Bank lending technologies and credit availability in Europe. What can we learn from the crisis?

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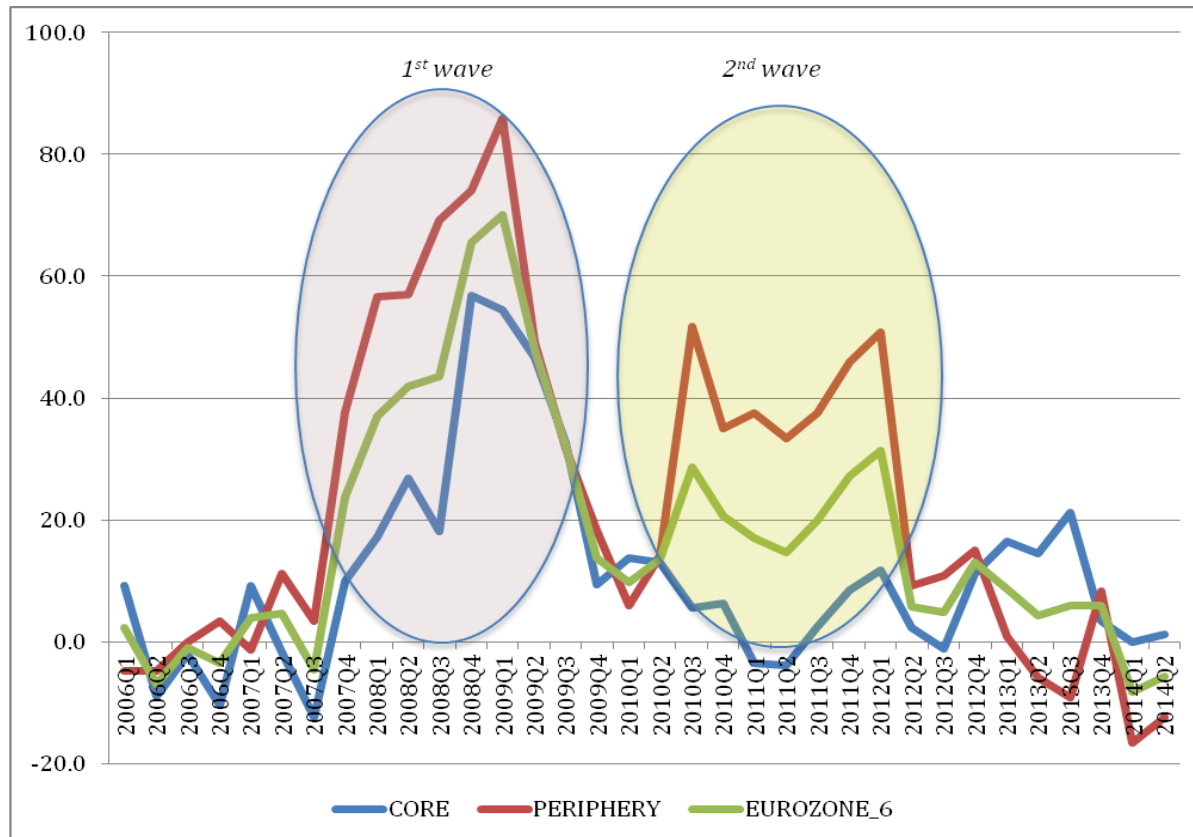
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Motivation

Banks' loan supply to the SMEs in Europe significantly tightened from the fourth quarter of 2007 and particularly in 2008 and early 2009.

Degree of restriction in loan supply to SMEs in the Eurozone

This Paper

We investigate whether the probability of individual firm credit rationing in 2009 – the time of most intense loan supply restriction – was affected by the lending technologies employed by the main bank of that firm and the production of soft information.

We use the EFIGE database, covering seven countries: five from the Eurozone (Austria, France, Germany, Italy and Spain) and two outside the Eurozone (Hungary and the UK). To all the surveyed firms we attach balance-sheet data provided by Bvd-Amadeus, the most comprehensive and widely used source of financial information for public and private enterprises in Europe.

This Paper

Estimation results indicate that:

- during the crisis firms matching with transactional main banks had a larger probability of experiencing credit restrictions;

- relational lending technologies did not significantly affect firms' access to credit;

- soft information production had a negative and significant impact on credit rationing during the crisis;

- with regard to the hardening of soft information process, the extent of credit rationing increased less for firms matching with transactional main banks that managed to adopt soft information during the crisis.

