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Lending Organization and Credit Supply During the Crisis

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Abstract

Using a unique dataset, which combines bank organizational variables, information on lending techniques, firms' credit demand and others balance sheet indicators, we investigate the impact of lending organization on credit dynamics during the crisis period. Our main findings suggest that the variables shaping the organization of a bank in its lending activity to non financial firms have a complex impact on its ability to expand credit. Banks that heavily resort to credit scoring techniques actually reduced their credit expansion during the economic downturn. At the same time, banks that delegate more power to their local branch managers (LBM) were likely to expand loans at a higher rate. Finally, contrary to the evidence referred to the pre-crisis period, we find that a longer tenure of the LBM in the same branch is detrimental for the credit growth rate. These finding are robust to a wide set of robustness checks.

JEL Classification: G21, L15
Keywords: Banking organization, lending techniques, financial crisis, bank heterogeneity.

Contents

1. Introduction[1]

A recent stream of literature shows that the adoption of different lending technologies is associated with heterogeneous credit policies and performance. In this paper, we contribute to this literature by investigating the nexus between heterogeneity in bank organization and the lending activity towards firms during the recent economic and financial crisis.

Internal organization, lending techniques and the credit extension from Italian banks have been recently addressed by Cannari, Pagnini and Rossi (2010). Both the use of quantitative methods for assessing borrowers' creditworthiness, and the autonomy granted to local loan managers within the bank hierarchy are factors which could affect the willingness and the ability of the bank to collect, circulate and employ different types of information about its borrowers (Stein, 2002). The effect of rating models on the amount (and quality) of credit to small businesses is still an open question; it may depend on the degree of flexibility adopted by banks when using quantitative models to assess creditworthiness (Berger, Cowan and Frame, 2011; Berger, Frame and Miller, 2005). ICT technologies, in turn, might have modified the costs and benefits underlying the decisions of banks about their degree of decentralization (Acemoglu *et al.*, 2007; Bloom, Garicano, Sadun and Van Reenen, 2009; Mocetti, Pagnini and Sette, 2010).

Banks are heterogeneous under this respect. Even if bank size appears a major driving force behind the internal organization of lending activity, still there is a lot of residual heterogeneity even within the same size category (Albareto *et al.*, 2011 and section 3).

Using a unique survey specifically designed to capture some organizational features and the lending techniques adopted by Italian banks, this paper analyses the link between organization of the lending process and the dynamics of credit granted to different kinds of firms after the financial crisis, in order to investigate how this heterogeneity affected the credit slowdown in 2009-10 following the Lehman Brothers' collapse. Since low economic growth and tight liquidity may lower both loan demand and supply, disentangling the impact of credit demand from changes in lending policies is crucial to correctly identify the effect of more structural factors, such as organizational characteristics.

[1] The views expressed in this paper are those of the authors and do not necessarily reflect those of the Bank of Italy. The authors wish to thank Massimiliano Affinito, Monica Andini, Simone Casellina, Alessio d'Ignazio, Massimo Gangeri, Giorgio Gobbi and participants at workshops held at the Banca d'Italia (October 2011 and February 2013) for insightful comments. The residual errors in the paper are only authors' responsibility.

The main results are summarized as follows. We find evidence that controls for short-term variations in credit demand are positively correlated to the firms' credit growth rate, in line with the recent literature on business cycles. Bank performance and riskiness indicators suggest that sounder institutions, especially among large banks, had more room left to expand their risky assets, while capital (gearing) ratio seems to be not relevant *per se*. Focusing on the banking organizational channel – on the supply-side – we argue that the simple adoption of scoring is irrelevant for the dynamics of credit granted both to small and large firms (Berger *et al.*, 2011), while its actual usage as a crucial factor to evaluate customers' creditworthiness negatively affects bank credit growth rate. At the same time, decentralization of decision-making power to loan branch manager (LBM) fosters credit expansion, with a significant effect on both small and large firm lending (see Cannari, Pagnini and Rossi, 2010). During the crisis period, and differently from previous evidence (Benvenuti *et al.*, 2010), the tenure of the LBM negatively affects credit dynamics for all kinds of borrowing firms. This apparently counterintuitive result suggests that the economic downturn could have exacerbated the agency costs and the risk that a LBM and the local economic community might collude at the expenses of the goals of the bank as a whole. Consequently, a faster turnover in lower local decisional levels should be used to reduce asymmetric information between CEOs and local managers and to monitor their behaviour, in order to prevent loss of control over decisions in a more uncertain economic context, even though this might discourage soft information gathering. Anticipating this policy may also have promoted particular caution by long-standing local branch managers, in order to favour good LBM reporting on the real wealth of borrowing firms (Hertzberg, Liberti and Paravisini, 2010).

The paper is organized as follows. In Section 2 we summarize the main findings and *a priori* of the extant literature on economic crisis, lending techniques and organization, while in Section 3 we describe the dataset we use for the analysis, which includes a unique organizational survey on a large sample of Italian banks. In Section 4 we present the econometric exercise, and explain our estimation strategy, while in the subsequent section we discuss the main findings stemming from our econometric set-up. These results undergo a few robustness checks, which are accounted for in Section 6. Finally, Section 7 draws some conclusions.

2. The theoretical background

The global, mostly unexpected, financial crisis which set off in 2008 was a huge "natural experiment" to assess the role of financial frictions in shaping economic activity. After the Lehman Brothers' collapse, in September 2008, the financial crisis triggered a sharp decline in credit aggregates and an extraordinary increase in credit frictions. Although both the Federal Reserve and the ECB reacted injecting liquidity in the system, the contraction in output and employment that followed was unprecedented and it is now known as the Great Recession.

This outcome has wiped out all the possible doubts on the relevance of the *lending channel* in the transmission of financial shocks to the real economy. Informational problems are pervasive in financial markets and hamper the access to external finance by firms. The equilibrium in credit markets may be characterized by adverse selection and credit rationing. By means of repeated interactions with their customers, banks acquire valuable information on the borrowing firms, which makes bank loans special with respect to other sources of financing, especially for those borrowers that face higher agency problems.

Previous literature emphasizes that endogenous pro-cyclical movements in borrowers' balance sheets can amplify and propagate business cycles (financial accelerator) with an heterogeneous impact according to different firm characteristics: in their flight to quality reaction to downturns, banks tend to favour wealthier firms, which have more assets to pledge as collateral (Bernanke, Gertler and Gilchrist, 1996).[2] Other papers stressed the importance of a *supply side channel* based on banks' balance sheets as a propagation mechanism of the crisis.

