Competition, bank orientation and sector specialization during the financial crisis.

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Abstract

This paper empirically investigates the relationship between interbank competition, bank orientation and credit availability for a sample of more than 30,000 loans granted by a large banking group operating in the Italian credit market. We test whether and how, during a credit crunch period, competition affects bank orientation and how relationship lending and interbank competition can mitigate the credit crunch problem, for financially distressed firms. Using a unique and large bank-firm level dataset, the main results show that an increase in competition is associated with a stronger relationship in terms of the length of bank-borrower interaction, whereas the distance bank branch-headquarter negatively affect it. Moreover, a stronger lender-borrower relationship is found positively significant in determining the change in the amount of credit granted. Non-linearity and sector specialization effects are tested, too, and report interesting results, supporting the crucial role of relationship lending during a financial crisis.

1. Introduction

The seminal paper by Boot and Thakor (2000) titled Can Relationship Banking Survive Competition? and subsequent literature have linked relationship banking with interbank competition suggesting that as interbank competition increases, banks make more relationship loans (but each loan has less added value for borrowers) whereas a higher competition of capital market reduces relationship lending (although each loan has more added value for borrowers).

This empirical paper revisits the link between interbank competition and bank-firm relationship during the great recession. Further, we investigate the role of relationship lending for borrowers more exposed to the crisis taking into consideration also the sector specialization by lenders.

Banks play an important role in the allocation of financial resources in all modern economies. Literature on financial intermediation has widely documented their ability in producing and analyzing information, setting loan contract terms (Berger and Udell, 1995), reducing informational frictions (Boyd and Prescott, 1986; Bhattacharya and Thakor, 1993) and minimizing the cost of monitoring (Diamond, 1984), hence their fundamental role in facilitating the movement of funds between individuals wishing to save and those that need to borrow (Ongena and Smith, 2000). This

function is crucial for small firms, that are often more informationally opaque and thus particularly vulnerable, do not have access to public capital markets and depend on financial institutions for external funding (Berger and Udell, 1995, 2002). In the Italian financial system, the relationship between banks and firms is particularly strong and banks play a key role in financing firms of all sizes (Bongini et al., 2007, 2009).

The financial literature has widely debated the issue about whether and how lenders and borrowers may benefit from strong ties. Under relationship lending, firms benefit in terms of increased credit availability (Cole, 1998; Elsas and Krahnen, 1998; Machauer and Weber, 2000), lower loan interest rates and reduced collateral requirements (Berger and Udell, 1995; Scott and Dunkelberg, 1999). Petersen and Rajan (1994) find that the benefits of relationship lending concern the quantity of finance rather than the price: in presence of close ties between a firm and an institutional creditor, the availability of financing increases, whereas borrowing from multiple lenders reduces the credit availability and increases the price. Relationship banking reduces information problems in small firm finance, improves the exchange of information between the bank and the borrower, gives flexibility and discretion to the contracts, can include covenants that allow to control potential conflicts of interest, may involve collateral that needs to be monitored; it could permit the funding of loans that are not profitable for the bank in short-term, but may result in future benefits if the relationship lasts long enough (Ongena and Smith, 2000; Boot, 2000)[1]. A significant amount of interbank competition literature has discussed the issue about how competition among banks could affect lender-borrower relationships (Petersen and Rajan, 1995; Boot and Thakor, 2000; Dinc, 2000; Degryse and Ongena, 2007; Presbitero and Zazzaro, 2011; Kano et al., 2011; Fraser et al., 2012; Cetorelli and Peretto, 2012) and an intense debate has rise in order to understand whether interbank competition could be beneficial or not. Most of the research finds that competition favors relationship, in the sense that bank branches facing stiff local competition engage more in relationship-based lending (Degryse and Ongena, 2007) and interbank competition leads to more relationship lending as it allows extracting higher rents from the borrower (Boot and Thakor, 2000). By contrast, some studies find a negative relationship, competition makes banks less interested in monitoring and relationship (Boyd and DeNicolò, 2005),