Related Literature

In the literature there is the perception that SMEs, due to their opaqueness, lack appropriate financing and are largely dependent on banks for their external finance (e.g., Berger and Udell, 1998; De la Torre et al., 2010) .

Berger and Udell (2006) define a lending technology as:

- a unique combination of primary information source, screening and underwriting policies, loan contract structure and monitoring mechanisms.

The choice of the main bank is a strategic choice for any firm, in particular for those firms that usually depend on bank financing as a source of external funding (Rajan, 1992; Ferri and Murro, 2015).

Related Literature

Banks lend to SMEs by means of a variety of technologies. Among the various lending technologies used to finance SMEs, the literature has thus far focused on two classes:

- Transaction-based lending technologies;
- Relationship lending technology.

Transactional lending technologies are based primarily on hard information, while relationship lending technologies assigns a key role to soft information.

According to Petersen (2004), hard information is quantitative, easy to store and transmit, and its content is independent of the collection process. Conversely, soft information is qualitative, often communicated in words, and not easy to store and transmit to other parties.

Related Literature

Impact of relationship lending on the financing of the SMEs:

- Angelini et al. (1998) find that the intensity of relationship banking reduces the probability of rationing, even though lending rates increase as the firm-bank relationship lengthens.

- Cenni et al. (2015) show that longer banking relationships make it easier for a firm to obtain credit, while the number of banking relationships the firm maintains is positively linked to the probability of experiencing credit restrictions.

- For the US, Cole (1998) finds that lenders are less likely to grant credit when the customer relationship has lasted for less than one year or the firm deals with other financial counterparts.

- Dewatripont and Maskin (1995) find that the presence of a significant number of creditors complicates the refinancing process and makes lending less profitable for banks.

- Bartoli et al. (2011) show that during the last financial crises Italian banks tended to support borrowers characterized by more intense informational tightness.

Related Literature

Recently, both the theoretical and the empirical literatures have started to analyze also the transaction lending technologies.

Berger and Udell (2006) underline that transactions technologies include financial statement lending, small business credit scoring, asset-based lending, factoring, fixed-asset lending, and leasing.

About the empirical literature:

- Berger and Frame (2007) study the use of credit scoring for SMEs and its effects on credit availability;

- Klapper (2006) tests the role of factoring for financing SMEs;

- Udell (2004) focuses on asset-based lending.

Related Literature

Recently, the academic literature has also suggested the possibility that technological innovation, by **hardening soft information**, may improve the ability of banks to lend to opaque borrowers at a greater distance (Petersen and Rajan, 2002; Berger, 2015; Udell, 2015).

By incorporating soft qualitative data into transactional lending technologies, such as credit scoring models, the problems associated with transmitting this information through the hierarchical layers of large banking organizations diminish, with beneficial effect on credit availability (Stein, 2002; Filomeni et al., 2016).

Hypotheses to be tested

Starting from this literature, as information asymmetries magnify during deep recessions and financial crises, in this paper we test the following three hypotheses:

- **Hypothesis 1:** Firms matching with a transactional main bank have a larger probability of experiencing credit restrictions during the crisis.

- **Hypothesis 2:** The extent of credit rationing is lower for firms coupling with a relational main bank.

- **Hypothesis 3 (Hardening of soft information hypothesis):** The probability of experiencing credit restrictions might increase less if transactional main banks engage in gathering and processing soft information.

Data

- Main data source is the EU-EFIGE dataset.

- Representative sample (at the country level for the manufacturing industry) of almost 15,000 surveyed firms (above 10 employees) in seven European economies (Austria, France, Germany, Hungary, Italy, Spain, the United Kingdom).

- The data was collected in 2010, covering the years from 2007 to 2009.

- This database combines information on firm ownership structure and governance systems, workforce characteristics, innovation and internationalization activities, market structure and competition, financial conditions and bank-firm relationships

Empirical model

We analyze the role of lending technologies and soft information on credit rationing. To test our hypotheses we start building an empirical model of the probability that firms are rationed in the credit market.

$$y = \begin{cases} 1 & if \quad y^* > 0 \\ 0 & otherwise \end{cases}$$

$$y^* = x'\alpha + z'\beta + u$$

As control variables we use:
- Firms' characteristics: age, size (employees), group, foreign, debt ratio (total debt over total assets), liquidity ratio, differential ROS, labor productivity and capital intensity (fixed assets per worker).
- Bank-firm relationship characteristics: number of banks, length of the main bank-firm relationship.
- Country fixed effect and sector dummies.

