FINANCIAL FRAGILITY AND GROWTH PROSPECTS: CREDIT RATIONING DURING THE CRISIS

by Giorgio Albareto* and Paolo Finaldi Russo*

Abstract

This paper analyzes firms' difficulties in accessing credit before and during the crisis, by focusing on two of their characteristics: financial fragility and growth prospects. Our econometric analysis indicates that fragile financial conditions were associated with a much higher than average probability of rationing, both before and during the crisis. High rates of growth in sales and investments, in value added per employee and in the propensity to export – indicators presumably linked to growth prospects – favoured access to credit in the period leading up to the financial crisis; during the crisis, instead, credit rationing was more widespread and less related to firms' potential growth. Lending relationships facilitated access to the credit market, especially for firms with better growth prospects; this result is consistent with the hypothesis that the banks which are more involved in firms' financing have better information and stronger incentives to use it.

JEL Classification: E51, G21, G32
Keywords: rationing, lending relationships, financial fragility, growth prospects

Contents

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1. Introduction

During the crisis the percentage of firms stating that they had not obtained the funding they had requested increased considerably compared with the period immediately preceding it. The availability of external sources of funds not only influenced the investment and growth decisions of entrepreneurs, but it often marked the borderline between their temporary lack of liquidity and the definitive closure of their companies.

The main aim of this paper is to evaluate which firms have suffered the most difficulties in accessing credit or, in other words, how the credit system has selected its own clientele in a phase of great uncertainty as regards the economic outlook and the marked weakness of firms' and even of banks' finances.

The literature on the rationing of credit has not dedicated much attention to the heterogeneity of firms, concentrating almost exclusively on their size. L. Guiso (1998) investigated the different probabilities of high-tech firms having difficulties in obtaining credit compared with others. Angelini, Di Salvo and Ferri (1998) concentrated their attention on small businesses. L. Guiso (2003) studied the reduction of credit supplied to small firms in Italy as part of a broader analysis of the characteristics of their financial structure.

The literature on the impact of the recent crisis on funding the economy has recently widened the categorization of firms. A. Ferrando and N. Griesshaber (2011) used the survey on access to credit by small and medium-sized enterprises in terms of how size, sector, age and ownership structure influence their capacity to obtain loans. With reference to Italy, U. Albertazzi and D. Marchetti (2010) analysed bank lending to firms considering four factors: size, risk profile, productivity and propensity to export. This last characteristic is also the subject of a paper on the real effects of the crisis on the Italian productive system written by M. Bugamelli, R. Cristadoro and G. Zevi (2009), who also considered the stage the firms had reached in restructuring production. Another aspect was considered by A. Accetturo, A. Giunta and S. Rossi (2011) who analysed the performance of Italian firms during the crisis categorizing them according to their contribution to production process of a good.

In this paper we consider, in various ways, most of the categorizations of firms used in the literature on the effects of the crisis, evaluating to what extent these have conditioned firms' access to credit before and during the crisis. Our analysis focuses on two important characteristics of a business that are important when applying for a loan: financial fragility and growth prospects. For a business whose financial conditions are less sound, its difficulty in accessing credit may undermine

its budget balance, even leading to bankruptcy, whereas for a business with good growth prospects, it may jeopardize the possibility of making investments or undertaking new development paths; on a large scale, tightening of this last type can seriously depress the country's economic growth.

The findings of an econometric analysis of the probability of not obtaining the funding requested show that, in deciding whether to lend, banks mainly looked at firms' balance sheets: the presence of fragile financial conditions is associated with a much higher probability of credit rationing than average, both before and after the crisis.

The difficulties in measuring firms' growth prospects have led to the use of multiple indicators based both on budget variables and on qualitative data drawn from the Bank of Italy's Survey of Industrial and Service Firms (henceforth ISF survey). The findings were less clear than those relating to financial fragility: high values for the growth rates of turnover or investments, value added by employee and propensity to export facilitated access to credit in the pre-crisis period; during the crisis, however, credit rationing was more indiscriminate, with less importance being given to firms' growth prospects. The presence of some management and organization factors, which were strategic to the development of enterprises (spending on research and development, trademarks and patents, and organizational, product or process innovations) did not influence the likelihood of credit restriction, either before or during the crisis, presumably revealing a greater difficulty on the part of intermediaries to introduce soft information into the quantitative models which guide lending decisions.

Lastly, the empirical evidence confirms some recent findings on the importance of customer relations in protecting firms against the tightening of the supply of credit (see De Mitri et al. 2010). During the crisis a high concentration of loans managed by the principal bank was accompanied by a lower probability of rationing. In these years the presence of closer relations, moreover, influenced banks' choices: firms' growth potential was more important in facilitating access to credit. This evidence could reflect the wealth of information available to intermediaries more involved in lending to business and the greater incentive to make use of it when selecting their customers.

Our paper, based on information available up to April 2012, is organized as follows. In the next section there is a brief summary of the evolution of the demand for and supply of credit in the last few years, including some descriptive evidence on credit rationing. The third section presents the findings of the econometric analysis on the probability of tightening before and during the crisis. Some concluding considerations are given in the final section.

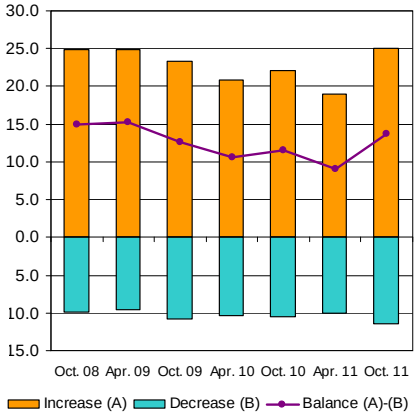
2. Credit demand and supply during the crisis

Both demand and supply factors contributed to the credit crunch of 2009 and the weak economic cycle that ensued; it is not easy to distinguish the relative weight of each of them.[1]

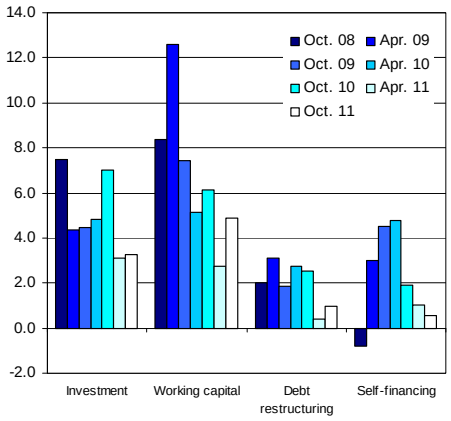
Figure 1

CREDIT SUPPLY AND DEMAND (1)

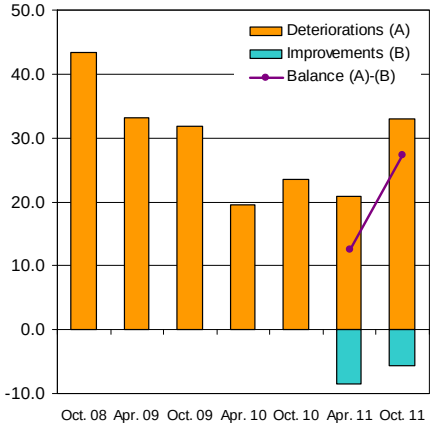
(a) Credit demand
(percentages of firms)



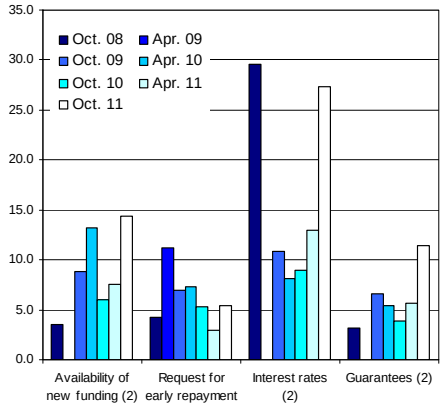
(b) Main reasons for credit demand
(percentages of firms, multiple responses)



(c) Worsening of debt conditions overall
(percentages of firms)



(d) Main reasons for worsening
(percentages of firms; multiple responses)



Sources: Survey of Industrial and Service Firms and Business Outlook Survey, various years.
(1) The dates refer to the period in which the surveys were carried out and the firms' responses to the preceding six months. The question as to whether firms had experienced an improvement in the conditions for accessing credit was only introduced into the Survey of Industrial and Service Firms in 2011. – (2) This question was not included in the Survey of Industrial and Service Firms in 2009.

[1] Various papers have analysed the performance of bank lending to firms in Italy during the crisis with the objective of identifying the contribution of demand and supply factors. Panetta and Signoretti (2010) indicated a prevalence of demand factors, principally ascribable to the trend in investment. The findings of Del Giovane et al. (2010) highlight a relative weight that is fairly balanced between demand and supply factors, which seem to be largely due to a change in banks' perception of risk. Analysing the credit relations of firms borrowing from many banks, Albertazzi and Marchetti (2010) test if the relationship between capital and assets weighted for risk conditions the supply of credit. For a broader analysis of the factors conditioning lending activity deriving from the impact of the financial crisis on the banks' balances, see E. Bonaccorsi and E. Sette (2012).

