Non-performing Loans and Bank Lending Behavior

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Introduction

- The global financial crisis of 2008 exposed deteriorating asset quality of European banks as a possible constraint on financial intermediation and further expansion of credit.

- The level of NPLs in the Euro area increased substantially during the crisis, from a low of 2.5 percent at end-2007 to as high as 7.7 percent at end-2013.

- At the same time, double-digit pre-crisis credit growth plummeted and never fully recovered, with loan growth rates only surpassing 2.3 percent in December 2015 and rising to 4.7 percent in December 2016.

Introduction (2)

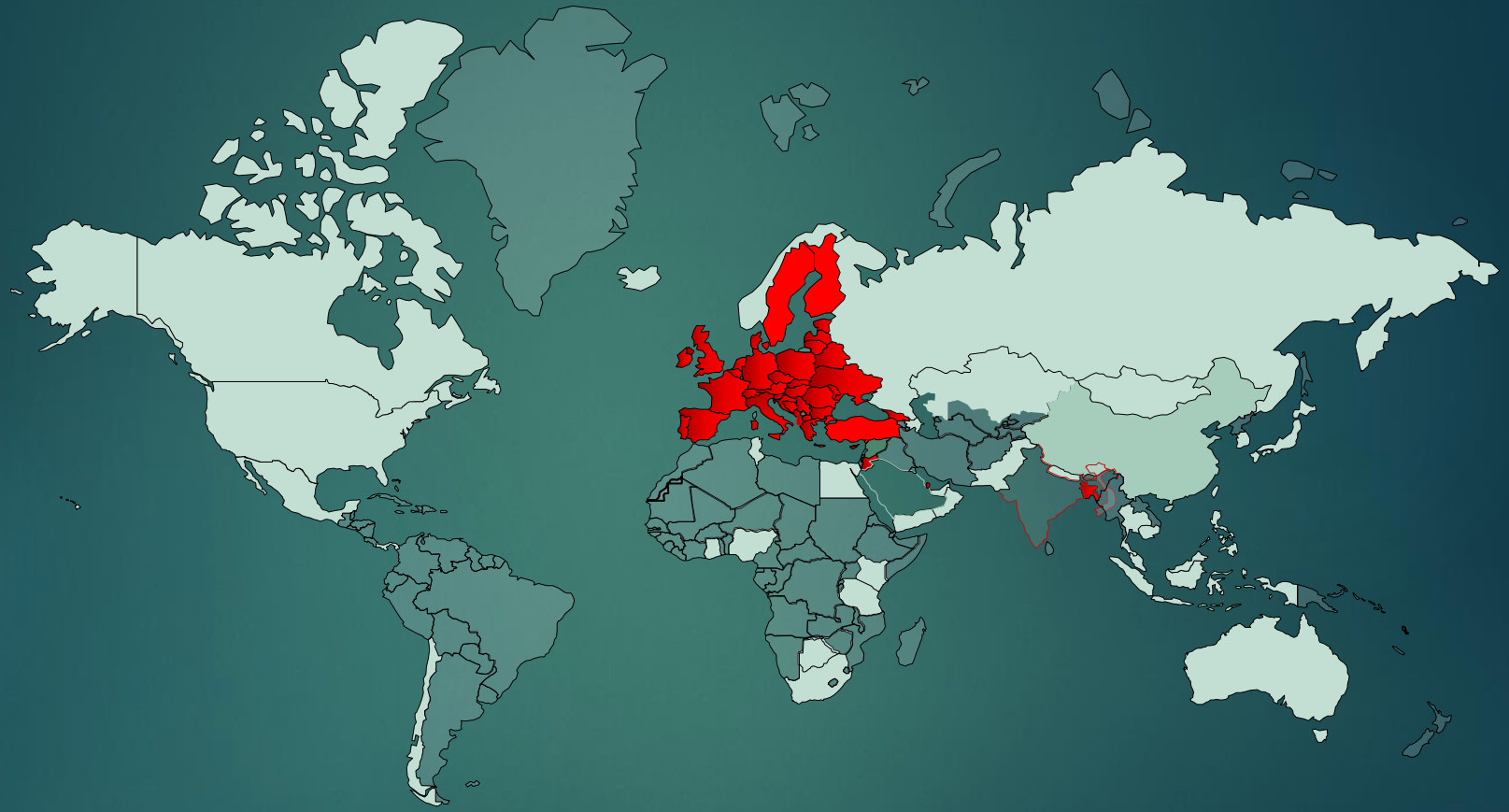
- Conceptually, the relationship between NPLs and bank lending runs in both directions:

1. lowering lending standards associated with rapid credit expansion may lead to greater levels of NPLs in the future (Erdic and Abazi, 2014; Shahzad et al., 2019; Chavan and Gambacorta, 2019).

