THE EFFECT OF MARKET STRUCTURE AND RELATIONSHIP LENDING ON THE LIKELIHOOD OF CREDIT TIGHTENING

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The results support the hypothesis that the likelihood of credit tightening is lower for firms having closer lending relationships, after controlling for their riskiness and for other firm-specific characteristics. Furthermore, all else being equal, the probability of tightening is decreasing in credit market concentration, and intense lending relationships reduce such probability more in highly concentrated than in competitive markets.

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This paper contributes to the debate on the effect of banking market competition jointly with the lending relationship on the availability of credit by adding new empirical evidence from an European market. By using a unique panel database of Italian firms, we aim to analyse the determinants of the likelihood of a tightening lending policy at micro level, and to assess the market conditions under which banks and firms are able to establish a beneficial long-term relationship. This study provides tests that examine (1) whether establishing strong lending relationships translates into a lower probability of being credit tightened by the banking system, (2) whether the market structure does directly affect the probability of tightening, and (3) whether the value of the relationships for the borrower is affected by the local credit market structure, i.e., if more intense lending ties influence the probability of tightening more in highly concentrated than in competitive markets.

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1. Introduction

During recessionary phases of the business cycle, fears of credit tightening become widespread in the business community, especially among small firms. Some marginal borrowers are indeed more likely to be credit rationed, if they no longer meet minimal lending standards. But while denial of credit to creditworthy borrowers is a cause for concern, as it affects the general level of economic activity[1], credit tightening in response to declining repayment capability is a rational business decision and key to a sound and stable banking system. If the bank receives new and not favourable information on the borrowing firm's creditworthiness, it may adjust its behaviour vis-à-vis the firm and tighten the firm's financial constraints.

But are all (riskier) borrowing firms equally affected by credit tightening?

Extensive theoretical and empirical research suggests that market conditions and institutions/market devices may alleviate credit constraints. At micro level, a market solution to credit constraints may be the firm-bank relationship, as it can substantially reduce the informational asymmetry between borrower and lender, and benefit the firm especially during periods of financial difficulties. An impressive body of empirical research has been built up over the past decade, documenting the role of relationships in the availability and cost of bank credit to small business (for a comprehensive review, see Boot, 2000; Ongena and Smith, 2000) and households (Chakravarty and Scott, 1999; Chakravarty and Yilmazer, 2004, among others). But more recently a strand of literature - both theorethical and empirical - has focused on the relation between bank market power, the amount of relationship financing provided by banks and the value of the lending relationship for the borrower. Theorethical predictions - discussed in section 2 - are not unambiguous and the net effect of market power on credit availability has to be empirically tested.

In light of the above considerations, this paper aims to add new evidence on the role of banking market competition jointly with the lending relationship on the availability of credit. We analyse the determinants of the likelihood of a tightening lending policy at firm level, and the market conditions under which banks and firms are able to establish a beneficial long-term relationship. The Italian banking system is a

good ground for investigating the value of the relationship lending in local markets characterized by different level of competition. The credit industry is regionally segmented into many small local markets and thus offers a variety of maket structures, which are relevant at least for the medium and small sized firms included in the sample. Furthermore, it is very important to understand the implications of the lending relationship on borrowing conditions, due to the heavy reliance of Italian firms on bank financing.

More specifically, this study provides tests that examine (1) whether establishing strong lending relationships translates into a lower probability of being credit tightened by the banking system, (2) whether the market structure does directly affect the probability of tightening, and (3) whether the value of the relationships for the borrower is affected by the local credit market structure, i.e., if more intense lending ties influence the probability of tightening more in highly concentrated than in competitive markets.

In order to test these hypotheses, we first construct an indicator of credit tightening, described in details in section 3. The tightening indicator is a categorical dummy variable, which equals 1 if the firm is credit constrained, and 0 otherwise. The hypotheses are tested through logistic regression, which estimates the probability of a sample firm being constrained. The analysis is performed on a unique panel data set including more than 9,000 Italian firms that have a relationship with at least one bank and borrowed a positive quantity of credit over the years 1996-2002.

The results support the hypothesis that the likelihood of credit tightening is lower for firms having closer lending relationships, after controlling for their riskiness and for other firm-specific characteristics. Furthermore, all else being equal, the probability of tightening is lower in more concentrated credit markets, and intense lending relationships reduce such probability more in highly concentrated than in competitive markets. In other words, concentrated lending relationships are more beneficial to borrowing firms if bank market power is high.

This study contributes to the existing empirical literature on lending relationships and bank market power in two main areas. First, as far as we are aware, no other study has yet examined such – individual and joint - effects of relationship and credit market

[1] On the relationship between the economic and lending cycles see Bernanke and Blinder, 1988; Bernanke and

competition on credit tightening in a comprehensive framework and in an European banking market. We test hypotheses originally developed in a different context in a new institutional enviroment. Second, data allows us to construct a meaningful proxy for bank credit tightening, based on observable measures of financial constraints. Furthermore, the data covers several years, allowing for a more robust econometric analysis.

The remainder of the paper is organised as follows. In section 2 we briefly discuss the main theoretical and empirical literature that provides rationales for the empirical predictions. We describe our main hypotheses and the research design in section 3. Major results are discussed in section 4, as are the results of the robustness tests. Conclusions are presented in section 5.

2. Related studies and previous results

Although this paper draws on different strands of literature, the most closely related to our analysis are the studies on the interactions between bank market power, relationship lending and credit supply

The potential incompatibility between bank competition and relationship building is highlighted in some recent papers. Several models (Mayer, 1988; Petersen and Rajan, 1995; Dell'Ariccia et al., 1999; Hauswald and Marquez, 2000; Boot and Thakor, 2000) develop the hypothesis that, if there is asymmetric information between lenders and borrowers, the theoretical relationship between market power and supply of credit is not trivially negative, as market power increases the rent extraction associated with acquiring private information about firms. All these papers address the issue of the effects of credit market competition on relationship lending. Despite their different assumptions, they all conclude that the amount of relationship financing provided by financial intermediaries and the value of lending relationship for the borrower – as measured by borrowing cost and credit availability - are strictly related to competition, both at firm level[2] and at banking industry level.

Gertler, 1989; Bernanke and Gilchrist, 1996; and Driscoll, 2004.

[2] At firm level, bank competition may be induced by the firm itself through multiple lending, in order – primarily - to reduce the hold-up costs (von Thadden, 1995).

According to the model developed by Petersen and Rajan (1995), lending relationship is less valuable to a firm in competitive markets. While in a competitive market the lender does not expect to share future profits and has to break even period by period, a monopolistic creditor is able to extract rents from the firm's future profits and, therefore, may be willing to offer credit even to risky firms and to smooth rates intertemporally. Such an effect has been recently defined as the "informational effect of credit market power", in contrast with the "traditional effect of credit market power" suggested by the static approach to industry competition (de Mello, 2003). In their model, Petersen and Rajan show that a close relationship to their borrowers enables banks to require moderate terms of lending (especially lower rates) relative to average borrower quality in the early stage of a relationship and stricter terms of lending in later stages, when average borrower quality has risen. Thus banks smooth the dynamics of credit conditions over time according to changes in borrower quality. This mechanism is also efficient, since it can avoid or reduce credit rationing towards young/risky firms. The model also predicts that (1) relatively more firms should be able to obtain credit in more concentrated markets; (2) the average quality of firms obtaining finance and the cost of credit should be decreasing in market concentration and (3) the cost of credit should decrease faster as the quality of the firm improves in a competitive market.

The results of empirical analysis carried out on US data support all former predictions. Petersen and Rajan (1995) and Petersen (1999) find that young[3] firms are more likely to obtain bank financing in concentrated markets, while older firms are less influenced by the concentration of the local credit market. With respect to the cost of lending, young firms pay lower rates in concentrated markets, while older firms receive better rates in competitive markets. Banking competition and lending relationships are compatible, provided that the borrowing firm confer monopoly power to just one lending banks (Montoriol Garriga, 2005).

