its country (the mean in the sample) is expected to experience NPL growth which is higher by 0.21 (0.15) for an LSI (SI) compared to the largest bank in the same country, which is equivalent to a 0.56 (0.45) standard deviation difference. When the absolute size of the bank is used (Model 4) the negative relationship between size and NPLs holds both for SIs and LSIs. Model 5 uses only the LSI sample and confirms a statistically significant and negative relationship between NPL and relative size. Therefore, it seems that also the

Table 2: Estimation results

NPLs growth (2014-2019)	(All loans)					Household loans		NFC loans	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
GDP	-0.040**					-0.015		0.019	
	(0.017)					(0.014)		(0.044)	
Fixed effects[a]	No	Yes	Yes	Yes	Yes	No	Yes	No	Yes
NPL ratio	-1.102***	-0.833*	-0.544	-0.694*	-1.243*	-0.255	-0.420	-1.081**	-0.827***
	(0.362)	(0.424)	(0.374)	(0.361)	(0.577)	(0.354)	(0.439)	(0.462)	(0.247)
Leverage	-0.393	-0.739	-1.307*	-1.272**	-1.311**	-1.035*	-1.763***	-0.698	-1.065
	(0.575)	(0.636)	(0.630)	(0.577)	(0.575)	(0.527)	(0.508)	(1.128)	(0.811)
SI	-0.118**	-0.143**	-0.448	-2.214***					
	(0.0525)	(0.0525)	(0.637)	(0.375)					
Size[b]			-1.830**	-0.126***	-2.638***	-1.210***	-1.101**	-2.673*	-2.703**
			(0.750)	(0.018)	(0.794)	(0.334)	(0.430)	(1.485)	(1.015)
SI*Size[b]			0.509	0.0974***					
			(0.787)	(0.018)					
Constant	0.107	-0.287***	1.316**	2.575***	2.006**	1.005***	0.897**	2.487	2.138**
	(0.0839)	(0.0621)	(0.621)	(0.459)	(0.668)	(0.305)	(0.396)	(1.475)	(0.990)
Clustered residuals[a]	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Wald test	(4,216)= 5.05***	(3,17)= 4.50**	(5,17)= 24.41***	(5,17)= 27.18***	(3,13)= 19.04***	(4,17)= 5.41***	(3,17)= 11.17***	(4,17)= 2.98**	(3,17)= 4.14**
N	221	221	221	221	85	230	230	236	236
Adj. R^2	0.301	0.331	0.336	0.362	0.342	0.245	0.273	0.435	0.441

Standard errors in parentheses, * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

[a] Fixed effects and clustering of residuals refer to the country level.

[b] Size is relative size within the country, except from model (4) where the absolute size ln(assets) is used.

largest banks that remained under national supervision managed to achieve larger risk-reduction, potentially reflecting increased efficiency also at the national supervision level e.g. due to resources freed up at the country level.

As a further robustness test we run the same specification separately for household and non-financial corporation (NFCs) NPLs. The negative relationship between relative size and NPL growth still persists. According to Model 7 (9) a one-standard deviation increase in relative size would lead to a decrease in the household (NFC) NPL growth by a factor of 0.21 (0.26) standard deviations.

4. Conclusions

Overall, our results show that, in the aftermath of the euro area financial crisis and the setting up of a supranational supervisor, banks' size is negatively related to risk-taking. On average, larger banks tend to reduce their NPL ratios more compared to smaller banks after controlling for other country- and bank-specific factors. A supranational supervisor seems to be effective in reducing banks' risk-taking due to enhanced organisational capacity rather than through incentive alignment of banks with the supervisors. Future research could analyse whether risk reduction can be observed also in other dimensions e.g. as regards the extent of the home bias in the banks' sovereign bond holdings.

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