We go beyond these bank balance sheet channels and argue that the mechanism may be further amplified by changes in lending technologies and in banking organizational choices in terms of decentralization of power (henceforth, the *organizational channel*).

Credit scoring and rating techniques are now largely adopted among banks (Berger, Cowan and Frame, 2011; Albareto *et al.*, 2011). Furthermore, before the financial crisis large banks improved their competitive position in small business lending by using scoring techniques based on 'hard' information (de la Torre, Martínez Pería and Schmukler, 2008; Berger and Black, 2011). The widespread use of these techniques in assessing creditworthiness of borrowers may induce some automatic reactions in loan supply as a consequence of the reduction in firm's wealth, thus affecting the borrowing capacity of the

[2] Empirical evidence has confirmed that firms with low capital or liquidity are less likely to get a loan during an economic recession (Jiménez, Ongena, Peydró and Saurina, 2010).

firm. Hasumi, Hirata and Ono (2010) provide some evidence of the negative lending attitude during the global financial crisis in case of loans extended to small businesses by means of credit scoring techniques.

Moreover, the hard information commonly used in rating and scoring models represents the situation of the company with a significant lag. Overall, this may induce a backward-looking behaviour, which further enhances heterogeneous reactions in banks' lending policies and exacerbates the persistency of cyclical downturns. Value-at-Risk methodologies, used by financial intermediaries also for regulatory purposes, amplify these effects (Borio and Zhu, 2008). Khwaja, Mian and Zia (2010) show that when banks heavily rely on balance-sheet-based credit limits, financial constraints to borrowing firms are tight even if a positive liquidity shock occurs, such as the large capital inflow into Pakistan following the new economic cooperation with the United States after September 11, 2001.

This backward bias in the lending process may be smoothed by the use of 'soft' information acquired by the bank through repeated interactions with its customers. However, this knowledge is gathered mainly by local branch managers, who develop a lending relationship with the borrowing firms (Berger and Udell, 2006). Soft information is not codified by nature and, as a consequence, it is difficult to transmit along the hierarchal structure of the bank (Stein, 2002). Liberti and Mian (2009) assess empirically that a greater distance between the information-collecting agent and the loan approving officer leads banks to rely more on hard (objective) rather than soft (subjective/proprietary) information.

Decentralized organizations, by delegating more authority to local branch managers, may acquire a competitive advantage in the lending activity especially during economic recessions. The empowerment of LBMs and tailored compensation schemes to these managers provide incentives to gather alternative, less codified, information, which could supplement the lack of standard financial data. Qian, Strahan and Yang (2011) assess how increased delegated power to lower decisional levels and accountability of loan officers in China improved the quality of information produced. Decentralization is the way larger banks improve their ability to process soft information, whereas smaller banks have a comparative advantage in this respect (Uchida, Udell and Yamori, 2011). Furthermore, the process might be conditioned to the target pool of customers: Benvenuti *et al.* (2010) show that the degree of decentralization is related to the specialization of banks into small business lending.

However, higher delegation to local loan officers may go together with the adoption of credit scoring techniques: according to Bloom, Garicano, Sadun and Van Reenen (2009) better information technologies are associated with more autonomy at the low level of the hierarchy, having an 'empowering' effect on local managers. Mocetti, Pagnini and Sette (2010) confirm that banks resorting to credit scoring techniques and with more ICT capital tend to delegate more decisional powers to local managers.

Yet, the optimal degree of decentralization is subject to a trade-off, rooted into a twofold potential source of information asymmetry: a closer link between the lender and its borrowers reduces bank-firm information asymmetry, enhances soft information gathering, but it magnifies information asymmetries between bank's periphery and central headquarters. The partial loss of control by the principal entails a risk of moral hazard, since branch managers may be 'captured' by the local community interests and their actions become less consistent with the main goals of the bank. Managers can use their superior information to pursue private benefits, making choices that are not in line with the goals of the principal (Acemoglu *et al.*, 2006), both in terms of bank performance and risk monitoring. This risk is amplified by the increased difficulty to evaluate future prospects of the economy and creditworthiness of borrowers during cyclical downturns.

Similar considerations apply to local branch managers' turn-over (Scott, 2006). Stable branch managers tend to build up close ties with entrepreneurs, thus improving the understanding of their projects and repayment capacity. However, longer tenures could exacerbate the risks of 'capture' by local community. Therefore, banks tend to adopt well defined turn-over policies in loan officers, in order to mitigate agency problems. The other side of the coin is a reduced incentive to acquire and process soft information, which will be wasted in the turn-over process. According to Hertzberg, Liberti and Paravisini (2010), rotation policies affect the officers' reporting behaviour: when an officer anticipates rotation, reports are more accurate and contain more bad news about borrower's repayment prospects, since the principal can compare current reports with future reports issued by the successor. This behaviour has a cyclical pattern: internal evaluation tends to be more optimistic during the first 2 years of the loan office tenure, while this bias disappears when rotation becomes imminent.

Summing up, the direction of the effect stemming from heterogeneous bank organizations during the crisis might *a priori* be mixed because of a trade-off between the need of more precise and qualitative information (i.e. *soft information*) to better assess borrower riskiness, especially for SMEs which are more financially constrained during the

turmoil (De Mitri *et al.*, 2010), and the enhanced uncertainty of the economic environment, which strengthens the need to monitor the lending approval process to avoid moral hazard behaviours.

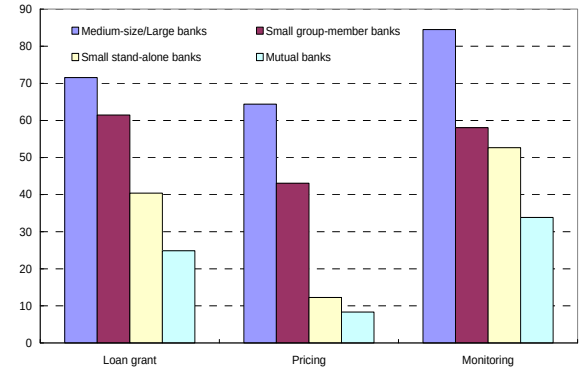
3. Data description

In order to investigate the impact of banks' organizational choices on their lending behaviour towards firms, we resort to a unique data set, which merges information stemming from several sources.