2. higher levels of NPLs tie down bank capital, reduce bank net income and narrow access to funding due to higher perception of risk by market participants (Aiyar et al, 2015).

- These factors may in turn constrain future lending. The focus of our study is on this second relationship, which is particularly relevant in the aftermath of the last financial crisis.

Bank and country level data



- **Sample:** Panel data set over the period 2000 to 2017.
- **Countries:** 42 countries. EU and non-EU member states.
- **Sources:** Fitch Connect; World Bank
- Unconsolidated annual financial statement data
- Commercial, Savings and Co-operative Banks

Empirical model

To examine the impact of non-performing loans on loan growth, controlling for the effects of bank-specific variables and country-level indicators the following model is specified:

- $$\Delta logLG_{i,j,t} = \alpha_i + \rho\Delta logLG_{i,j,t-1} + \beta NPL_{i,j,t-1} + \gamma Bank_{i,j,t-1} + \delta Macro_{j,t-1} + \partial BankType_{i,j,t} + \theta Year_t + \varepsilon_{i,j,t} \quad (1)$$

- where index i refers to the bank, c to the country and t to the time period.
- $\mathbf{\Delta logLG_{i,j,t}}$= is the loan growth rate for bank i, located in country j, in year t;
- $\mathbf{\Delta logLG_{i,j,t-1}}$ = the lagged dependent variable included in the right-hand side to account for underlying autoregressive process;
- $\mathbf{NPL_{i,j,t-1}}$ = represents the non-performing loans ratio, measured by total impaired loans over total gross loans;
- $\mathbf{Bank_{i,j,t-1}}$ = represents the vector of bank variables (*bank size, capitalization, deposits to total assets ratios, ROAE, net interest margin*);
- $\mathbf{Macro_{j,t-1}}$ = is a vector of macroeconomic variables (*the real GDP growth rate and real interest rate*);
- $\mathbf{BankType_{i,j,t}}$ = dummy variable included in this matrix distinguish commercial, co-operative and savings banks
- $\mathbf{Year_t}$ = denotes yearly dummy variables to control for unobserved time specific effects;
- $\boldsymbol{\varepsilon_{i,j,t}}$ = represents the error term.

- Dynamic panel data generalized method of moments (GMM) estimation and FE (Fixed effect)

Empirical estimations – baseline results

Table 1. The relationship between NPL and loan growth: the total sample with different estimation methods

Dependent variable: ΔlogGL	(1)	(2)	(3)
Intercept	-0.00456	-0.376**	
	(-0.24)	(-2.45)	
Bank specific variables			
Lagged ΔlogGL $_{i,t-1}$			**0.130*** **
			(4.93)
NPL$_{i,t-1}$	**-0.00323*** **	**-0.00270*** **	**-0.00235*** **
	(-7.31)	**(-4.78)**	**(-5.96)**
Bank Size$_{i,t-1}$	0.00337**	0.0448**	0.00122
	(2.24)	(2.44)	(1.29)
Deposits/Assets$_{i,t-1}$	0.000603***	0.000607*	0.000535***
	(2.92)	(1.71)	(3.43)
Capitalization $_{i,t-1}$	0.00209***	0.00528***	0.000592
	(2.73)	(4.17)	(0.93)
ROAE$_{i,t-1}$	0.000702***	0.000501**	0.000578**
	(3.09)	(2.14)	(2.42)
NIM $_{i,t-1}$	0.0173***	0.0244***	0.0111***
	(5.10)	(4.86)	(3.56)
Macroeconomic indicators			
GDP growth $_{i,t-1}$	0.00766***	0.00878***	0.00688***
	(5.00)	(5.00)	(4.63)
RIR $_{i,t-1}$	-0.00872***	-0.00931***	-0.00649***
	(-6.29)	(-5.71)	(-4.53)
Coefficient Estimates	RE	FE	GMM
No. Obs.	12,295	12,295	11,353
R-squared within	0.1407	0.1503	
Hansen J statistic(p-value)			69.66(0.074)
AB test AR(2) (p-value)			-0.04(0.966)
Dummies Year	Yes	Yes	Yes
Dummy account standards	Yes	Yes	Yes