Credit rationing

F13. *During the last year, did the firm apply for more credit?*

F14. *To increase its borrowing, was the firm prepared to pay a higher rate of interest?*

We construct three variables of credit rationing:

- *Rationing:* Dummy taking value one if the firm answers "Yes, applied for it but was not successful" to question F13, zero otherwise.

- *Wide credit rationing*: Dummy taking value one if the firm answers to question F13 "Yes, applied for it but was not successful" or "No, did not apply for it" (in this way we consider as rationed also the firms discouraged from applying for new credit).

- *Strong credit rationing*: Dummy variable taking value one if the firm answers yes also to question F14, zero otherwise.

Lending technology indices

F16. *Which type of information does the bank normally use/ask to assess your firm's credit worthiness?*

- Collateral

- Balance sheet information

- Interviews with management on firm's policy and prospects

- Business plan and firms' targets

- Historical records of payments and debt service

- Brand recognition

- Other

Transactional lending   Relationship lending

Lending technology indices- Robustness

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- Collateral

- Balance sheet information

- Interviews with management on firm's policy and prospects

- Business plan and firms' targets

- Historical records of payments and debt service

- Brand recognition

- Other

Transactional lending 2   Relationship lending 2

Soft information index

F12. *Which factors are key in the choice of a main bank?*

- the bank offers competitive services and funding
- the bank offers efficient internet services
- the bank's lending criteria is clear and transparent
- the bank is conveniently located
- the bank has an extensive international network
- the bank offers also a consultancy on strategic financial decisions
- the bank has a long-lasting relationship with the firm
- the bank has flexible procedures/not constrained by red tape
- it was the Group's main bank

Summary statistics

	Mean	Median	St. dev.	Obs.
Firm characteristics:				
AGE	26.50	21.00	22.58	14,759
NUMBER EMPLOYEES	71.63	26.00	142.92	11,442
DEBT RATIO	66.16	66.45	27.69	13,844
LIQUIDITY RATIO	1.54	1.04	1.73	13,322
DIFFERENTIAL ROS	0.00	0.00	0.08	9,827
CAPITAL INTENSITY	38.37	18.88	53.72	10,884
LABOUR PRODUCTIVITY	51.31	45.75	27.67	9,645
GROUP	0.22	0.00	0.41	14,759
FOREIGN	0.10	0.00	0.29	14,302
NUMBER OF BANKS	3.10	2.00	2.65	14,655
DURATION	15.85	12.00	13.81	6,757
Lending technologies:				
TRANS LENDING	0.60	0.67	0.30	6,875
RELAT LENDING	0.52	0.50	0.43	6,868
TRANS LENDING 2	0.62	0.50	0.33	6,875
RELAT LENDING 2	0.40	0.33	0.34	6,870
SOFT INFORMATION	0.29	0.00	0.35	8,910
Credit rationing:				
RATIONING	0.09	0.00	0.28	6,837
WIDE RATIONING	0.19	0.00	0.39	6,837
STRONG RATIONING	0.05	0.00	0.23	6,605

Univariate test

	RATIONING			STRONG RATIONING		
	Yes	No	t-statistics	Yes	No	*t-statistics*
Lending technologies:						
TRANS LENDING	0.72	0.59	-11.78***	0.73	0.59	-9.55***
RELAT LENDING	0.51	0.52	0.67	0.52	0.52	-0.09
TRANS LENDING 2	0.69	0.62	-5.76***	0.70	0.62	-4.72***
RELAT LENDING 2	0.38	0.40	0.97	0.40	0.40	0.03
SOFT INFORMATION	0.36	0.39	2.30**	0.35	0.39	2.30**
Firm characteristics:						
AGE	22.49	25.47	4.00***	22.13	25.47	3.66***
NUMBER EMPLOYEES	59.38	64.91	1.01	71.35	64.91	-0.83
DEBT RATIO	81.49	69.23	-12.86***	82.68	69.23	-11.23***
LIQUIDITY RATIO	0.77	1.18	12.51***	0.73	1.18	15.67***
DIFFERENTIAL ROS	-0.02	0.00	5.22***	-0.02	0.00	4.31***
CAPITAL INTENSITY	47.79	44.01	-1.37	44.06	44.01	-0.02
LABOUR PRODUCTIVITY	41.79	49.44	7.85***	40.70	49.44	7.96***
GROUP	0.19	0.19	0.31	0.20	0.19	-0.10
FOREIGN	0.05	0.07	1.60	0.06	0.07	0.65
NUMBER OF BANKS	4.69	3.63	-7.96***	5.11	3.63	-7.89***
DURATION	13.43	16.07	5.27***	13.06	16.07	4.76***