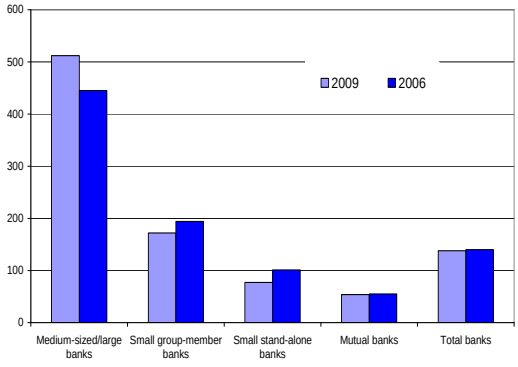
Firstly, we employ an organizational survey conducted by the Bank of Italy on almost 400 Italian banks, covering around the 80 per cent of the outstanding credit to Italian firms. The survey was carried out in March 2010 with reference to the situation as at the end of 2009 and tackled issues dealing with bank organization and lending techniques. A similar survey was carried out at the beginning of 2007 and referred to 2006: since the topics within the two surveys overlapped to a large extent, results from the older survey can be used as instrumental variables for the bank's features emerging from the more recent one. Descriptive evidence shows (Figure 1) that some important changes are now ongoing relative to rating adoption and decentralization of decision-making power, and that the crisis occurred in 2008-09 has probably interfered with this process within banking organizations, accelerating or slowing down it (see Del Prete *et al.*, 2013).

Figure 1

a) Importance of rating models in the lending process to SMEs (1)
(percentage values at the end of 2009)



b) Delegated power to Local Branch Manager (LBM) (2)
(values in thousand euros)



Source: Authors' elaborations on Bank of Italy's survey on organization and lending techniques.

(1) Frequency at which rating models are defined as "crucial" or "very important" during the granting, pricing or monitoring of a loan to a SME. Frequencies are weighted by the loans extended by the responding banks to firms. – (2) The maximum amount of loans a Local Branch Manager can autonomously grant to non financial firms, asking for the first time credit to a given lending bank.

Since end 2008, and twice per year in regular waves, the same large sample of Italian banks has been also asked to report variations in demand and supply credit conditions at bank level (the so-called "Regional Bank Lending Survey" - RBLS). This

survey is carried out much in the same vein as the ECB's Bank Lending Survey. On each wave, the questions refer to the current and past semester, and therefore give a picture of the conditions of credit market and allow disentangling short-term demand from supply factors at bank level.

Finally, we use the Bank of Italy's Supervisory Reports on the same sample of banks, in order to capture balance sheet conditions of the surveyed institutions, for instance their degree of capital constraints, the average riskiness of their credit portfolio, their operational efficiency or profitability, etc. In particular, the figures retrieved from Supervisory Reports allow us to gauge the amount of credit actually extended by each bank to the customer firms at each period of time which is relevant for the analysis. This allows us to build a credit growth rate at bank level (i.e. the dependent variable in our econometric exercise) in order to investigate how different bank organizational models might have differently affected the dynamics of credit to non-financial firms during the crisis period.

4. Specification and variable definition

The relationship among organizational variables and growth of the extended credit to Italian firms will be investigated by means of the following reduced form:

$$GrowthCreditFirms_{bt} = \alpha + \beta ORG_b + \gamma DC_{bt} + \delta BSI_{bt} + \varepsilon Date + \mu_{bt} \qquad (1)$$

where $GrowthCreditFirms_{bt}$ is the yearly loan rate variation for bank b in period t, where t denotes semesters within the time span 2008 II-2010 II. We consider loans extended to non-financial firms, and we run distinct econometric exercises for small borrowers (less than 20 employees). In order to smooth erratic changes in data, we use as dependent variable an average growth rate, as the mean of the half-year credit growth at semester t and at semester $t-1$. To lower the impact of different bias on accounting data, the effects of mergers and acquisitions have been wiped out, as well as other distorting factors. Nevertheless, the use of a rather large panel of banks for a number of time periods inevitably causes the presence of outlier growth rates. Therefore, in the econometric exercises we decided to restrict estimation to a subset of observations, dropping loan growth rates outside the boundaries of the 5^{th} – 95^{th} percentile of the same variable.

The set of our explicative variables on the left hand side can be summarized by the following groups.

(a) ORG_b is a vector of time invariant organizational variables as observed at the end of 2009:

- *Scoring* and *Scoring_Grant*: these variables provide two definitions for the use of quantitative rating models, and as such will be used alternatively. *Scoring* is a dummy variable for credit rating/scoring adoption (1 = adoption), whereas *Scoring_Grant* is a dummy variable indicating whether the bank considers credit rating/scoring as 'crucial' or 'very important' for granting credit (=1);

- *LBM_Delegation*: is a measure of decisional powers delegated to the local branch manager (LBM), i.e. the amount of credit that a LBM is allowed to extend to firms without asking for a formal authorization to higher levels in the bank hierarchy, as observed in 2009. For reasons explained in Albareto *et al.* (2010), we normalize that amount with the corresponding loan that can be autonomously offered by the CEO (relative delegation).

- *LBM_Tenure:* (log of) LBM's tenure in the same local branch, measured as the average tenure (in months) of bank managers, as at the end of 2009;

- *Bk_classification*: is a vector of categorical variable (dummies) accounting for bank size and legal nature; we use four different groups of banks: 1) medium and large sized banks (used as benchmark), 2) small banks belonging to a banking group, 3) stand alone small banks, 4) mutual banks (very small and local banks).

- *Bk_area*: is a vector of categorical variables (dummies) indicating the macro-regional area in Italy where bank headquarters are located; in particular, we use four area dummy variables: 1) North West (as the base-category), 2) North East, 3) Centre and 4) South and Islands. It is important to notice that some large banks extend credit throughout Italy, irrespective of the location of their headquarters.

b) DC_{bt} is a vector of credit demand synthetic indicators as reported by each bank in the several waves of the RBLS. The *Demand* indexes we use in the econometric analysis represent qualitative bank assessments about the intensity of the variations in loan demand (positive and higher values of the indicator stand for stronger demand expansion; the range

is set between –1 and +1). Responses are also differentiated for small and medium-sized enterprises.[3]

(c) BSI_{bt} is a vector of time-varying bank characteristics including:

- *L1_risk* : is the riskiness of loan portfolio as measured by bad loans over total outstanding loans, lagged by one semester; the ratio refers either to total loans to non-financial firms or to loans to small firms, according to the relevant relationship to be investigated;

- *L1_roa*: is the lagged return on assets (ROA);

- *L1_capratio*: is the lagged ratio of net equity and reserves over total assets.

