

Lending Supply and Unnatural Selection: An Analysis of Bank-Firm Relationships in Italy After Lehman

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Motivation (1)

- Better understanding of the factors behind the rapid contraction of credit to firms after Lehman: is there a credit crunch?
 - Main difficulty: control for credit demand graph
- Was credit supply contraction across the board or did we experiment phenomena like “unnatural selection” in credit allocation (“evergreening”, “forbearance lending” or “zombie lending”)?
 - Main difficulty: distinguish unnatural selection from the behavior of “patient” banks

Motivation (2)

- Unnatural selection: Troubled banks may have an incentive to allocate credit to impaired borrowers (“zombies”) to avoid the realization of losses on their own balance sheet (Peek-Rosengren, 2005)
- Is this relevant outside of Japan?
 - Similarities between ‘lost decade’ and current crisis (Hoshi-Kashyap, 2008)
 - Factors specific to Japanese economy (e.g. loose banking supervision, government pressure on banks, *keiretsu* system)
 - Basle II standards and procyclical capital requirements

Contribution

- We analyze credit developments (both credit growth and interest rates) at bank-firm level in Italy after Lehman (September 2008-March 2009)
- We effectively control for credit demand by exploiting the widespread use of multiple lenders in Italy
- We focus on more forward-looking measure of firms' profitability
- Main findings:
 - We document a contraction of credit supply associated to low bank capitalization (credit crunch)
 - We find that banks with less capital have tended to reduce credit to their typical borrowers but less so to impaired ones (unnatural selection)

Data

- We use data on all outstanding loans extended by banks located in Italy to a representative sample of Italian manufacturing and services firms.
- Period: September 2008-March 2009.
Over 19,000 bank/firm observations, related to roughly 500 banks and 2,500 firms.
Matched with data on bank and firm characteristics.
- Information is drawn from four sources:
 - a) Bank of Italy (BI) Credit Register – outstanding loans
 - b) BI Banking Supervision Register – bank variables
 - c) BI Survey of Industrial and Services Firms – firm variables
 - d) Company Accounts Data Service – firms' balance sheets

The Methodology: Controlling for demand

- Basic assumption: credit demand is firm specific (i.e. not firm-bank specific; i.e. it does not matter who the lender is)
- Widespread use of multiple lenders allows to introduce fixed effects at firm level, allowing to control for all firm's “bank-invariant” characteristics and, in particular, for credit demand (in the semester considered)

The Methodology:

Identification of impaired borrowers (1)

- Previous literature has used firms' balance-sheet indicators (e.g., RoA, leverage); however, they reflect current conditions and do not allow to distinguish efficient ('patient') banks from inefficient ones
- Besides, latest balance sheet data are available only for 2007, so very noisy for describing firms' conditions after Lehman
- Others (Caballero et al., 2008) used interest rate subsidies, but unnatural selection may take place without any form "debt forgiveness"
- We adopt two main alternative approaches to build more forward-looking indicators

The Methodology:

Identification of impaired borrowers (2)

- First approach (banks “revealed preferences”): *if well capitalized banks are NOT affected by distortions in credit allocation, they should cut credit aggressively to firms with bad economic prospects*
- 4 steps:
 - Identify highly-capitalized banks
(total capital ratio > 16.8%; top 25%)
 - Identify impaired borrowers as firms to which highly-capitalized banks reduced credit more aggressively
($\Delta\text{credit}(b,i)/\text{assets}(i) < -6.3\%$; bottom 5%)
 - Discard, in the rest of the analysis, all firm/bank observations (i,b) regarding:
 - highly capitalized banks
 - firms which are NOT borrowing from at least one highly highly-capitalized banks AND at least one of the remaining banks
 - Within the remaining subsample, check if credit granted to these impaired borrowers is related to bank capital and how

First approach: impaired borrowers' characteristics

(difference from sectoral average)

- Number of firms used in regression about 2,000 (from 2,500)
- Number of obs. used in regression about 14,000 (from 20,000)
- Observable differences, small but sensible:

Difference from sectoral mean of:	Impaired borrowers (first methodology)	Other firms
Ln(TFP)	-.097	.005
Z-score (scale: 1 to 9)	.506	-.026
Export propensity	-.022	.001
Ln(Size)	-.389	.021
Leverage	-.148	.008
Interest paid/operating income	.011	-.001
No. firms	104	1,958

The Methodology:

Identification of impaired borrowers (3)

- Second approach — Economic fundamentals (TFP)
Impaired borrowers are the least productive firms (log-difference of TFP from sectoral mean)
- Third approach — Combines the first two
- Fourth approach: use (backward-looking) balance-sheet indicators (Z-score)

The regression framework

- Dependent variable is change in credit by bank b to firm i from September 2008 to March 2009, divided by total firm assets
- Normalization to deal with mass of extreme values of rates of growth of credit at bank-firm level (robustness checked)
- We use fixed-effects at firm-level, to control for demand and any other firm-specific factor (we have only one period, and exploit multiple lenders)
- Regressors are a number of bank characteristics (dummies)
 - Banks with low capital (total capital ratio $<$ median = 12%)
 - Banks with a high liquidity ratio; banks net borrowers on the interbank market
 - Bank belonging to the first 5 banking groups
- and interaction of 'low capital' with 'impaired borrower' dummy