On the basis of the Bank of Italy's survey of firms, which carries out a twice-yearly check of the conditions of access to credit since 2008, the percentage balance between how many have increased their demand for bank loans and how many have reduced their demand for credit has remained constantly positive even if it was declining up to April 2011 (Figure 1.a); there was a marked reduction for large firms.

On the basis of this evidence, it is difficult to infer the quantity of credit actually requested by firms; this could help explain the different results that emerge from the bank surveys.[2] Nevertheless, the indications given by the various sources of information with reference to the quality of demand are basically in agreement. Above all in the early stages of the crisis, the reasons for borrowing were closely linked to the financial strains due to the reduction in income flows. In particular there was high demand for loans in connection with the working capital requirements, which were affected by both lower sales and difficulties in collecting payments (Figure 1.b).

With reference to credit supply, the findings of the various surveys are more consistent than those in relation to demand: in the period immediately after the failure of Lehman Brothers, the adoption of tighter supply conditions was reflected in a marked increase in firms' difficulties in obtaining credit.

The data from the surveys show that the percentage of companies experiencing more difficulties in accessing credit reached its peak at the start of the crisis (43 per cent; Figure 1.c); after this, the percentage declined to 20 per cent at the beginning of 2010 and then showed a new, sharp, increase in 2011.

The reasons underlying this perception on the part of firms of a worsening situation have changed over time. At the start of the crisis and in the most recent period, at times characterized by strong pressure on the bank liquidity side, firms have complained above all about the growth in interest rates (Figure 1.d). Besides the cost of bank debt, during the crisis a significant percentage of firms - between 15 and 20 per cent – highlighted problems in achieving the desired level of borrowing because of requests for early repayment by the banks or due to greater difficulties in obtaining new funding (Figure 1.d).

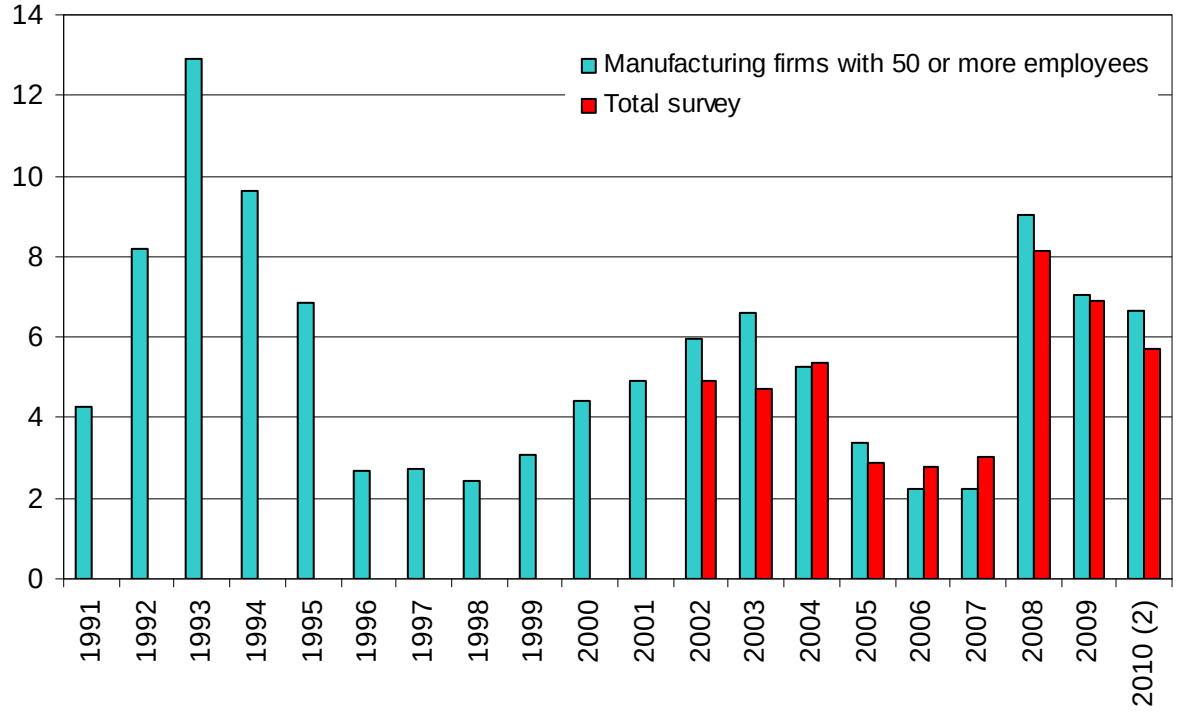
On the basis of the survey data, the share of companies applying for new bank funding which was not granted grew sharply between 2007 and 2008, reaching 8.1 per cent, a value below that recorded at the time of the recession of the early 1990s (Figure 2). In 2009-10 rationed firms

[2] In particular in 2009, at the height of the crisis, the bank lending survey showed a prevalence of banks reporting a contraction in firms' demand for credit, mainly linked to the trend in investments.

have been numerous, especially if compared with the years immediately preceding the crisis.[3] The increase in credit rationing on the part of the banks was particularly marked in relation to manufacturing firms and those located in the southern regions. Differently from in the past, moreover, during the crisis the difficulty in obtaining credit was not concentrated among small businesses but involved larger firms to a similar extent (Figure 3).

Figure 2

PERCENTAGE OF FIRMS REQUESTING BUT NOT OBTAINING CREDIT (1)
(per cent)



Source: Survey of Industrial and Service Firms.
(1) If not otherwise specified, the question on the difficulty of accessing credit refers to the period bridging the end of the year indicated and the beginning of the following one; see the Appendix. – (2) Data refer to the whole year.

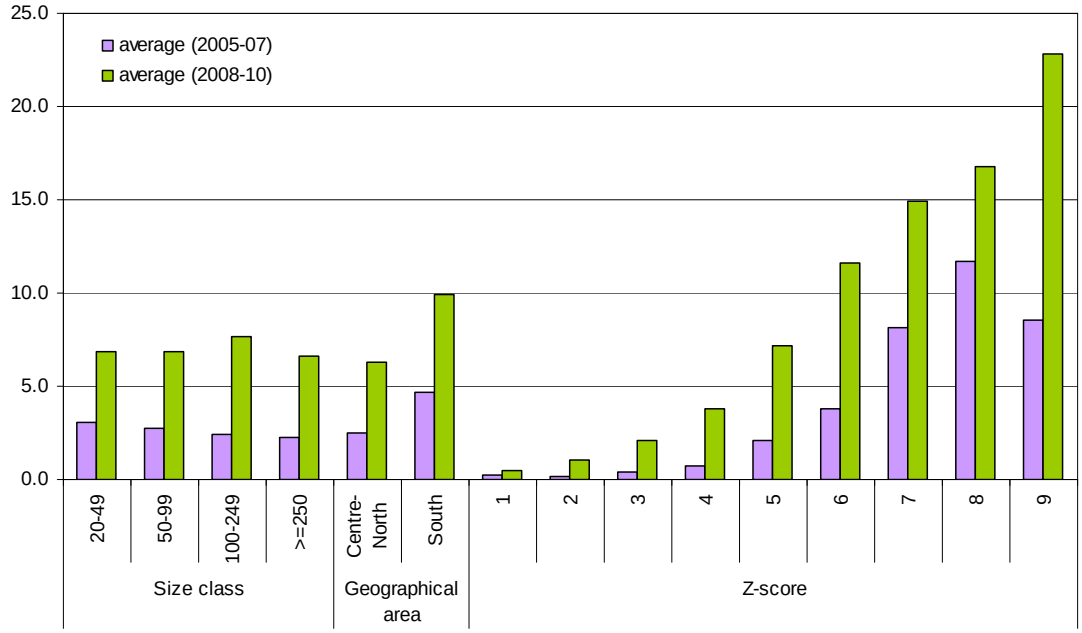
The economic and financial conditions of a firm are one of the main determinants of its capacity to access credit. During the crisis the incidence of rationing remained close to zero for firms with more balanced books on the basis of the Z-score attributed by Cerved[4] and was more than 20 per cent for the most risky firms. The results of a shift-share analysis conducted on the increase in the share of firms rationed between 2005-07 and 2008-10 indicate that the increase in the share, equal to 4 percentage points, is entirely attributable to the variation within the single risk

[3] The most recent data show that the percentage of firms that did not obtain the credit they had applied for reached around 12 per cent in 2011, the highest level since the start of the crisis; cf. Banca d'Italia, Annual Report 2011.
[4] The Z-score is an indicator calculated by Cerved that assumes values of between 1 and 9 as financial conditions worsen. See the Appendix for more details.

classes. The sharp increase in credit rationing should not, therefore, be ascribed to the worsening of the average quality of company balance sheets.

