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Bank-firm relations and the role of Mutual Guarantee Institutions during the crisis

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Abstract

We examine the role played by Mutual Guarantee Institutions (MGIs) in the lending policies undertaken by banks at the peak of the Great Crisis of 2007-2009. We address this issue by using a large database on Italian firms built from the credit files of UniCredit banking Group and focusing on small business. We provide an empirical analysis of the determinants of the probability that a borrowing firm will suffer financial tension and obtain two main innovative findings. First, we show that small firms supported by MGIs were less likely to experience financial tensions even at that time of utmost financial stress. Second, our empirical evidence shows that MGIs have played a signalling role beyond the simple provision of a collateral. This latter finding suggests that the information provided by MGIs turned out to be key for bank-firm relations as scoring and rating systems – being typically based on pro-cyclical indicators – had become less informative during the crisis.

JEL Classification: D82, G21, G30
Keywords: financial crisis, bank-firm relationships, asymmetric information, credit guarantee schemes, small business finance, peer monitoring

1 Introduction

We bring together two different strands of literature related to the extent of financial constraints. First, given the existing state of the firm-bank relationship, we ask whether the support of external institutions may help ease those financial constraints. Second, we address that issue within the specific context of the Great Crisis of 2007-2009.

On the first matter, the literature often recognizes that borrowers' access to credit may benefit from the assistance of Mutual Guarantee Institutions (MGIs). However, it is not clear through which channel that beneficial effect materializes. On one hand, the bank could simply value the guarantee offered by the MGI to the borrowing firm, which would reduce both the probability of default and the loss given default. In this sense, the MGI

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guarantee acts merely as a collateral available to the bank vis-à-vis that borrower. On the other hand, the bank might interpret the MGI guarantee as an important signal of the good quality of the firm. Indeed, the MGI has access to private information on the firm beyond what the bank can normally see and if the MGI grants its guarantee to that firm it is implicitly revealing to the bank that such private information is good.

On the second matter, the Great Crisis of 2007-09 brought about extreme financial instability, especially after the bankruptcy of Lehman Brothers, by mid-September 2008. That wave of instability kept aggravating during the rest of 2008. The acute difficulty they had to obtain funding on the wholesale markets induced the banks to become particularly reluctant to maintain their supply of credit at the previous levels, let alone granting new loans. So, there is evidence the banks curtailed credit supply by the end of 2008 and that the adjustment reached its climax during the first half of 2009. Even though, given the concurrent drop in demand, most enterprises postponed their investment projects or even cut their production levels, the resulting drop in the demand for credit was much less than the drop in the credit supply. Thus, the extent of financial constraints during the crisis is a very special experience, something that comes close to a laboratory experiment, where the external shock imparted by the crisis induced a sudden and likely unexpected contraction in the credit supply. In turn, it is useful to assess whether the value of the MGI support eclipsed because of the crisis or it was still working at that time of utmost financial stress.

To answer those research questions we use the credit files of a large commercial bank (UniCredit) taking two snapshots of them: at the end of December 2008 and at the end of March 2009. First, we build a proxy measure of credit constraints considering the ratio between the amount of credit effectively drawn by the enterprise and the amount of the credit limits the banks had granted to it. Namely, we classify as experiencing financial tension those enterprises that: i) had a very high value of such ratio by end December 2008 and ii) suffered a significant increase in that ratio by end March 2009. Then, we study empirically whether and to what extent, controlling for other possible determinants, the probability of suffering financial tension was smaller for the firms assisted by MGIs.

As regards our research questions, we reach the following results. First, we confirm that borrowing firms assisted by MGIs less likely experienced financial tension. Second, MGI assistance benefited more the borrowing firms with intermediate and low internal ratings whereas it did not matter so much for the companies enjoying higher ratings. Third, our results indicate that MGIs' beneficial impact to reduce the probability of financial tension was significantly larger for the more opaque firms, namely those endowed with a shorter firm-bank relationship length. The second and third results together suggest that MGIs played a signalling role beyond the pure provision of guarantees.

In the rest of the paper, section 2 presents a brief summary of the literature on the two aspects: i) the impact of systemic financial crises on the amplification of credit constraints via the bank lending channel, and ii) the effect of MGI assistance at facilitating firms' access to credit during normal times. The bulk of the paper consists of section 3, where we present our empirical analysis in detail. Finally, section 4 concludes highlighting why our results have a bearing on the design of an optimal financial structure, particularly with a view at the small business segment.

2 The literature background

It is a well known tenet that banks exist to (partly) overcome the information asymmetries between investors and borrowers. Building on the seminal paper by Stiglitz and Weiss (1981), Diamond (1984) shows that savers/depositors delegate to banks the monitoring of borrowers. It follows from this that banks play a key function to remedy market failures in the credit market given that, by accumulating information on borrowers, they may lower the extent of asymmetries in information and provide the borrowers with the appropriate incentives to tackle the adverse selection and moral hazard problems.

According to a bulky strand of the literature, banks perform the task above better if they engage in long-term relationships with borrowers, i.e. if they follow the relationship banking model. Boot (2000) holds that relationship banking centers around two critical dimensions: the extraction of proprietary information from the borrower by the lender and the occurrence of multiple interactions between the two parties. As such, relationship banking may be defined as "the provision of financial services by a financial intermediary that: i. invests in obtaining customer-specific information, often proprietary in nature; and ii. evaluates the profitability of these investments through multiple interactions with the same customer over time and/or across products". This special status can facilitate a Pareto-improving exchange of information between the borrower and the bank. But relationship banking can also add value through several additional contractual welfare-improving enhancements: i) through flexibility and discretion, it can facilitate implicit long term contracting; ii) it may help controlling potential conflicts of interest; iii) it can improve the monitoring of collateral; iv) it may render feasible for the bank to make loans that would not be profitable from a short term perspective but may become profitable if the relationship with the borrower lasts long enough.

But, why should relationship banking be most valuable during financial crises? The answer depends on the fact that in those circumstances economies experience widespread distress. This implies that borrowers need financial assistance the most exactly when the economy is plundered by pervasive lack of liquidity. If this financial assistance is denied, many viable firms might become insolvent and become bankrupt, with large potential depletion of corporate value (Andrade and Kaplan, 1998). Which is then the link between relationship banking and distress? We find a rather general agreement that relationship banking may help deal with financial distress.

Analyzing the case of Japanese firms, Hoshi, Kashyap, and Scharfstein (1990) show that the costs borne to overcome episodes of financial distress are significantly lower for firms enjoying long-standing relationships with a main bank. Kawai, Hashimoto, and Izumida (1996) find that the main bank system reduces the firm's financial cost for Japanese firms in financial distress. Elsas, and Krahnen (1998) reach analogous conclusions on German data: they unveil that housebanks provide liquidity insurance in situations of unexpected deterioration of borrower ratings. Building on the hypothesis that implicit contracts may characterize bank lending (Fried and Howitt, 1980), Berlin, and Mester (1998) find evidence that relationship banks smooth loan rates in response to exogenous shocks. They argue that loan rate smoothing is part of an optimal long-term contract between a bank and its borrower if it happens in response to interest rate shocks – but not in response to a credit risk. Examining micro-data on corporate borrowing in Italy during the episode of sharp monetary tightening in 1992 – aimed to resist the extant

exchange rate crisis – Conigliani, Ferri, and Generale (1997) show that the intensity of lending rate increase and of credit constraints was higher the larger the number of lending banks.

