Non-Performing Loans and the Supply of Bank Credit: Evidence from Italy

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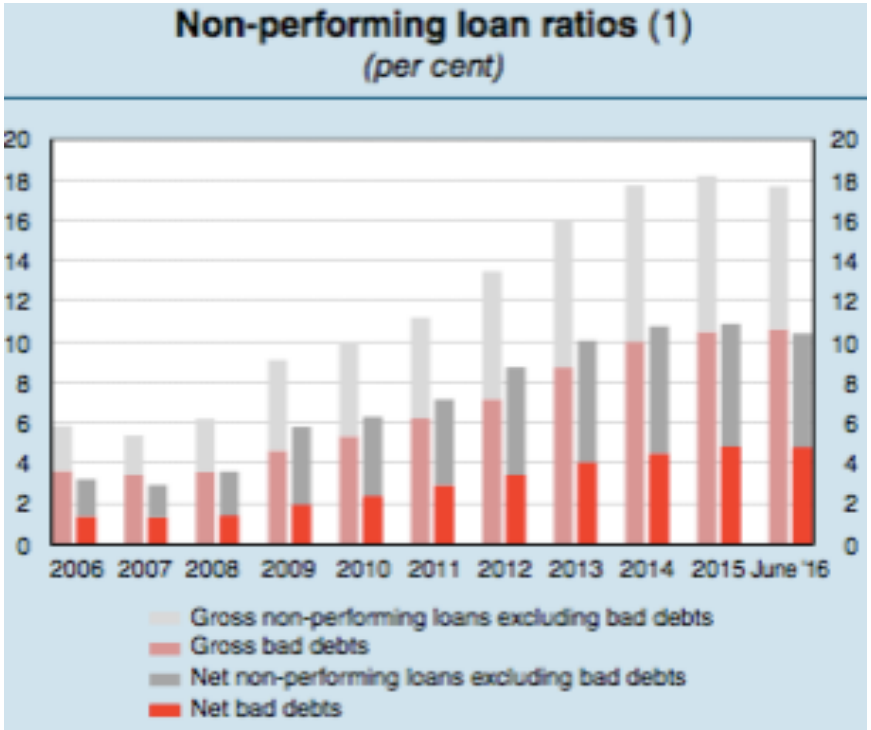
Research question

Does a build-up in NPLs weaken banks' capacity to finance the economy?

- **policy relevance** - widely discussed
- and for a **clear reason** - large increase in NPLs in European banks and slack in credit dynamics since GFC