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[1] Relationship lending is costly as well. Boot (2000) identifies two primary costs in the soft-budget constraint and the hold-up problem. First, borrowers could exploit the relationship because they know that they can easily ask the bank for more credit in case of distress or renegotiate their contracts ex post, thus may have perverse incentives ex ante in not preventing a bad outcome from happening (*soft-budget constraint problem*); at the same time, banks have an information monopoly, could charge high loan interest rates, thus borrowers could be informationally locked in the relationship (*hold-up problem*).

young firms in concentrated markets receive more finance, at lower interest rates and with an easier access to credit, than firms in competitive markets (Petersen and Rajan, 1995). Presbitero and Zazzaro (2011) show that competition and relationship lending could be both "friends" or "foes", depending on banks' size: large banks have competitive advantage in transactional lending thanks to scale economies in collecting, processing and assessing hard information, whereas small banks take advantage from close ties; starting from this assumption, if the market is dominated by large banks, interbank competition and relationship lending are negatively associated, while in presence of small banks, the relationship is positive.

Even if widely developed over time, a few literature about relationship lending focuses on credit crunch periods. So, *What happens in times of crisis? How does interbank competition affect bank orientation?* and *Do strong relationships between firms and banks lead to an increase in the amount of credit granted?* The recent turmoil in the financial markets has gradually affected the economy worldwide and has also showed how lender-borrower relationship is conditioned by shocks to the financial system. If borrowers are not able to repay their loans, it generates losses which affect the banks' balance sheet; as a consequence, while in periods of stability or economic development the relationship between banks and firms is prevalently dialectical, in times of crisis it could become conflictual; a careful and prescient management of credit, liquidity and capital is, in times of crisis, even more important than in normal times (Signorini, 2012). During credit crunch periods, lender-borrower relationships may change. A strong relationship should bring the bank to fund not profitable loans, or continue doing business together through financially tough times, and make sacrifices in short-term, in order to obtain future benefits and thus facilitating long term contracting (Ongena and Smith, 2000; Boot, 2000). Cotugno et al. (2012) show that the benefits of strong lender-borrower relationships persist even during a credit crunch period but the existing literature shows a gap in analyzing whether relationship lending is affected by the degree of interbank competition and how it impacts on the amount of credit availability in credit crunch periods.

This paper tries to fill this gap and aims to empirically investigate the relationship between interbank competition, bank orientation and credit availability for a sample of Italian bank-firm relationships. Specifically, the aim of this paper is twofold. First, we would like to empirically test the link between interbank competition and intensity of bank-firm relationship trying to answer this primary question: i) *How does interbank competition affect bank orientation in credit crunch periods?* The second aim of the paper is to detect the role that bank-firm relationship and interbank

competition play in the credit channel during recession times. We attempt to enrich the current literature, focusing on the impact of relationship lending and interbank competition for a set of borrowers that suffer particularly the crisis. Hence, our relevant question is: *How do bank orientation and interbank competition affect credit availability for financially distressed firms?*

For this study, we use credit-file data provided by a large Italian banking group containing detailed loan contract information; specifically, this data consists of contract terms and bank-firm relationship variables and other control variables for more than 30,000 firms, referred to two points in time (December 2008 and December 2010). The recent global financial crisis, begun in 2007 and exploded in 2008, is an ideal background to investigate whether past evidences provided by the literature on interbank competition and relationship lending are valid also during recession times.

Several characteristics of the Italian credit market make this data set ideally suited to investigate relationship lending issues in credit crunch periods. Previous studies show that the Italian financial system is an excellent laboratory for this analysis for several reasons (as observed by De Mitri et al., 2010). First of all, the Italian economy is composed of small and medium-sized enterprises (SMEs) or, even when bigger, companies are managed by the family owner; they are not able (or don't want, in the case of family owner) to directly access the capital market. The Italian financial system is bank-based and banks represent a fundamental partner of firms in providing funds, especially for small firms. Moreover, during the period investigated there was no intervention by the Italian government to support domestic banks or firms after the crisis; it means that supply and demand of loans were not affected by external factors.