While there is general consensus that relationship banking should be most valuable during financial crises, we need to make an important caveat. Specifically, as Berlin, and Mester (1998) also show, loan rate smoothing – and, we can add, the provision of liquidity insurance more in general – reduces bank profits. This means that financial crises may impose a greater burden on relationship banks than on arm's length banks. If one considers that such a burden is compounded with the accrual of increasing losses triggered by the crisis, this entails that the stability of (some) relationship banks may be at risk. In other words, there is a limit to the intertemporal smoothing and liquidity insurance offered by relationship banks. And, in some cases, relationship banks may become distressed. Should such occurrence materialize, borrowers would be hit by the curse of relationship banking rather than enjoying its benefits. In practice, distressed relationship banks would be recalling their loans and their borrowers might be the least prepared to deal with such a situation. It may, in fact, be rather difficult for borrowers to substitute distressed relationship banks exactly at the time of a financial crisis.

Ferri, Kang and Kim (2001) reach relevant findings in this respect. Studying the Korean crisis of 1997-98 they show that: i) outstanding loans plunge more for firms with weaker pre-crisis relationship banking; ii) also the drop in credit lines – arguably a proxy identifying shifts in the loan supply – is larger for firms relying less on strong relationship banking; iii) more intense pre-crisis relationship banking reduces the probability that a previously non-delinquent firm will build (increase her) loans in arrears; iv) ceteris paribus, the aforementioned probability depends on whether firms were borrowing from one (or more) of the five banks foreclosed in June 1998, testifying that it may be particularly difficult for borrowers to substitute distressed lending banks during a financial crisis.

Credit guarantee schemes have recently experienced renewed interest as a response to credit crunch in advanced economies (see for instance Honohan 2010). Columba *et al.* (2010) provide empirical evidence showing that even young small firms, with little collateral and short credit relationships, may mitigate their borrowing constraints by joining MGIs. Members of MGIs contribute to a guarantee fund used as collateral for obtaining loans. Banks, especially large ones, appreciate this kind of lending technology as MGIs members are better informed about each member's characteristics and behavior. Hence participation to an MGI provides a signaling effect on firms creditworthiness. Moreover, as MGIs members incur a penalty in case of default by a single member, members have an incentive to monitor each other (peer monitoring).[1]

However, to our knowledge, little is known in the literature about the role of MGIs during financial crises. The present paper provides a first assessment for the Great Crisis of 2007-2009 and focuses on the lending practices followed by a large bank, for which asymmetric information problems with opaque borrowers are more severe compared to small territorial banks.

[1] As explained by Columba et al. (2010) this mechanism is similar to a collective credit agreement where a group of borrowers without collateral are linked by a joint responsibility clause. See also the literature reported in their article.

3 Empirical evidence

This section is divided into four parts. Subsection 3.1 is devoted to outline the definition of the data sources, of the variables we use as well as to present some descriptive statistics. In subsection 3.2 we introduce our empirical model. Subsection 3.3 articulates our main results while subsection 3.4 reports various robustness checks to further ascertain the strength of our results.

3.1 Variables and descriptive statistics

Data on firms are taken from the UniCredit loan portfolio of the Italian small business segment.[2] The sample used in the empirical analysis comprises around 77,000 firms, customers of the bank, and is based on the information available at the end of December 2008 and at the end of March 2009. An important additional source of information for our dataset is represented by the Italian Credit Register, where banks can verify granted credit lines and actual utilization of credit lines with respect to the whole banking system for each customer.[3]

The dataset is obtained by treating a wider record file: we have filtered outliers and misreported cases from the Italian Credit Register; we have also dropped all the observations for which no information about the internal rating of UniCredit was available. The variables investigated are those reported in Table 1.

The dependent variable is an indicator of financial tension. We define financial tension as a dichotomous variable taking value 1 if in December 2008 the firm was using more than 70% of the credit lines granted by the banking system and subsequently, in March 2009, it was using more than 80%. This variable identifies firms in a situation of potential financial stress that during the crisis faced a worsening of their situation with an increase of at least 10% of the indicator of financial tension[4].

In order to test the robustness of our definition of financial tension we consider as alternative dependent variable the rate of growth from December 2008 to March 2009 of the total granted credit line for the firm by the banking system. Having defined the indicator of financial tension in terms of the amount of the credit line used with respect to the amount granted, *ceteris paribus*, an increase of the granted credit line diminishes the risk of potential financial stress.

The key explanatory variable is a dichotomous variable taking value 1 if the line of credit granted to the firm is backed by mutual guarantees. As discussed previously, MGIs may enhance the bank-firm relationship by favouring the access to bank loans for small firms with a limited collateral capacity, or characterized by the lack of a sufficient track record or credit history. Specifically, the MGI may reduce asymmetric information problems through members' screening and monitoring activities on each other (*peer monitoring*), and/or can mitigate the risk borne by the bank by supplying financial guarantees (and in some cases also personal and real estate guarantees) that allow a partial coverage of

[2] In the present analysis small business is defined as firms with turnover up to 5 million euros.

[3] Banks must report to the Italian Credit Register when: granted or actual short term credit lines are no less than 75,000 €, while bad loans or losses are reported regardless of the amount.

[4] The thresholds introduced are derived from heuristic evidence based on operational experience, and have been tested by means of a sensitivity analysis.

potential losses. In the present sample 19% of firms had a guarantee posted by an MGI on a loan. [5]

Moreover, we have added several control variables:

- the firm's rating according to the UniCredit internal assessment in December 2008. The original values have been rearranged such that better firms are associated with higher values of the rating, with 1 being the worst (default) and 14 being the best, and then taken in logarithms. We also construct three dichotomous variables based on the discrete specification, such that values from 5 to 9 correspond to bad quality firms, values from 10 to 12 correspond to intermediate quality firms, and values 13 and 14 correspond to high quality firms;[6]
- the firm's share of short-term loans from the banking system in December 2008;
- a proxy of the firm's leverage, defined as the logarithm of the ratio of firm's total loans from the banking system to firm's sales in December 2008, which measures the firm's ability to repay debt;
- Corporation, a dummy variable taking value 1 if the firm is a limited liability company;
- Size, defined as the logarithm of the firm's employees in December 2008;
- HHI, corresponding to the average value of the Herfindhal Hirschman index of concentration on bank loans in the province during 1991-1998 period;[7]
- Growth, corresponding to the rate of growth of the provincial value added during the 1991-1998 period;
- North, a dummy variable taking value 1 if the bank branch where the credit relationship takes place is located in Northern Italy (Emilia Romagna, Veneto, Friuli Venezia Giulia, Trentino Alto Adige, Lombardia, Piemonte, Val d'Aosta); 0 otherwise;
- Agriculture, an industry dummy variable taking value 1 if the firm operates in Agriculture; 0 otherwise;
- Energy, an industry dummy variable taking value 1 if the firm operates in the Energy sector; 0 otherwise;
- Manufacturing, an industry dummy variable taking value 1 if the firm operates in the Manufacturing sector; 0 otherwise;
- Constructions, an industry dummy variable taking value 1 if the firm operates in the Constructions sector; 0 otherwise;
- Trade, an industry dummy variable taking value 1 if the firm operates in the Trade and repair sector; 0 otherwise;
- Other services, an industry dummy variable taking value 1 if the firm operates in the sector "Other services"; 0 otherwise.