(d) *Date*: is a vector representing time fixed effects. The time period has been chosen with a view to covering the toughest phase of the economic downturn, which also caused credit volumes to slow down, and the following phase of moderate recovery in the pace of credit growth for Italian firms. In order to evaluate the effect of organization on credit dynamics during the financial crisis, we only focus on the first part of the cyclical downturn (2008-09). This allows us to use as a 'natural experiment' a broadly unexpected event, whereas it is likely that the subsequent recession was progressively incorporated by both banks and firms in their behaviours and in their organizational choices, thus confounding the identification strategy.

(e) Finally, α, β, γ, δ and ε are parameters to be estimated while μ_{bt} is an error term for which we assume $\mu_{bt} = \upsilon_b + \varepsilon_{bt}$

The variables in ORG_b, and their effects on credit dynamics are the focus of our analysis, since we are trying to disentangle the bearing that a given organizational model or the use of some lending technologies have on a bank ability (or willingness) to extend credit to firms, especially during a severe cyclical downturn. In this set of variables are also included dummies picking up the governance structure (bank size and group affiliation) and the location of bank headquarters.

DC_{bt}, denotes short-run variations in credit demand that in turn reflect idiosyncratic factors like the economic conditions of the local credit markets where the bank operates, the performance of the main industries financed or the type of loan contracts offered. Since we observe dynamics that are an equilibrium point between credit

[3] In some (unreported) regressions, we also control for short term supply-side indicators; in particular, we take into account variations in supply conditions averaged across two consecutive half yearly responses (higher values stand for tighter lending criteria, the range is –1 to +1) and we get similar results.

demand and supply, through this variable it is possible to control for several important potential determinants of the loan dynamics related to borrowing firm characteristics.[4] The set of demand indicators drawn from the RBLS are not very common in the banking literature, mainly because they are rarely available.

Several studies addressed the link between the balance sheet conditions of the bank and credit growth.[5] Against this background, the third set of variables, BSI_{bt} is aimed at ensuring that we control for bank balance-sheet indicators. In particular, the portfolio riskiness allows us to control for possible flight-to-quality strategies, which might display different patterns according to the current quality of bank portfolio. Bank profitability and capital endowment account for potential economic, liquidity and capital constraints, which could affect lending decisions.

Table a[1] reports summary statistics for the dependent variable, with a breakdown for the values of the credit demand variable as recorded in the RBLS. These statistics show a positive correlation between the perceived dynamics in credit demand, as reported in the survey, and the actual growth rate of loans to Italian firms.[6]

Tables a[2] summarizes the descriptive statistics related to the explanatory variables and reports their definition. In our data, we observe that the median bank shows: *a)* a credit growth rate that is 2-3 percentage points lower for small firms relatively to the whole sample; *b)* a low bank profitability (as suggested by ROA close to zero) and a slightly higher portfolio riskiness for SMEs. Focusing on organizational variables, on average around 70 per cent of the banks in our sample have adopted a credit scoring or internal rating system, but only 16 per cent attributed a prominent role to these lending techniques in the decision to grant credit to non-financial firms. Finally, Table a[3] provides correlations across the main variables used in our estimates, highlighting no-collinearity problems in the econometric analysis.

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[4] For the same reason, and in order to check the robustness of our main findings, in some unreported regressions we separately consider the influence of the credit standards applied by the bank in the short-term and we obtain similar results to those presented in our paper. So, we are confident that our main findings, above all those on the organizational variables, are robust with respect to controlling for supply credit standards.

[5] See Kashyap and Stein (2000) and Angeloni *et al.* (2003) for a review. Recent empirical evidence confirms that banks' balance sheet conditions have played a role in affecting the lending supply reaction after Lehman collapse (Albertazzi and Marchetti, 2010; Puri *et al.*, 2010; Popov and Udell, 2010; Jimenez *et al.*, 2010; Gambacorta and Marques-Ibanez, 2011; Hempell and Soerensen, 2010, Ivashina and Sharfestein, 2010). According to Del Giovane, Eramo and Nobili (2010), in Italy one fourth of the reduction in lending activity after the Lehman collapse, i.e. a drop of 2.2 to 3.1 percentage points in growth rates, can be attributed to banks' balance sheet position.

[6] This is why we prefer to directly investigate the effects of demand and supply behaviours on the actual credit growth, instead of using as dependent variable survey's proxies of credit demand, reflecting banks' sentiments.

5. Main findings

5.1 Random effects model

We run regression in equation (1) for a sample of slightly more than 300 banks participating to the Bank of Italy's banking organization and Regional Bank Lending Surveys and reporting information on their internal organization of lending activity. Our baseline specification allows for bank random effects, as they seem to be consistent with the fact that credit variations at bank level may be subject to several idiosyncratic factors that are erratic and hardly observable. Results are shown in Table a[4] and a[5], Panel *a*. Although we deem the random effect specification is consistent with the nature of the dependent variable, we also use an alternative econometric strategy including bank fixed effects (see Section 5.2) and we get similar results.

Firstly our findings point out that the mere adoption of rating models for assessing the firms' creditworthiness is irrelevant to the dynamics of credit granted to non financial firms in the crisis period (column [1]). This holds both for the entire sample and for the credit dynamics specifically referred to small businesses. However, when we re-define the variable considering those banks that actually assign a major role to scoring systems in their lending process (column [2]),[7] its effect is significant and negative: a tight use of credit scoring models contributes to dampen credit growth, with a similar impact considering the entire sample or just small firms. Thus, our evidence provides support to the idea that banks that heavily rely on codified information have a negative attitude in the lending process during the crisis, most likely introducing a persistency factor in the cyclical downturn, owing to the lag of these models with respect to the current situation of the firm.

Delegating more decisional power to local branch managers (LBM) had a positive effect on loan dynamics during the crisis, even when controlling for short-term variations in demand conditions, bank size and governance models, as well as random specific shocks hitting individual banks. This positive impact was more marked as far as the dynamics of credit to small business is concerned. This evidence is consistent with the LBM being less closely involved in the decision to lend to large firms, for which the loan process approval is directly managed either by the bank CEO or by intermediate levels between the CEO and the LBMs within the bank hierarchy.