The main results reveal that an increase in interbank competition is associated with a stronger relationship lending in terms of the length of the bank-borrower relationship, whereas the distance between bank's local branch and bank's headquarter negatively affect the length; the presence of collateral, the rating assigned and the borrower behavior are found significant, too, in determining the length of the bank-borrower interaction. Furthermore, we document that interbank competition and the strength of bank-firm relationships are significantly associated with increased credit availability. As robustness checks, several sample splits based on the lending bank, the degree of competition and the borrowers' size support these results. Moreover, non-linearity and sector specialization effects are tested, too, and report interesting results, supporting the crucial role of relationship lending during a financial crisis.

This paper contributes to the existing literature in three ways. First, while the topic of interbank competition and relationship lending is widely explored by the literature, to the best of our

knowledge this paper represents the first attempt to reconcile past findings (enriching them) with new evidences provided during the current credit crunch period. Second, this study is based on a large and unique dataset that captures both public and confidential information on borrowers from the bank's point of view. Among these, one of the most relevant information is represented by the availability of rating calculated by the lender for each borrower in the sample at the beginning and during the financial crisis. We cross this information with industry-level data to isolate a sub-sample of borrowers particularly exposed to the financial crisis. Then, we try to measure the impact of relationship lending and interbank competition for this special sample of firms. To the best of our knowledge, this sample-restriction approach represents a novelty. Third, we provide empirical evidences on the impact of sector specialization by lenders on credit availability. As pointed out by Boot and Thakor (2000), sector specialization may be beneficial to the firms, to the extent that banks may use the knowledge accumulated in a sector where they hold many loans, to support their borrowers (in that specific industry) to improve their pay-off.

The remainder of the paper is organized as follows. Section 2 identifies the streams of the literature close to this research and develops the hypotheses to test. Section 3 describes the empirical strategy, focusing on sample, model and variables description. Sections 4 and 5 provide and discuss the empirical results. Section 6 concludes the paper.

2. Literature review and hypotheses development

2.1 How does interbank competition affect bank orientation?

The existing literature about the impact of interbank competition on bank orientation is quite controversial. Boot and Thakor (2000) discuss this issue through a theoretical model, finding that increased interbank competition will increase relationship lending (more relationship loans), but each loan will have less added value for borrowers, whereas higher capital market competition will reduce relationship lending (less loans), but each relationship loan will have higher added value for borrowers. Degryse and Ongena (2007), in line with Boot and Thakor (2000), find that a fiercer local interbank competition results in increased relationship lending; borrowers located physically closer to the bank branch are also more likely to consume other bank services and to be engaged over a longer time period.

Other works find that competition prevents the formation of mutually beneficial relationships between firms and banks. Petersen and Rajan (1995) find that young firms in concentrated markets

receive more institutional finance and more benefits, in terms of lower loan rates and easier access to credit, than do similar firms in competitive markets; as firms get old, this difference disappears. It happens because creditors in concentrated markets accept lower returns in change of obtaining future surplus from the firms. Cetorelli and Peretto (2012) model how competition affects the quantity and the quality of credit, showing that a more intense competition reduces banks' incentives to provide relationship services and results into a smaller volume of credit (quantity), but at the same time it yields lower spreads between interest rates on loans and the rate of return to saving and thus reduces the deadweight loss due to banks' exercise of market power (quality).