Testing for credit crunch and unnatural selection

Fixed effects (firm-level) estimation – Robust s.e. (cluster at firm level)

Dependent variable: $\Delta \text{credit}(b,i) / \text{assets}(i) * 100$

Scheme for identifying imp. borrow.	-	Lending by high cap banks	Combined	TFP only
Low_cap(b)	-.590***	-.215**	-.158*	-.618***
Low_cap(b)*imp_bor(i)	-	1.901***	1.149**	.849**
High_liq(b)	.150*	.127*	.131*	.153*
Ib_borr(b)	.231***	.472***	.476***	.232***
Large(b)	-.279***	-.469***	-.465***	-.278***
No. firms	2,558	1,983	1,983	2,558
No. obs.	19,576	13,642	13,642	19,576

Testing...at “t-2”

Fixed effects (firm-level) estimation – Robust s.e. (cluster at firm level)

Dependent variable: $\Delta\text{credit}(b,i)/\text{assets}(i)$

Scheme for identifying imp. borrow.	-	Lending by high cap banks	Combined	TFP only
Low_cap(b)	.577	.169	.144	.057
Low_cap(b)*imp_bor(i)	-	-.970	-.410	.030
High_liq(b)	-.077	-.292**	-.290**	-.076
Ib_borr(b)	-.151**	-.356**	-.360**	-.151**
Large(b)	-.076*	-.163*	-.162*	-.076*
No. firms	2,371	634	634	2,558
No. obs.	18,447	5,838	5,838	19,576

Testing...on interest rates

Fixed effects (firm-level) estimation – Robust s.e. (cluster at firm level)

Dependent variable: interest rate paid on credit(b,i) (period average)

Scheme for identifying imp. borrow.	-	Lending by high cap banks	Combined	TFP only
Low_cap(b)	.120***	.078	.085	.201***
Low_cap(b)*imp_bor(i)	-	.049	-.354	-.043
High_liq(b)	-.251***	-.244**	-.244**	-.252***
Ib_borr(b)	.070	.144**	.144**	.071
Large(b)	-.027	-.045	-.044	-.027
No. firms	2,357	1,859	1,859	2,357
No. obs.	13,782	9,454	9,454	13,782

Scoring and unnatural selection

Fixed effects (firm-level) estimation – Robust s.e. (cluster at firm level)

Dependent variable: $\Delta \text{credit}(b,i) / \text{assets}(i)$

Impaired borrowers: bad Zscore

	Large banks	Scoring banks
Low_cap(b)	-.856***	-1.060***
Low_cap(b) * imp_bor(i) * Large(b)	-.621***	-
Low_cap(b) * imp_bor(i) * (1-Large(b))	.479***	-
Low_cap(b) * imp_bor(i) * Scoring_bank(b)	-	-.410**
Low_cap(b) * imp_bor(i) * (1-Scoring_bank(b))	-	.595**
High_liq(b)	.354***	.368***
Ib_borr(b)	.145***	.364***
Large(b)	-.142***	-.053
No. firms	2,452	2,440
No. obs.	18,981	17,074

Results and robustness

- Robustness across:
 - (i) model specification (bank FE added)
 - (ii) dependent variable (rate of growth of credit by bank)
 - (iii) definition of low-capitalized banks (bottom 25%)
 - (iv) use of continuous variables
 - (v) alternative thresholds for benchmark identification method:
 - bottom 1% firms
 - bottom 10% firms
 - top 50% banks
 - (vi) subsamples and, in particular, using just observations with positive/large outstanding loans at the beginning of the period

Extensions

- Relationship intensity. Forbearance lending...
 - diminishes with a higher number of lenders (coordination?)
 - but it also diminishes if the low cap bank is the (impaired) borrower's main bank (accounting)
 - Is NOT different if the low cap bank is a “cooperative” bank (which have been shown to foster relationship lending; Angelini et al. 98)

Overall, not clear indications that relationship intensity exacerbates/attenuates forbearance lending (consistent with Peek Rosengren, 2005)

- Firms features. Forbearance lending weakly less likely with exporting and large firms.

Conclusions

■ Main findings:

- Contraction of credit supply was associated to low bank capitalization (credit crunch)
- but less so for impaired borrowers (based on alternative approaches)
- This holds both for “quantities” and “prices”
- No clear role of relationship lending
- Credit scoring poses a trade-off: procyclicality VS forbearance lending
- Findings are crisis-specific (credit crunch indicators?)

■ Policy implications:

- Credit crunch more severe than observed
- bank recapitalization good for credit supply and for the allocative efficiency

Future research

- Investigate the potential crowding out effects on the investment and employment growth of healthy firms (Caballero et al., 2008)
- Investigate if banks might have focused disproportionately on the short-term solvency of their borrowers, signalled by balance sheet indicators and credit scoring results, putting too little weight on the economic fundamentals and medium-term prospects of the firm (‘short-termism’, ‘lazy banks’)

Loans to non-financial firms and lending standards

Euro area