Figure 3

PERCENTAGE OF FIRMS APPLYING FOR BUT NOT OBTAINING CREDIT BY CATEGORY OF FIRM (1)
(per cent)

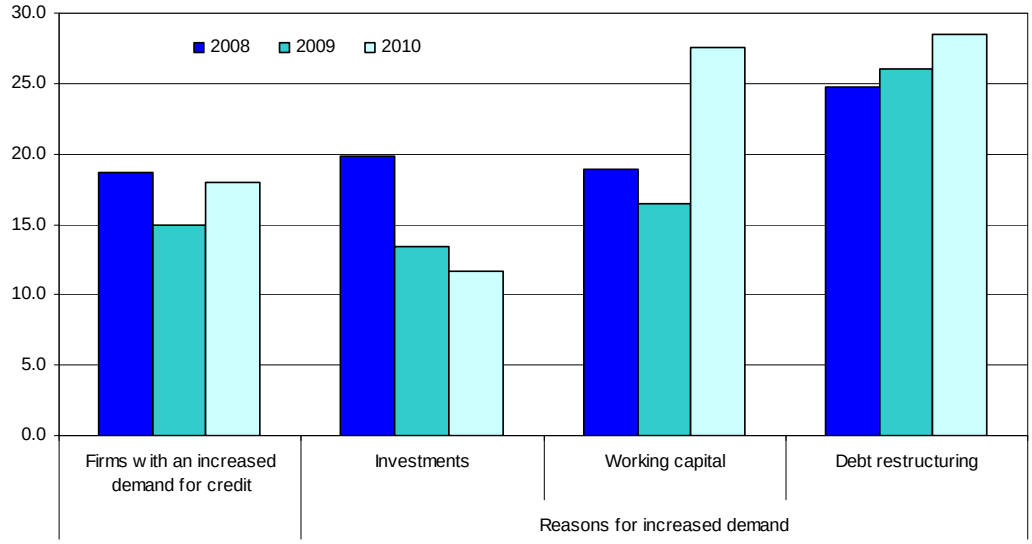


Source: Survey of Industrial and Service Firms.
(1) The question on the difficulty of accessing credit refers to the period bridging the end of the year indicated and the beginning of the following one, except for 2010 when it refers to the whole year.

Another aspect, partly connected to firms' financial conditions, which seems to influence the likelihood of obtaining new loans is the purpose to which the funding will be put: firms who have applied for the largest loans to finance debt-restructuring operations, followed by those needing more working capital, were on average rationed more severely than those who requested more funds to finance investment activity (Figure 4). This finding could also explain the greater incidence of credit rationing of subcontracting firms (more than 2 percentage points more than other firms), whose need for working capital has significantly increased because their own contractors pay late.

Figure 4

PERCENTAGE OF FIRMS WHICH HAVE REQUESTED BUT NOT OBTAINED CREDIT BY PERFORMANCE AND TYPE OF DEMAND FOR CREDIT (1)
(per cent)



Source: Survey of Industrial and Service Firms.
(1) The question on the difficulty of accessing credit refers to the period bridging the end of the year indicated and the beginning of the following one, except for 2010 when it refers to the whole year.

Overall, the main indications to emerge from the evidence presented thus far can be summarized as follows:

- Reflecting the weakness of financial conditions, the quality of the demand for external funding has worsened; the borrowing requirement was mainly made up of requests for working capital rather than for funds to build up stocks of physical capital;
- While the need for external capital was reduced but not nil, the contraction of credit in the most acute phase of the crisis indicated a significant tightening of supply by the banks; the number of firms which applied for credit but did not obtain it grew and has remained high compared with the past;
- The tightening of supply seems only partly connected to the worsening of the average quality of applicants: the increase in rationed firms has been important even in the same risk class.

3. Financial fragility, growth prospects and access to credit

In the context of a weak economy, the availability of external funding can be a determinant factor for growth and, sometimes, even for a firm's survival. Numerous studies have shown that difficulty in accessing credit is correlated with the different characteristics of firms, such as size,

sector of economic activity, financial conditions, and the configuration of banking relations.[5] In the analysis that follows, we present the results of some econometric estimates carried out to verify which company characteristics were associated, during the crisis, with an extreme degree of difficulty in obtaining credit, i.e. the impossibility of accessing new loans.

The analysis focuses on two aspects of firms' characteristics: financial fragility and growth prospects. For companies characterized by fragile financial conditions, the difficulty of accessing credit can undermine a balanced budget and lead to failure; for enterprises with good growth prospects it may prejudice the ability to win contracts or expand orders, to make investments or to embark on new growth paths.

The period for analysis was divided into two three-year periods (2005-07 and 2008-10) with the aim of verifying if firms' difficulty in obtaining new credit changed during the crisis compared with the previous period.

The dependent variable of the estimated equations, taken from the ISF Survey[6], is a dummy that identifies firms that have requested but not obtained credit.[7] All the estimates were made on the sample of firms which applied for credit in the period under investigation.[8] These firms account for 58 per cent of those in the Survey (56 and 61 per cent, respectively, before and during the crisis). Matching the Survey data with information from the Central Credit Register on credit used by firms (Figure 5) provides two important confirmations of how the estimates are set: i) it is essential to focus the analysis only on firms which have applied for funding because, among the non-rationed companies there are many who spontaneously reduce their bank debt; ii) our dependent variable actually identifies companies benefiting from a reduced flow of credit with respect to the other companies which have requested credit.

[5] See, for Italy, P. Angelini, R. Di Salvo and G. Ferri (1998), Guiso (1998) and Guiso (2006).

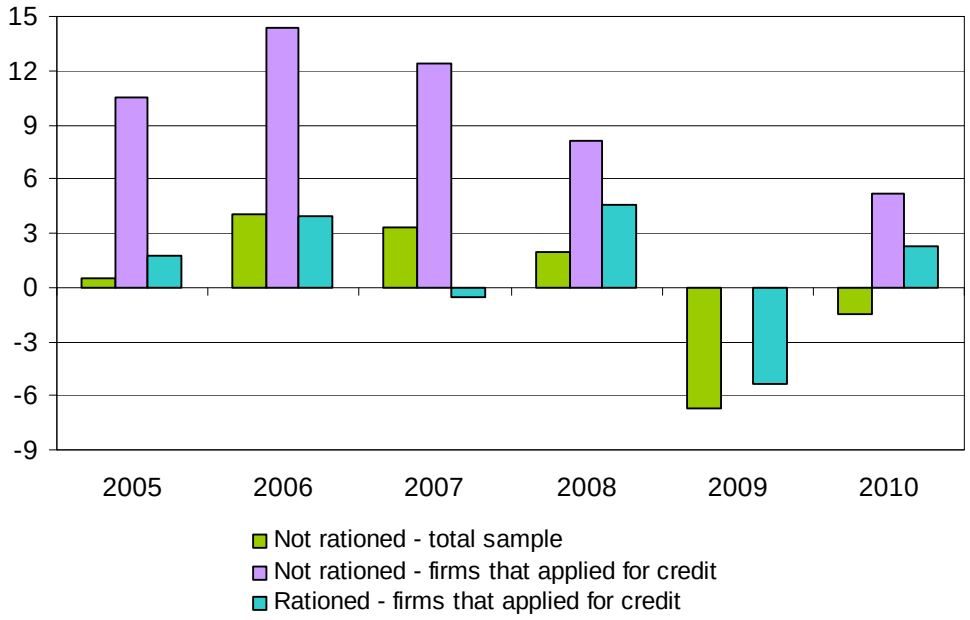
[6] The ISF survey's sample has some limitations in analysing access to credit because it does not include businesses which, in particular during the crisis, could have had serious difficulties in raising external funds, such as companies with less than 20 employees and those in the construction sector. Furthermore, although the sample is closed, there is an inevitable distortion in favour of companies in better conditions. Even with these limitations, however, the sharp increase in the percentage of rationed firms during the crisis suggests that the data could be useful to study how the criteria for selecting bank customers have changed. In addition, the survey provides a large amount of qualitative information difficult to find in other databases.

[7] The estimates made using the dummy as a dependent variable to identify firms which simply stated that they wanted more credit did not provide significantly different results.

[8] The identification of firms applying for credit is based on information contained in the Central Credit Register and the Survey of Industrial and Service Firms, which shows if a contact with the banking system was made to request credit. In particular, a firm was considered to have applied for credit if (1) the credit granted and reported to the Central Credit Register increased or if it declared (2) to have borne investment costs significantly different from that planned for reasons connected with the variation in the availability of credit; (3) to have increased their level of debt; 4) to want to take on more debt; (5) to have increased the demand for credit; and (6) to have experienced a worsening of credit conditions. Some estimates made on the complete sample (not presented) did, however, produce results that are broadly consistent with those discussed here.

Figure 5

USED AND RATIONED CREDIT
(12-month percentage change; median values)



Sources: Survey on Industrial and Service Firms and the Central Credit Register.

The percentage of firms rationed in the sample is, respectively, 5 and 11 per cent in the two three-year periods (Table 1). The rationed firms are on average more indebted, less profitable and productive and more frequently located in the southern regions compared with non-rationed firms. The principal bank of rationed firms holds a lower proportion of total loans granted to them and the incidence of the medium and longer term loans on total loans is lower for rationed firms (Table 2).