In order to estimate with Instrumental Variables techniques we consider the following set of instruments:

[5] Columba *et al.* (2010) examine Italian small firms with less than 20 employees that received a loan in June 2005, 17% of which had a guarantee posted by an MGI on a loan.

[6] The worst quality firms, characterized by a rating from 1 to 4, are not informative for the analysis so these latter classes are not taken into consideration.

[7] These data are based on Bank of Italy statistics and we have used the values computed in Herrera and Minetti [2007].

- Branches per thousand inhabitants in the region in 1936;
- Number of saving banks per thousand inhabitants in the region in 1936;

Table 2 reports the summary statistics for all the variables included in the regressions presented in the paper.
As it is possible to observe in Figure 1, the sector composition is affected by the nature of the sample. In fact, small firms are usually overrepresented in sectors such as Trade and Other Services compared to medium or large firms.

3.2 The empirical model

A situation of potential financial stress experienced by a firm can be modelled as:

$$y_i = \alpha_1 z_i + x_i \delta_{11} + u_i \,. \tag{1}$$

where y_i is the Financial Tension proxy experienced by firm i, z_i is the vector of control variables, x_i accounts for the presence of a MGI providing firm i with guarantees to be used as collateral to back bank loans and u_i is the vector of heteroskedastic-robust standard errors.
Instrumental variables are used to account for endogeneity in estimating the relation between a situation of financial tension and the presence of MGI guarantees. To fix ideas, think of the two-stage least squares interpretation of instrumental variables (IV, henceforth). First, we define a vector of instrumental variables that are correlated with the explanatory variable $x_i \in X$, but are uncorrelated with the error term in the regression (1). The effect of these instruments on x_i is captured by the parameters in the following relationship equation:

$$x_i = w_i \delta_{21} + v_i, \tag{2}$$

where x_i is the endogenous variable in (1), w_i is the vector of instruments and v_i is the stochastic error term. After estimating the first-stage regression (2) x_i is replaced with the fitted values of x_i in the second-stage regression (1).
The set of instruments in the present empirical analysis are taken from Guiso, Sapienza and Zingales [2004]. In particular, we have a set of variables that describe the banking market in 1936, when a strict entry regulation was introduced: the number of branches per thousand inhabitants in the region in 1936, and the number of saving banks per thousand inhabitants in the region in 1936. Guiso, Sapienza and Zingales [2004] have used these instruments to account for endogeneity in the case of a local banking development indicator, taken as a regressor in a firm's growth equation. Since the quality of MGI is probably related to banking development, we use an analogous set of instruments.[8]
To ensure the validity of the chosen instruments we have to perform diagnostic checks. First of all, we consider the F-test of linear restrictions that the instruments are jointly

[8] For a detailed discussion on the justification of these instruments, see Guiso, Sapienza and Zingales [2004].

significant. Then, for an excluded exogenous variable to be a good instrument, it must be sufficiently correlated with the included endogenous regressor and orthogonal to the error term. The first-stage regression indicates that the instrumental variables are correlated. The assumption of correlation is tested with an F-test of the excluded instruments that corresponds to Shea's (1997) "partial R-squared" measure of instrument relevance, that takes inter-correlations among instruments into account. The first-stage results are considered with small-sample statistics, to be consistent with the recommended use of the first-stage F-test as a diagnostic. As the estimated equation is reported with heteroskedastic-robust standard errors, the first-stage F-test is also heteroskedastic-robust. In turn, the assumption of orthogonality to the error term is tested using the Hansen-Sargan over-identification test. Tests of over-identifying restrictions actually check also whether the equation is misspecified, meaning that one or more of the excluded exogenous variables should be included in the structural equation. Hence, a rejection of the Hansen-Sargan over-identification test can be interpreted as either having invalid instruments and/or incorrect model specification.
We also report a test of endogeneity for the instrumented variable, in order to check whether the variable presumed to be endogenous in the OLS model could instead be treated as exogenous. If the null hypothesis of exogeneity cannot be rejected, then the OLS estimator is more efficient, and should be used instead. Under the null hypothesis that the specified endogenous regressor can actually be treated as exogenous, the test statistic is distributed as a chi-squared with a number of degrees of freedom equal to the number of regressors tested. The endogeneity test is implemented like the C statistic, defined as the difference of two Hansen-Sargan statistics: one for the equation with the smaller set of instruments, where the suspect regressor is treated as endogenous, and one for the equation with the larger set of instruments, where the suspect regressor is treated as exogenous. Under conditional homoskedasticity, this endogeneity test statistic is numerically equal to the Hausman test statistic (see Hayashi, 2000).
Unfortunately, the IV estimation method relies on the assumption of a linear probability model for mutual guarantees influencing the financial tension experienced by firms. Therefore we also provide the estimates derived from a conditional maximum likelihood (IV-Probit) technique proposed in Wooldridge (2002) which does not require the assumption of a linear probability model. This technique uses maximum likelihood to estimate a probit model in the presence of an endogenous variable. We report a Wald test of endogeneity for the instrumented variable, i.e. an MGI backing firms' loans. Under the null hypothesis that the specified endogenous regressor can actually be treated as exogenous, the test statistic is distributed as a chi-squared with one degree of freedom.

3.3 Findings

We examine six different specifications. First of all, we use the following baseline equation:

$$Financial\ tension = \alpha + \delta_1 MGI_i + \delta_2 Rating + \delta_3\ Share\ of\ short\ term\ loans_i + \delta_4\ Leverage_i + \delta_5 Corporation_i + \delta_6 Size_i + \delta_7 HHI_i + \delta_8 Growth_i + \delta_9 North_i + \sum_{J=1}^{5} \gamma_j Sector_{ij} + u_i \quad (3)$$

where $i = 1, \ldots, N$ represents the firm, and $j = 1, \ldots, 5$ is the economic activity sector.

The financial tension experienced by firm i depends on both firm and local economy characteristics. We consider as explanatory variable the affiliation with an MGI (dummy MGI), and take as control variables the following firm characteristics: the rating assigned (Rating), the share of short-term loans received from the banking system (Share of short term loans), the ratio of total loans to sales (Leverage), the limited liability (dummy Corporation), the number of employees (Size), the geographical location (dummy North), and the activity sector (one dummy variable for each sector considered). Local economy characteristic are the degree of concentration on bank loans in the province (HHI) and the rate of growth of provincial value added (Growth).

Results by OLS and Probit are reported in Table 4. In both cases, the δ_1 coefficient indicates that firms guaranteed by MGIs have a higher probability of experiencing financial tension than those not associated with an MGI. The sign of the coefficient is not the one we expect, but this counterintuitive finding can be rationalized in the light of an endogeneity problem: on one hand, firms supported by MGIs experience less difficulties in obtaining loans; on the other hand, firms join an MGI since they actually experience difficulties in obtaining loans.