Empirical estimations

Table 2. Channels through which NPL affects loan growth

Dependent variable: ΔlogGL	(1)	(2)	(3)	(4)	(5)	(6)
Intercept	-0.422***		-0.362**		-0.388**	
	(-2.67)		(-2.24)		(-2.30)	
Bank specific variables						
Lagged $\Delta logGL_{i,t-1}$		0.130***		0.119***		0.123***
		(4.92)		(4.51)		(4.70)
$NPL_{i,t-1}$	0.000980	-0.00196*	-0.00158**	-0.00125***	-0.00274***	-0.00234***
	(0.82)	(-1.86)	(-2.49)	(-2.60)	(-4.75)	(-6.15)
Bank $Size_{i,t-1}$	0.0496***	0.00165	0.0411**	0.000403	0.0454**	0.000499
	(2.63)	(1.17)	(2.15)	(0.43)	(2.26)	(0.50)
$Deposits/Assets_{i,t-1}$	0.000700*	0.000537***	0.000580	0.000445***	0.000579	0.000487***
	(1.96)	(3.44)	(1.57)	(2.84)	(1.53)	(3.09)
Capitalization $_{i,t-1}$	0.00530***	0.000605	0.00678***	0.00141*	0.00558***	0.000243
	(4.13)	(0.95)	(5.51)	(1.94)	(4.26)	(0.38)
$ROAE_{i,t-1}$	0.000496**	0.000581**	0.000495**	0.000717***	0.000418*	0.000567**
	(2.17)	(2.44)	(2.05)	(2.95)	(1.76)	(2.41)
$AMC_{i,t}$					0.0841	0.0110
					(1.46)	(0.26)
NIM $_{i,t-1}$	0.0246***	0.0111***	0.0246***	0.0110***	0.0263***	0.0114***
	(4.94)	(3.56)	(4.89)	(3.47)	(5.10)	(3.60)
Macroeconomic indicators						
GDP growth $_{i,t-1}$	0.00829***	0.00684***	0.00682***	0.00586***	0.00770***	0.00595***
	(4.64)	(4.60)	(4.00)	(3.92)	(4.56)	(3.96)
RIR $_{i,t-1}$	-0.00991***	-0.00653***	-0.00823***	-0.00571***	-0.00804***	-0.00559***
	(-6.02)	(-4.59)	(-4.92)	(-3.75)	(-4.87)	(-3.79)
Interaction term						
NPL*Bank Size	**-0.000420*** **	**-0.0000444**				
	(-3.52)	**(-0.38)**				
NPL*Capitalization			**-0.000109*** **	**-0.0000707*** **		
			(-5.10)	**(-3.11)**		
NPL*AMC					**-0.000559**	**-0.00146**
					(-0.08)	**(-0.33)**
Coefficient Estimates	FE	GMM	FE	GMM	FE	GMM
No. Obs.	12,295	11,353	11,720	10,813	11,720	10,813
R-squared within	0.1540		0.1590		0.1505	
Hansen J statistic(p-value)		69.63(0.075)		69.56(0.075)		70.19(0.068)
AB test AR(2) (p-value)		-0.04(0.968)		-0.43(0.666)		-0.29(0.769)
Dummies Year	Yes	Yes	Yes	Yes	Yes	Yes
Dummy account standards	Yes	Yes	Yes	Yes	Yes	Yes