In contrast with the assumption – common to most theoretical papers on relationship lending – that inside banks acquire private information through a simple and costless learning-by-lending technology, other models presuppose that information acquisition is a costly activity and a choice variable for the bank. Competitive market

[3] In both papers age is a proxy for credit quality.

pressures do influence the bank's incentive to invest in the acquisition of borrower specific information and, therefore, relationship financing can be a competitive driver. Boot and Thakor (2000) develop a model in which they relate the level of inter-bank and capital market competition to the level of bank lending and the value of the relationship to the borrower. Relationship orientation – by making a bank more unique relative to other banks – should alleviate the price competition pressure on profit margins. Their key result referring to credit markets is that increased competition, either among banks, types of debt or from outside sources, drives banks to invest more in relationship lending (i.e., to make a larger volume of relationship loans and to invest in information production to improve the quality of the relationship), as this is the primary source of bank profits. Boot and Thakor (2000) also predict that low-quality borrowers are offered loans with commitment and the threshold of creditworthiness above which these loans are offered does increase with competition.

Another recent papers (Hauswald and Marquez, 2000) complement the results of Boot and Thakor (2000) on relationship banking and competition. Hauswald and Marquez (2000) investigate how changes in the industry structure affect a bank's incentive to invest in its core market, and its ability to extract informational rents. Banks compete with each other in transaction and relationship loan markets. Growing competition, by endogenously eroding informational rents, encourages banks to increase the percentage of loans granted as relationship loans, in order to protect their rents, and induces more aggressive competition to recruit good borrowers and more investment in acquiring private borrower-specific information. Informational rents attract competition from both potential entrants and from other established banks and, therefore, lead to a larger supply of credit since banks, anticipating future rent extraction, compete more aggressively. But, the informational monopoly of inside lenders makes competition less effective, because of the adverse selection faced by competitors, and may induce non-competitive bank behaviour.

In summary, the theoretical predictions on whether lending relationships and market power are beneficial to borrowing firms are ambiguous and have to be empirically tested.

3. Hypotheses and research design

The main objective of this study is to investigate at micro level the determinants of the probability of credit tightening, focusing on the effects of lending relationships and bank market power. In this section we set out a brief discussion of the main testable hypotheses, describe the methodology and define the variables used in the empirical analysis.

First of all, we analyse the impact of bank-firm relationships, after controlling for the borrowing firm's characteristics and changes in its riskiness. The main argument supporting the hypothesis that lending relationships affect borrowing conditions is that inside banks gain private information beyond readily available information through multiple interactions over time or the provision of multiple financial services, and use this information to adjust the contract terms. Strong relationships can reduce the lender's expected cost of providing capital, because the bank should be better able to assess the borrower's riskiness and can spread any fixed cost of producing information about the firm over multiple products. Both effects reduce the cost for the lender of providing loans and services. If the cost savings are passed along in the form of greater availability of credit and/or lower interest rate and lower collateral requirements, the lending relationship will be beneficial to the borrower. Other benefits of relationship banking are related to flexibility in recontracting, which may allow the intertemporal smoothing of contractual terms, including losses for the inside bank in the short term that are recovered later in the relationship.

The first testable hypothesis follows:

H1: Strong (intense) lending relationships reduce the probability of a firm being credit constrained.

The supply of credit is also influenced by bank market power, which may be associated with non-competitive behaviour ('traditional effect of market power') or may induce more aggressive competition to recruit good borrowers and more investment in acquiring private borrower-specific information. In the latter case, a higher degree of credit market power leads to a larger supply of credit since banks, anticipating future rent extraction, compete more aggressively ("informational effect of credit market power"). If the informational effect of market power outweighs the traditional effect, the

availability of bank credit should be higher for firms in concentrated markets than in competitive markets. This suggests the second testable prediction:

H2: The probability of a firm being credit constrained is decreasing in local banking market power.

As discussed in the previous section, bank market power does also affect the amount of relationship financing provided by banks and the value of lending relationships for the borrower. According to the model developed by Petersen and Rajan (1995), a lending relationship is more valuable to a firm in monopolistic markets than in competitive markets. The third empirical prediction follows:

H3: Strong (intense) lending relationships lower the probability of a firm being credit constrained in concentrated banking markets more than in competitive banking markets.

The hypotheses are distinct, but strictly related. All predictions are tested through logistic regression estimations, in which the dependent variable (DV_TIGHT) is the probability of a sample firm being credit constrained. The basic econometric specification is of the form:

$$\text{Prob}(DV\_TIGHT = 1) = \alpha_0 + \alpha_1(FIRM\ CONTROLS_{it}) + \alpha_2(RELATION_{it}) + \alpha_3(MKTPOWER_{it}) + \alpha_4(OTHER CONTROLS_i) + \varepsilon_{it} \quad (1)$$

where 'FIRM CONTROLS' is the vector of firm-specific characteristics at time t, and 'OTHER CONTROLS' is the time invariant vector of other industry and geographical location control dummies. 'RELATION' and 'MKTPOWER' indicate, respectively, the intensity of bank-firm relationships and the bank market power for firm *i* at time *t*, and are the key variables in the tests.

3.1 Data description

To test the hypotheses, we construct a unique data set resulting from the merger of a time series-cross section of more than 10,000 firms for which accounting data is available over the period 1996-2002, with data on total exposure to the banking system from the Central Credit Register (CR) for the entire time period. The original sample includes firms that have a relationship with at least one bank in Italy and which borrow

a positive quantity of credit over the sample period[45]. The panel data set is, therefore, balanced by construction[6].

Pure financial holding companies, financial firms and intermediaries, agricultural and real estate companies are eliminated from the sample, which is reduced to 9,436 non-financial, for-profit firms per year. The distribution of sample firms by geographical area and industry broadly reflects the distribution of Italian firms population, though firms based in Northern regions (68%) and manufacturing firms (67%) are slightly over-represented. Almost all sample firms (98%) are corporations, and only 5% of them are based in industrial district areas[7].

The database is composed of (1) year-end annual balance sheet and income statement data; (2) other information on sample firm characteristics, such as date of incorporation, governance structure, industry, location; (3) year-end data on debt exposure vis-à-vis the banking system; (4) data on local banking market structure.

Accounting data and information are drawn from the Italian Company Account Register (Centrale dei Bilanci - CeBi) archives, which also provide the other information on firm-specific characteristics and identification data, allowing matches with the CR data. The CeBi sample is highly representative of Italian non-financial industries, but it is tilted towards medium-large companies.

Data on individual firm exposure towards the banking system comes from the CR archives. The CR collects from Italian banks monthly data on the individual credit exposures of their borrowers and returns to contributing banks information on their customers' total exposure vis-à-vis the whole banking system.

The reporting threshold is 75,000 euro[8]. The information collected by CR refers to credit lines (drawn and undrawn amount), overdrafts, mortgages, subordinated loans,

4 The raw sample includes all customer firms of Banca Commerciale Italiana from 1997 to 2000 and of Banca Intesa for 2001-2002.

5 The sample period starts from 1997, as the reporting structure of the Central Credit Register was radically changed in 1996 and previous data are not comparable, and ends in 2002 because the most updated available annual balance sheets refer to fiscal year 2002.

6 The sample may be affected by a form of survivorship bias towards firms having longer relationships with the banking system.

7 Detailed data available from the authors upon request.

8 As of December 2001 the Credit Register included over 1,500,000 individuals and 710,000 firms. The total outstanding amount covered 96% of loans to enterprises and 40% of loans to households. For a detailed description of the CR database see Foglia (2002).

repos, leasing and factoring. For each type of loan maturity, risk-mitigating guarantees and collateral are also reported. Other information includes data needed to identify borrowers, such as taxpayer identification numbers, sector of activity, geographical location. Elementary data on individual loans is aggregated to obtain total outstanding credit, drawn amounts, and degree of collateralisation by loan category.

Finally, the Bank of Italy Statistics Department provided us with the raw data on individual Italian banks' branch network, which we have used to construct the Herfindahl index of branch concentration.

3.2 Description of variables

The empirical analysis encompasses the use of several explanatory measures. Table A.1 in Appendix summarises variables and measures used in the regression specifications. Some of them are directly provided by the raw database, others have been constructed. All proxies are widely accepted and used by the related empirical literature. Only the financial constraints indicator (DV_TIGHT) has been newly defined as a function of four meaningful and measurable proxies for credit constraints[9]: (1) the ratio of credit drawn to bank credit granted, (2) the degree of collateralization, (3) the degree of guarantee coverage, and (4) the number of so called 'first information requests'.

The first metric is commonly used as an inverse measure of credit availability: firms that have higher ratios are more likely to be liquidity constrained. This variable potentially varies between 0 and infinity, as firms can overdraw on their credit lines, though at a very high cost. Assuming that – under normal conditions - the loan market is supply-driven, firms that are constrained by banks can either access alternative sources of financing or increase the use of committed credit lines.