In all the estimated equations, among the regressors we introduced a proxy for firm size (the number of employees expressed as a logarithm; *size*), a dummy equal to one for firms located in the south (*south*) and a set of 11 dummies which identify the sector of economic activity (*sector*).[9] Some variables were added, delayed by one year in respect of the dependent variable, which captures the main characteristics of the relationship with the banking system, such as the share of loans granted by the main bank (*l_qban*), that of medium and longer-term loans (*l_rml*) and that of the amount guaranteed (*l_rgar*). Lastly we introduced dummies relating to each of the years in the period under consideration (*time*).

The following equation was then estimated:[10]

[9] The sectors of economic activity are defined on the basis of Ateco 2002 (4-digit).
[10] We tried to take account of the problem of endogeneity associated with the use of this estimation model by introducing variables that were delayed in relation to the dependent variable.

$$prob(rationing)_{j,t} = a + \theta\ size_{j,t} + \beta\ south_j + \xi\ l\_qban_{j,t-1} + \pi\ l\_rm,_{j,t-1} + \varphi\ l\_rgar_{j,t-1} + \gamma\ FRAGILITY_{j,t-1} + \delta\ GROWTH_{j,t-1} + \nu\ sector_j + \rho\ time_t + \varepsilon_{j,t}$$

where j indicates the firm and t the time. FRAGILITY and GROWTH represent two groups of variables which will be used to capture the aspects connected with financial equilibrium and growth prospects. There is a more detailed description of the variables used in the estimates in the Appendix; some descriptive statistics and the correlation matrix between the variables used in the estimates are presented in Tables 3 and 4.

3.1. Financial fragility

Firstly, it is more difficult for firms with less balanced budgets to access credit; the high probability of default of these enterprises makes intermediaries cautious in granting credit and they require more guarantees and apply higher interest rates. All the more so during the crisis, in a situation where some intermediaries were barely capitalized, the high absorption of capital connected with lending to financially fragile firms could have induced the banks to refuse loan applications from these companies more frequently. Nevertheless, in the presence of fragile firms which were highly indebted to the banks, intermediaries could have been induced to renew their own financial support to protect against capital losses connected with bankruptcies;[11] any difficulty in accessing credit on the part of these firms could have not insignificant effects on the financial stability of the lender banks themselves. Besides what can be observed in Figure 3, evidence consistent with the hypothesis of a positive relationship between financial fragility and credit rationing is provided by the evolution of bank loans by risk class. For the sample of firms in the Cerved archives, there was a decidedly more pronounced contraction in lending to companies with a Z-score of more than 6 in the period 2008-10 than to other companies.

In order to represent aspects of fragility in financial conditions, the estimate model considered two dummies equal to one respectively for vulnerable firms (with a Z-score of between 5 and 7; *mzscore*) and for riskier firms (with a Z-score of 8 and 9; *hzscore*);[12] both these variables were introduced for the previous year in respect of that of the dependent variable. The percentage of rationed firms among those with a Z-score greater than 4 goes from 8 per cent on average in the three years 2005-07 to 16 per cent during the crisis (Table 1).

[11] This is the phenomenon known as "zombie lending" or "evergreening". For the importance of the phenomenon in Italy during the recent crisis, see U. Albertazzi and D. Marchetti (2010).

[12] We also estimated some alternative equations in which in place of these dummies based on the Z-score, financial indicators of debt, income and liquidity were introduced directly. The results are consistent with those presented in the text.

The results of the probit estimates of the basic model in reference to the period of the crisis and that preceding it (Table 5, columns A and B) indicate that being located in the southern regions is associated with a significantly higher probability of rationing, while the correlation between rationing and firm size is negative and significant only in the period of the crisis.[13] Among the productive sectors, difficulties in accessing credit before the crisis was greater for chemical companies, for those working non-metallic minerals and commercial firms (the coefficients are not given in the table); during the crisis the differences between the sectors disappeared. Only during the crisis was a greater capacity for accessing credit associated with a greater concentration of loans.[14] Limited to the period preceding the crisis, the probability of rationing was also lower for firms characterized by a higher percentage of medium and long-term loans out of the total, most likely because of reduced financial pressure connected with refinancing needs. However, the percentage of the guaranteed amount increases the probability of the loan being refused; this result can be explained by hypothesizing that, in the presence of risk-averse entrepreneurs, firms with the higher guarantees to offer tend to take on greater risks and for this reason they are rationed more severely by the banks, i.e. there is a negative selection effect (see Stiglitz and Weiss, 1981).

The positive and statistically significant coefficients of the variables identifying vulnerable and risky firms clearly show that applications for credit by these types of firms, especially those with the most precarious financial conditions, were rejected more frequently by the banks both before and during the crisis.

These findings, which tend to rule out the existence of "evergreening", are also confirmed for the banks more involved in lending to firms, that is, those with the greatest incentives to prolong lending to firms in financial difficulties: in the estimate (not shown) made on the sub-sample of firms whose main bank holds more than 30 per cent of total loans (a value close to the first quartile of the distribution), the coefficients of the variables *mzscore* and *hzscore* continue to have a positive sign and to be statistically significant.[15]

[13] The different relationship between size and probability of credit rationing in respect of that observed in the previous section can mainly be attributed to the fact that the estimates are made on the sub-sample comprising firms which have applied for credit. In the estimates made on the basis of the whole sample (not presented), the coefficient associated with the variable *size* is statistically insignificant both before and during the crisis.

[14] During the recent financial crisis this characteristic mitigated the difficulty in accessing credit on the part of firms which had seen a reduction in credit granted to them; the opposite was the case for those that had benefited from an increase in bank credit (see De Mitri, Gobbi and Sette, 2010; the results refer to the period from June 2008 to June 2009).

[15] Estimates made on sub-samples composed of firms whose main bank holds more than 20 and 40 per cent of total loans granted to them, give the same results.

3.2. Growth prospects: quantitative indicators

While rationing the credit of financially fragile firms can accentuate their financial strains and, in extreme cases, lead to crises and company failures, rationing firms with good growth prospects, independently of their financial situation, could have an adverse effect on the Italian economy's growth potential. The risk that this could have been the case even during the recent crisis was augmented by the increasingly widespread use, especially by large banks, of statistical methods to evaluate the creditworthiness of their customers based mainly on balance-sheet data and they do not always take sufficient account of a firm's growth prospects and their investment opportunities.[16]

From the empirical point of view, measuring firms' growth prospects is not easy. Given the difficulty of reliably estimating the future cash flows of individual firms in order to calculate their net present value, we decided to use many kinds of information deriving from both balance sheets and the ISF Survey in the attempt to capture the aspects linked to the growth potential of firms and independent, as far as possible, of their financial situation. The four variables measure, as an average of the three years preceding that in which the dependent variable is defined, the rate of growth of turnover (*medfat*), investment (*medinv*), value added per employee (*medvadip*) and the quota of exports in the turnover (*medexp*). The capacity of these variables to capture growth prospects is based on two considerations: 1) firms' performance, indicated by the variables relating to turnover, productivity and exports, is characterized by a strong inertial component, which it is reasonable to assume is partly linked to firms' competitiveness or entrepreneurs' management skills;[17] 2) as regards the investment rate, it is likely that firms' growth prospects are positively correlated with investments made in the past.

The descriptive statistics show that when the four variables considered have high values, the percentage of rationed firms is almost always lower than the sample average in both the sub-periods. Nevertheless, during the crisis there were generally fewer differences in respect of the sample average (Table 1).

The coefficients of the four variables are all negative and statistically significant in the period preceding the crisis. During the crisis only firms characterized by high turnover growth

[16] On the basis of anecdotal evidence, during the crisis the automatic systems evaluating creditworthiness carried more weight in lending decisions and a significant part of the information feeding these systems, such as balance-sheet data, suffered a structural lag of several months, thus weakening banks' capacity to evaluate firms' prospects (see Banca d'Italia, Annual Report, 2010). As regards the development of procedures to adopt scoring techniques during the crisis, see also the results of the last Regional Bank Lending Survey (S. Del Prete, M. Pagnini, P. Rossi and V. Vacca, 2011).

[17] For example, calculations made on the basis of the entire Cerved archives, show that the ratio between value added per employee and the rate of growth of turnover has a high level of persistence: between 2003-05 and 2006-08 the percentage of firms which did not significantly change their performance in relation to the median for their sector was, respectively, to 65 and 55 per cent.

continue more frequently to obtain the funding requested (Table 5, columns C and D). The credit rationing imposed by the banks during the crisis seems to have therefore hit firms indiscriminately, placing less importance on growth prospects.

Considering only those firms whose main bank holds more than 30 per cent of the loans granted, three of the coefficients associated with the variables capturing growth prospects are negative and statistically significant during the crisis (Table 6, columns A and B).[18] In this case, during the crisis not only those firms with good turnovers in the past had fewer difficulties obtaining credit, but also those with high productivity and more investment activity.[19] This result is consistent with the fact that the banks more involved in business lending are those which are better at selecting their customers, both because they have more information than the others and because they have more incentive to make a good selection in the light of their greater financial exposure.