In order to control for this endogenity problem we estimate with IV techniques. The first-stage regression (eq. 3a reported in Table 5) shows that we can reject the null that the chosen instruments are jointly not significant in the equation of financial tension (eq. 3b reported in Table 6): the *F*-statistic on the *F*-test on linear restriction is significant at less than 1% confidence level. Moving to the second-stage regression, the results of the test of exogeneity in the 2SLS estimation establish the need for an IV approach. In fact, the *F*-test of excluded instruments confirms that the instrumental variables considered are correlated with the endogeous regressor MGI.[9] Second, the result on the χ^2-statistic on the Hansen-Sargan over-identification states that the null of either having invalid instruments and/or incorrect model specification can be rejected. Finally, the test of endogeneity for the instrumented variable rejects the null that the MGI variable could be treated as exogenous in the OLS estimation.

Consider now the effect of an MGI backing firms' loans. Contrary to the OLS and Probit estimation, which, as shown above, are affected by endogeneity problems, the IV estimation confirms the importance of MGI in reducing the probability of financial tension. In fact, the estimated coefficient of MGI is negative and significant at less than the 1% confidence level. However, the IV estimation method relies on the assumption of a linear probability model. Therefore, in Table 6 we also provide the estimates derived from a conditional maximum likelihood (IV-Probit) estimation, which does not impose the assumption of a linear probability model (eqs. 4 to 6).

Besides the baseline equation, which features MGI as explanatory variable (eq. 4), we study how the probability of experiencing financial tension changes when the guarantee is associated to an intermediate or bad quality firm (eq. 5 and eq. 6, respectively). Replacing the explanatory variable MGI with the two corresponding interaction variables, the baseline equation hence becomes:

[9] Specifically, the *F*-statistic equal to 490.52, with a *p*-value of 0.0000. Stock, Wright and Yogo [2002] suggest that the *F*-statistic should exceed 10 for inference based on the 2SLS estimator to be reliable where there is only one endogenous regressor.

$$Financial\ tension = \alpha + \delta_1 MGI_i \times intermediate\ quality\ firm_i + \delta_2 Rating + \delta_3 Share\ of\ short\ term\ loans_i + \delta_4 Leverage_i + \delta_5 Corporation_i + \delta_6 Size_i + \delta_7 HHI_i + \delta_8 Growth_i + \delta_9 North_i + \sum_{J=1}^{5} \gamma_j Sector_{ij} + u_i \quad (3a)$$

and:

$$Financial\ tension = \alpha + \delta_1 MGI_i \times bad\ quality\ firm_i + \delta_2 Rating + \delta_3 Share\ of\ short\ term\ loans_i + \delta_4 Leverage_i + \delta_5 Corporation_i + \delta_6 Size_i + \delta_7 HHI_i + \delta_8 Growth_i + \delta_9 North_i + \sum_{J=1}^{5} \gamma_j Sector_{ij} + u_i \quad (3b)$$

In all three specifications, the Wald test confirms that the instrumented regressor should be treated as endogenous, and the δ_1 coefficient is negative and significant at less than 1% confidence level. However, since the IV-probit estimates are not linear, for comparison purpose we have to compute marginal effects (Table 7). MGIs turn out more effective in reducing the probability of experiencing financial tension when associated with intermediate and bad quality firms. During the crisis asymmetric information problems have been exacerbated, so that the signals typically embedded in scoring and rating systems to assess credit worthiness have become less informative, since typically based on pro-cyclical indicators. Our findings show that MGIs played an important role during the crisis in relaxing asymmetric information problems for intermediate and low quality firms, allowing them to reduce the probability of experiencing financial tension and to increase granted credit. In particular, the MGI assistance was more important for firms with intermediate and low internal rating whereas it did not matter so much for firms having a high rating.

Now, given that MGIs are most valuable for small firms during financial crises, as shown above, is the rationale for this finding to be found in their capacity to convey signal to banks about their members creditworthiness or in their capacity to provide a guarantee fund for the group of members lacking collateral?

In order to examine this issue we split the sample into two subsamples, with respect to the median value of the length of the bank-firm relationship, in our sample equal to 4.28 years. In fact, a long-term relation of the firm with its main bank may be important in reducing the extent of information asymmetry. By distinguishing between long-term and short-term bank-firm relationships we can study the signalling effect of MGIs in the two subsamples.

The corresponding IV-probit estimations are reported in Table 8. In order to maintain internal consistency, the set of instruments used is the same of previous regressions.

First of all, we consider the relationship length (taken in logarithms) as explanatory variable instead of MGIs, and analyze its impact over the probability of experiencing financial tension. The equation we estimate is the following:

$$Financial\ tension = \alpha + \delta_1 Relationship\ length\ with\ the\ Bank_i + \delta_2 Rating + \delta_3 Share\ of\ short\ term\ loans_i + \delta_4 Leverage_i + \delta_5 Corporation_i + \delta_6 Size_i + \delta_7 HHI_i + \delta_8 Growth_i + \delta_9 North_i + \sum_{J=1}^{5} \gamma_j Sector_{ij} + u_i \quad (4)$$

As expected, the δ_1 coefficient is negative and significant at less than 1% confidence level (eq. 7, in Table 8). Having confirmed the role of long-term relationships with the bank in reducing the probability of financial tension, we then re-estimate our baseline specifications (3), distinguishing between long-term and short-term relationships (eq. 8

and 9, respectively), where the threshold is given by the median value of the relationship length with the bank, equal to 4.28 years. Despite having the correct sign, the coefficient associated with MGIs is not significant when considering the long-term relationships sub-sample. On the contrary, it becomes significant at less than 1% confidence level in the short-term sub-sample, which confirms our hypothesis. During extreme financial crises, asymmetric information problems entail that in the presence of a short-term bank-firm relationship, MGIs play a signalling role that goes beyond the pure provision of guarantees.

3.4 Robustness analysis

As the definition of financial tension is somehow arbitrary although logically grounded, we test the robustness of our findings by considering a variable indirectly linked to financial tension. Specifically, we consider as endogenous variable the rate of growth from December 2008 to March 2009 of the total line of credit granted to the firm by the banking system. Having defined the indicator of financial tension in terms of the amount of the credit line used with respect to the amount granted, ceteris paribus, an increase of the granted credit line diminishes the risk of potential financial stress. Given that it was very difficult for banks to extend new credit lines and/or amplify the existing ones during the period examined, hence the benefits arising from MGIs are now confirmed by a positive impact on the dependent variable. The findings of this exercise are reported in Table 9. First of all, we use the following baseline equation:

$$\textit{Growth of the granted credit line} = \alpha + \delta_1 MGI_i + \delta_2 Rating + \delta_3 \textit{Share of short term loans}_i + \delta_4 Leverage_i + \delta_5 Corporation_i + \delta_6 Size_i + \delta_7 HHI_i + \delta_8 Growth_i + \delta_9 North_i + \sum_{J=1}^{5} \gamma_j Sector_{ij} + u_i \quad (5)$$

Also in this case the sign of the δ_1 coefficient in the OLS estimate may reveal an endogenity problem, and the results of the tests in the 2SLS estimations (eq. 10 to 16) support the need for an IV approach. The set of instruments is the same used in the previous analysis.