According to the theoretical literature on the economics of collateral[10], it can be used as a screening device (to sort out riskier borrowers from safer ones) or an incentive device (to reduce the consequences of adverse selection and moral hazard). As it is

[9] All proxies are computed on data referring to individual firms' total exposure towards the whole banking system - returned by the Italian Credit Register to contributing banks.

[10] Loan contracts with provision for collateral are of two general types. In the first, collateral may be an existing asset of the borrowing firm that is pledged to a lender in the event of default. In the second type of loan contract, collateral is an addition to the usual assets that are attachable by the lender in case of default. This provision is more common in small business loans which are secured by a personal asset or guarantee of the entrepreneur.

costly to pledge collateral and/or personal guarantee, we consider the share of collateralised loans and guarantee coverage as costly non-price contract terms[11], which can be eased or tightened by the lending banks in response to changes in the borrowing firm's conditions. The share of collateralised loans is given by the amount of the loans that are secured by real collateral. The variable is bounded between 0 and 1 by construction.

The third metric is guarantee coverage, i.e. the ratio of the value of personal guarantee to the total amount of loans granted under credit lines. This proxy is upper unbounded, as the nominal value of the pledged guarantee can be higher than the total amount of credit granted.

Finally, the 'number of first information requests' is provided by the Italian Central Credit Register: each time a new potential borrower applies for a loan, the potential lender can request from the Central Credit Register detailed information about the borrower's credit exposure towards the banking system (i.e., outstanding loans amount, drawn and unused lines of credit, guarantee and collateral amount, number of lending banks, etc.). The 'number of first information requests' adds valuable information to the previous metrics. If associated with other evidence of credit tightening, it may signal the willingness of the firm to access other sources of bank debt. Therefore, this variable reinforces the evidence of liquidity constraints.

More precisely, we assume a firm is credit tightened[12] (the financial constraints indicator equals 1) if there is an increase in the ratio of credit drawn to bank credit granted and an increase in the ratio of collateralization or an increase in the guarantee coverage and the CR signals at least 1 information request for the firm.

In order to test the hypotheses H1-H3, it is also critical to construct proxies for the strength of firm-banks relationships, which is commonly measured by the length of the relationship between the borrower and the current lender and/or the breadth (or scope) of the relation. Non-interest rate fees, number of products/services provided (Berlin and Mester, 1999; Cole, 1998; Elsas, 2002), bank debt concentration and number of lending banks (Petersen and Rajan, 1994 and 1995; Houston and James, 2001; Wenying et al,

[11] Wenjing et al. (2005) consider collateral as a proxy for cost of lending.

12 Please note that our measure of credit constraints is based on non-price tightening actions, as we do not have access to data on the average interest rate spread charged by the banking system on each firm/credit line.

2005; Montoriol Garriga, 2005, among others) are the most widely used proxies for the breadth of the banking relationship.

We employ two indicators that (alternatively) proxy for the intensity of banking relationships: the number of lending banks (NUMBK) and the skewness of bank debt (SKEW)[13]. The number of banks from which the firm borrows is a measure of borrowing concentration and a proxy for the intensity of the bank-borrower relationship: the more exclusive the relationships, the more intense the relationships are expected to be. In contrast, borrowing from multiple institutions makes relationships more diffused and weaker. The skewness-variable proxies for the relative size of a lender claims or, alternatively, the heterogeneity of banks' lending shares. It is defined as follows[14]:

$$\text{SKEW} = \left| \frac{\text{BANK}_i\text{'S DEBT}}{\text{TOTAL BANK DEBT}} - \frac{1}{\text{NUMBK}} \right|$$

SKEW is small when the bank's lending share is equal to the average share (i.e., 1/NUMBK), and it increases if the bank i lends more or less than this. In the former case, the firm is unlikely to have strong lending relationships; in the latter, the firm is likely to have at least one strong relationship. A simple example may help. Assuming a firm has a total bank debt of 100 and 5 lending institutions. If the i-bank lends 20, SKEW will equal 0; if the i-bank lends 5, the absolute value of SKEW will be 0.15. Similarly, if the i-bank lends 20, but the number of banks is 10, then SKEW equals 0.1. Figure A.1 in the Appendix describes the distribution of SKEW as a function of borrowing concentration. A high SKEW signals that bank debt is not equally distributed among lending institutions, and therefore it can reasonably be assumed that the borrowing firm has a more intense lending relationship with at least one bank.

The other independent variable of interest is bank market power. In what follows, we use the concentration of the local market as a proxy for the lender's market power. It is well known that market concentration is an imperfect measure of market power: high concentration is compatible with very competitive market structures, and low concentration is also compatible with little competitiveness. This notwithstanding, concentration has been extensively used in the banking literature as a proxy for market

[13] To our knowledge, the skewness of bank debt was first defined and tested by Brunner and Krahnen (2002) to measure debt distribution.

[14] We use the relative share of Banca Intesa's bank debt to construct the indicator.

power. We measure concentration using the Herfindahl index of bank branches (HERFIND) at province level[15].

When testing the hypotheses, it is necessary to control for firm-specific characteristics and changes in riskiness, which are likely to affect the probability of the firm being credit tightened. We expect such a probability to be increasing in the riskiness of the firm and to be positively related to a deterioration in its risk profile. Firm-specific explanatory variables are intended to jointly capture borrower riskiness, asset liquidity and information asymmetry between firm and lenders. First of all, we assign to each firm a credit risk score, based on an internal scoring model[16]. Appendix A.2 shows the variables and ratios used to specify the model, estimated using multinomial logistic regression. For practical purposes, the predicted probability of default is associated with a discrete score, ranging from 1 (very safe) to 100 (high risk).

We also control for firm size, measured by the natural log of total assets (LNTA), since this should be inversely related to the riskiness of the firm. Larger firms are more likely to be well established, have access to relatively stable cash flows that can service debt, enjoy a better reputation, and are supposed to behave in ways that reduce the probability of future distress.

A firm's asset and capital structures clearly concern lending banks. The ASSET LIQUIDITY measures the availability of short-term liquid assets relative to total assets. Ordinarily, a firm experiencing consistent operating losses will have shrinking current assets as a percentage of total assets, and will be perceived as riskier. Therefore, more liquid firms are expected to be less credit constrained. Conversely, firms highly exposed towards the banking system (i.e. firms that have a high BANK DEBT/TOTAL FINANCIAL DEBT ratio) face – all else being equal – a greater likelihood of credit tightening: lending banks face significant moral hazard problems and high risks of asset substitution, and may consequently tighten credit conditions.

15 Provinces are considered by the Italian Antitrust Authority as the relevant banking markets. The Italian industrial structure is characterised by many SMEs, which almost entirely rely on bank loans as a source of financing. These firms are locally based and are not likely to access banking services provided in areas different from those in which they operate: Bonaccorsi di Patti (2003) provides evidence that 82.5% of bank-firm relationships are between banks and companies located in the same province, and 50% in the same municipality.

16 The scoring model has been elaborated and tested for internal use by Banca Commerciale Italiana (now Banca Intesa), to estimate the probability of default among customer firms.

One other firm-specific control variable is employed: the AGE of the firm. Age – defined as the number of years since incorporation - is an (inverse) measure of asymmetric information between firm and lenders: the older the firm, the longer is supposed to be its track record of debt payments, and the better known the firm is. Age should capture the difficulty for lenders to value the firm, and thus the adverse selection and moral hazard problems faced by the banks. Thus, older firms are less likely to be credit constrained, as they are considered less risky.

Finally, industry[17] and location dummy variables are introduced into the regression analyses. Industry dummies are included to further control for the specific riskiness of the industry. Since many features of the economic and legal environment show deep differences across geographical areas in Italy, dummy variables for firms located in Northern (NORTH), Central (CENTRE) and Southern (SOUTH) regions are introduced. One additional location control variable is the DISTRICT dummy: it equals 1 if the firm is located in an industrial district area, 0 otherwise[18]. Theoretical models (Stiglitz, 1994; Banerjee et al., 1994) acknowledge the role played by peer monitoring - exerted by other firms- and ex-post verification – exerted by local banks - in reducing moral hazard and free riding in industrial clusters, and consequently in improving credit conditions for district firms. The lending relationship literature also highlights the role of soft information and banking relationships in reducing credit constraints. Empirical studies (Finaldi Russo and Rossi, 2001, for example) show that firms located inside industrial districts may have an advantage in terms of financial relations with the banking system (lower cost of credit and lower probability of encountering financial constraints). We therefore expect district firms to be less liable to tightening.