[7] Please note that this stricter definition of the 'scoring' dummy includes all the banks that according to the organizational survey considered ratings 'crucial' or 'very important', regardless of whether they had their Internal Rating Based systems validated by the Supervisory Authority (i.e. the so-called IRB Italian banks) at the time of the organizational survey, or not.

Against this background, it is somehow surprising that a comparatively longer LBM's tenure reduced a bank's credit expansion during the crisis. One could expect a longer tenure to be a crucial condition at mitigating the effects of the crisis on credit availability to firms. In this direction, previous empirical evidence emphasized a positive correlation between LBM's tenure and small business lending and supported this view with reference to the pre-crisis period (Benvenuti *et al.*, 2010). However, most likely the economic downturn exacerbated the agency costs between the headquarters and the periphery: a long-established LBM, owing to its longer tenure, might more easily collude with the local community of borrowing firms, thus worsening the overall effectiveness and smoothness of the credit allocation process. According to our estimates, the (negative) magnitude of the effect of a slower turnover is similar for credit to SMEs and other firms. It must also be remarked that the estimated parameters account also for the bank category: small independent banks and mutual ones usually apply a slower turnover than other banks (see Del Prete *et al.*, 2013). As a consequence, the estimated negative impact of slower turnover must be understood to emerge *within* a given bank category.

The estimated coefficients allow gauging the economic relevance of the factors driving credit growth, besides their statistical significance. Assigning a key role to quantitative methodologies (rating and credit scoring) in the credit allocation triggers a reduction around 0.9-1 percentage points in the yearly credit growth rate, depending on the sample of firms taken into account. Moreover, the switch in LBM delegation from the first to the third quartile of the distribution in our sample entails an estimated 0.5 percentage points increase in the growth rate. Finally, moving from the first to the third quartile the average tenure of the local managers would yield a 0.5 per cent decrease in yearly expansion of its credit to firms. According to these estimates, the 'organizational channel' has by no means negligible effects on credit aggregates.

Moreover, having controlled for bank size and other legal and institutional characteristics, our findings on the impact of organizational variables on bank lending corroborate and extend those in Albareto *et al.* (2011). While they found a substantial heterogeneity in bank organization that goes beyond that of the traditional dichotomy between large and small sized banks, we show that this heterogeneity does matter for bank strategies and performance in a crucial time span as that represented by the recent economic crisis. In other words, different banking organizational models behaved differently in terms of firm credit dynamics also during the 2008-09 credit slowdown.

As far as the other control variables are concerned, the credit demand conditions are significant and, as expected, boost the loan growth pattern.[8] The findings confirm those reported in similar studies referred to the equivalent ECB survey (De Bondt *et al.*, 2010), as well as the simultaneous presence of demand and supply side factors behind the recent credit slowdown (Panetta and Signoretti, 2010).

Turning to balance sheet indicators, a flight-to-quality phenomenon seems to emerge; this effect appears to be stronger for those banks whose portfolio had undergone a sharper deterioration in the previous periods: those banks with the greater idiosyncratic risk in their portfolio have more prominently slowed down their credit expansion, especially towards larger firms. Bank profitability does not exhibit a significant impact on credit dynamics. Furthermore, the impact of capital endowments is unclear and the estimated parameter is not statistically significant, suggesting that the crisis has not suffered a capital-induced credit crunch, at least for the period covered by our analysis.

Finally, the institutional/size features of the banks appear to be relevant: credit expansion has been faster for smaller banks than for larger ones, particularly for small lenders not involved in larger groups, in line with previous empirical findings (Panetta and Signoretti, 2010) and with the evidence emerging from economic regional reports (Bank of Italy, 2011). These results support the belief that size and organizational complexity strongly matter for lending behaviour, both in normal period and during economic crisis. The location of bank's headquarters does not have any relevant impact, apart from a slower volume expansion for banks established in the North-eastern regions.

5.2 Fixed effects vector decomposition model

In order to check our results, we verify our findings by introducing fixed effects, thus assuming individual, time-invariant, differences for individual lenders. These idiosyncratic effects allow us to control for bank-specific characteristics potentially correlated with other bank explicative variables different from organizational features for which we account for.

Yet, our main variables of interest are time-invariant. Therefore, we use the three-stage estimation procedure proposed by Plümper and Troeger (2007, 2011). Following the so-called fixed effects vector decomposition procedure (FEVD), in the first stage the dependent variable is regressed upon the time-dependent variables (i.e. credit demand indexes, balance sheet indicators and time dummies) and bank-level fixed effects; in the

[8] In unreported regressions, we also find that, *ceteris paribus*, the fine-tuning of credit supply standards applied by the bank in the short run has the expected effect to depress credit volumes expansion.

second stage, average residuals from the first stage at bank level are explained through the bank time-invariant regressors, especially those related to organization and lending techniques we focus on. In the third stage, the error term estimated in this second stage is then used to run a full model, which encompasses both time –variant and –invariant variables and which is estimated by normal OLS. Yet, there is quite a debate on the FEVD estimator. Most of the critiques focuses on underestimation of the standard errors, although some concerns on the consistency of the estimator were put forwards, too. (Greene, 2011). Indeed, the literature recommend to compare the results with a Hausman-Taylor estimation (Breusch *et al.,* 2011), which we perform in the next section. In Panel *b* of Tables a[4] and a[5], we report equation (1) through this FEVD estimation procedure.

Focusing on the model relying on the more restrictive definition of rating models, as crucial technique in assessing credit [column (3) in Panel *b*], we find that the outcome of the FEVD estimation method broadly confirms the findings of our random effect model. In particular, the significance, sign and magnitude of the parameters related to organization and lending technologies validate our previous conclusions that – everything being equal – (i) an intense use of rating/scoring models has weighed down loan activity, (ii) decentralization of decisional powers to LBMs has favoured credit flows to all kind of firms, and (iii) a slower turnover of managers at branches has been detrimental to a faster credit growth. Also the control variables appear rather robust under this alternative specification, with the exception of a weaker significance for balance-sheet indicators.

6. Robustness checks

In order to check for the robustness of our results from random and fixed-effects models, we ran a Hausman-Taylor estimation (Hausman and Taylor, 1981), which allows for correlation among independent variables and random shocks at individual level. In this specification, the time-variant regressors accounting for credit demand are treated as endogenous, since the answers from the banks might be influenced by the credit dynamics really experienced by lenders. The remaining explanatory variables are kept as time-invariant or time-dependent exogenous regressors.