It is fundamentally important for banks to identify the firms with the best growth prospects when these companies are experiencing financial difficulties and looking only at the balance-sheet data would discourage lending. To investigate this aspect further, a model was estimated considering only those companies with elements of fragility in their balance-sheet (a Z-score of more than 4). These firms account for 52 per cent of those requesting loans. The results show that before the crisis financial fragility might weaken the capacity to obtain credit for firms with good prospects (Table 6, columns C and D): between 2005 and 2007 only the coefficients associated with the variables *medfat* and *medvadip* were negative and statistically significant, while during the crisis only the *medfat* coefficient was significant, the same as observed for the whole sample.[20] The biggest difference in respect of the basic model is linked to the geographical location of the firms: among the financially weaker firms there are no significant differences between the Centre-North and the South. This suggests that the greater difficulties in accessing credit in the southern regions mainly reflect the fact that there are more firms in this area with less balanced budgets.

3.3. Growth prospects: qualitative indicators

Given the difficulty of capturing firms' growth prospects, other, mainly qualitative, information on the management aspects affecting growth can be used.

[18] For the period prior to the crisis only 3 of the 4 coefficients associated with the variables capturing firms' growth prospects were negative and statistically significant.

[19] In this case as well, estimates made on sub-samples made up of firms whose main bank holds more than 20 and 40 per cent of total loans granted to them provide similar results.

[20] The estimate made on the sub-sample composed of only those firms whose main bank held a percentage of more than 30 per cent of total loans shows similar findings (not presented); in this case the only firms with better growth prospects having minor difficulties in accessing credit during the crisis in respect of others were those with more investment activity.

The 2007 ISF Survey contains some questions on the adoption of new strategies in the period 2000-2006 (changes in the range of products on offer, investment in the firm's own brand, internationalization) with the aim of adjusting operations and management policies for the new competitive environment and of making the most of new profit opportunities. Supposing that the adoption of these strategies increases the probability of improving performance, a dummy was introduced into the model to identify firms that had adopted new strategies (*newstrat*); the findings of the estimate made only on the pre-crisis period show that the coefficient associated with this dummy is statistically insignificant (Table 7, column A).[21]

Research and development activities and management and organizational innovations constitute important factors affecting firms' growth prospects. To capture these aspects some survey data was used in relation to research and development activities, registration of patents, introduction of process, organizational and product innovations. This information refers to the period 2008-10 and is only relevant to half of the sample, for which there are fairly few observations which makes estimating the coefficients less precise. Therefore a dummy was introduced for each of the previous activities (respectively *rs0810, brm0810, iproc0810, iorg0810 and iprod0810).* The coefficients are statistically insignificant with the exception of one positive coefficient associated with *iproc0810* (Table 7, column B).[22]

Another attempt to capture growth prospects was made by using information from the ISF Survey on investment plans for the following year. A dummy was therefore constructed equal to 1 for the last quartile of the distribution of planned investment growth rates (*dproginv*). Once again, the estimates of the coefficient associated with this dummy are not statistically significant in either the period of the crisis or the preceding one (Table 7, columns C and D).

Overall, comparing the results of the estimates described in this section with those presented in Table 5, it emerges (especially in the pre-crisis period) that there was a lower influence on the probability of credit rationing of the qualitative aspects of the firm's activity with respect to other aspects which are more easily quantifiable (such as those linked to the firm's financial situation or its economic performance in past years). This finding presumably reveals that banks have more

[21] All the estimates presented in Table 7 were also conducted by excluding the four variables used previously to identify the firms with better growth prospects; the results were basically unchanged. Even using three dummies divided by type of new strategy adopted (range, brand, internationalization) did not give different results from those described (results not presented).

[22] The variables introduced have a very high correlation with each other (with coefficients of between 0.29 and 0.63) which could cause lower precision in estimating the related coefficients due to collinearity problems. When the variables are considered one at a time (results not given), the only statistically significant coefficient is the negative one associated with *iorg0810*.

difficulty in incorporating soft information in the quantitative models which guide their lending decisions.

3.4. Lender bank size

During the financial crisis different types of banks were affected in different ways by the turmoil in the financial markets and by the slowdown in economic activity. It is therefore useful to check to what extent the probability of rationing and the capacity to select their customers were influenced by the type of bank counterparty. Since the rationing data taken from the ISF Survey does not refer to specific banks (thus it is not possible to identify which intermediaries had denied credit to a firm), the sample was limited to only those firms with more than 30 per cent of loans granted by their main intermediary. The hypothesis is that if these firms say that they have applied for but not obtained credit, it is very likely that they have also been rejected by an intermediary that was of great importance to them. The main banks were divided into the following 5 categories: those belonging to the 5 largest banking groups; the other large banks; foreign bank branches; small banks and those belonging to small groups; and the smallest banks. Based on this classification by size, the dummy *smallbank* was constructed, equal to 1 when the main lender bank belongs to the groups of the small and smallest banks. These banks, which have been less affected by the financial crisis, should have had a lower incentive to ration credit than the larger banks. Furthermore, the greater propensity of smaller banks to form close relationships with the firms they lend to could have afforded better customer protection at the times when the financial strains were more acute.[23]

The findings given in Table 8 (columns A and B) show that for the set of firms with more than 30 per cent of their loans coming from their first bank, the rate of rationing does not vary significantly according to the type of main bank in the pre-crisis period. During the crisis, however, the coefficient of the dummy *smallbank* becomes statistically significant with a negative sign, consistently with the a priori: during this period the firms which used a small bank as their main bankers have a lower probability of having their credit rationed compared with the others.[24]

As already underlined, in the sub-sample composed of only those firms whose main bank holds more than 30 per cent of the loans granted to them, the coefficients of the variables which capture growth prospects are predominantly significant and with a negative sign. In addition, this finding regards all types of banks; the coefficients relating to the terms of interaction between these

[23] See, among others, G. Ferri and G. B. Pittaluga (1997) and P. Angelini, R. Di Salvo and G. Ferri (1998).

[24] However, this evidence is not robust: estimates made on the basis of the sub-samples composed of those firms whose main bank holds more than 20 and 40 per cent of total loans confirm only in the first case the results described above. More in general, the results of these estimates suffer from the fact that the sub-sample on which they are based includes firms that are more "protected" in terms of accessing credit in that these firms are the ones with closer relationships with their own main bank (see the results for the coefficient of the abovementioned variable *l_qban*).

variables and the dummy *smallbank* are all statistically insignificant, with the exception of the coefficient relating to the interaction with *medfat*, negative and statistically significant in the pre-crisis period (Table 8, columns C and D). The greater protection guaranteed by the small banks to their customers was therefore generalized and did not regard, in particular, firms with good growth prospects.

3.5. Reasons for applying for credit

To capture the effects of the type of loan application on the probability of credit rationing, three dummies were introduced into the model to identify firms which increased their demand for credit, compared with six months earlier, for the purpose of financing, respectively, investment activity (*dominv*), working capital (*domwk*) and debt restructuring (*domris*). The results presented in Table 9 (column A) confirm the descriptive evidence given in section 2: the probability of credit rationing is significantly greater for firms that have applied for credit to finance working capital or debt restructuring. To the extent that this increased borrowing requirement reflects firms' deteriorating profitability and liquidity, the result shows that during the crisis credit rationing could have undermined firms' resilience in the face of financial difficulties more than their capacity to make new investments.[25]

3.6. Worsening of access-to-credit conditions

During the crisis firms that managed to obtain the funding they wanted from the banks often had to face tighter conditions for accessing credit. This took various forms among which the most common were higher financing costs, an increase in the guarantees required, or higher ancillary expenses. Although to a lesser extent compared with credit rationing, the worsening of access-to-credit conditions may have seriously damaged firms' financial balance or may have heavily conditioned their activities, especially in terms of investment. Therefore in this case too, it is important, as for credit rationing, to try and identify the characteristics of the firm which have had the greatest influence on the worsening of credit conditions. The results obtained by this analysis represent a robustness check for the credit rationing results.

The observations regarding firms which have suffered tighter conditions for accessing credit, in reference only to the period of the crisis, account for 39 per cent of the sample of firms which applied for credit during the crisis; the percentages for firms characterized by high growth prospects are all between 30 and 40 per cent, less than that related to financially fragile firms (47 per cent). The results of the estimate of the model analogous to the one presented in Table 5

[25] On the impact of the financial crisis on investment activity in the manufacturing sector, see E. Gaiotti (2011).

(column D) largely confirm those observed for rationed firms: the coefficients associated with vulnerable and risky firms are positive and statistically significant, while among the variables that capture growth prospects the only statistically significant coefficients are those in relation to turnover and investment growth (Table 9, column B).