4. Results

Before turning to the impact of lending relationships and credit market power on the probability of tightening, we describe the main firm-specific characteristics, and the patterns of lending relationships and credit constraint indicators for the firms in our sample.

[17] In the regression analysis only industry dummies not controlled for in the credit scoring model are included.

[18] Sixty-two industrial districts are identified according to the Mediobanca – Unioncamere (2003) criterion.

The mean book value of total assets is euro 58 million, while the median value is euro 12 million (table I). Such high dispersion of firm size suggests that the sample includes many large companies, but most firms are SMEs and are relatively young (the median age is 14 years). Consistently, the sample mean and median credit risk score is high (49 or Ba3/BB-)[19]. For firms with debt, banks represent the most relevant – if not sole – source of external financing: the bank debt/total financial debt ratio is, on average, over 80%. Multiple banking relationships are widespread, as suggested by the median number of banks[20] (10) from which sample firms borrow. Summary statistics are consistent with previous evidence from the Italian banking market (Ongena and Smith, 2000; Foglia et al., 1998; D'Auria et al., 1999): even small businesses have fragmented lending relationships, and the skewness of bank debt is rather low. It is worth noting that the skewness of bank debt is significantly different, both in mean and median values, if considering the credit drawn (10% on average) and the credit granted (6% on average). This suggests that, even if borrowing from multiple lenders, firms are able to differentiate their credit links and choose their borrowing pattern in such a way as to distribute information on the firm differentially across creditors. Firms appear to allocate "information rights" heterogeneously, mixing relationship funding (more informed) and transactional funding (less informed).

Table II describes the distribution of credit constraint proxies by firm riskiness. The average ratio of credit drawn to credit granted, the degree of collateralisation and the number of first information requests increase substantially as the borrowers' risk rises. Riskier firms may have more difficulty in obtaining bank financing, and thus are likely to make more extensive use of outstanding credit lines. A positive correlation between riskiness of the borrower and collateral use is consistent with models focusing on the incentive role of collateral[21]: the right to repossess collateral gives lenders a powerful threat to ensure the firm will not use the borrowed money unproductively, or hide or divert the proceeds of an investment project or default strategically. Less clear is the correlation between the pledge of personal guarantee and firm riskiness: both highly

[19] The distribution of sample firms by credit risk score is reported in table A.3 in the Appendix.

[20] The number of lending banks is a truncated variable, as CR does not report (for privacy reasons) the actual number of banks if this number is lower or equal to three. Almost 10% of sample firms borrow from three or fewer banks.

risky and safe borrowers seem to pledge more guarantees, but there is no difference in the guarantee coverage ratio for medium-risk and high-risk firms. However, pledging real collateral and/or personal guarantees may have very different motivations: while the former can be more easily seized by the receiving bank in case of default, a personal guarantee is not exclusive (i.e., it can be posted on loans borrowed from different banks) and is more difficult to seize. Therefore, it may also be used by lending banks as a screening mechanism: only (observably less risky) borrowers who are willing to post guarantees are granted loans.

In what follows, we assume the share of collateralised loans and the guarantee coverage ratio as costly non-price contract terms that can be tightened by the lending banks in response to an increase in the borrowing firm's riskiness.

But do changes in credit constraint measures reflect modifications in firm riskiness or, in other words, do banks tighten credit conditions in response to such modifications? And is credit tightening correlated with the characteristics of lending relationships?

As discussed in Section 3, we assume a firm is tightened if the drawn credit/granted credit ratio increases and there is an increase in the collateralisation ratio or in the guarantee coverage ratio and CR signals at least one first information request. If tightening actions reflect changes in the borrowers' risk profile, we will expect the variation in the borrowing conditions to be consistent with such changes. Table III reports the mean value of two relevant firm-specific variables (size and risk) and banking relationship proxies by tightening action. Tightened firms are larger and riskier firms. The evidence is partly unexpected: according to well-known theories on small business financing, we should find that SMEs are more likely to be constrained, whereas we observe the opposite. If backed by the regression results, the evidence would contrast with theoretical predictions and other empirical evidence, although there are plausible explanations which we discuss in the next section. Univariate statistics also show that credit constrained firms have weaker lending relationships: they borrow from a statistically significant higher number of banks and tend to have less concentrated debt.

To sum up, the univariate analysis suggests that borrowing conditions jointly reflect borrower riskiness and the modifications in firm risk profile.

[21] See Coco (2000) for a survey of the theoretical models.

4.1 Regression results

In this section we examine the regression results of the hypotheses testing. Under H1, strong lending relationships should lower the likelihood of credit tightening. To correctly capture the role of relationships, it is necessary to control for firm-specific characteristics and other control variables. The correlation matrix of regressors is shown in table IV.

The results of the random effects logistic regression[22] I (reported in table V) indicate that the riskiness variables have the predicted sign and are statistically and economically significant: the probability of credit constraints is increasing both in the firm credit score and delta score, and decreasing in its asset liquidity. However, the size effect[23] is puzzling: larger firms are more likely to be tightened, though the marginal effect of additional size is decreasing. Results do not change even considering different proxies for size (i.e. sales) or specifications (i.e. row levels instead of natural log). As a robustness check, we have also partitioned the sample into four quartiles by size, and used the size dummies instead of the continuous variable, but results[24] are essentially unchanged: larger firms are more likely to be credit tightened. However, two main arguments may explain our results: first, loans to large companies have been growing at a slower rate than loans to SMEs since 2001 and, according to recent lending surveys, the seven largest Italian banking groups have been very cautious towards large firms (Bank of Italy, Annual Report 2004). Second, banks might pay more attention to managing large loans (i.e. loans granted to large firms) and in renegotiating contract terms - should they receive unfavourable information about the borrowing firm - because they would risk more in case of default. The statistical significance of firm size is not affected by the inclusion of the firm AGE as a control variable to avoid bias, since the two regressors are positively (though modestly) correlated. The estimates in column

[22] Along with the parameter tests, we perform specification tests in order to gauge whether the econometric models are correct. In particular, we test a random effects versus a pooled logistic specification. The likelihood-ratio tests the hypothesis that rho=0, i.e. the random effects have zero variance and the random effects logit collapses to a pooled logit. The results of the tests suggest that the random effects specification is correct.

[23] We replace TOTAL ASSETS and firm AGE by the natural log of assets and age and include second order terms, allowing for the possibility of diminishing marginal effects. Results do not change if such variables are measured in levels.

[24] Data not reported in tables.

I confirm that AGE is a statistically important control variable, although the predicted sign of the coefficient is again unexpected. A possible explanation is that if AGE reflects a firm's public reputation and the information revealed to the market as a whole, its impact on (private) bank contract terms decreases over time. In other words, AGE is relevant for a lending bank if the firm is new or very young, but it does not significantly affect the lending relationship if the firm is old and well established. Actually, the sample mean of AGE is high (17 years) and, due to our sample selection criteria, the variable AGE is also truncated: only firms with AGE greater or equal 6 are included in the sample.

The location control variables are consistent with existing evidence from the Italian banking industry: firms located in Northern and Central regions are less likely to be tightened, as are manufacturing firms. The DISTRICT dummy variable is never significant, although the sign of the parameter is negative, as expected. Actually, the number of district firms in our sample is very low. Moreover, district firms are more likely to have better lending relationships with local banks, whose strength might not be captured only by the number of lending institutions or the skewness of bank debt. In other words, the negative sign of the DISTRICT coefficient may well be due to the role of soft information in smoothing the borrowing conditions offered by local banks. But, since we only have access to 'average' lending conditions offered by the banking system, we cannot disentangle the effect of lending relationships with local banks from that of relationships with large/national banks.