Consider then the 2SLS estimations. First of all, we work on the baseline equation by replacing the variable MGI with two interaction variables which jointly feature the presence of an MGI and an intermediate (eq. 12) or bad quality firm (eq. 13). In this two latter cases, the size of the δ_1 estimated coefficient is larger compared to the result obtained in the equation featuring MGI only. This seems to confirm the importance of MGIs in favouring the access to bank loans for small firms with a limited collateral capacity, or characterized by the lack of a sufficient track record or credit history. However, note that the rating has a positive impact on the growth of the granted credit line only when worse customers are considered, and still the coefficient is not significant (eq. 13). The crisis imparts a negative shock characterized by a shortage of liquidity, and firms with lower ratings are the ones likely asking for more credit, resulting thereby the more financed. Differently put, during the crisis a "demand effect" is at work, which contrasts the traditional "credit worthiness effect", inserting a bias in the analysis. Equations 14 to 16 support this reasoning. In fact, once we replace the rating variable with the two dummies, identifying respectively an intermediate or bad quality firms with

respect to the rating associated, the signs of the coefficients become positive within each cluster of rating. Specifically, the estimated equation is:

$$Growth\ of\ the\ granted\ credit\ line = \alpha + \delta_1 MGI_i + \delta_2\ Intermediate\ quality\ firm + \delta_3\ bad\ quality\ firm + \delta_4\ Share\ of\ short\ term\ loans_i + \delta_5\ Leverage_i + \delta_6 Corporation_i + \delta_7 Size_i + \delta_8 HHI_i + \delta_9 Growth_i + \delta_{10} North_i + \sum_{J=1}^{5} \gamma_j Sector_{ij} + u_i \quad (6)$$

The δ_1, δ_2 and δ_3 coefficient are positive, and significant at less than 1% confidence level. Moreover, the coefficient associated to bad quality firms is bigger than the one associated to intermediate quality firms. Clusters of rating render explicit the situation the market faces during the crisis: thanks to MGIs, lower rated firms turn out to have more credit, having asked for more. Once we consider the interaction variables instead of accounting for the presence of an MGI only, the phenomenon is even more evident (eq. 15 and 16). Whereas the single dummy is not significant per se, when already captured on the explanatory variable, the other one has a coefficient significant at less than 1%, an with the expected positive sign.
Summing up, the robustness check confirms the importance of MGIs in favouring the access to bank loans for small firms with a limited collateral capacity, or characterized by the lack of a sufficient track record or credit history. In harsh times MGIs allow to reduce asymmetric information problems, providing a signalling effect that counts more than the simple guarantee itself. This is especially true for intermediate quality firms. That is, firms maybe creditworthy, but damaged by the shortage of liquidity generated by the crisis.

4 Conclusions

The Great Financial Crisis of 2007-2009 imparted an exogenous, likely unanticipated, shock on the macroeconomy. In particular, the crisis dried up liquidity sources for the banking system while, at the same time, it worsened business prospects in the economy at large. As such, the peak of the crisis provides a unique vantage point for the researchers aiming to investigate how financial constraints aggravate. Following the widely studied literature on the credit channel of transmission of monetary and financial shocks, we expect that, in those circumstances, financial constraints will amplify principally for the small businesses. By and large, the small-sized enterprises are, in fact, the ones suffering the most severe asymmetry of information vis-à-vis lenders and, so, the lenders will naturally tend to place on them overwhelmingly the burden of their crisis-provoked, selected stiffening in credit supply.
In this paper we studied whether the assistance of Mutual Guarantee Institutions (MGIs) can offer small businesses a shield against aggravating credit constraints. Specifically, we asked two questions. First, as previous literature has shown that MGI support may ease financial constraints for small-sized enterprises in normal times, is that mechanism still functioning during the harsh times of a systemic crisis? And, second, if so, through which particular channel does the MGI's assistance benefit the small businesses? As to the first question, our results confirm that MGI assistance proved if anything even more important during the dire straits of the crisis. Regarding the second question, we showed that MGIs played a signalling role beyond the pure provision of guarantees.

Therefore, our empirical evidence suggests that the presence of MGIs constitutes an important component of the financial system to tame the malfunctioning of credit markets at the time of systemic crises. Accordingly, since the episodes of instability have by far intensified within the financially liberalised environment of the recent decades, it appears desirable for countries to be able deploying MGIs to help the small businesses weather the negative consequences of those recurrent crises.

Finally, we can envisage two possible directions to be investigated. First, building on the detailed taxonomy of SME lending provided by Berger and Udell (2006), it would be interesting to ascertain whether the introduction of MGIs as a lending facilitator between the bank and the firm could itself provide a new twist to the available lending technologies. For instance, it might turn out that, thanks to the support of MGIs, even transactional banks could be able to lend to opaque firms normally thought to fall in the domain of relational banks. Second, it could be worth investigating whether the presence of MGIs as ancillary counterparts in SME lending brings about a change in the bank's organizational model, possibly favoring convergence across different types of banks. We leave these questions for future research.

References

Andrade, G., and S.N. Kaplan (1998), "How costly is financial (not economic) distress? Evidence from highly leveraged transactions that became distressed", *Journal of Finance* 53, 1443-1495.

Berger, A.N., and G.F. Udell (2006), "A more complete conceptual framework for SME finance", *Journal of Banking and Finance* 30, 2945–2966.

Berlin, M., and L.J. Mester (1998), "On the profitability and cost of relationship lending", *Journal of Banking and Finance* 22, 873-97.

Bongini, P., G. Ferri, and H. Hahm (2000), "Corporate Bankruptcy in Korea: Only the Strong Survive?", *The Financial Review* 35 (4), 31-50.

Boot, A.W.A. (2000), "Relationship Banking: What Do We Know?", *Journal of Financial Intermediation* 9 (1), 7-25.

Columba, F., L. Gambacorta, P.E. Mistrulli, (2010), "Mutual garantee institutions and small business finance", *Journal of Financial Stability* 6, 45-54.

Conigliani, C., G. Ferri, and A. Generale (1997), "The impact of bank-firm relations on the propagation of monetary policy squeezes: An empirical assessment for Italy", *Banca Nazionale del Lavoro Quarterly Review* 50, 271-99.

Diamond, D.W. (1984), "Financial Intermediation and Delegated Monitoring", *The Review of Economic Studies* 51 (3), 393-414.

Ferri, G., T.S. Kang, and I.J. Kim (2001), "The Value of Relationship Banking During Financial Crises: Evidence from Korea", *World Bank Policy Research* w.p. 2553.

Ferri G., Riggi M.R., Rotondi Z., (2009), "Inside the crisis: the importance of the bank-firm relationship in harsh times". In: Bracchi G., Masciandaro D. (eds.), *Le banche italiane tra crisi finanziaria, tutela del risparmio e sviluppo produttivo*, XIV Rapporto sul Sistema Finanziario Italiano della Fondazione Rosselli, EdiBank, Rome.

Fried, J., and P. Howitt (1980), "Credit rationing and implicit contract theory", *Journal of Money, Credit, and Banking* 12 (3), 471-487.

Elsas, R., and J.P. Krahnen (1998), "Is relationship lending special? Evidence from credit-file data in Germany", *Journal of Banking and Finance* 22, 1283-316.

Guiso, L., Sapienza P., Zingales L., (2004), "Does local financial development matter?" *Quarterly Journal of Economics* 119, 929-969.

