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THE IMPACT OF STATE LOANS POLICY ON BANK STABILITY

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Abstract *The banking crisis has demonstrated the weakness of regulatory and countries' institutional authorities in responding and resolving banking sector problems. Many decisions regarding intervention in the banking sector were made too late,and many such decisions were rushed, without proper evaluation of the effectiveness of the chosen mechanisms and their potential consequences for the banking sector (Hoshi, T. and Kashyap, A.K. 2010). Recent findings show that government rescue measures results in only a small proportion of bank recoveries. Our paper examines the effectiveness of the state loan policy adopted during the global financial crisis on bank stability. We combine unique bank-level data of 85 European banking institutions and cross-country data in order to estimate the impact of this state measure on the banking sector stability. Our empirical results are correlated with an existing theoretical model from the literature (Dietrich, D., Hauck, A,. (2012),) and reflect a significant negative influence of state loan policy measure on bank stability.*

Key words:

policy rescue measures, state loan, banking sector stability, banking crisis

JEL Codes:

C23,G18, G21

1. Introduction

In order to maintain banking stability, governments implemented a series of policies at the national level taking the form of guarantees, state loans, acquisitions of toxic assets and nationalizations. It is estimated that all these rescue measures were above 3 trillion Euros in the European Union area (Petrovic,A., Tutsch, R., (2009)). We provide a framework that assesses the relationship between state loan and banking stability.

The academic literature presents mixed evidence regarding the effects of various rescue measures on banking activity: Cordella, T., Yeyati, E.L., (2003), Corsetti, G., Guimaraes, B., Roubini, (2006) and Martin A., (2006), Berger, A.N., Bouwman, C.H., Kick, T., Schaeck, K., (2011), Duchin, R., Sosyura, D., (2012), Mehran, H., Thakor, A., (2011), Black, L., Hazelwood, L., (2012), Harris, O., Huerta, D., Ngo, T., (2013), Philippon, T., Schnabl, P., (2013),(Hryckiewicz A., (2014).

Our paper contributes significantly to this strand of literature in several ways. First, we use a large and unique sample that consists of 85 banking institutions from 10 European countries. They account for about 18,37% of the total European banking system assets within this area at the beginning of the economic crisis. Second, we explore a large set of bank-level, macroeconomic and market structure variables over the period 2009-2013. The bank-level data consists of quarterly balance sheet items.

The remainder of the paper is organized as follows: Section 2 describes data and the methodology; Section 3 presents the empirical results; finally, section 4 provides policy implications and conclusions.

2. Data analysis and Methodology

2.1. Data analysis

We analyze the impact of various bailout programs in the European banking sector through a sample that consists of 85 European banks. Their assets total 18,37%% from the total assets of the European banking sector at the end of 2007. They represent 10 high-income European states: Germany, Denmark, Finland, Greece, Hungary, Italy, Poland, Portugal, Spain and Sweeden (Table 1). We focus just on active banks from high-income OECD members because they represent the most important players in the European banking sector. Time span observed is 20 quarters (q12009-q42013).

Table 1. The distribution of banks

Country	No of banks analyzed	% TA sample / TA banking system for large banks
Germany	4	6.30%
Denmark	12	1,21%
Finland	3	-
Greece	8	-
Hungary	1	-
Italy	18	4,44%
Poland	12	-
Portugal	4	-
Spain	4	3,99%
Sweden	4	2,43%
Total	**85**	**18,37%**

Source: *own calculations based on Worldscope data for Total Assets of our sample (TA sample) and European Central Bank data for Total Assets of the banking system (TA banking system) at the the end of 2007.*

We exclude banks that have more than 75% of the quarterly balance sheet data unavailable. These institutions are analyzed after the interventions of the governments in the banking sector, during the period q12009-q42013.

The main independent variables is represented by state loan policy taken by governments in country j (*State loans policy*$_{j,t-1}$). This policy instrument is described in Table 2 and 3. The aim of government interventions is to restore a bank's financial condition and prevent bankruptcies. Analyzing this rescue measure we'll provide answers to the question of how effective the state loan was to alleviate the bank's distress, and thus limit the probability of the bank's future collapse.