The results of this estimation are displayed in Table a[6]. The main findings from the random effect model are confirmed. Short-term credit demand variations are positively correlated with those in credit volumes, even if the magnitude of the estimated coefficients and their statistically significance are lower when we restrict the sample to small business lending (Panel *b*). The past riskiness of loan portfolio plays a clear role to constrain further expansion of loans to non-financial firms, while other balance sheet indicators are more

ambiguous in their effects. For instance, bank profitability positively correlates with credit dynamics, but the estimated parameter is statistically weak. By contrast, the bank capital is not significant, at least during the period under examination. All other things being equal, smaller banks display a faster credit growth, while banks headquartered in the North East regions experience a slower dynamics of credit in the whole sample. Concerning lending technologies, the use of rating models have hampered credit activity whenever banks, apart from adopting these quantitative assessment models, assign them a key role in their loan processing. The size of the coefficient is very similar to the previous estimation.

Turning to the bank organization, delegating powers to local managers positively affects credit growth in the whole sample of firms while the span of decisional power delegated to LBM does not seem to have any significant impact on the dynamics of small business lending, although the magnitude of the estimated parameter is broadly consistent with our preferred specification. Finally, a longer tenure for branch managers contributes to hold back extension of loans to firms (on average, but not on the subsample of smaller borrowers), once again after controlling for bank size and governance features.

Another important concern is that most of our results should be biased by the fact that some organizational variables we use to account for credit supply could be determined by the dynamics of credit we try to explain by organization and lending techniques. In order to tackle this potential endogeneity problem related to reverse causality between the dependent variable and our core explicative factors, we run an IV regression (Table a[6], panel *c*). To this aim, we employ as instruments for the set of organizational characteristics (usage of scoring in assessing credit, LBM delegated powers and LBM tenure) their lagged values, as recorded by banks in the previous Bank of Italy's organizational survey, depicting the Italian banks at the end of 2006, before the Great Crisis. The identification strategy based on our proposed instruments hinges on the fact that the financial crisis was to a large extent an unpredictable event in 2006. Hence, it is likely that organizational variables in that year are uncorrelated with the credit dynamics during the crisis period. At the same time, the organization variables should be strongly and positively correlated across the two years due to the slackness in organization design. Unfortunately, the sample coverage in the 2006-survey was lower than in 2009. Therefore, we recover some of these missing data by using the 2007-survey, as far as the LBM's tenure is concerned, and by dating back to 2006 the use of scoring techniques, on the ground of the year of adoption reported in the last wave of the survey.

Findings from this alternative econometric set-up broadly confirm our baseline results obtained from GLS bank random effect model. Particularly, credit demand index and bank balance sheet indicators preserve their impact on the credit dynamics, significant at the usual confidence levels. Focusing on bank organizational characteristics, the coefficient on LBM delegated power is not yet significant, while the crucial role of credit scoring in granting credit and the LBM tenure are robust and negatively affect the actual credit dynamics, once again supporting our previous results.

7. Conclusions

After the Lehman Brothers' collapse in the September 2008, the uncertainty of the economic environment and the financial turmoil have strongly conditioned the lending process and the relationships paradigm of credit, above all for that extended to smaller and opaque firms.

Extant literature has devoted significant effort in order to clearly disentangle demand and supply factors behind the credit slowdown. In this paper we take a further step in this direction, and attempt to isolate bank heterogeneity stemming from organizational choices as a distinct channel of transmission of financial distress to credit markets for firms. To this end, we use a very unique dataset, based on the Bank of Italy's surveys on bank lending demand and supply, on different lending techniques and on organizational data. Our analysis on such dataset allows us to go beyond the traditional credit channel literature (Bernanke and Blinder, 1988), which magnifies the movements in borrowing firms' balance sheets, and to argue that the observed tightening in credit conditions could be also explained by a sort of "banking organizational channel" through the cycles.

Our main findings can be summarized as follows. On the one hand, short-term controls for firms' credit demand positively correlate with the real credit dynamics, in line with the evidence of a recent strand of the literature (Panetta and Signoretti, 2010), supporting the view that credit dynamics have also been dampened down by flatness in loan demand. Secondly, we find evidence of heterogeneous behaviours among banks according to their diverse organizational complexity and prevalent lending techniques adopted in loan approval process. Other things being equal, we point out that small and local banks present a higher credit dynamics during the recent crisis with respect to larger and more complex intermediaries. Moreover, more decentralized banks (in terms of the

share of decisional power delegated to local managers) have generally over-performed in extending credit to firms, probably owing to a greater ability to complement valuable soft information into the credit selection process (as suggested, e.g., by De Mitri *et al.*, 2010). By contrast, the assignment of a crucial role to scoring or internal ratings to assess borrower's creditworthiness has reduced credit dynamics. The latter finding might suggest that banks should produce more efforts in trying to find an optimal mix between quantitative and qualitative information in assessing borrowers' creditworthiness through standardized methodologies, especially during a deep recession. Finally, contrary to previous evidence, we have found that a longer LBM tenure has hampered credit growth: our interpretation of this result is that, during the crisis, increased uncertainty in creditworthiness evaluation could have exacerbated agency and coordination costs between headquarters' and branch network. Furthermore, this evidence can again support a more balanced mix of the usage of hard and codified relatively to soft and qualitative information, since, during the crisis, the latter type of information has boosted for the banks the costs of moral hazard behaviour in local hierarchical levels, and caused a loss of control over lending decisions.

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Tables and Figures

Table a[1]

Summary Statistics: Dependent Variable (credit to non-financial firms)

(annual growth rates)

Credit demand situation (1)	Mean	Median	Inter-quartile range	N. of observ.
Strong contraction	0.055	0.043	0.110	78
Contraction	0.049	0.042	0.100	478
Neutral	0.060	0.048	0.110	620
Expansion	0.096	0.085	0.110	597
Strong expansion	0.120	0.110	0.082	68
Total	**0.071**	**0.060**	**0.110**	**1841**

Source: Our calculations on Bank of Italy, Regional Bank Lending Survey (RBLS) and Supervisory reports.

(1) The variable is a judgement of the banks about the credit demand situations from non financial firms, ranging from –1 (strong contraction) to 1 (strong expansion).