Hayashi F., (2000), *Econometrics*, Princeton University Press, Princeton.

Herrera A.M, Minetti R., (2007), "Informed finance and technological change: evidence from credit relationship", *Journal of Financial Economics* 83, 223-269.

Honohan, P., (2010), "Partial credit guarantees: principles and practice", *Journal of Financial Stability* 6, 1-9.

Hoshi, T., A. Kashyap e D.S. Scharfstein (1990), "The role of banks in reducing the cost of financial distress in Japan", *Journal of Financial Economics* 27 (1), 67-88.

Kawai, M., J. Hashimoto, and S. Izumida (1996), "Japanese firms in financial distress and main banks: Analyses of interest-rate premia", *Japan and the World Economy* 8, 175-94.

Shea J., (1997), "Instrument relevance in multivariate linear models: A simple measure", *Review of Economics and Statistics* 79, 348–352.

Stiglitz, J.E. and A.M. Weiss (1981), "Credit Rationing in Markets with Imperfect Information", *American Economic Review* 71, 393-410.

Stock J.H., Wright J.H., Yogo M., (2002), "A Survey of Weak Instruments and Weak Identification in Generalized Method of Moments", in *Journal of Business and Economic Statistics* 20, 518-529.

Wooldridge J.M., (2002), *Econometric Analysis of Cross Section and Panel Data*, The MIT Press, Cambridge, Mass.

Yamori, N., and A. Murakami (1999), "Does bank relationship have an economic value? The effect of main bank failure on client firms", *Economics Letters* 65, 115-20.

Table 1. Variables: definition and source

Variable	Definition
Financial Tension	Takes value 1 if in December 2008 the firm was using more than 70% of its line of credit granted by the banking system and subsequently in March 2009 it was using more than 80% (i.e. an increase of more than 10%). It takes value 0 otherwise
Growth of granted line of credit	Rate of growth from December 2008 to March 2009 of the total granted line of credit for the firm for the banking system.
MGI	Dummy variable taking value 1 if the line of credit granted to the firm is backed by a Mutual Guarantees Institution
Rating	Log of the firm's rating, a discrete variable taking value 1 for customers with the highest probability of default and 14 for those with the lowest probability of default
Intermediate quality firm	Dummy variable taking value 1 if the firm belongs to discrete rating classes from 10 to 12
Bad quality firm	Dummy variable taking value 1 if the firm belongs to discrete rating classes from 5 to 9
MGI × intermediate quality firms	Interaction between MGI and intermediate quality firm
MGI × bad quality firms	Interaction between MGI and bad quality firm
Relationship Length with the Bank	Log of the number of years of the relationship between the firm and the bank
Share of Short-Term Loans	Firm's share of short-term loans over the total (short & long-term) granted to it by the banking system as of end December 2008
Leverage	Log of the ratio of firm's total used loans from the banking system to firm's sales as of end December 2008
Corporation	Dummy variable taking value 1 if the firm is a limited liability company; 0 otherwise
Size	Log of the firm's number of employees as of end December 2008
HHI	Average value of the Herfindhal Hirschman index of concentration on bank loans in the province during 1991-1998 period
Growth	Rate of growth of the provincial value added during 1991-1998 period
North	Dummy variable taking value 1 if the bank branch where the credit relationship with the firm takes place is located in Northern Italy; 0 otherwise
Agriculture	Dummy variable taking value 1 if the firm belongs to the Agriculture industry; 0 otherwise
Energy	Dummy variable taking value 1 if the firm belongs to the Energy industry; 0 otherwise
Manufacturing	Dummy variable taking value 1 if the firm belongs to the Manufacturing industry; 0 otherwise

Constructions	Dummy variable taking value 1 value 1 if the firm belongs to the Constructions industry; 0 otherwise
Trade	Dummy variable taking value 1 value 1 if the firm belongs to the Trade and repair industry; 0 otherwise
Other services	Dummy variable taking value 1 value 1 if the firm belongs to the Other services industry; 0 otherwise
Branches	Branches per thousands inhabitants in the region in 1936
Saving banks	Number of saving banks per thousands inhabitants in the region in 1936

Table 2. Summary statistics

Variables	Median	mean	1st percentile	99th percentile	Standard Deviation
Financial Tension	0.0000	0.0713	0.0000	1.0000	0.2574
Growth of granted line of credit	0.0000	0.4101	-0.3693	7.5882	2.7607
MGI	0.0000	0.1957	0.0000	1.0000	0.3967
Rating	2.3979	2.3262	1.3863	2.6390	0.3338
Relationship Length with the Bank	1.4532	1.3066	-1.4691	3.0598	0.8655
Share of Short Term Loans	0.7760	0.6975	0.0287	1.0000	0.3131
Leverage	-1.1005	-1.1795	-4.7493	1.9445	1.2263
Corporation	0.0000	0.1323	0.0000	1.0000	0.3388
Size	0.0000	0.0773	0.0000	2.7080	0.4355
HHI	0.0644	0.0718	0.0362	0.1963	0.0293
Growth	0.0558	0.0680	-0.1241	0.2702	0.0578
North	1.0000	0.6394	0.0000	1.0000	0.4802

Table 3. **Correlation matrix**

	Financial Tension	Growth of the granted line of credit	MGI	Rating	Relationship Length with the Bank	Share of Short Term Loans	Leverage	Corporation	Size	HHI	Growth	North
Financial Tension	1.0000											
Growth of the granted line of credit	-0.0002	1.0000										
MGI	0.0298	-0.0386	1.0000									
Rating	-0.1653	-0.0375	-0.0166	1.0000								
Relationship Length with the Bank	-0.0273	-0.0181	0.0624	0.02184	1.0000							
Share of Short Term Loans	-0.0075	0.0806	-0.1750	-0.0426	0.0043	1.0000						
Leverage	0.0730	-0.1644	0.1135	-0.1425	-0.0370	-0.4366	1.0000					
Corporation	0.0161	0.0109	0.0066	0.0089	0.0529	-0.0208	0.0306	1.0000				
Size	-0.0096	-0.0097	-0.0075	0.0238	-0.0020	-0.0144	0.0007	-0.0456	1.0000			
HHI	0.0286	-0.0024	0.0094	-0.0788	-0.0425	0.0098	-0.0286	0.0075	-0.0047	1.0000		
Growth	-0.0137	-0.0042	-0.0233	0.0690	0.0686	0.0073	-0.0152	0.0047	0.0024	-0.1829	1.0000	
North	-0.0390	-0.0085	0.0815	0.1726	0.1308	-0.0323	0.0482	0.0272	-0.0006	-0.3533	0.2205	1.0000

Table 4. Determinants of Financial Tension.