Table 2. State loan measure taken by the European member states in the banking sector

Countries	State Loans
Denmark	✓
Finland	✓
Germany	
Greece	✓
Hungary	✓
Italy	
Poland	
Portugal	
Spain	
Sweden	

Source: *Petrovic and Tutsch, 2009. European Central Bank Legal Working Paper Series No 8 / July 2009.*

The bank-level variables (*Bank controls*$_{ij,t-1}$) include bank size, net loans to total assets ratio, net loans to total deposits ratio, return on equity and liquidity ratio. As macroeconomic (*Macro controls*$_{j,t-1}$) controls, we use GDP growth, inflation rate, government debt ratio and unemployment rate. As market structure variables (*Market controls*$_{j,t-1}$), we use Lerner concentration and a herding measure. We also use a dummy for Euro countries and a financial crisis dummy. A description of these variables is provided in Table 4. All explanatory variables are lagged one period in order to control for the speed of adjustment of the systemic risk indicators. $\varepsilon_{ij,t}$ is an *iid* error term specific to bank i from country j in year t.

The bank size is especially important because it allows us to distinguish between risk effects stemming from diversification and those associated with government bailout (Gropp, R., Hakenes, H., Schnabel, I., (2011)), (Andries, Mutu and Ursu, (2014)). We use the ratio of loans-to-total assets because it allows us to control for the different attitudes of various banking groups toward lending. On the one hand, a higher loan ratio might indicate higher risk-taking by banks and lower stability, but on the other hand, De Jonghe (2010) documents that banks more heavily involved in traditional banking activities tend to take on less risk than those more heavily involved in non-traditional activities. Therefore, we expect a positive influence of credit activity level on z-score. Additionally, we use the ratio of net loans-to-total deposits to control for maturity mismatch level. A higher loans-to-deposits ratio might indicate higher risk-taking by banks and lower stability.

In the robustness analysis, we also include additional bank characteristics that may influence our risk measure. We include a bank's profitability ratio, measured as net interest income to common shareholders equity (roe), and a liquidity ratio, defined as liquid assets to total assets. These variables allow us to partially control for the differential magnitude of financial shocks affecting different banking systems. We expect a negative effect of liquidity ratio on bank stability. This is because even though higher asset liquidity directly benefits stability by encouraging banks to reduce the risks on their balance sheets and by facilitating the liquidation of assets in a crisis, it also makes crises less costly for banks. As a result, banks have an incentive to take on an amount of new risk that more than offsets the positive direct impact on stability (Wolf, W.,(2007)). We expect a positive effect of profitability ratio on bank stability. We expect that financially stronger banks are less prone to additional risk-taking due to the threat of losing future rents (Keeley, M.C., (1990)). We also control for a country's macroeconomic environment by including the GDP growth rate, the inflation rate and general government

debt. In the robustness analysis, we also include unemployment ratio. We examine the impact of market structure variables on risk-taking and financial stability using the Lerner index as a proxy for market power. Lerner concentration combines banks' concentration index in the loan market with market monopoly power at the end of 2008. We expect a negative correlation between the risk level and this variable because more concentrated banking sectors are easier for regulators to monitor and thus to more carefully scrutinize (Beck, T., Demirgüc-Kunt, A., Levine, R., (2006)). We also specify an alternative measure of market power, the herding measure. The herding measure represents the standard deviation of the percentage non-interest income (with respect to total assets) as in Beck, T., De Jonghe, O., Schepens, G., (2013)), per year (t). It takes into consideration the possible incentives for banks to increase their risk-taking following an increase in competition. The higher the value of this indicator, the more heterogeneous are the sources of revenues of Euro zone banks (i.e., less herding) and therefore, we have a higher bank instability. Additionally, we include a dummy variable for Euro countries and a dummy variable for 2009 financial crisis.

Table 2. Description of variables

Symbol	Variable	Description	Source
Balance sheet data (bank level)			
size	Logarithm of Total Assets	log(Total Assets)	Own calculations using data from Bankscope.
Inta	Specialization	Loans net to Total Assets	Own calculations using data from Bankscope.
Intd	Maturity mismatch	Loans net to Total Deposits	Own calculations using data from Bankscope.
lr1	Liquidity ratio	Liquid assets to total assets	Own calculations using data from Bankscope.
Roe	Finanical rentability	Net interest margin to Shareholders' equity	Own calculations using data from Bankscope.
Rescue measures (country level)			
Loans	State loans	Dummy variable that takes the value 1 for the entire period if the country provided state loans after October 2008.	Petrovic and Tutsch(2009) and IMF
Macoeconomic variables			
Infl	Inflation rate	Volatility for inflation annual rate of change (2005=100)	World Bank
Une	Unemployment rate	Unemployment rates by sex, age and nationality, total (%).	Eurostat
Gov	Government lending	Net government lending minus net borrowing as a percentage of GDP. Figures are at general government level.	Eurostat
Gdp	Gross domestic product	Gross domestic product at market prices, price index - percentage ch.ange on previous period, based on 2005=100	Eurostat

Market structure variables

conc_lerner	Concentration Lerner	Mixed measure that combines banks' concentration index in the loan market with market monopoly power at the end of 2008. A measure of market power in the banking market. An increase in the Lerner index indicates a deterioration of the competitive conduct of financial intermediaries. Higher values of the Lerner index indicate less bank competition.	WorldBank
herd_year	Herding measure	This is a measure of banking industry heterogeneity obtained as the within country standard deviation of the percentage non-interest income (with respect to total assets) as in Beck et al. (2013), per year (t).	Own calculations using data from Bankscope.