Table a[2]

Descriptive statistics: whole sample

Variables	Variable definition	Mean	P25	Median	P75
credit growth rate (all firms)	Average yearly growth of credit to whole sample of firms	0.092	0.012	0.070	0.132
credit growth rate (small firms)	yearly growth of credit to small firms (with less than 20 employees)	0.063	-0.002	0.051	0.111
credit demand index (all firms)	Credit demand index for all kinds of firms, as recorded by each bank in the RBL survey (ranging between -1 and +1)	0.028	-0.500	0.000	0.500
credit demand index (small firms)	Credit demand index for small firms, as recorded by each bank in the RBL survey (ranging between -1 and +1)	0.046	-0.500	0.000	0.500
Portfolio riskiness (all firms)	Bad loans on firms' total loans	0.050	0.018	0.034	0.061
Portfolio riskiness (small firms)	Small firms' bad loans on small firms' total loans	0.095	0.019	0.039	0.076
ROA	Earnings before taxes on total assets	0.003	0.001	0.003	0.005
Capital ratio	Capital and Reserves on Total assets	0.110	0.082	0.102	0.131
Scoring	Dummy equal to 1 in case of adoption of credit scoring or internal rating systems to evaluate firms creditworthiness	0.684	0.000	1.000	1.000
Scoring_grant	Dummy equal to 1 if the adoption of credit scoring or internal rating systems is crucial or very important to grant credit to firms	0.165	0.000	0.000	0.000
LBM Delegation	Max Loan LBM on Max loan CEO	0.162	0.040	0.125	0.240
LBM Tenure	Log. of months a LBM stays in charge at the same branch	3.595	3.219	3.584	4.094
Bank Size	Log of total assets	20.108	19.001	19.883	21.023

Source: Our calculations on Bank of Italy, Regional Bank Lending Survey (RBLS) and Supervisory reports.

Table a[3]

Summary Statistics: Correlation table (dependent variable: credit growth to all Italian firms) (1)

(pair-wise correlation statistics)

	Depend. variable	Organisational variables				Demand/Supply variables		Balance Sheet variables			
Variable	Credit growth rate	Scoring	Scoring_Grant	LBM Delegation	LBM tenure	Credit demand	Credit supply	Portfolio riskiness	Return on assets	Capital ratio	Size (Log managed funds)
Credit growth rate	1										
Scoring	0.005 *0.835*	1									
Scoring_Grant	-0.049* *0.006*	0.410* *0.000*	1								
LBM Delegation	0.124* *0.000*	-0,088 *0,000*	-0.179* *0.000*	1							
LBM tenure	-0.087* *0.000*	-0.054* *0.023*	-0.075* *0.002*	-0.118* *0.000*	1						
Credit demand	0.314* *0.000*	-0.020 *0.442*	0.016 *0.536*	0.117* *0.000*	-0.073* *0.008*	1					
Credit supply	-0.058* *0.029*	-0.004 *0.895*	-0.034 *0.201*	0.004 *0.879*	0.048 *0.080*	-0.176* *0.000*	1				
Portfolio riskiness	0.011 *0.513*	0.022 *0.327*	-0.07 *0.671*	0.016 *0.504*	-0.028 *0.242*	0.047 *0.079*	-0.024 *0.364*	1			
Return on assets	0.098* *0.000*	0.037 *0.102*	0.037* *0.040*	0.049* *0.044*	-0.024 *0.305*	-0.056* *0.036*	-0.005 *0.846*	0.308* *0.000*	1		
Capital ratio	0.045* *0.012*	-0.057* *0.013*	-0.080* *0.000*	0.179* *0.000*	-0.017 *0.482*	0.052 *0.052*	-0.061* *0.022*	0.222* *0.000*	0.021 *0.238*	1	
Size (Log managed funds)	-0.157* *0.000*	0.223* *0.000*	0.366* *0.000*	-0.495* *0.000*	-0.031 *0.191*	-0.119* *0.000*	-0.065* *0.014*	-0.008 *0.659*	-0.013 *0.472*	-0.402* *0.000*	1

Source: Authors' calculations on Bank of Italy, Organizational Survey, Regional Bank Lending Survey (RBLS) and Supervisory reports.

(1) Stars denote statistical significance: * p<0.10, ** p<0.05, *** p<0.01.; probabilities of the estimated correlation to be statistically not different from 0 in italics.

Table a[4]

Yearly growth rate of credit to Italian firms: whole sample of firms (1)

Dependent variable: yearly growth rate of credit to Italian firms	Panel a: Bank randon effects (GLS)		Panel b: Bank fixed effects (vector decomposition model)	
	Baseline	Rating very important	Baseline	Rating very important
Credit demand	0.0131***	0.0131***	0.0113***	0.0113***
	(0.002)	(0.002)	(0.002)	(0.002)
portfolio riskiness (lag1)	-0.1192**	-0.1221**	-0.1371***	-0.1406***
	(0.057)	(0.055)	(0.037)	(0.037)
Return on assets (lag1)	0.4891	0.4917	0.2793	0.2881
	(0.311)	(0.309)	(0.363)	(0.363)
Capital ratio (lag1)	0.0434	0.0551	0.0363	0.0500
	(0.071)	(0.072)	(0.051)	(0.052)
Scoring	0.001		0.0011	
	(0.004)		(0.003)	
Scoring_grant		-0.0088**		-0.0074*
		(0.004)		(0.004)
LBM Delegation	0.0254*	0.0264**	0.0245*	0.0253**
	(0.014)	(0.013)	(0.013)	(0.013)
LBM Tenure	-0.0061**	-0.0062**	-0.0064**	-0.0065**
	(0.003)	(0.003)	(0.003)	(0.003)
Small banks in groups	0.0197**	0.0169**	0.0194***	0.0170**
	(0.008)	(0.007)	(0.007)	(0.007)
Independent small banks	0.0283***	0.0230**	0.0280***	0.0234***
	(0.009)	(0.009)	(0.009)	(0.009)
Mutual banks	0.0164**	0.0098	0.0160**	0.0103
	(0.008)	(0.008)	(0.007)	(0.008)
North east	-0.0113**	-0.0109**	-0.0111**	-0.0108**
	(0.004)	(0.004)	(0.004)	(0.004)
Center	-0.0058	-0.0055	-0.0043	-0.0041
	(0.005)	(0.005)	(0.005)	(0.005)
South	-0.0018	-0.001	-0.0003	0.0003
	(0.006)	(0.006)	(0.006)	(0.005)
constant	0.0297**	0.0365***	0.0326**	0.0385***
	(0.014)	(0.014)	(0.013)	(0.013)
Time dummies	YES	YES	YES	YES
R-sqr	-	-	0.5701	0.5701
Wald - Chi2	359	359		
N. obs.	1,536	1,536	1,536	1,536
N. of banks	327	327	327	327

(1) Stars denote statistical significance: * p<0.10, ** p<0.05, *** p<0.01. Standard errors in brackets.