4. Conclusions

During the crisis years, reflecting the weakening of financial conditions, the quality of firms applying for external funding worsened: the borrowing requirement had more to do with the need for working capital than a desire to build up physical capital. In the most acute phase of the crisis, the contraction in credit indicated a significant tightening of supply on the part of the banks, only partly due to the worsening of the financial conditions of their customers. Compared with the years immediately preceding the crisis, the percentage of companies being refused credit more or less tripled. In a prolonged period of weakness in the economy and low profitability, the availability of external financing may be crucial for firms, both for those with good growth prospects which may need funds to support investment or to finance an expansion of their business, and also for those in difficulties which need credit to cover temporary cash-flow problems. Therefore, the way the banks selected their customers during the crisis may have been an important factor in conditioning economic growth in the following years, allowing firms that were evaluated positively to follow a growth path or to avoid default.

The results of the analysis on the probability of credit rationing show that in deciding whether to grant financing, banks looked above all at firms' financial situation: fragile financial conditions, for example high indebtedness or low profitability, was associated with very much greater credit rationing than average, both before and during the crisis. In line with this evidence, the probability of rationing was higher for firms applying for credit to finance working capital or to restructure their debt. These findings imply that during the crisis credit rationing may have had a greater effect on firms' resilience to financial difficulties than on their capacity to make new investments.

Firms with high growth rates for turnover, investment, productivity or propensity to export were rationed less in the pre-crisis period; however during the crisis these firms did not generally benefit from easier access to credit. The adoption of some management choices aimed at increasing competitiveness and improving the firm's growth prospects (spending on research and development, on trademarks or patents, and organizational, product or process innovations) did not however influence the probability of rationing, even in the pre-crisis period, presumably revealing a

greater difficulty on the part of intermediaries to include this soft information in the quantitative models which guide lending decisions.

The findings on credit rationing are also confirmed by the worsening of access-to-credit conditions during the crisis: firms which suffered most from the deterioration in credit conditions were more financially fragile; among the variables that capture firms' growth prospects, only a change in turnover counts in improving access to credit.

One of the main results of our analysis regards the influence of the characteristics of banking relationships on access to credit. During the crisis, firms were more financially protected by the banks most involved in lending, especially if they were small banks. Differently from what was observed for the whole sample, furthermore, among firms with a closer relationship with their own main bank, the probability of credit rationing was significantly lower for those with better growth prospects. This finding could depend on the fact that the banks more involved in lending to firms have better information and greater incentives to use it when selecting their customers.

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APPENDIX

A) Firms' balance sheets – CERVED data

The balance-sheet archives of the Cerved Group cover the universe of Italian businesses. There are some problems connected with the quality of balance-sheet data since the information is not always compatible with the level of detail required to construct the indicators. As a result we selected a wide subset of companies meeting specific requirements.
We constructed the sample used in our work in sequential stages starting with non-financial corporations and selecting:

a) Firms with a turnover and total assets greater than zero;
b) Firms which, if they draw up their balance sheet in the "simplified CEE" form, have enhanced their financial debt (calculated by summing bank debt, bonds, debts towards partners and other financing sources) and/or they report commercial debt or tax debt (under the Cerved reclassified scheme, indistinguishable commercial and financial debts are both placed under different debts);
c) Firms which, independently of the reclassification scheme adopted, present data congruent with the Central Credit Register data i.e. if they declare they have no financial debt they must not figure in the Central Credit Register with an exposure to banks.

B) The Z-Score

The Z-Score is an indicator of the financial soundness of firms, calculated by Cerved on the basis of a wide range of budget variables. Firms are classified in nine risk categories which can be grouped into the following three classes:

- Sound firms: very sound (score = 1), sound (score = 2), above average solvency (score = 3), solvent (score =4);
- Vulnerable firms: vulnerable (score = 5), high vulnerability (score = 6);
- Risky firms: risky (score = 7), high risk (score = 8), very high risk (score = 9).

C) Bank of Italy surveys

Survey on Industrial and Service Firms (the ISF Survey). – The Bank of Italy has conducted this survey annually since 1972. Up until 1998 the survey only looked at industrial firms with 50 or more employees. Over the years, the field of observation has widened to include, since 1999, all manufacturing firms and the energy and mining sectors and, since 2001, firms with 20-40 employees. The reference population was further extended in 2002 to include firms providing private non-financial services with 20 or more employees.
The reference universe is currently composed of firms with head offices in Italy, with at least 20 employees, belonging to the sectors of economic activity within industry excluding construction, construction and private non-financial services.
The sample for the survey conducted in early 2011 was composed of 2,809 firms working in industry excluding construction and 1,128 firms providing private non-financial services. The distribution of the sample is relatively biased towards larger firms: 61.2 per cent of the sample is composed of firms with 50 employees and the remaining 38.8 per cent are firms with 20-49 employees (against 30.1 and 69.9 per cent, respectively, of firms in the population). As regards sectors of activity, the subsamples for industry and services were distributed in a way similar to the reference population. When calculating the descriptive statistics presented in this paper, account

was taken of the differences in the composition of the sample in respect of the population by using weighting coefficients.

Business Outlook Survey of Industrial and Service Firms. – Since 1993 the Bank of Italy has carried out a business outlook survey of firms in the period between the last ten days of September and the first twenty days of October. In 2011 the survey concerned 4,078 firms with 20 or more employees, of which 2,916 working in industry excluding construction and 1,162 firms providing private non-financial services.
The sample design is the same as that used for the ISF Survey above and the firms contacted are for the most part the same ones.

For further information on the two surveys, please see the supplements to the Bank of Italy's Statistical Bulletin which regularly reports the findings.

D) Estimates on the probability of rationing

The dependent variable. – The dependent variable is a dummy, constructed on the basis of the various questions in the ISF Survey. It identifies the firms which state:

a. would like to have more debt at the same cost and guarantee conditions currently applied to the company;
b. that the financial intermediaries contacted were not willing to increase the volume of loans.

Up until the survey conducted in 2010, firms' replies referred to the moment in which they filled in the questionnaire (therefore in the first few months of each year). Presumably, therefore, their dealings with intermediaries took place between the end of the preceding year and the early months of the year in which the survey is being done. In the 2011 survey, with the aim of anchoring firms' replies to a more precise time horizon, questions a) and b) explicitly referred to the whole of the previous year.

The survey. – If not otherwise specified, the estimates are made on the basis of samples of firms which applied for credit. In the absence of a variable that pinpoints these firms precisely, their identification is based on a multiplicity of information held in the Central Credit Register and in the ISF Survey from which it is possible to deduce if there were any applications for loans made through the banking system. In particular, a firm is considered to have applied for credit if (1) the agreed amount of credit recorded in the Central Credit Register has increased; (2) it says that it has had significantly different investment costs from those planned because of a change in the availability of credit; (3) it has increased its level of debt; (4) it would like to take on more debt; (5) it has increased its demand for credit; or (6) it has experienced a worsening of access-to-credit conditions.

The estimation method. – The paper presents the results of pooled probit estimates on the probability that the firm stated it had applied for but not obtained credit. All the estimates include 11 dummies which identify the sector the firms belong to and the temporal dummies.
The tables do not give the estimated coefficients but rather the marginal effects; these measure the effect on the probability of credit rationing of an infinitesimal change in the continuous variables or of a discrete change for the dummies. The robust standard errors of the related coefficients are given in brackets. Three asterisks indicate a coefficient that is significant at 1 per cent, two asterisks at 5 per cent, and one asterisk at 10 per cent.
The other variables. – In the following table there is a detailed description of the variables used in the estimates. The descriptive statistics and the correlation coefficients are presented in Tables 3 and 4.

Variables	Description	Source
size	Logarithm of the number of dependent variables	ISF Survey
south	dummy=1 for firms in the South of Italy	ISF Survey
mzscore	dummy=1for firms with a Z-score of 4 or 5	Cerved Group
hzscore	dummy=1for firms with a Z-score of between 6 and 9	Cerved Group
l_qban	Share of credit given by the main intermediary	Central Credit Register
l_rml	Share of the credit used in the medium and long term	Central Credit Register
l_rgar	Guaranteed share of the credit used	Central Credit Register
medinv	3-year average of the annual percentage change in investments	ISF Survey
medvadip	3-year average of the value added and number of employees	Cerved Group
medfat	3-year average of the annual percentage change in turnover	ISF Survey
medexp	3-year average of the share of exports in turnover	ISF Survey
newstrag	dummy=1 for firms saying they adopted new strategies between 2000 and 2006	ISF Survey
rs0810	dummy=1 for firms that had research and development costs in the period 2008-10	ISF Survey
brm0810	dummy=1 for firms that had patent or trademark costs in the period 2008-10	ISF Survey
iproc0810	dummy=1 for firms that introduced process innovations in the period 2008-10	ISF Survey
iorg0810	dummy=1 for firms that introduced organizational innovations in the period 2008-10	ISF Survey
iprod0810	dummy=1 for firms that introduced product innovations in the period 2008-10	ISF Survey
dproginv	dummy=1 for firms in the last quartile of the distribution of the expected rate of investment for the following year	ISF Survey
smallbank	dummy=1 for firms whose main bank belongs to the “small” or “smallest” size class	Central Credit Register
domwk	dummy=1 for firms who said they had increased their demand for credit in the preceding six months due to a greater need for working capital	ISF Survey
dominv	dummy=1 for firms who said they had increased their demand for credit in the preceding six months due to a greater investment needs	ISF Survey
domris	dummy=1 for firms who said they had increased their demand for credit in the preceding six months due to a greater need to restructure their debt.	ISF Survey

STATISTICAL TABLES

Table 1

DIFFICULTIES IN ACCESSING CREDIT (1)
(average values)

	Share of firms applying for and not obtaining credit			Share of firms which experienced worsening conditions
	2005-10	2005-2007	2008-2010	2008-2010
Total firms	8.44	5.07	11.33	39.28
Financially fragile firms (2)	12.11	7.71	15.91	46.87
Firms with high growth in turnover (3)	7.95	4.15	12.70	40.95
Firms with high VA per employee (3)	6.04	1.85	9.14	36.44
Firms with high growth in investments (3)	7.81	4.32	10.86	36.67
Firms with a high share of exports (3)	7.20	3.05	10.46	37.32

(1) The percentages refer to firms which have applied for credit. – (2) Financially fragile firms are those whose Z-score is more than 4. – (3) Firms belonging to the last quartile of the distribution of each indicator (see the Appendix).