	OLS (Eq. 1)	Probit (Eq. 2)
MGI	0.017***	0.137***
	0..003	*0.018*
Rating	-0.116***	-0.632***
	0.004	*0.018*
Share of Short Term Loans	0.014***	0.172***
	0.003	*0.028*
Leverage	0.013***	0.128***
	0.001	*0.007*
Corporation	0.01***	0.073***
	0.003	*0.023*
Size	-0.002	-0.025
	0.002	*0.019*
HHI	0.114***	0.781***
	0.039	*0.266*
Growth	0.015	0.068
	0.017	*0.142*
North	-0.006**	-0.065***
	0.002	*0.017*
Energy	0.007	0.06
	0.0.25	*0.159*
Manufacturing	-0.03***	-0.235***
	0.009	*0.056*
Construction	-0.013	-0.081
	0.009	*0.058*
Trade	-0.004	-0.011
	0.009	*0.056*
Other Services	-0.006	-0.026
	0.009	*0.056*
Constant	0.352***	0.015
	0.014	*0.075*
Observations	66148	66148
F-test, F-statistic	112.49***	
Wald Test, χ^2-statistic		2239.92***

NOTES*: The endogenous variable is a dummy with value 1 if the firm experiences a situation of financial tension in December 2008 which worsens in March 2009, 0 otherwise. For the definition of the explanatory variables see Table 1. Robust standard errors are reported below coefficients. (*): coefficient significant at 10 percent; (**): coefficient significant at 5 percent; (***): coefficient significant at less than 1% confidence level. The table also reports, as goodness-of-fit tests, the F-statistic for an F-test in the OLS estimation (eq. 1) and the χ^2-statistic for a Wald test in the Probit estimation (eq. 2).*

Table 5. Determinants of firms' participation to a MGI (first stage regression).

	OLS (Eq. 3a)
Instrumental variables	
Branches	0.063***
	0.017
Saving banks	17.271***
	0.615
Exogenous variables	
Rating	-0.052***
	0.005
Share of Short Term Loans	-0.206***
	0.006
Leverage	0.008***
	0.001
Corporation	0.005
	0.005
Size	-0.006*
	0.003
HHI	0.643***
	0.056
Growth	-0.356***
	0.033
North	0.073***
	*0.01714****
Energy	0.06**
	0.0.3
Manufacturing	0.115***
	0.01
Construction	0.082***
	0.01
Trade	0.07***
	0.01
Other Services	0.052***
	0.01
Constant	0.257***
	0.016
Observations	66148
F-statistic	313.88***
F-test of linear restrictions on instruments	808.23***

NOTES*: The endogenous variable is the natural logarithm of the firm's rating. For the definition of the explanatory variables see Table 1. Robust standard errors are reported below coefficients. (*): coefficient significant at 10% confidence level; (**): coefficient significant at 5% confidence level; (***): coefficient significant at less than 1% confidence level. The table also reports, as goodness-of-fit test, the F-statistic for an F-test.*

Table 6. Determinants of Financial Tension.

	IV (Eq. 3b)	IV-probit (Eq. 4)	IV-probit (Eq. 5)	IV-Probit (Eq. 6)
MGI	-0.064***	-0.564***		
	0.02	*0..142*		
MGI × intermediate quality firms			-1.759***	
			0.361	
MGI × bad quality firms				-1.903***
				0.415
Rating	-0.119***	-0.638***	-0.462***	-1.009***
	0.004	*0.018*	*0.056*	*0.066*
Share of Short Term Loans	-0.003	0.019	0.035	0.02
	0.005	*0.042*	*0.036*	*0.039*
Leverage	0.014***	0.131***	0.141***	0.119***
	0.001	*0.007*	*0.006*	*0.008*
Corporation	0.01***	0.074***	0.079***	0.069***
	0.003	*0.022*	*0.021*	*0.021*
Size	-0.003	-0.031*	-0.034**	-0.023
	0.002	*0.019*	*0.017*	*0.017*
HHI	0.157***	1.083***	1.172***	0.911***
	0.042	*0.262*	*0.243*	*0.243*
Growth	-0.004	-0.099	-0.117	-0.024
	0.018	*0.142*	*0.131*	*0.129*
North	0.001	-0.006	-0.007	0.006
	0.003	*0.021*	*0.019*	*0.021*
Energy	0.010	0.091	0.142	0.066
	0.025	*0.155*	*0.144*	*0.143*
Manufacturing	-0.21**	-0.146***	-0.112**	-0.136**
	0.009	*0.056*	*0.057*	*0.056*
Construction	-0.006	-0.021	-0.004	-0.023
	0.009	*0.057*	*0.054*	*0.054*
Trade	0.001	0.036	0.054	0.040
	0.009	*0.055*	*0.051*	*0.051*
Other Services	-0.001	0.011	0.029	0.022
	0.009	*0.055*	*0.051*	*0.052*
Constant	0.376***	0.23***	-0.034	1.199***
	0.015	*0.085*	*0.07*	*0.247*
Observations	66148	66148	66148	66148
Wald Test, χ^2-statistic	1520.70***	2379.07***	3539.76***	2427.10***
Test of excluded instruments, F-statistic	490.54***			
Endogeneity test of instrumented regressor , χ^2-statistic	16.49***	22.47***	19.77***	20.67***
Overidentification test, Hansen J-statistic	1.98***			

NOTES*: The endogenous variable is a dummy with value 1 if the firm experiences a situation of financial tension in December 2008 which worsens in March 2009, 0 otherwise. For the definition of the explanatory variables see Table 1. Robust standard errors are reported below coefficients. (*): coefficient significant at 10% confidence level; (**): coefficient significant at 5% confidence level; (***): coefficient significant at less than 1% confidence level. The table also reports, as goodness-of-fit tests, the χ^2-statistic for a Wald test. For the other diagnostic tests reported in the table see Section 3.3.*

Table 7. Marginal Effects of the Determinants of Financial Tension

	IV-Probit (Eq. 4)	**IV-Probit (Eq. 5)**	**IV-Probit (Eq. 6)**
MGI [(i)]	-0.059***		
	0.014		
MGI × intermediate quality firms [(i)]		-0.115***	
		0.023	
MGI × bad quality firms [(i)]			-0.108***
			0.019
Rating	-0.085***	-0.076***	-0.162***
	0.003	*0.003*	*0.026*
Share of Short Term Loans	0.002	0.006	0.003
	0.005	*0.005*	*0.006*
Leverage	0.018***	0.023***	0.019***
	0.001	*0.002*	*0.001*
Corporation [(i)]	0.010***	0.013***	0.011***
	0.003	*0.004*	*0.004*
Size	-0.004*	-0.006*	-0.004
	0.002	*0.003*	*0.003*
HHI	0.145***	0.194***	0.146***
	0,036	*0.049*	*0.042*
Growth	-0.013	-0.0194	-0.004
	0,019	*0.022*	*0.021*
North [(i)]	-0.001	-0.001	0.001
	0.003	*0.003*	*0.003*
Energy [(i)]	0.013	0.026	0.011
	0.024	*0.029*	*0.025*
Manufacturing [(i)]	-0.019***	-0.018**	-0.021***
	0.007	*0.008*	*0.008*
Construction [(i)]	-0.003	-0.001	-0.003
	0.007	*0.009*	*0.008*
Trade [(i)]	0.005	0.009	0.006
	0.007	*0.009*	*0.008*
Other Services [(i)]	0.001	0.005	0.003
	0.007	*0.009*	*0.008*

NOTES*: The endogenous variable is a dummy with value 1 if the firm experiences a situation of financial tension in December 2008 which worsens in March 2009, 0 otherwise. For the definition of the explanatory variables see Table 1. Robust standard errors are reported below coefficients. (*): coefficient significant at 10% confidence level; (**): coefficient significant at 5% confidence level; (***): coefficient significant at less than 1% confidence level.*