Turning to the focus of our analysis, the relationship variables are statistically significant and have the predicted signs. Specification I includes the (truncated) continuous variable number of banks, while in specification II the strength of the relationships is measured by the skewness of drawn bank debt. In both cases, the results are consistent with the hypothesis H1: all else being equal, firms having stronger lending relationships – either because they borrow from few institutions or because they have a more skewed credit drawn distribution – face a lower likelihood of credit tightening[25]. The coefficients have the predicted sign and are statistically highly

[25] We also estimate a specification including the binary variable 'number of banks greater than 3' as a measure of relationship strength, and the results are consistent with hypothesis H_1, i.e. firms borrowing from less than three banks face a lower probability of credit tightening.

significant, though their marginal effect is very low. To check for robustness, we also test a different model specification by replacing the skewness of drawn bank debt with the skewness of granted bank debt. The parameter of the latter is positive, but statistically and economically insignificant[26]. Consistent with the evidence of Table III, it seems that what does really influence the likelihood of tightening is the concentration of the share of drawn loans, not the distribution of granted credit lines.

The relevance of relationship variables is further confirmed by the estimates of specification III, where the strength of the relationship is measured jointly by the number of banks and borrowing concentration, as measured by the share of loans drawn from one current lender. An interaction term is also included. The three regressors enable us to disentangle the impact of each single variable used to construct the skewness of bank debt. As in specification I, the probability of tightening is positively related with the number of banks, and negatively with borrowing concentration, but the interaction term has a significant positive sign. In this specification, the marginal effect of each independent variable has to be estimated taking the other one into account. For example, the marginal effect of the number of banks is equal to:

$$\frac{dy}{d(number\ of\ banks)} = [\alpha_1 + \alpha_2(borrowing\ concentration)] * f(\beta' \bar{x})$$

where y is the probability of tightening, α_1 is the coefficient of 'number of banks', α_2 is the coefficient of the interaction term, and $f(\beta' \bar{x})$ is the logistic density function[27]. The figures 1 and 2 show, respectively, the marginal effect of multiple banks and borrowing concentration.

[26] Data not reported in tables.

[27] The parameters of logistic estimations do not represent the marginal increase in the estimated probability due to the marginal variation in the independent variable. Therefore, the marginal impact of each independent variable on the dependent variable has to be computed as follows. First, the expected probability of credit tightening is computed using the formula:

$$E(DV\_TIGHT) = \frac{e^{\beta' X}}{1 + e^{\beta' X}} = \Lambda(\beta' X)$$

where β'X is obtained as the product of the mean values of the independent variables and their estimated coefficients, and Λ indicates the logistic cumulative distribution function. The marginal effect of each variable is equal to:

$$\frac{\partial E(y|x)}{\partial x} = \Lambda(\beta' X)[1 - \Lambda(\beta' X)]\beta.$$

It is obvious that this expression will vary with the values of x. For convenience, marginal effects are calculated at the means of the regressors.

As shown in fig. 1, the marginal effect of the number of banks on the dependent variable – though economically negligible – increases in the share of loans borrowed from one bank. In other words, all else being equal, the probability of tightening increases as the number of lending institutions rises, and the marginal impact of multiple banks is itself increasing in borrowing concentration. Fig. 2 shows the marginal impact of the share of loans borrowed from one lender: the effect - which is also modest - is always negative (i.e. the likelihood of tightening decreases as the concentration ratio rises), but it is strictly decreasing in the number of multiple banks. These results further confirm the hypothesis H1 that having more concentrated lending relationships, either by borrowing from a small number of lenders and/or by borrowing a relevant share of debt from just one bank, is beneficial to the firm, as it faces a lower probability of tightening.

Turning to the testing of hypothesis H2, the degree of concentration in local banking markets also has the predicted sign: firms in more concentrated markets are significantly less likely to be credit constrained. After controlling for observable measures of creditworthiness and lending relationship strength, the probability of a firm being credit tightened is decreasing in bank market power, in keeping with the Petersen and Rajan (1995) model. The so-called "informational effect of market power" seems to outweigh the negative effect of non–competitive behaviour in more concentrated banking markets.

To conclude: taken together, the results of the logistic estimations support the hypotheses H1 and H2.

We can now try to gain more insight into the value of lending relationships in different credit markets. Under H3, lending relationships are more valuable to the firm in more concentrated markets than in competitive markets or, alternatively, lending relationships lower the probability of tightening more in concentrated than in competitive banking markets.

In order to test this hypothesis, we first construct two new variables by interacting the market concentration index with the two measures of relationship. We then regress the probability of tightening on the usual set of independent variables, including the two new interacting variables. Logistic regression results are reported in table VI, columns I

and II. The multiple banks parameter is still positive and statistically highly significant, but the Herfindahl index coefficient is not (column I). The interaction term is negative and significant.

The marginal effect of multiple banks estimated as a function of banking market concentration is depicted in Fig. 3. The marginal impact of the number of banks is decreasing in the market concentration, and it is positive if the Herfindahl index is lower than 0.29, but negative if the index is higher than 0.29 (which is greater than the 99th percentile). Therefore, increasing the number of banks always increases the probability of tightening (except for exceptional cases, when the Herfindahl index is in the last percentile), but it does so in a much more powerful way when the market is less concentrated. A possible explanation for this finding is that an increase in the number of banks in highly competitive markets lowers the commitment of the bank toward the borrowing firm due to (possible) free-riding behaviour among financers, and thus raises the probability of tightening. By contrast, the increase in the probability of tightening following an increase in the number of banks is immaterial (it tends to 0) when the market is concentrated. Thus, firms located in very concentrated local markets may induce competition at firm level through differentiated financing sources with a limited risk of being credit tightened.

In specification II of Table VI, the lending relationship is proxied by the skewness of drawn bank debt: both the parameters of skewness and Herfindahl index have the predicted sign, but the interaction is not significant.

To investigate the value of lending relationships by market structure, we construct three binary variables to distinguish the most competitive banking markets (DV_competitive market, equal 1 if the Herfindahl index is lower than or equal to the 10th percentile threshold, 0 otherwise), the most concentrated markets (DV_concentrated market, equal 1 if the Herfindahl index is higher than or equal to the 90th percentile threshold, 0 otherwise) and the middle competition markets (DV_middle competition market; Herfindahl index ranging between the 10th and the 90th percentile thresholds)[28]. We replace these continuous measure of concentration with the dummy variables. Regression results are reported in table VI, columns III and IV. Since we

[28] The 10th and 90th percentile thresholds are, respectively, 0.08 and 0.184.

expect multiple banks and skewness to have a different effect in competitive and concentrated markets, we estimate different intercepts and slopes for each level of market concentration. The intercept measures the difference between a firm based in the most concentrated and in the most competitive markets. In specification III, only the (negative) marginal effect of DV_concentrated market is statistically and economically significant. Consistently with the H1 hypothesis and with the estimates of column I, the likelihood of tightening is lower in highly concentrated markets and it increases as the number of banks increases, but the rate at which the predicted probability changes does not significantly differ (at conventional statistical levels) across markets. Different results are obtained by interacting the skewness of debt with the concentration dummy variables (table VI, specification IV): the more skewed the bank debt is, the lower the probability of tightening, but the two intercepts are not statistically and economically different. In this case, only the slope coefficient of DV_concentrated market*Debt skewness is significant.

Overall, the above evidence is consistent with hypothesis H3: intense lending relationships seem to be more beneficial to firms located in concentrated rather than in competitive banking markets.

4.2 Robustness checks

In order to assess the robustness of the random-effects logistic regression results, further tests are performed. The analysis aimed at testing the robustness of results to different specifications of some independent variables has already been discussed in the previous section. In what follows, we describe a set of checks intended to prove that the results are also robust to a different specification of the dependent variable. More precisely, we focus on the construction of the credit constraints measures upon which the DV_TIGHT is based.

As described in sections 3 and 4, we computed the drawn debt/granted debt ratio, the collateralisation ratio and the guarantee coverage ratio by firm/year considering all categories of loans reported by the Central Credit Register. However, contractual terms of some forms of loan - such as long-term loans and mortgages – cannot be easily renegotiated by lending banks according to the borrower's changing conditions.

Tightening actions may thus affect more short-term, non-committed lines of credit. To account for this, we first drop from the Central Credit Register database all data referred to long term loans, mortgage loans, factoring and leasing contracts, and repos, and we then compute the (new) three measures of credit constraints by firm/year and their y/y variation, and finally re-define the dependent variable. We test all the econometric specifications reported in tables V and VI using the 'new' dependent variable. The results[29] are essentially unchanged: the only coefficient that becomes lower and loses significance in some specifications is that of the Herfindahl index, while the other parameters are basically unaffected and consistent with the results of tables V and VI.