Table 2

COMPARISON OF RATIONED AND NON-RATIONED FIRMS
(average values)

	Total firms	Non-rationed firms	Rationed firms
Size (log. of number of employees)	3.93	3.94	3.84
Dummy South	0.18	0.17	0.27
Leverage (%)	53.14	51.74	69.24
Liquidity (%)	136.79	135.46	152.16
Financial debt on turnover (%)	45.98	41.61	96.22
Cash flow on financial costs	20.38	21.73	4.98
Value added (thousands of euros)	5,932	6,080	4,235
Value added per employee (thousands of euros)	57.0	57.8	46.9
Value added on total assets (%)	31.08	31.50	26.30
Physical fixed assets (thousands of euros)	8,519	8,631	7,234
Gross operating profit (thousands of euros)	2,159	2,261	985
Return on equity (%)	-4.15	-1.31	-37.45
Z-score	4.78	4.68	5.96
Share main bank (%)	53.87	54.39	48.16
Share medium-long term (%)	39.41	39.62	36.92
Share guaranteed amount (%)	17.78	17.45	21.41

Note: the total sample refers to all firms which have applied for credit.

Table 3

DESCRIPTIVE STATISTICS OF THE SAMPLE USED FOR THE ESTIMATES (1)

	2005-2007			2008-2010		
	Median	Average	St. dev.	Median	Average	St. dev.
size	4.28	4.55	1.22	4.32	4.60	1.24
south	0.00	0.35	0.48	0.00	0.36	0.48
mzscore	0.00	0.44	0.50	0.00	0.44	0.50
hzscore	0.00	0.03	0.17	0.00	0.03	0.17
qban	48.95	55.61	27.45	49.11	56.45	27.02
rml	33.13	38.10	32.14	35.40	41.16	34.84
rgar	2.70	18.78	27.25	0.00	17.74	26.54
medinv	16.33	60.24	134.32	13.14	58.63	135.29
medvadip	51.46	59.30	42.36	54.81	63.76	48.03
medfat	3.25	3.82	11.91	0.86	1.11	11.68
medexp	9.87	23.24	28.06	9.30	23.80	28.64
rs0810				1.00	0.52	0.50
brm0810				0.00	0.28	0.45
iproc0810				0.00	0.42	0.49
iorg0810				0.00	0.45	0.50
iprod0810				0.00	0.48	0.50
newstrat	1.00	0.52	0.50			
dproginv	0.00	0.26	0.44	0.00	0.23	0.42
domwk				1.00	0.58	0.49
dominv				0.00	0.36	0.48
domris				0.00	0.20	0.40
smallbank	0.00	0.09	0.29	0.00	0.07	0.26

(1) See the Appendix for the description of the variables and information on the source.

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CORRELATION MATRIX OF THE VARIABLES USED IN THE ESTIMATES (1)
(Pearson correlation coefficients)

	size	south	mzscore	hzscore	l_qban	l_rml	l_rgar	medinv	med vadip	medfat	medexp	rs0810	brm0810	iproc 0810	iorg 0810	iprod 0810	small bank	domwk	dominv	domris
size	1																			
south	-0.2687	1																		
mzscore	-0.0426	0.07	1																	
hzscore	0.007	0.0395	-0.1587	1																
l_qban	-0.0324	0.0416	-0.2365	0.0105	1															
l_rml	0.0939	-0.0356	-0.0578	-0.0179	0.1285	1														
l_rgar	-0.0612	0.1075	0.0615	-0.011	0.1042	0.4241	1													
medinv	-0.1162	0.0345	0.0112	-0.0181	0.0264	-0.0041	0.0178	1												
medvadip	0.0555	-0.0516	-0.0751	-0.0342	0.0264	0.0182	-0.0413	-0.0035	1											
medfat	0.0509	-0.0195	0.0049	-0.0598	-0.0054	0.0202	0.0016	0.1114	0.0575	1										
medexp	0.1816	-0.2361	-0.0741	0.0036	-0.0516	0.0048	-0.0269	-0.0418	-0.0061	0.0166	1									
rs0810	0.1898	-0.2543	-0.083	-0.0101	-0.0365	0.0236	-0.004	-0.0898	0.01	0.0177	0.3638	1								
brm0810	0.2619	-0.2089	-0.0735	0.0071	-0.0807	0.0415	-0.0538	-0.062	0.0229	0.0311	0.2652	0.4119	1							
iproc0810	0.2118	-0.1768	-0.0776	-0.0143	-0.0261	0.0353	-0.0277	-0.043	0.0108	0.0279	0.2193	0.4756	0.3397	1						
iorg0810	0.2475	-0.2126	-0.0481	-0.0077	-0.0288	0.0435	-0.0009	-0.0548	0.0211	0.0204	0.1543	0.3393	0.2896	0.5485	1					
iprod0810	0.2135	-0.217	-0.0744	-0.0273	-0.0434	0.0205	-0.0485	-0.0683	-0.0197	0.0116	0.2954	0.5913	0.471	0.6284	0.4884	1				
smallbank	-0.0917	-0.037	0.0108	0.0048	0.0286	0.0026	0.0236	0.0081	-0.0467	-0.0093	-0.0326	-0.0856	-0.0451	-0.0211	-0.0055	-0.0453	1			
domwk	-0.0287	0.0346	0.057	-0.0285	-0.0607	-0.061	-0.0432	-0.0515	-0.0546	0.0192	0.0135	0.0551	0.0047	0.025	0.0513	0.038	-0.0452	1		
dominv	0.1448	-0.0216	-0.078	-0.0302	0.0234	0.0907	0.0404	0.0792	0.0615	0.0945	0.0261	0.007	0.0283	0.0751	-0.0057	-0.0397	0.0537	-0.2253	1	
domris	-0.0462	0.0434	0.1284	0.0571	-0.1405	0.0045	0.0235	-0.0361	-0.0203	-0.0545	-0.0138	-0.0826	-0.0327	-0.0242	-0.0348	-0.0064	-0.0238	-0.0541	-0.1662	1

(1) See the Appendix for the description of the variables and information on the source.

Table 5

ESTIMATE OF THE PROBABILITY OF RATIONING/1 (1)
(pooled probit estimates; marginal effects)

Variables	2005-07 *A*	2008-10 *B*	2005-07 *C*	2008-10 *D*
size	-0.0034	-0.0082 **	-0.0011	-0.0100 **
	(0.0022)	*(0.0039)*	*(0.0025)*	*(0.0047)*
south	0.0126 ***	0.0387 ***	0.0122 **	0.0210 *
	(0.0052)	*(0.0101)*	*(0.0063)*	*(0.0119)*
mzscore	0.0612 ***	0.1018 ***	0.0582 ***	0.0876 ***
	(0.0062)	*(0.0094)*	*(0.0079)*	*(0.0111)*
hzscore	0.2815 ***	0.3180 ***	0.2477 ***	0.2441 ***
	(0.0488)	*(0.0449)*	*(0.0608)*	*(0.0583)*
l_qban	0.00005	-0.0009 ***	0.0001	-0.0009 ***
	(0.0001)	*(0.0002)*	*(0.0001)*	*(0.0002)*
l_rml	-0.0002 **	-0.0001	-0.0001	0.00003
	(0.0001)	*(0.0001)*	*(0.0001)*	*(0.0002)*
l_rgar	0.0004 ***	0.0003 *	0.0003 **	0.0004 **
	(0.0001)	*(0.0002)*	*(0.0001)*	*(0.0002)*
medinv			-0.00004 *	-0.00003
			(0.00002)	*(0.00004)*
medvadip			-0.0001 *	-0.0002
			(0.0001)	*(0.0001)*
medfat			-0.0006 **	-0.0012 ***
			(0.0002)	*(0.0004)*
medexp			-0.0002 *	-0.0001
			(0.0001)	*(0.0002)*
Predicted prob.	0.0280	0.1042	0.0253	0.0955
Pseudo R-squared	0.1278	0.0710	0.1425	0.0741
Number of observations	6,441	6,285	3,855	4,068

(1) See the Appendix for a description of the estimation method and the variables used.