Others variables

d_eurozone	Eurozone area dummy	Dummy	Eurostat
Crisis	Crisis dummy: 1 for 2009 and 0 otherwise.	Dummy	Authors'calculation

Source: *own calculations based on Bankscope data*

2.2. Methodology

We analyze the impact of the state loans taken by national supervisory authorities in the banking sector to limit the negative spillovers of the 2008 financial crisis. The estimates are run through Pooled OLS panel data method with robust standard errors, consistent with panel-specific autocorrelation and heteroskedasticity. The impact of national rescue measures on systemic risk is examined on a quarterly basis through the following baseline model specification.

$$Z\text{-}score = = \beta_0 + \beta_1 \times State\ loans\ policy_{,t-1} + \Phi \times Bank\ controls_{i,t-1} + \Theta \times Macro\ controls_{j,t-1.} + \eth \times Market\ controls_{j,t-1} + \varepsilon_{i,t} \quad (1)$$

We proxy bank stability using the natural logarithm of the Z-Score (as, for instance, in Laeven, L., Levine, R., (2009); Beck, T., De Jonghe, O., Schepens, G., (2013)). We compute the Z-score at bank level as:

$$Z - Score_{i,t} = \frac{ROA_{i,t} + (E_{i,t} / A_{i,t})}{\sigma(ROA_T)} \quad (1)$$

where $ROA_{i,t}$ is the return on assets for bank *i* in year *t*, $E_{i,t}/A_{i,t}$ denotes the total shareholder equity to total assets ratio for bank *i* in year *t*, $\sigma(ROA_T)$ is the standard deviation of return on assets over the full sample period (5 years). *ROA* is the ratio between net interest income to total assets for bank *i* in year *t*. The Z-Score provides a measure of bank soundness as it indicates the number of standard deviations by which returns have to diminish in order to deplete the equity of a bank. A higher Z-Score implies a higher degree of solvency and therefore it gives a direct measure of bank stability. We also use leverage or the ratio between common

shareholders' equity to total assets as a measure for bank stability. A higher leverage ratio also implies a higher degree of solvency.

4. Empirical results and Robustness check

There are two theories about the interventions of governments in the banking sector - the first one predicts a positive effect of rescue measures due to improvement of banks' profitability ratios and charter value and, the second, which predicts a negative effect as a result of increased risk-taking.

Table 3. The impact of government interventions in the banking sector

VARIABLES	(1)
loans	**-19.09*** **
	(6.386)
size	2.938**
	(1.372)
lnta	1.117***
	(0.143)
lntd	-6.333*
	(3.613)
infl	-21.86**
	(9.864)
gov	1.074*
	(0.578)
gdp	0.907
	(0.671)
conc_lerner	-38.00
	(38.22)
eurocountries	-67.61***
	(5.286)
Constant	40.58
	(37.52)
Observations	1,427
R-squared	0.157

Source: *own calculations*

Note: The table reports the estimation results of the OLS Pooled regression: $Z\text{-}score = = \beta_0 + \beta_1 \times Rescue\ measures_{j,t-1} + \Phi \times Bank\ controls_{i,t-1} + \Theta \times Macro\ controls_{j,t-1.} + \eth \times Market\ controls_{j,t-1} + \varepsilon_{i,t.}$ The sample consists of 85 banks. The estimation period ranges from q12009 to q42013. Method used is Panel OLS with robust standard errors. Explanatory variables are one quarter lagged. Definitions of all variables are given in Table 4. Robust standard error in brackets.*, ** and *** denote significance levels of 10%, 5% and 1%.

State loans exert a significant negative influence on bank stability. A possible reason can be related to the fact that this type of loans is given under certain conditions (the remuneration for management is limited, the bonuses are prohibited and the dividends may be distributed only to government (Petrovic and Tutsch, 2009), Dietrich, D., Hauck, A,.2012)).