5. Conclusions

This paper seeks to analyse the determinants of the likelihood of tightening lending policy, in order to contribute to the debate on the role of lending relationships and banking market structure in bank lending behaviour. Consolidated theoretical arguments underpin the testable hypotheses that strong lending relationships may increase the availability of credit for the firm, and that bank market power does affect both the supply of credit and the value of the relationship for the borrowers.

The analysis of an extensive longitudinal database of Italian firms supports the hypothesis that the estimated probability of credit tightening is significantly lower for firms having closer lending relationships, as measured by the number of banks from which the firms borrow or by the skewness of bank debt. Tightening actions do reflect the riskiness of the firm and the changes in its risk profile. The results are statistically and economically significant, and are robust to different variable and model specifications. Furthermore, all else being equal, the probability of credit constraints starts lower in most concentrated markets, and it increases (decreases) with the number of banks (skewness of bank debt) more in highly concentrated than in competitive markets. Overall, the preliminary evidence is consistent with the hypothesis that intense lending relationships seem to be more beneficial to firms located in concentrated than in competitive banking markets.

[29] Results are not reported in tables, but available from the authors upon request.

To the best of our knowledge, this is the first study which examines the direct effects of relationship and credit market structure on credit tightening, and tests the effects of market competition on the value of lending relationships in a comprehensive framework and in an European banking market.

Table I - FIRM-SPECIFIC CHARACTERISTICS AND LENDING RELATIONSHIPS

This table reports summary statistics of sample firm-specific characteristics and bank borrowing pattern. Summary statistics are computed on mean values by firm over the years 1997-2002. Local banking market concentration is measured by the Hefindahl Index of bank branch network at province level.

	Obs	Mean	Std Dev	Median
BOOK VALUE OF TOTAL ASSETS (mil. euro)	9436	58	813	12
CREDIT SCORE	9357	48	21	49
BANK DEBT/TOTAL FINANCIAL DEBT	9320	84.4%	22.0%	94.6%
ASSET LIQUIDITY (CURRENT ASSETS/TOTAL ASSETS)	9424	73.9%	16.9%	76.5%
AGE (years)	7527	17	14	14
NUMBER OF LENDING BANKS (if greater than 3)	8826	11	6	10
SKEWNESS OF BANK DEBT (CREDIT DRAWN)	8749	10.0%	9.0%	7.0%
SKEWNESS OF BANK DEBT (CREDIT GRANTED)	8790	6.0%	6.0%	5.0%
BORROWING CONCENTRATION (CREDIT DRAWN)	9246	10.4%	14.0%	6.2%
HERFINDAHL INDEX OF LOCAL BANKING MARKETS	9436	12.5%	4.9%	10.7%

Table II - LENDING STANDARDS BY FIRM RISKINESS

This table reports the distribution of lending standards by firm riskiness. Mean values by firm over the years 1997-2002.

			FIRM RISKINESS				
		TOTAL SAMPLE	VERY LOW RISK	LOW RISK	MEDIUM RISK	HIGH RISK	VERY HIGH RISK
Credit drawn/Credit granted (%)	Obs.	9343	233	1455	4395	3028	153
	Mean	54,3	28,9	45,2	53,2	61,6	62,2
Collateralisation ratio (%)	Obs.	9343	233	1455	4395	3028	153
	Mean	11,8	10,6	11,3	11,1	13,1	14,7
Guarantee coverage ratio (%)	Obs.	9343	233	1455	4395	3028	153
	Mean	5,5	9,0	7,3	5,0	5,0	7,6
Number of first information requests	Obs.	9099	221	1422	4265	2966	147
	Mean	0,9	0,6	0,8	0,9	1,0	1,2

Table III - CREDIT TIGHTENING, FIRM CHARACTERISTICS AND LENDING RELATIONSHIPS

This table reports the mean value of the main firm-specific characteristics and lending relationship measures by dummy variable ' CREDIT TIGHTENING'. The t-statistics tests the hypothesis that the two mean values are equal.

DV_TIGHTENING	TOTAL ASSETS		CREDIT SCORE		NUMBER OF BANKS		DEBT SKEWNESS (CREDIT DRAWN)		DEBT SKEWNESS (CREDIT GRANTED)	
	Obs.	Mean	Obs.	Mean	Obs.	Mean	Obs.	Mean	Obs.	Mean
0	50922	59	49383	47	43378	11	42103	9.4%	43017	6.0%
1	3400	64	3301	53	3326	13	3307	8.8%	3307	6.0%
T-test	***-3.71***		***-9.45***		***-22.09***		***6.66***		***-0.02***	
P-value	***0.000***		***0.000***		***0.000***		***0.000***		***0.983***	

Table IV - CORRELATION MATRIX OF REGRESSORS

	Total assets	*Age*	*Bank debt/Total financial debt*	*Asset liquidity*	*Score*	*Delta score*	*Number of banks*	*Skewness (credit granted)*	*Skewness (credit drawn)*	*Herfindahl Index*	*DV_District*	*North*	*Centre*	*South*	*DV_Manufact*
Total assets	1,000														
Age	0,022	1,000													
Bank debt/Total financial debt	-0,044	0,003	1,000												
Asset liquidity	-0,092	-0,080	0,082	1,000											
Score	-0,026	-0,042	0,020	0,055	1,000										
Delta score	-0,005	0,003	0,021	-0,003	0,361	1,000									
Number of banks	0,203	0,058	0,049	-0,116	0,076	0,008	1,000								
Skewness (credit granted)	0,016	0,012	-0,078	-0,060	-0,066	-0,007	-0,280	1,000							
Skewness (credit drawn)	0,000	0,007	-0,110	-0,013	-0,085	-0,012	-0,319	0,617	1,000						
Herfindahl Index	-0,019	0,012	0,042	-0,021	0,033	0,025	-0,033	0,006	0,011	1,000					
DV_District	-0,003	0,027	-0,011	0,015	0,039	0,009	-0,016	0,025	0,010	-0,115	1,000				
North	0,005	0,023	-0,019	-0,014	-0,008	-0,007	0,014	0,025	0,024	-0,112	0,058	1,000			
Centre	-0,014	-0,007	0,052	0,067	0,001	0,001	0,023	-0,038	-0,024	-0,031	0,018	-0,667	1,000		
South	0,008	-0,022	-0,030	-0,053	0,009	0,007	-0,043	0,008	-0,005	0,181	-0,095	-0,608	-0,186	1,000	
DV_Manufacturing	-0,014	0,044	-0,029	-0,165	0,267	-0,011	0,051	-0,023	-0,004	0,026	0,155	0,059	-0,002	-0,075	1,000

Table V - CREDIT TIGHTENING, LENDING RELATIONSHIPS AND MARKET COMPETITION

This table reports the results of the random-effect logistic regression analysis. The dependent variable is the probability of a sample firm being credit tightened. 'DELTA SCORE' is a dummy variable equal 1 if the firm credit risk score increases y/y (i.e., if the firms riskiness increases). Borrowing concentration is measured by the fraction of bank debt borrowed from one current lender.