Table 6

ESTIMATE OF THE PROBABILITY OF RATIONING/2 (1)
(pooled probit estimates; marginal effects)

Variables	Subsample of firms with qban>30		Subsample of fragile firms	
	2005-07	2008-10	2005-07	2008-10
	A	*B*	*C*	*D*
size	-0.0014	-0.0107 **	-0.0009	-0.0221 ***
	(0.0032)	*(0.0054)*	*(0.0064)*	*(0.0084)*
south	0.0113 *	0.0316 **	0.0206	0.0018
	(0.0074)	*(0.0132)*	*(0.0153)*	*(0.0196)*
mzscore	0.0618 ***	0.0891 ***		
	(0.0100)	*(0.0126)*		
hzscore	0.2324 ***	0.1859 ***		
	(0.0614)	*(0.0626)*		
l_qban			0.0004	-0.0016 ***
			(0.0003)	*(0.0004)*
l_rml	-0.0001	-0.00005	-0.0003	-0.0002
	(0.0001)	*(0.0002)*	*(0.0003)*	*(0.0003)*
l_rgar	0.0003 *	0.0003	0.0004	0.0009 **
	(0.0001)	*(0.0002)*	*(0.0003)*	*(0.0004)*
medinv	-0.00005 **	-0.0001 *	-0.0001	-0.0001
	(0.00002)	*(0.00004)*	*(0.00005)*	*(0.0001)*
medvadip	-0.0001	-0.0003 **	-0.0004 *	-0.0001
	(0.0001)	*(0.0001)*	*(0.0002)*	*(0.0002)*
medfat	-0.0005 *	-0.0013 **	-0.0014 **	-0.0018 **
	(0.0003)	*(0.0005)*	*(0.0006)*	*(0.0008)*
medexp	-0.0002 *	0.00006	-0.0003	-0.0002
	(0.0001)	*(0.0002)*	*(0.0003)*	*(0.0004)*
Predicted prob.	0.0264	0.0880	0.0699	0.1527
Pseudo R-squared	0.1536	0.0743	0.0511	0.0403
Number of observations	2,786	3,155	2,000	2,132

(1) See the Appendix for a description of the estimation method and the variables used. The subsample of fragile firms includes firms with a Z-score of more than 4.

Table 7

ESTIMATES OF THE PROBABILITY OF RATIONING ALTERNATIVE VARIABLES FOR GROWTH PROSPECTS (1)

(pooled probit estimates; marginal effects)

Variables	2005-07 *A*	2008-10 *B*	2005-07 *C*	2008-10 *D*
size	-0.0030	0.0116	0.0001	-0.0093 **
	(0.0027)	*(0.0076)*	*(0.0023)*	*(0.0047)*
south	0.0111 **	0.0271	0.0124 **	0.0164
	(0.0061)	*(0.0242)*	*(0.0061)*	*(0.0120)*
mzscore	0.0562 ***	0.1006 ***	0.0564 ***	0.0882 ***
	(0.0085)	*(0.0208)*	*(0.0078)*	*(0.0112)*
hzscore	0.2129 ***	0.3732 ***	0.2332 ***	0.2825 ***
	(0.0640)	*(0.1119)*	*(0.0653)*	*(0.0617)*
l_qban	0.0001	-0.0006 *	0.0001	-0.0009 ***
	(0.0001)	*(0.0004)*	*(0.0001)*	*(0.0002)*
l_rml	-0.0001	0.0003	-0.0001	0.00004
	(0.0001)	*(0.0002)*	*(0.0001)*	*(0.0002)*
l_rgar	0.0003 **	0.0006 *	0.0002 *	0.0004 *
	(0.0001)	*(0.0003)*	*(0.0001)*	*(0.0002)*
medinv	-0.00003	-0.0001 *	-0.00004 *	-0.00004
	0.00002	*(0.0001)*	*0.00002*	*0.00004*
medvadip	-0.0002 **	-0.0002	-0.0001 *	-0.0001
	(0.0001)	*(0.0002)*	*(0.0001)*	*(0.0001)*
medfat	-0.0004 *	-0.0011	-0.0005 *	-0.0010 **
	(0.0002)	*(0.0007)*	*(0.0002)*	*(0.0004)*
medexp	-0.0002	0.0001	-0.0002 *	-0.00005
	(0.0001)	*(0.0003)*	*(0.0001)*	*(0.0002)*
newstrat	0.0010			
	(0.0052)			
rs0810		-0.0008		
		(0.0218)		
brm0810		-0.0281		
		(0.0191)		
iproc0810		0.0508 *		
		(0.0260)		
iorg0810		-0.0172		
		(0.0219)		
iprod0810		-0.0391		
		(0.0287)		
dproginv			-0.0027	-0.0153
			(0.0049)	*(0.0116)*
Predicted prob.	0.0201	0.0740	0.0236	0.0913
Pseudo R-squared	0.1635	0.1381	0.1403	0.0782
Number of observations	3,271	1,056	3,730	3,872

(1) See the Appendix for a description of the estimation method and the variables used.

Table 8

PROBABILITY OF RATIONING AND TYPE OF MAIN BANK (1)

(pooled probit estimates; marginal effects)

Variables	Subsample of firms with qban>30			
	2005-07 *A*	2008-10 *B*	2005-07 *C*	2008-10 *D*
size	-0.0037	-0.0104 **	-0.0012	-0.0108 **
	(0.0027)	*(0.0044)*	*(0.0032)*	*(0.0055)*
south	0.0116 **	0.0432 ***	0.0109	0.0333 ***
	(0.0058)	*(0.0109)*	*(0.0072)*	*(0.0133)*
mzscore	0.0643 ***	0.1044 ***		
	(0.0075)	*(0.0104)*		
hzscore	0.2693 ***	0.3141 ***		
	(0.0495)	*(0.0507)*		
l_rml	-0.0002	-0.0002	-0.0001	-0.0001
	(0.0001)	*(0.0001)*	*(0.0001)*	*(0.0002)*
l_rgar	0.0004 ***	0.0002	0.0003 *	0.0003
	(0.0001)	*(0.0002)*	*(0.0001)*	*(0.0002)*
smallbank	-0.0054	-0.0302 *	-0.0114	-0.0626
	(0.0080)	*(0.0146)*	*(0.0164)*	*(0.0274)*
fragile			0.0603 ***	0.0877 ***
			(0.0098)	*(0.0125)*
medinv			-0.00005 **	-0.0001 *
			(0.00002)	*(0.00005)*
medvadip			-0.0001	-0.0003 **
			(0.00009)	*(0.0002)*
medfat			-0.0004	-0.0013 **
			(0.0003)	*(0.00052)*
medexp			-0.0002 *	0.0001
			(0.0001)	*(0.0002)*
smallbank*fragile			0.0219	0.0592
			(0.0323)	*(0.0732)*
smallbank*medinv			-0.00002	0.0001
			(0.0001)	*(0.0001)*
smallbank*medfat			-0.0020 **	-0.0007
			(0.0010)	*(0.0015)*
smallbank*medvadip			0.00005	0.0004
			(0.0003)	*(0.0004)*
smallbank*medexp			-0.0001	-0.0007
			(0.0004)	*(0.0009)*
Predicted prob.	0.0290	0.0945	0.0258	0.0870
Pseudo R-squared	0.1304	0.0752	0.1529	0.0766
Number of observations	4,744	4,864	2,786	3,138

(1) See the Appendix for the description of the estimation method and variables used.

Table 9

PROBABILITY OF RATIONING AND TYPE OF DEMAND AND PROBABILITY OF A WORSENING OF ACCESS-TO-CREDIT CONDITIONS (1)

(pooled probit estimates; marginal effects)

Variables	Rationing	Worsening conditions
	2008-10 *A*	2008-10 *B*
size	0.0058	-0.0078
	(0.0081)	*(0.0075)*
south	0.0317	-0.0190
	(0.0204)	*(0.0198)*
mzscore	0.1216 ***	0.1395 ***
	(0.0190)	*(0.0178)*
hzscore	0.3674 ***	0.2940 ***
	(0.0884)	*(0.0552)*
l_qban	-0.0003	-0.0028 ***
	(0.0004)	*(0.0004)*
l_rml	-0.0001	0.0004
	(0.0003)	*(0.0003)*
l_rgar	0.0001	0.0008 **
	(0.0004)	*(0.0004)*
medinv		-0.0002 ***
		(0.0001)
medvadip		-0.00003
		(0.0002)
medfat		-0.0044 ***
		(0.0008)
medexp		-0.0001
		(0.0003)
domwk	0.0805 ***	
	(0.0180)	
dominv	0.0084	
	(0.0206)	
domris	0.1013 ***	
	(0.0250)	
Predicted prob.	0.1625	0.3773
Pseudo R-squared	0.0671	0.0871
Number of observations	1,857	4,000

(1) See the Appendix for the description of the estimation method and the variables used.