Presbitero and Zazzaro (2011) find that interbank competition could encourage but also discourage relationship lending, depending on the lending institution which predominates in the local credit market. Thus, in the presence of highly hierarchical (large and functionally distant) banks, higher market concentration (lower interbank competition) favors close bank-firm ties; whereas for small, non hierarchical local banks, stronger interbank competition (lower market concentration) promotes relationship lending. It is explained why, when the competition is tough, large banks have comparative advantages in transaction-oriented lending technologies, because of scale economies in collecting, processing and assessing hard information; on the contrary, small banks have advantage when dealing with soft information and establishing close lending relationships. Dinc (2000), through a theoretical model, observes that banks usually offer loans to highest quality borrowers, but an increase in credit market competition (competition from bond markets) may enhance the bank's incentive to lend to a borrower in distress (lower quality borrowers) and maintain a good reputation. Kano et al. (2011) find evidence that, in the Japanese banking industry, firms without audited financial statements suffer from stronger relationships, the benefit from stronger relationships in terms of reduced loan interest rates and increased credit availability is limited to smaller banks, competition has little effect on the benefits from relationship lending.

Thus, the existing literature shows that interbank competition may have a positive or negative influence depending on several factors: on the one hand, more competition could encourage borrowers to switch to other banks or to the financial markets, makes also more difficult for banks to invest in monitoring and to support borrowers in short-term for future rents, thus more competition means less relationship lending; an alternative view is that competition may underline the importance of relationship as a way to make the tie unique (Boot, 2000). It is expected that, following the second point of view, in difficult financial times, in presence of high interbank competition, banks engage more in relationship lending, in order to increase their market power,

extract future rents and create a competitive advantage, adopt a long-term approach and it results into a longer relationship established with the borrowers; it also avoids that borrowers could switch to another bank before the benefits of the relationship materialize. Thus, the first hypothesis to test is the following:

H₁: In credit crunch periods, high levels of interbank competition are associated with a stronger lender-borrower relationship.

2.2 How does relationship lending affect credit availability?

Most of the recent literature on financial intermediation discusses about relationship lending, its determinants and effects, in periods of stability. Relationship lending can be defined as the provision of financial services by a financial intermediary, who invests in obtaining customer-specific information and establishes multiple interactions with the same customer over time and/or across products (Boot, 2000). Relationship lending, unlike transactions-based lending technologies (financial statement lending, asset-based lending and credit scoring), is based on the collection over time of soft, confidential and customer-specific information, that cannot easily be observed, verified or transmitted, collected through a variety of contacts with the firm, its owner, the local community and the business environment (Boot, 2000; Berger and Udell, 2002); this interaction goes beyond the execution of simple, anonymous, financial transactions (Ongena and Smith, 2000). It is like an implicit contract that ensures the availability of finance to the firm and to partake in the returns from the bank's point of view (De Mitri et al., 2010).Through the collection of soft information by the loan officer and through contacts with the firm, its owner and its local community, banks acquire information and use it to determine credit availability and credit terms (Berger and Udell, 2002).

The existing literature introduces several dimensions to measure the strength of the lender-borrower relationship: the length or duration of their interaction (Petersen and Rajan, 1994, 1995; Berger and Udell, 1995; Ongena and Smith, 2000), the exclusivity of the relationship or the number of banks from which the firm borrows (Petersen and Rajan, 1994; Ferri and Messori, 2000; Ongena and Smith, 2000), the concentration of credit with each bank (share bank), the distance between banks and borrowers or between bank's branches and its headquarter (Degryse and Ongena, 2005; Agarwal and Hauswald, 2010; Cotugno et al., 2012); the scope or breadth of services offered by the bank and utilized by its customers (Cole, 1998; Scott and Dunkelberg, 1999; Ongena and Smith,

2000). This paper focuses on three relationship lending measures: length, number of banks and distance[2].