Among the regressors, the results suggest that the bank's size, credit activity (measured as loans net to total assets), and maturity mismatch are key drivers of a bank's financial stability. Size is positively associated with banking stability indicators, showing that larger banks contribute more to banking stability than the medium and the smaller ones. Indeed the failure of a large bank influences the banking stability much more than the failure of a smaller one. Credit activity is also positively associated with banking stability indicators. De Jonghe (2010) documents that banks more heavily involved in traditional banking activities tend to take on less risk than those more heavily involved in non-traditional activities. An increase in funding liquidity risk reflected by loans-to-deposits ratio significantly reduces banks' stability. The impact of GDP growth and government debt on banking stability is positive, while the impact of inflation is significant and negative. Concentration is positively correlated with risk levels, which implies that lower concentration has a positive effect on the long-run stability of a banking sector; this finding is consistent with the results of Structure Conduct Performance (SCP) hypothesis, which shows that lower concentration is associated with reduced frequency of financial crises due to more careful monitoring. We found a significant negative influence of Euro countries dummy on bank stability. The regression results indicate that Euro countries have higher bank instability than non-Euro countries. This result demonstrates that risk-taking of banks in Euro economies is higher than in non-Euro countries, precisely because they operate in the same currency and thus they are more interconnected.

We run a number of robustness checks on our baseline model (Table 4). First, run our regressions adding specific banking variables (eq.2) and macro and market structure control variables (eq3) including the liquidity ratio, the profitability ratio and the unemployment rate. We changed the dependent variable with leverage ratio (eq4), we introduced a dummy variable for financial crisis (eq5). The robustness checks are generally consistent with the findings of the previous section. The robustness tests also confirm the finding that state loan significant negative influence on z-score ratio.

Table 4. Robustenss checks

VARIABLES	(2)	(3)	(4)	(5)
L.loans	**-25.62*** **	**-14.29** **	**-0.359**	**-9.472**
	(6.752)	**(6.204)**	**(0.298)**	**(15.24)**
L.size	1.227	4.067***	-0.782***	4.619*
	(1.443)	(1.395)	(0.0499)	(2.798)
L.lnta	-1.745**	1.184***	-0.00990	1.339***
	(0.861)	(0.143)	(0.00669)	(0.247)
L.lntd	-6.928*	-6.366*	-0.337***	-19.23***
	(3.953)	(3.841)	(0.127)	(4.388)
L.roe	-0.0118			
	(0.0235)			
L.lr1	-3.040***			
	(0.848)			
L.infl	-20.53**	-19.54**	-0.307	-30.92
	(9.947)	(9.947)	(0.371)	(20.68)
L.gov	0.706	0.130	-0.00671	3.506***
	(0.577)	(0.592)	(0.0211)	(1.257)
L.gdp	1.266*	1.127*	0.0261	0.997
	(0.696)	(0.664)	(0.0255)	(1.002)
L.une		-2.526***		
		(0.515)		
L.conc_lerner	-41.81		7.986***	70.72
	(41.28)		(1.675)	(84.54)
L.herd_year		-71.33*		
		(39.54)		
Eurocountries	-71.32***		-2.347***	-38.84***
	(5.537)		(0.210)	(12.77)
Constant	359.5***		27.70***	-31.38
	(96.92)		(1.417)	(79.04)
Observations	1,381	1,427	1,634	292
R-squared	0.184	0.168	0.364	0.173

Source: *own calculations*

Note: The table reports the estimation results of the OLS Pooled regression: $Z\text{-}score = = \beta_0 + \beta_1 \times Rescue\ measures_{j,t-1} + \Phi \times Bank\ controls_{i,t-1} + \Theta \times Macro\ controls_{j,t-1.} + \delta \times Market\ controls_{j,t-1} + \varepsilon_{i,t.}$ The sample consists of 85 banks. The estimation period ranges from q12009 to q42013. Method used is Panel OLS with robust standard errors. Explanatory variables are one quarter lagged. Definitions of all variables are given in Table 4. Robust standard error in brackets.*, ** and *** denote significance levels of 10%, 5% and 1%. *Model (2) estimates the impact of government interventions in the banking sector-with additionaly specific banking variables, model (3) estimates the impact of government interventions in the banking sector- with additionaly macroeconomic and market structure variables, model (4) estimates the impact of government interventions in the banking sector- using leverage measure as the dependent variable, model (5) estimates the impact of government interventions in the banking sector- using a dummy crisis*

5. Conclusions and policy implications

In this paper we investigated the impact of state loan on bank's stability reflected through z-score ratio. We used a unique bank-level dataset that consisted of 85 banking institutions from 10 European countries over the q12009-q42013 period. We used a set of specific banking variables, macroeconomic and market structure ratios and we used Pooled OLS regression metthodology. Our emipirical findings suggest that state loans measure reflect a significant and negative influence on bank stability. Therefore, we demonstrated that our empirical results were correlated with an existing theoretical model from the literature (Dietrich, D., Hauck, A,. (2012),).

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