Baseline results

	RATIONING	WIDE RATIONING	STRONG RATIONING
TRANS LENDING	0.114***	0.123***	0.065***
	[0.013]	[0.019]	[0.009]
RELAT LENDING	-0.002	-0.013	-0.003
	[0.009]	[0.014]	[0.006]
AGE	0.000	-0.000	0.000
	[0.000]	[0.000]	[0.000]
SIZE (ln)	0.001	-0.003	0.005*
	[0.004]	[0.007]	[0.003]
DEBT RATIO	0.001***	0.001***	0.001***
	[0.000]	[0.000]	[0.000]
LIQUID RATIO	-0.057***	-0.044***	-0.037***
	[0.010]	[0.012]	[0.007]
DIFF ROS	-0.143***	-0.200**	-0.060
	[0.055]	[0.084]	[0.038]
CAPIT INTENSITY	0.012*	0.022**	0.003
	[0.007]	[0.011]	[0.005]
LABOUR PROD	-0.066***	-0.098***	-0.048***
	[0.021]	[0.031]	[0.015]
GROUP (0,1)	0.011	0.013	0.004
	[0.011]	[0.016]	[0.007]
FOREIGN (0,1)	0.015	0.026	0.005
	[0.019]	[0.026]	[0.012]
NUMBER OF BANKS	0.002*	0.003	0.003***
	[0.001]	[0.002]	[0.001]
DURATION	-0.001**	-0.001**	-0.000*
	[0.000]	[0.001]	[0.000]
Observations	4,570	4,595	4,396
Pseudo R^2	0.141	0.072	0.160

Baseline results - Robustness

	Main results			Robustness checks		
	RATIONING	WIDE RATIONING	STRONG RATIONING	RATIONING	WIDE RATIONING	STRONG RATIONING
TRANS LENDING	0.114***	0.123***	0.065***			
	[0.013]	[0.019]	[0.009]			
RELAT LENDING	-0.002	-0.013	-0.003			
	[0.009]	[0.014]	[0.006]			
TRANS LENDING 2				0.046***	0.028	0.026***
				[0.013]	[0.018]	[0.009]
RELAT LENDING 2				0.008	0.005	0.006
				[0.012]	[0.019]	[0.008]
AGE	0.000	-0.000	0.000	0.000	-0.000	0.000
	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]
SIZE (ln)	0.001	-0.003	0.005*	-0.002	-0.007	0.004
	[0.004]	[0.007]	[0.003]	[0.004]	[0.007]	[0.003]
DEBT RATIO	0.001***	0.001***	0.001***	0.001***	0.001***	0.001***
	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]
LIQUID RATIO	-0.057***	-0.044***	-0.037***	-0.062***	-0.046***	-0.041***
	[0.010]	[0.012]	[0.007]	[0.010]	[0.012]	[0.007]
DIFF ROS	-0.143***	-0.200**	-0.060	-0.151***	-0.202**	-0.066*
	[0.055]	[0.084]	[0.038]	[0.057]	[0.084]	[0.040]
CAPIT INTENSITY	0.012*	0.022**	0.003	0.014*	0.024**	0.004
	[0.007]	[0.011]	[0.005]	[0.007]	[0.011]	[0.005]
LABOUR PROD	-0.066***	-0.098***	-0.048***	-0.079***	-0.110***	-0.058***
	[0.021]	[0.031]	[0.015]	[0.022]	[0.031]	[0.016]
GROUP (0,1)	0.011	0.013	0.004	0.011	0.012	0.004
	[0.011]	[0.016]	[0.007]	[0.011]	[0.016]	[0.008]
FOREIGN (0,1)	0.015	0.026	0.005	0.013	0.027	0.005
	[0.019]	[0.026]	[0.012]	[0.019]	[0.027]	[0.013]
NUMBER OF BANKS	0.002*	0.003	0.003***	0.002*	0.003	0.003***
	[0.001]	[0.002]	[0.001]	[0.001]	[0.002]	[0.001]
DURATION	-0.001**	-0.001**	-0.000*	-0.001**	-0.001**	-0.001**
	[0.000]	[0.001]	[0.000]	[0.000]	[0.001]	[0.000]
Observations	4,570	4,595	4,396	4,570	4,595	4,396
Pseudo R^2	0.141	0.072	0.160	0.121	0.064	0.141