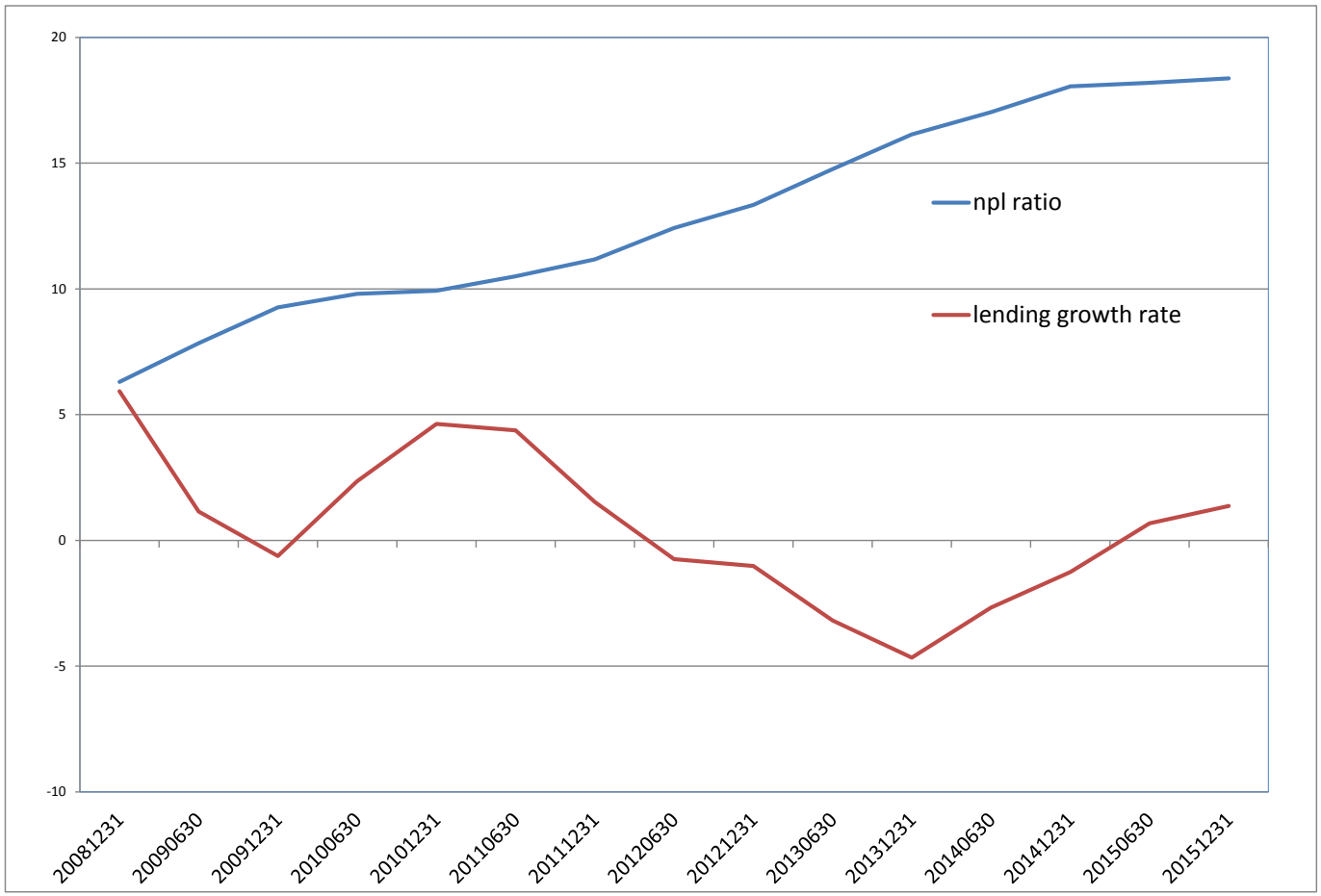
Motivating evidence 1

Increase in NPLs for Italian banks



Motivating evidence 2

Aggregate negative correlation between NPL and credit growth



Yet a conclusion is hard to come by

Two issues complicate causal inference on the credit quality - credit growth nexus

- **correlation vs causation** - NPLs are largely the endogenous product of slack in GDP which affects both demand and supply of credit
- **different mechanisms overlap** - *high* NPLs and *increasing* NPLs can in fact activate different channels and have temporary or permanent effects

From NPL to credit supply: a primer

- A helpful distinction from an accounting perspective

  1. Adjustment effects.
     Increasing NPLs can lead to lower credit growth
     - increasing **provisions** depress profitability
     - increasing **risk weights** weaken capital positions
     - increasing **risk premia** raise the cost of funding

  2. Equilibrium effects.
     These can **persist** when reaching stable **high NPL levels** if, for instance,
     - funding cost is permanently higher
     - capitalization is permanently lower

- Worsening / worse credit quality can also be associated to risk-taking behavior, which pushes the NPL-credit growth relationship in the opposite direction .

How we go about

We address these two issues

1. relying on a **granular dataset** at the borrower level which allows to purge out demand components

2. using **different empirical specifications**, to identify the specific channels, and sort out temporary from permanent effects

Preview of Findings

1. **NPL ratios (levels) do not weigh on credit supply**
   Conditional on relevant bank-level characteristics, intermediaries that have higher NPL ratios do not reduce credit supply more than those with lower NPLs

2. **NPL (exogenous) variations reduce lending**
   Exogenous increases in NPLs have a negative effect on bank lending, similarly to negative shocks to banks capital buffers

From the (Macro)Economy to Credit Quality

1) The existing literature on NPL has mostly investigated the drivers of NPLs, looking at macroeconomic and bank-level determinants:

   - economic activity (Bofondi and Ropele (2011), Louzis et al., (2012), Klein (2013), Messai (2013), Angelini et al. (2017))
   - poor managerial practices (Keeton (1999), Jimenez and Saurina (2006))
   - credit booms and loosening credit standards (Berger and De Young (1997))

From Credit Quality to the Macroeconomy

2) Only recently attention has been devoted to the implication of high/increasing NPLs, based on aggregate data

using country-level data

- NPLs and banking crises (Kaminsky and Reinhart (1999))
- NPL stocks and output growth (Balgova et al. (2014))

using bank-level data

- NPL ratios and changes in correlation with growth in corporate and commercial loans (Bending et al. (2014))
- NPLs and the loan-loss provision ratio impact on the supply of bank loans (Cucinelli (2015))

Empirical challenges

In the ideal setting

1. there are no confounding factors of credit quantities and the borrower-bank match is random
2. NPL levels are also randomly assigned to banks.

In fact

1. credit equilibrium quantities not only depend on supply, but also on demand and borrowers' characteristics; furthermore borrowers might be heterogeneously distributed across lenders
2. NPLs are the endogenous product of banks' past behaviors and not only of macroeconomic conditions

Addressing them

1) Compare credit growth from different banks to the same firm, as in Khwaja Mian (2008)

2.1) Saturate regressions with bank-level relevant characteristics and / or fixed effects within a panel analysis

2.2) Resort to an event study related to the ECB Asset Quality Review (AQR) of 2013

The dataset

- Outstanding loan amounts from the Italian Credit Register over the period from 2008 to 2015 to performing firms
- 800.000 borrowers (firms) and more than 2 million bank-firm relationship
- bank-level information on a consolidated basis from the Supervisory and Statistical Reports on both balance sheets and profit and loss accounts

Panel Specification

$$\Delta Log(Credit_{ijt}) = \mu_{it} + \gamma_{ij} + \beta NPL_{jt-1} + \phi' Z_{ijt-1} + \phi' X_{jt-1} + \epsilon_{ijt}$$

- *Credit*: credit granted by bank j to firm i
- Fixed Effects
  - Bank γ_j / Bank-Firm γ_{ij}
  - Borrower μ_i / Borrower-Time μ_{it}
- Relationship level controls Z_{ijt-1}
- Bank level controls X_{it-1}

Net NPL ratio

VARIABLES	(1) No fixed effects	(2) Firm fixed effects	(3) Firm*time Fixed effects	(4) **Firm*time FE Relationship ctrls**	(5) Firm*time FE Relationship ctrls Bank fixed effects	(6) Firm*time FE Relationship ctrls Bank*firm fixed effects
Net NPL ratio	0.0741	-0.287***	0.0282	**-0.0605**	-0.0650	-0.206
	(0.0667)	(0.0735)	(0.0759)	**(0.0770)**	(0.129)	(0.133)
Drawn over granted				**-0.0162*** **	-0.0113***	-0.00584
				(0.00348)	(0.00267)	(0.00478)
Share of Overdraft				**0.0999*** **	0.0929***	0.199***
				(0.00432)	(0.00357)	(0.00925)
Share of Total Granted				**-0.308*** **	-0.323***	-1.898***
				(0.0135)	(0.0125)	(0.0272)
Constant	-4.203***					
	(0.530)					
Observations	911174	910124	897844	**897844**	897841	845230
R-squared	0.000	0.092	0.351	**0.374**	0.376	0.579

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

- **Result**: The correlation between NPL ratios and credit growth in the data is driven by variations in borrower characteristics and not much by supply factors

- **Open question**: Could NPLs changes be capturing in fact changes over time in other relevant bank characteristics?