Dependent variable **Prob. (Tightening = 1)**

	I				**II**				**III**			
Independent variables	*Coeff.*	*z-score*	*P-value*	*dy/dx*	*Coeff.*	*z-score*	*P-value*	*dy/dx*	*Coeff.*	*z-score*	*P-value*	*dy/dx*
Constant	-15,69	-14,41	0,000	-	-15,24	-13,82	0,000	-	-15,92	-14,52	0,000	-
Firm-specific characteristics												
Log (Total assets)	2,28	10,98	0,000	0,127	2,18	10,42	0,000	0,122	2,35	11,25	0,000	0,133
Log (Total assets)^2	-0,10	-9,76	0,000	-0,005	-0,09	-8,87	0,000	-0,005	-0,10	-10,06	0,000	-0,006
Log (AGE)	0,13	1,44	0,150	0,007	0,13	1,42	0,155	0,007	0,13	1,41	0,158	0,007
Log (AGE)^2	-0,03	-1,57	0,117	-0,002	-0,03	-1,55	0,120	-0,002	-0,03	-1,57	0,117	-0,002
Bank debt /Total financial debt	0,80	7,54	0,000	0,045	0,80	7,45	0,000	0,045	0,72	6,66	0,000	0,041
Asset liquidity	-1,20	-9,84	0,000	-0,067	-1,16	-9,38	0,000	-0,065	-1,20	-9,77	0,000	-0,068
Credit score	0,00	3,07	0,002	0,000	0,00	3,43	0,001	0,000	0,00	3,16	0,002	0,000
Delta score	0,32	7,15	0,000	0,018	0,32	7,07	0,000	0,018	0,32	7,10	0,000	0,019
Lending relationship												
Number of banks	0,02	6,39	0,000	0,001					0,02	3,84	0,000	0,001
Debt skewness (drawn debt)					-0,78	-3,43	0,001	0,044				
Borrowing concentration									-0,01	-2,50	0,012	0,000
Number of banks * Borrowing concentration									0,00	4,67	0,000	0,000
Credit market concentration												
Herfindahl index	-0,84	-1,86	0,062	-0,047	-0,94	-2,06	0,040	0,053	-0,85	-1,88	0,060	-0,048
Other control variables												
DV_district	-0,06	-0,54	0,589	-0,003	-0,07	-0,62	0,532	-0,004	-0,07	-0,69	0,49	0,00
North	-0,17	-2,73	0,006	-0,010	-0,15	-2,42	0,016	-0,009	-0,17	-2,84	0,005	-0,010
Centre	-0,14	-1,81	0,070	-0,007	-0,11	-1,39	0,162	-0,006	-0,14	-1,78	0,075	-0,007
DV_Manufacturing	-0,07	-1,38	0,167	-0,004	-0,07	-1,40	0,162	-0,004	-0,06	-1,23	0,218	-0,004
Obs	36638				36072				36072			
Wald chi2(15)	707,33				657,74				712,46			
Prob > chi2	0,000				0,000				0,00			
rho	0,08				0,09				0,08			
Likelihood-ratio test of rho=0	30,79				33,76				28,52			
Prob > chibar2	0,000				0,000				0,000			

Fig. 1 - Marginal effect of multiple banks

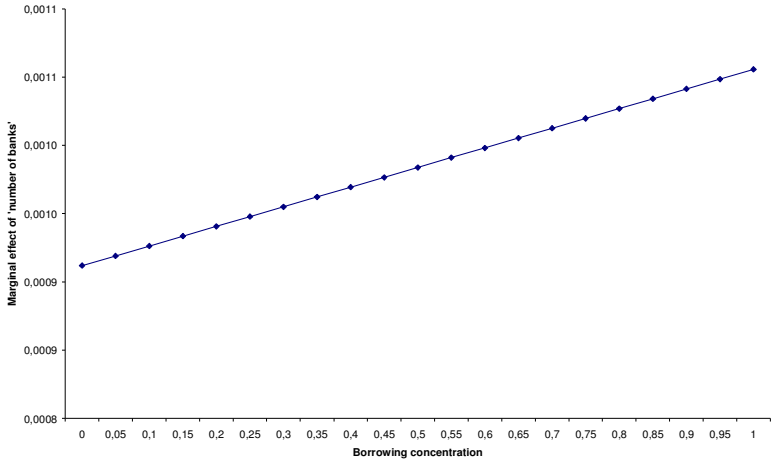


Fig. 2 - Marginal effect of borrowing concentration

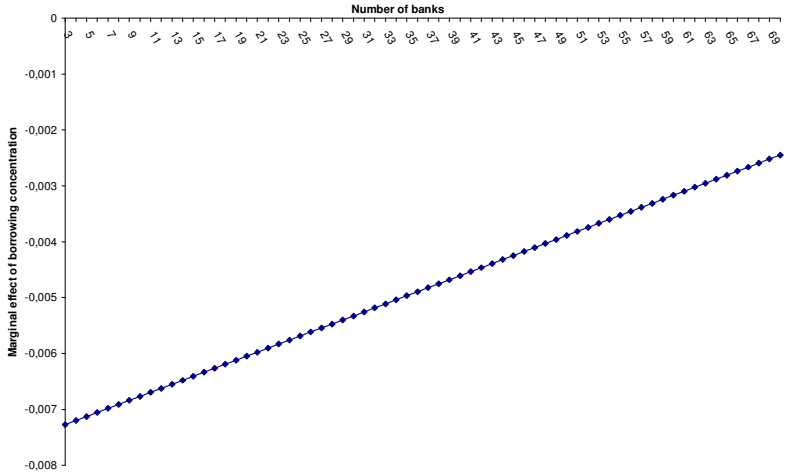


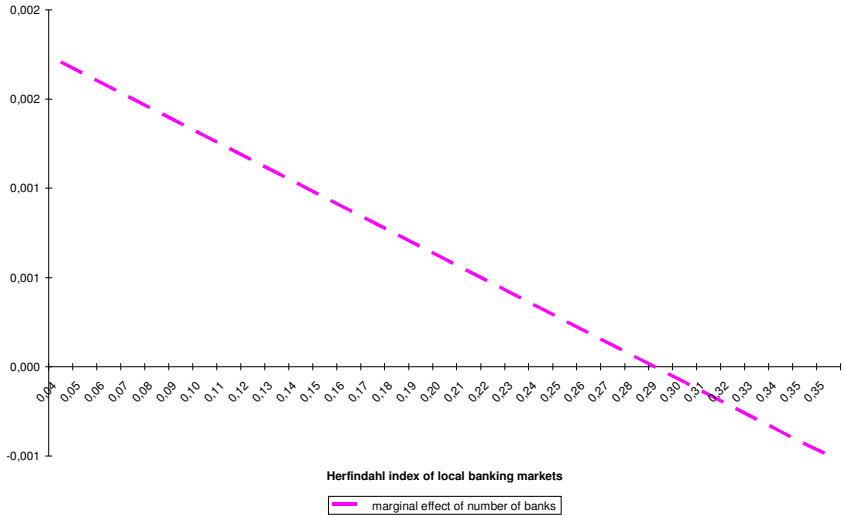
Table VI - CREDIT TIGHTENING AND MARKET COMPETITION

This table reports the results of the random-effect logistic regression analysis. The dependent variable is the probability of a sample firm being credit tightened. In the specifications III and IV the Herfindahl index of local banking markets is replaced by two dummy variables. The most competitive markets are those with a value of the Herfindahl index of less than the 10th percentile, while the most concentrated markets are those with an index higher than the 90th percentile.