Empirical estimations

Table 3. NPL and loan growth in different regions

Dependent variable:	(1)	(2)	(3)	(4)
ΔlogGL	**EU**	**Non-EU**	**Advanced**	**Emerging**
Lagged $\Delta logGL_{i,t-1}$	0.168***	0.0884*	0.101***	0.227***
	(5.79)	(1.91)	(3.67)	(3.80)
Bank specific variables				
$NPL_{i,t-1}$	**-0.00237*** **	**-0.00227*** **	**-0.00314*** **	**-0.00180*** **
	(-4.72)	**(-3.02)**	**(-6.63)**	**(-2.98)**
Bank $Size_{i,t-1}$	0.000610	0.00479**	0.00257**	-0.000175
	(0.48)	(2.14)	(2.05)	(-0.08)
$Deposits/Assets_{i,t-1}$	0.000444**	0.000216	0.000399**	0.000457
	(2.52)	(0.63)	(2.28)	(1.25)
Capitalization $_{i,t-1}$	0.000841	0.000709	0.000155	0.00133
	(0.96)	(0.98)	(0.20)	(1.56)
$ROAE_{i,t-1}$	0.000296	0.00110***	0.0000195	0.000849**
	(0.92)	(4.11)	(0.08)	(2.40)
NIM $_{i,t-1}$	0.00367	0.0177***	0.0117**	0.00448
	(0.89)	(3.49)	(2.26)	(1.11)
Macroeconomic indicators				
GDP growth $_{i,t-1}$	0.00184	0.00735***	0.00290	0.00456**
	(0.71)	(2.69)	(0.90)	(2.28)
RIR $_{i,t-1}$	0.000359	-0.0108***	-0.00180	-0.00773***
	(0.12)	(-5.59)	(-0.42)	(-4.92)
Coefficient Estimates	GMM	GMM	GMM	GMM
No. Obs.	7,906	3,447	9,578	1,775
Hansen J statistic (p-value)	61.35 (0.229)	67.50 (0.103)	57.63 (0.343)	28.34 (0.393)
AB test AR(2) (p-value)	0.70 (0.484)	-0.31 (0.759)	-0.37 (0.710)	0.87 (0.386)
Dummies Year	Yes	Yes	Yes	Yes
Dummy account standards	Yes	Yes	Yes	Yes

Empirical estimations

Table 4. NPL and loan growth before, during, and after global financial crisis

Dependent variable: ΔlogGL	(1)	(2)	(3)
Lagged ΔlogGL $_{i,t-1}$	0.126***	0.122***	0.122***
	(4.80)	(4.67)	(4.63)
Bank specific variables			
$NPL_{i,t-1}$	-0.00201***	-0.00232***	-0.00184***
	(-5.61)	(-6.11)	(-2.62)
Bank $Size_{i,t-1}$	0.000459	0.000459	0.000541
	(0.48)	(0.48)	(0.56)
$Deposits/Assets_{i,t-1}$	0.000498***	0.000489***	0.000474***
	(3.16)	(3.07)	(2.99)
Capitalization $_{i,t-1}$	0.000407	0.000275	0.000233
	(0.65)	(0.43)	(0.37)
$ROAE_{i,t-1}$	0.000626***	0.000561**	0.000561**
	(2.66)	(2.35)	(2.37)
NIM $_{i,t-1}$	0.0107***	0.0116***	0.0114***
	(3.37)	(3.64)	(3.56)
Macroeconomic indicators			
GDP growth $_{i,t-1}$	0.00631***	0.00590***	0.00584***
	(4.17)	(3.90)	(3.78)
RIR $_{i,t-1}$	-0.00556***	-0.00553***	-0.00563***
	(-3.65)	(-3.59)	(-3.66)
NPL*BEFORE GFC	**-0.00413*** **		
	(-3.02)		
NPL*DURING GFC		**-0.000659**	
		(-0.96)	
NPL*AFTER GFC			**-0.000726**
			(-1.12)
Coefficient Estimates	GMM	GMM	GMM
No. Obs.	10,813	10,813	10,813
Hansen J statistic (p-value)	69.68 (0.072)	69.93 (0.071)	69.60 (0.075)
AB test AR(2) (p-value)	-0.28 (0.782)	-0.26 (0.793)	-0.41 (0.679)
Dummies Year	Yes	Yes	Yes
Dummy account standards	Yes	Yes	Yes

Findings and conclusion

- We evaluate the relationship between non-performing loans and bank lending behavior. Our analysis is based on a sample of 6,434 banks distributed across 42 EU and non-EU member countries, and observed over the period from 2000 to 2017.

- We find that the negative association between NPLs and bank loan growth is stronger for larger and well-capitalized banks. A potential explanation could be that the effects of high levels of NPLs might increase the cost of capital, which might cause lowering bank lending activity.

- We report no statistical evidence that asset companies' presence influences the link between non-performing loans and loan growth in a country.

- We show that the effect of NPL on lending activity is less pronounced during the pre-crisis period.

- From a policy perspective, these results point to facilitating roles of bank resolution tools as well as strengthened capital regulation in mitigating the effects of NPL overhang on the provision of credit.