Net NPL ratio and bank-balance sheets vrbls

VARIABLES	(1) Firm fixed effects	(2) Firm*time Fixed effects	(3) Firm*time FE Relationship ctrls Bank fixed effects
Net NPL ratio	-0.296***	0.00208	-0.130
	(0.0923)	(0.0825)	(0.110)
Bank size	0.0734	0.107	-2.250*
	(0.0915)	(0.0779)	(1.336)
Tier 1 ratio	-0.103	0.180***	0.513***
	(0.0818)	(0.0520)	(0.0701)
Return on Equity	0.102***	-0.0134	-0.00782
	(0.0293)	(0.0233)	(0.0238)
Writedowns/offs over operprofits (lag)	1.202***	0.0565	0.241
	(0.333)	(0.172)	(0.268)
Mutual Bank dummy	3.116***	1.900***	
	(0.556)	(0.502)	
Drawn over granted			-0.0113***
			(0.00263)
Share of Overdraft			0.0927***
			(0.00357)
Share of Total Granted			-0.323***
			(0.0124)
Constant			
Observations	909983	897666	897725
R-squared	0.093	0.352	0.377

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

The Asset Quality Review (AQR)

The AQR was a year-long examination carried out by the ECB in 2014 on the 130 largest banks in the Euro area to evaluate

1. the accuracy of loans classification in the performing and non-performing categories
2. and the adequacy of the related provisions

If the related balance sheet revisions were at least in part

1. independent of future business cycle conditions
2. unanticipated by the banks

then they can be interpreted as exogenous variations in the quality of the balance sheets

Using the experiment

1. with a diff-in-diff

$$\Delta Log(Credit_{ijt}) = \mu_{it} + \gamma_{ij} + \beta_1 dum_{AQRbank} + \beta_2 dum_{AQRbank} \times dum_{postAQR} + \epsilon_{ijt}$$

   - $dum_{AQRbank}$ equal to one if the bank underwent AQR
   - $dum_{postAQR}$ equal to one in the post AQR period

2. with an IV using the change in NPL related to AQR reclassification as an instrument for the change in credit quality

Diff-in-Diff

VARIABLES	(1)	(2)	(3)	(4)
AQR bank	5.343***		12.12***	
	(1.543)		(4.032)	
AQR bank * post AQR	8.702***	8.911***	4.110	0.905
	(2.738)	(2.785)	(5.796)	(6.848)
NPL ratio			0.151	0.779**
			(0.205)	(0.379)
Npl ratio * post AQR			-0.115	-0.253
			(0.161)	(0.197)
Npl ratio * AQR bank			-0.977**	-3.109**
			(0.493)	(1.513)
Npl ratio * AQR bank * post AQR			0.713	1.679*
			(0.651)	(0.943)
Relationship level controls	yes	yes	yes	yes
Firm*Time fixed effects	yes	yes	yes	yes
Bank fixed effects	no	yes	no	yes
Observations	633978	633968	595319	595316
R-squared	0.423	0.429	0.429	0.433

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

The relation between NPL ratios and credit is not clear-cut

IV

	New default rate instrumented by					
VARIABLES	(1) AQR-provisions (basis points)	(2) AQR-provisions (basis points)	(3) AQR-provisions (over total assets)	(4) AQR-provisions (over total assets)	(5) AQR-delta NPL	(6) AQR-delta NPL
New default rate	-0.827	-1.917	-1.233***	-1.596***	-1.713***	-2.330***
	(0.588)	(1.369)	(0.367)	(0.510)	(0.338)	(0.358)
Bank size		2.625***		2.544***		2.730***
		(0.632)		(0.478)		(0.549)
Tier 1 ratio		-0.591		-0.296		-0.970
		(1.309)		(0.598)		(0.554)
Return on Equity		0.171*		0.150***		0.198***
		(0.0942)		(0.0425)		(0.0436)
Net NPL ratio		0.652		0.580**		0.745***
		(0.373)		(0.204)		(0.171)
Bank balance sheet variables	no	yes	no	yes	no	yes
Firm time fixed effects	yes	yes	yes	yes	yes	yes
Relationship level controls	yes	yes	yes	yes	yes	yes
Observations	157001	157001	157001	157001	157001	157001
R-squared	0.461	0.463	0.462	0.463	0.462	0.462

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

The exogenous variation in default rates has a broad negative impact on credit growth (4 out of 6 specifications)