Dependent variable **Prob. (Tightening = 1)**

	I				**II**				**III**				**IV**			
Independent variables	*Coeff.*	*z-score*	*dy/dx*	*p-value*	*Coeff.*	*z-score*	*dy/dx*	*p-value*	*Coeff.*	*z-score*	*dy/dx*	*p-value*	*Coeff.*	*z-score*	*dy/dx*	*p-value*
Constant	-16.11	-14.58	-	0.000	-15.23	-13.81	-	0.000	-15.88	-14.57	-	0.000	-15.30	-13.90	-	0.000
Firm-specific characteristics																
Log (Total assets)	2.32	11.16	0.129	0.000	2.17	10.42	0.122	0.000	2.30	11.09	12.760	0.000	2.17	10.39	0.122	0.000
Log (Total assets)^2	-0.10	-9.95	-0.006	0.000	-0.09	-8.87	-0.005	0.000	-0.10	-9.87	-0.005	0.000	-0.09	-8.83	-0.005	0.000
Log (AGE)	0.13	1.44	0.007	0.149	0.13	1.42	0.007	0.155	0.12	1.39	0.006	0.166	0.12	1.37	0.007	0.169
Log (AGE)^2	-0.03	-1.56	-0.002	0.118	-0.03	-1.55	-0.002	0.120	-0.03	-1.54	-0.002	0.124	-0.03	-1.52	-0.002	0.127
Bank debt /Total financial debt	0.80	7.56	0.044	0.000	0.80	7.45	0.045	0.000	0.81	7.60	0.044	0.000	0.80	7.48	0.045	0.000
Asset liquidity	-1.20	-9.76	-0.066	0.000	-1.16	-9.37	-0.065	0.000	-1.21	-9.82	-0.066	0.000	-1.16	-9.37	-0.065	0.000
Credit score	0.00	3.08	0.000	0.002	0.00	3.43	0.000	0.001	0.00	2.92	0.000	0.004	0.002	3.25	0.000	0.001
Delta score	0.32	7.14	0.018	0.000	0.32	7.07	0.018	0.000	0.31	6.93	0.017	0.000	0.31	6.86	0.018	0.000
Lending relationship																
Number of banks	0.04	4.62	0.002	0.000					0.02	5.93	0.001	0.000				
Debt skewness					-0.84	-1.36	-0.047	0.174					-0.54	-2.23	-0.029	0.026
Credit market concentration																
Herfindahl index	0.84	0.95	0.047	0.344	-0.98	-1.61	-0.055	0.100								
DV_concentrated mkt									-0.41	-2.74	-0.019	0.006	-0.06	-0.61	-0.003	0.543
DV_competitive mkt									0.00	0.00	0.000	0.998	-0.11	-1.09	-0.006	0.274
Herfindahl index*Number of banks	-0.15	-2.13	-0.008	0.033												
Herfindahl index*Debt skewness					0.49	0.10	0.028	0.916								
DV_concentrated mkt*Number of banks									0.01	1.44	0.001	0.150				
DV_competitive mkt*Number of bank									-0.02	-1.26	-0.001	0.209				
DV_concentrated mkt*Debt skewness													-2.04	-2.17	-0.114	0.030
DV_competitive mkt*Debt skewness													-1.12	-1.19	-0.063	0.233
Other control variables																
DV_district	-0.06	-0.57	-0.003	0.570	-0.07	-0.62	-0.003	0.532	-0.04	-0.36	-0.002	0.717	0.05	-0.46	-0.003	0.649
North	0.16	-2.68	-0.009	0.007	-0.15	-2.42	-0.009	0.016	-0.14	-2.34	-0.008	0.019	-0.12	-2.04	-0.007	0.042
Centre	-0.14	-1.80	-0.007	0.072	-0.11	-1.39	-0.006	0.165	-0.15	-2.00	-0.008	0.045	-0.12	-1.55	-0.006	0.122
DV_Manufacturing	-0.07	-1.35	-0.004	0.177	-0.07	-1.40	-0.004	0.162	-0.07	-1.43	-0.004	0.154	-0.08	-1.47	-0.004	0.142
Obs	36638				36072				36638				36072			
Wald chi2(15)	712.22				657.79				717.79				667.42			
Prob > chi2	0.000				0.000				0.000				0.000			
rho	0.081				0.085				0.081				0.085			
Likelihood-ratio test of rho=0	30.07				33.75				30.66				33.85			
Prob > chibar2	0.000				0.000				0.000				0.000			

Fig. 3 Marginal effect of multiple banking and market concentration



Appendix

Table A.1: Variables

	Variables	Contruction
Lending standards	CREDIT LINES USAGE	Bank credit drawn / Bank credit granted
	COLLATERALISATION RATIO	Bank credit secured by real collateral/Total bank credit granted
	GUARANTEE COVERAGE RATIO	Personal guarantee/Total bank credit granted
	NUMBER OF FIRST INFORMATION REQUESTS	
Lending relationship	NUMBER OF LENDING BANKS	Truncated continuous variable (reported if the number of banks is greater than three)
	SKEWNESS OF BANK DEBT	$\left\lvert \frac{Credit\ granted\ by\ bank_i}{Total\ bank\ credit\ granted} - \frac{1}{number\ of\ lending\ banks} \right\rvert$
	BORROWING CONCENTRATION	Fraction of bank debt borrowed from one current lender (in %)
Firm-specific characteristics	SIZE	Book value of total assets
	RISKINESS	Credit risk score
	BANK DEBT EXPOSURE	Bank debt / Total financial debt
	ASSET LIQUIDITY	Current assets / Total assets
	AGE	Number of years since the firm was founded
	INDUSTRIAL DISTRICT	Dummy variable equal 1 if the firm is located in an industrial district area
Banking market concentration	HERFINDAHL INDEX OF BANKING MARKET	Concentration index of bank branch network, computed at province level

Table A.2: Credit scoring model

Variables	Ratios	
Capital structure	LEV1	Equity / (Equity + Financial debt)
	LEV2	Equity / Total liabilities
	AUTDE	EBITDA/Total liabilities
	IMMCA	Total fixed assets / (Equity + Long term liabilities)
	DBRPC	Short term financial debt / Liquidity
	OFFA	Interest expenses / Sales
	PRFIF	Interest earnings / Sales
Profitability	ROE	Net profit / Equity
	UTFA	Net profit / Sales
Liquidity	ACID	Current assets / Current liabilities
Industry trend	D(MOL/FATT)	Expected growth of (Industry EBITDA/ Industry sales)
	D(FATT)	Expected growth rate of industry sales

Model specification for firms operating in the service industry30:

$$SCORE_{serv} = \alpha_1 + \alpha_2(DV\_SOUTH) + \alpha_3(DV\_TRANSPORT) + \alpha_4 LEV2 + \alpha_5 OFFA + \alpha_6 PRFIF + \alpha_7 UTFA$$

Model specification for manufacturing firms:

$$SCORE_{ind} = \alpha_1 + \alpha_2(DV\_SOUTH) + \alpha_3(DV\_ENERGY) + \alpha_4 AUTDE + \alpha_5 IMMCA + \alpha_6 DBRPC + \alpha_7 OFFA + \alpha_8 ROE + \alpha_9 ACID1 + \alpha_{10} LEV1 + \alpha_{11} DMOL/FATT + \alpha_{12} DFATT$$

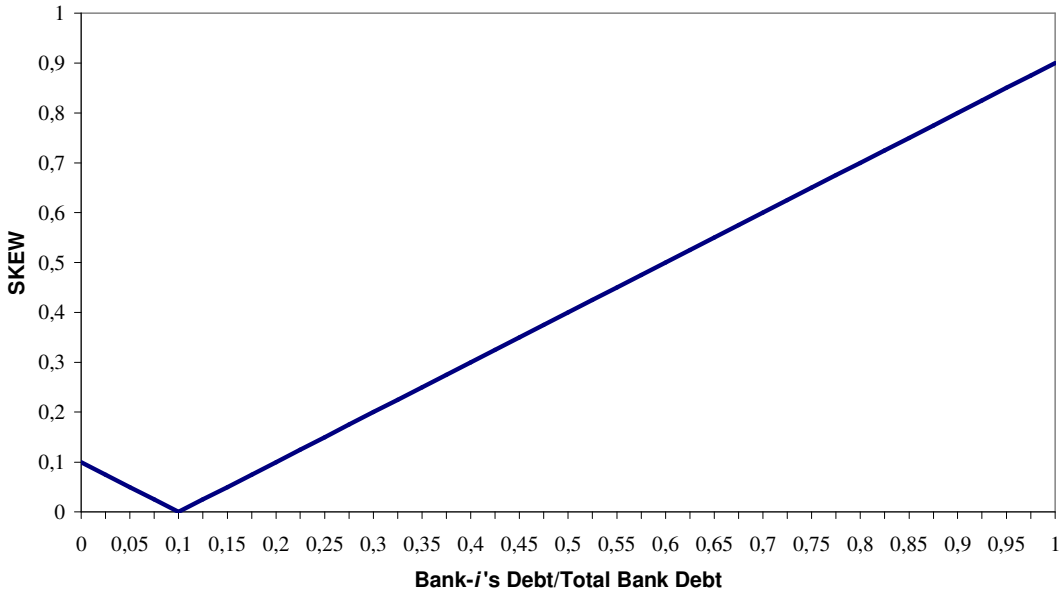
30 For privacy reasons, the estimated parameters are not reported.

Table A.3 - DISTRIBUTION OF SAMPLE FIRMS BY RISKINESS

This table reports the distribution of sample firms by riskiness. Firms are classified according to a credit risk score. The descrete score is associated to a predicted probability of default, estimated through multinomial logistic regression. The score ranges between 1 (very safe) and 100 (very high risk). Mean values by firm over the years 1997-2002.

RISKINESS	SCORE	MOODY'S RATING	FREQ.	PERC.	CUM. PERC.
VERY LOW RISK	1 < score < = 4	RATING >=A3	238	2,5	2,5
LOW RISK	4 < score <= 28	Baa3 <= RATING < A3	1472	15,7	18,3
MEDIUM RISK	28 < score <= 57	Ba3 <= RATING < Baa3	4437	47,4	65,7
HIGH RISK	57 < score <= 94	B3 <= RATING < Ba3	3056	32,7	98,4
VERY HIGH RISK	94 < score <= 100	RATING <= B3	154	1,6	100

Fig. A.1: Skewness of bank debt (assuming the number of lending banks =10)



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