Table a[5]

Yearly growth rate of credit to Italian firms: small firms (1)

	Panel a: Bank randon effects (GLS)		Panel b: Bank fixed effects (vector decomposition model)	
Dependent variable: yearly growth rate of credit to small Italian firms (less than 20 employees)	Baseline	Rating very important	Baseline	Rating very important
Credit demand small firms	0.0065***	0.0065***	0.0047*	0.0047*
	(0.002)	(0.002)	(0.003)	(0.003)
portfolio riskiness small firms (lag1)	-0.0756***	-0.0765***	-0.0956***	-0.0966***
	(0.029)	(0.028)	(0.021)	(0.021)
Return on assets (lag1)	0.2461	0.2718	-0.2032	-0.1492
	(0.399)	(0.399)	(0.397)	(0.396)
Capital ratio (lag1)	-0.043	-0.0302	-0.0603	-0.0442
	(0.074)	(0.072)	(0.052)	(0.052)
Scoring	0.0027		0.0027	
	(0.004)		(0.004)	
Scoring_grant		-0.0097**		-0.0090**
		(0.005)		(0.005)
LBM Delegation	0.0277**	0.0289**	0.0271**	0.0282**
	(0.014)	(0.013)	(0.013)	(0.013)
LBM Tenure	-0.0056*	-0.0057*	-0.0059*	-0.0060**
	(0.003)	(0.003)	(0.003)	(0.003)
Small banks in groups	0.0157*	0.0125	0.0150**	0.0119
	(0.008)	(0.008)	(0.007)	(0.007)
Independent small banks	0.0243**	0.0180*	0.0231***	0.0170*
	(0.010)	(0.010)	(0.009)	(0.009)
Mutual banks	0.0156*	0.0078	0.0140*	0.0067
	(0.008)	(0.008)	(0.007)	(0.008)
North east	-0.0089**	-0.0085**	-0.0082*	-0.0078*
	(0.004)	(0.004)	(0.004)	(0.004)
Center	-0.0053	-0.0051	-0.0041	-0.0039
	(0.005)	(0.005)	(0.005)	(0.005)
South	-0.001	-0.0001	0.0012	0.0020
	(0.006)	(0.006)	(0.006)	(0.006)
constant	0.0393***	0.0480***	0.0425***	0.0505***
	(0.014)	(0.014)	(0.014)	(0.013)
Time dummies	YES	YES	YES	
R-sqr	-	-	0.47	0.47
Wald - Chi2	140	161		-
N. obs	1,505	1,505	1,505	1,505
N. of banks	323	323	323	323

(1) Stars denote statistical significance: * p<0.10, ** p<0.05, *** p<0.01. Standard errors in brackets.

Table a[6]

Robustness checks (1): Hausman-Taylor (2) and IV estimation (3)

Dependent variable: yearly growth rate of credit to Italian firms	Panel a: whole sample (HT est.)		Panel b: small firms (HT est.)		Panel c: whole sample (IV est.)
	Baseline	Rating very important	Baseline	Rating very important	Rating very important
Credit demand	0.0113***	0.0113***			0.0103***
	(0.002)	(0.002)			(0.002)
Credit demand small firms			0.0040*	0.0040*	
			(0.002)	(0.002)	
portfolio riskiness (lag1)	-0.1194***	-0.1223***			-0.3243***
	(0.031)	(0.031)			(0.082)
portfolio riskiness small firms (lag1)			-0.0830***	-0.0843***	
			(0.021)	(0.021)	
Return on assets (lag1)	0.4627*	0.4657*	0.5182	0.5310*	0.5327*
	(0.275)	(0.274)	(0.320)	(0.319)	(0.323)
Capital ratio (lag1)	0.043	0.0543	-0.0980*	-0.0840	-0.0022
	(0.047)	(0.047)	(0.056)	(0.056)	(0.080)
Scoring	0.0015		0.004		
	(0.004)		(0.004)		
Scoring_grant		-0.0077*		-0.0098*	-0.0509**
		(0.005)		(0.005)	(0.022)
LBM Delegation	0.0256*	0.0265**	0.0248	0.0259	0.0502
	(0.013)	(0.013)	(0.016)	(0.016)	(0.060)
LBM Tenure	-0.0055*	-0.0056*	-0.0057	-0.0059	-0.0776***
	(0.003)	(0.003)	(0.004)	(0.004)	(0.028)
Small banks in groups	0.0206***	0.0180**	0.0179**	0.0144	0.0166
	(0.007)	(0.007)	(0.009)	(0.009)	(0.015)
Independent small banks	0.0293***	0.0245***	0.0287***	0.0218**	0.0288
	(0.009)	(0.009)	(0.010)	(0.011)	(0.023)
Mutual banks	0.0173**	0.0113	0.0208**	0.0124	0.0016
	(0.007)	(0.008)	(0.009)	(0.009)	(0.025)
North East	-0.0109**	-0.0106**	-0.0088	-0.0083	-0.0025
	(0.004)	(0.004)	(0.005)	(0.005)	(0.007)
Center	-0.0050	-0.0047	-0.0079	-0.0074	-0.0075
	(0.005)	(0.005)	(0.006)	(0.006)	(0.007)
South	-0.001	-0.0003	-0.0032	-0.0022	0.0064
	(0.006)	(0.006)	(0.007)	(0.007)	(0.010)
constant	0.0261*	0.0325**	0.0419**	0.0520***	0.3190***
	(0.014)	(0.014)	(0.017)	(0.016)	(0.099)
Time dummies	YES	YES	YES	YES	YES
N. obs	1,536	1,536	1,523	1,523	1,061
N. of banks	327	327	324	324	223
Wald - Chi2	567	570	112	114	401

(1) Stars denote statistical significance: * p<0.10, ** p<0.05, *** p<0.01. Standard errors in brackets. – (2) The estimation procedure consists of an Hausman-Taylor estimation where it is accounted for endogeneity of the credit demand time-variant variables. The other independent variables are treated as time-variant or time-invariant exogenous regressors. – (3) The IV estimation is implemented using as instrumental variables of banking organization features measured at the end-2009 the same variables recorded in previous survey at the end- 2006.