[(i)] *dy/dx is for discrete change of dummy variable from 0 to 1.*

Table 8. Determinants of financial tension with respect to the relationship length with the bank

	IV-Probit (Eq. 7)	IV-Probit (Eq. 8)	IV-Probit (Eq. 9)
		Long-term relationship (> 4.28 years)	Short-term relationship (≤ 4.28 years)
MGI		-0.187	-0.806***
		0.207	*0.197*
Relationship Length with the Bank	-0.541***		
	0.112		
Rating	-0.289***	-0.643***	-0.646***
	0.089	*0.028*	*0.025*
Share of Short Term Loans	0.146***	0.174***	-0.098*
	0.025	*0.060*	*0.058*
Leverage	0.112***	0.147***	0.118***
	0.009	*0.011*	*0.009*
Corporation	0.136***	0.091***	0.056*
	0.024	*0.031*	*0.032*
Size	-0.027	-0.015	-0.043*
	0.017	*0.028*	*0.025*
HHI	0.939***	1.292***	0.746**
	0.243	*0.420*	*0.337*
Growth	0.326**	0.155	-0.323
	0.143	*0.200*	*0.202*
North	0.043	-0.016	-0.160
	0.026	*0.034*	*0.025*
Energy	0.089	-0.128	0.308
	0.146	*0.240*	*0.210*
Manufacturing	-0.174***	-0.276***	-0.048
	0.054	*0.085*	*0.077*
Construction	-0.065	-0.133	0.056
	0.053	*0.086*	*0.076*
Trade	0.020	-0.044	0.099
	0.052	*0.082*	*0.074*
Other Services	0.016	-0.075	0.089
	0.053	*0.081*	*0.074*
Constant	-0.023	0.092	0.372***
	0.070	*0.122*	*0.124*
Observations	66148	33107	33041
Wald Test, χ^2-statistic	3286.63***	1077.40***	1256.89***
Endogeneity test of instrumented regressor , χ^2-statistic	17.43***	2.30	20.16***

NOTES*: The endogenous variable is a dummy with value 1 if the firm experiences a situation of financial tension in December 2008 which worsens in March 2009, 0 otherwise. For the definition of the explanatory variables see Table 1. Robust standard errors are reported below coefficients. (*): coefficient significant at 10% confidence level; (**): coefficient significant at 5% confidence level; (***): coefficient significant at less than 1% confidence level.*

Table 9. Determinants of the growth of the granted line of credit

	OLS (Eq. 10)	IV (eq. 11)	IV (Eq. 12)	IV (Eq. 13)	IV (eq. 14)	IV (Eq. 15)	IV (Eq. 16)
MGI	-0.129***	0.811***			1.054***		
	0.0129	*0.246*			*0.247*		
MGI × intermediate quality firms			2.651***			2.598***	
			0.831			*0.622*	
MGI × bad quality firms				2.834***			3.706***
				0.877			*0.903*
Rating	-0.514***	-0.476***	-0.650***	0.148			
	0.333	*0.032*	*0.063*	*0.196*			
Intermediate quality firms					0.441***	-0.066	0.395***
					0.024	*0.121*	*0.026*
Bad quality firms					0.679***	0.68***	-0.136
					0.034	*0.034*	*0.2*
Share of Short Term Loans	0.034**	0.233***	0.195***	0.225***	0.186***	0.173***	0.209***
	0.029	*0.056*	*0.049*	*0.056*	*0.056*	*0.055*	*0.064*
Leverage	-0.419***	-0.429***	-0.463***	-0.423***	-0.467***	-0.473***	-0.453***
	0.019	*0.019*	*0.025*	*0.019*	*0.021*	*0.021*	*0.02*
Corporation	0.140***	0.135***	0.117**	0.134***	0.138***	0.129**	0.125**
	0.049	*0.049*	*0.052*	*0.050*	*0.049*	*0.05*	*0.051*
Size	-0.043**	-0.034*	-0.025	-0.041**	-0.022	-0.023	-0.034*
	0.019	*0.019*	*0.020*	*0.019*	*0.019*	*0.019*	*0.02*
HHI	-0.715*	-1.213***	-1.476***	-1.088***	-1.290***	-1.385***	-1.235***
	0.381	*0.379*	*0.412*	*0.388*	*0.383*	*0.394*	*0.402*
Growth	-0.343*	0.118	-0.087	-0.210	0.034	-0.055	-0.129
	0.181	*0.132*	*0.204*	*0.191*	*0.195*	*0.193*	*0.191*
North	0.051**	-0.025	-0.017	-0.040	-0.003	-0.007	-0.032
	0.022	*0.032*	*0.031*	*0.036*	*0.032*	*0.033*	*0.039*
Energy	-0.552***	-0.595***	-0.679***	-0.568***	-0.594***	-0.664***	-0.573***
	0.13	*0.133*	*0.149*	*0.140*	*0.135*	*0.145*	*0.147*
Manufacturing	-0.433***	-0.551***	-0.573***	-0.547***	-0.561***	-0.568***	-0.561***
	0.109	*0.114*	*0.117*	*0.115*	*0.115*	*0.116*	*0.116*
Construction	-0.31***	-0.386***	-0.405***	-0.383***	-0.422***	-0.42***	-0.403***
	0.113	*0.115*	*0.117*	*0.116*	*0.115*	*0.116*	*0.117*
Trade	-0.512***	-0.574***	-0.603***	-0.585***	-0.591***	-0.596***	-0.61***
	0.112	*0.115*	*0.119*	*0.117*	*0.115*	*0.116*	*0.119*
Other Services	-0.083	-0.131	-0.157	-0.148	-0.155	-0.154	-0.178
	0.112	*0.114*	*0.116*	*0.115*	*0.114*	*0.114*	*0.117*
Constant	1.483	1.200***	1.584***	-0.243	-0.352***	-0.104	-0.078
	0.139	*0.147*	*0.154*	*0.518*	*0.125*	*0.115*	*0.118*
Observations	66148	66148	66148	66148	66148	66148	66148
F.test, F-statistic	49.42***						
Wald Test, χ^2-statistic	-	685.91***	669.21***	670.91***	702.59***	696.90***	681.16***
Test of excluded instruments, F-statistic	-	490.54***	91.31***	109.30***	476.01***	178.83***	112.78***
Endogeneity test of instrumented regressor , χ^2-statistic	-	14.91***	11.14***	12.51***	23.26***	2080.59***	21.81***
Overidentification test, Hansen J-statistic	-	0.02***	0.31***	0.05***	0.06***	0.19***	0.16***

NOTES*: The endogenous variable is the rate of growth from December 2008 to March 2009 of the total granted credit line for the firm for the banking system. For the definition of the explanatory variables see Table 1. Robust standard errors are reported below coefficients. (*): coefficient significant at 10 % confidence level; (**): coefficient significant at 5% confidence level; (***): coefficient significant at less than 1% confidence level. The table also reports, as goodness-of-fit tests, the F-statistic for an F-test in the OLS estimation (eq. 7) and the χ^2-statistic for a Wald test in the IV-Probit estimation (eq. 8 to 13). For the other diagnostic tests reported in the table see Section 3.3.*

Figure 1. Industry distribution of the sample