The role of soft information

	RATIONING	STRONG RATIONING	RATIONING	STRONG RATIONING	RATIONING	STRONG RATIONING
SOFT INFORMATION	-0.018*	-0.015*	-0.029***	-0.020***		
	[0.011]	[0.008]	[0.010]	[0.007]		
TRANS LENDING			0.116***	0.067***	0.179***	0.133***
			[0.013]	[0.009]	[0.022]	[0.019]
RELAT LENDING			0.002	-0.000	0.002	0.003
			[0.009]	[0.006]	[0.018]	[0.016]
SOFT x TRANS LENDING					-0.080***	-0.066***
					[0.030]	[0.025]
SOFT x RELAT LENDING					0.006	-0.000
					[0.025]	[0.021]
Control variables	Y	Y	Y	Y	Y	Y
Observations	4,570	4,396	4,570	4,396	4,599	4,425
Pseudo R^2	0.116	0.136	0.144	0.163	0.081	0.069

The effect of bank type

	RATIONING		WIDE RATIONING		STRONG RATIONING	
	Local	National	Local	National	Local	National
TRANS LENDING	0.171***	0.170***	0.167***	0.163***	0.121***	0.127***
	[0.027]	[0.025]	[0.033]	[0.030]	[0.023]	[0.021]
RELAT LENDING	0.006	0.007	-0.031	-0.016	-0.004	0.009
	[0.023]	[0.020]	[0.028]	[0.024]	[0.020]	[0.017]
SOFT x TRANS LENDING	-0.055	-0.056*	-0.062	-0.060	-0.048	-0.050*
	[0.036]	[0.033]	[0.045]	[0.040]	[0.031]	[0.027]
SOFT x RELAT LENDING	-0.012	-0.007	0.029	0.022	-0.001	-0.016
	[0.030]	[0.028]	[0.041]	[0.037]	[0.025]	[0.023]
Control variables	Y	Y	Y	Y	Y	Y
Observations	3,082	3,799	3,082	3,799	2,967	3,658
Pseudo R^2	0.080	0.083	0.060	0.065	0.069	0.071

The effect of firm type

	RATIONING		WIDE RATIONING		STRONG RATIONING	
	Large	SMEs	Large	SMEs	Large	SMEs
TRANS LENDING	0.186	0.178***	0.222	0.157***	0.236**	0.126***
	[0.113]	[0.023]	[0.136]	[0.028]	[0.113]	[0.020]
RELAT LENDING	0.045	-0.002	0.006	-0.017	-0.005	0.001
	[0.066]	[0.019]	[0.090]	[0.023]	[0.059]	[0.016]
SOFT x TRANS LENDING	0.060	-0.087***	-0.049	-0.066*	-0.006	-0.069***
	[0.178]	[0.030]	[0.195]	[0.038]	[0.175]	[0.025]
SOFT x RELAT LENDING	-0.064	0.010	0.109	0.011	0.001	0.001
	[0.110]	[0.026]	[0.139]	[0.035]	[0.097]	[0.022]
Control variables	Y	Y	Y	Y	Y	Y
Observations	245	4,354	245	4,354	241	4,184
Pseudo R^2	0.192	0.079	0.184	0.060	0.195	0.067

Conclusions

By using a detailed questionnaire on European manufacturing firms, we found that:

- The use of transactional lending technologies increased the probability of credit rationing.

- On the contrary, we uncovered no significant evidence of a supposed positive role of relationship lending on credit availability.

- The production of soft information reduced the probability of firms experiencing credit restrictions.

- The adoption of soft qualitative data marginally but significantly reduced the negative effect of transactional lending technologies.

- SMEs are found to benefit more when their transactional main banks use soft information.

- Large banks were more effective at incorporating soft information in transactional technologies, partially healing the credit crunch.

Conclusions

Overall, our findings support prior literature indicating that, also during a deep recession such as that of 2007-2009, lending technologies play an important role in determining firms' access to credit.

In a policy perspective, these results suggest that during a financial crisis regulations enabling banks to increase the discretionary power of loan officers could favor firms' access to liquidity. This might be achieved by either relying more on relationship lending technologies or incorporating soft information in credit scoring models.

Two issues then arise:

I. We need better theories to represent banking with extensive consequences for regulation, supervision and business practice (Ferri and Neuberger, 2014).

II. Second, instead of relying solely on the mechanistic method of the risk weighted asset approach (e.g., Basel 2 and 3), regulation should probably encompass also banking business models in evaluating the true risk behind banks (Ayadi et al., 2012).