The length or duration of the bank-borrower interaction is the amount of time the bank has provided loans, deposits or other services to the firm (Petersen and Rajan, 1994, 1995; Berger and Udell, 1995; Ongena and Smith, 2000). It is a proxy for the private information the institution has about the firm (Petersen and Rajan, 1994). Past interactions not only with the bank but with other stakeholders, like employees or prior creditors, are relevant to provide information, too; so, the age of the firm rather than the length should determine cost and availability of credit (Petersen and Rajan, 1994). Most of the literature agrees that, thanks to the existence of a past experience with the borrower, risk is reduced (Petersen and Rajan, 1994) and the borrower himself is trustworthy (Diamond, 1991); small firms with longer relationships grant more credit at lower rates (Berger and Udell, 1995). Thus, the duration of the relationship reduces the cost of lending by bank and increase its willingness to provide funds (Petersen and Rajan, 1994; Berger and Udell, 1995). Cole (1998) finds that the length of the relationship is unimportant, in the sense that just the pre-existence of a relationship leads the potential lender to be more likely to extend credit to a firm. The risk is being locked in the relationship, due to the information monopoly by the bank (Boot, 2000).

Consistent with most of the previous literature, it is expected that, when the duration of the relationship increases over time, the bank can observe, learn and utilize private information about its customers (Ongena and Smith, 2000). So, when the length of the relationship increases, banks acquire confidential information that bring them to financially support the borrower also in difficult financial times and the credit granted increases. Thus, the second hypothesis to test is the following:
H_2: In credit crunch periods, a high length of the relationship is associated with an increased credit availability.

The exclusivity of the relationship or the number of banks from which the firm borrows (Petersen and Rajan, 1994) indicates if a bank is the sole provider of bank loans and represents a measure of credit concentration.

Recent papers find that firms borrowing from a small number of banks benefit in terms of a smaller credit contraction and a lower probability of being credit rationed (Machauer and Weber, 2000; Ongena and Smith, 2000; De Mitri et al., 2010). Foglia et al. (1998) show that when a large number of lenders are involved, monitoring of the borrower tends to be weaker and to encourage

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[2] The available dataset allows us to measure length, distance and number banks variables. Data are not sufficient for measuring share bank and scope.

fragility in the firms' balance sheets; thus, multiple banking relationships are associated with a higher riskiness of the borrowers, even though the impact is moderate in comparison with the importance of real and financial variables derived from balance sheets. By contrast, Detragiache et al. (2000) present a theoretical model in which multiple banking can reduce liquidity risk; establishing multiple relationships serves to increase the probability that at least one informed bank will be able to refinance the project, thus reducing the likelihood of early liquidation. If firms are facing distress, multiple lenders may have serious coordination problems; based on the assumption that a bank pool mitigates the risk of uncoordinated creditor action in case of corporate distress, the empirical evidence shows that the existence of small pools increases the probability of workout success and that this effect reverses when pools become large (Brunner and Krahnen, 2008). The size is relevant, too: large businesses are more likely to access credit from multiple lenders; small businesses, which have long relationships and are physically close to lenders, are more likely to have dispersed borrowing relationships. Ongena et al. (2012) find that firms with lower levels of financial debt and more redeployable assets concentrate their borrowing; when the lender is more profitable and has lower monitoring costs, creditor concentration increases. Von Thadden (1995) observes that, under relationship lending, the bank acquires private information about the quality of the borrower and could use it to extract rents; the opportunity to obtain ex post rents could distort incentives ex ante. Thus, establishing a second relationship can restore competition among lenders and limit this phenomenon.

Thus, the duality between single or multiple relationships and which one should be preferred, is a quite ambiguous issue. Two contrasting theory can be addressed: on the one hand, multiple banking is positive in terms of risk sharing, but this parcellization of loans weakens the discipline exercised by banks and makes borrowers more fragile (Foglia et al., 1998); on the other hand, more concentrated relationships are found positive because there are stronger incentives for banks to invest in producing information and borrowers may benefit from this with easier access to finance (Petersen and Rajan, 1994) and/or favorable contract terms, such as lower costs (Berger and Udell, 1995). Multiple banking is also a way to answer to the hold-up problem, reducing the information monopoly of a bank, but possibly at a cost (Boot, 2000), in the sense that it worsens the availability of credit (Ongena and Smith, 2000). It should force banks to compete, thus improving contract terms for borrowers (Ongena and Smith, 2000). Moreover, multiple banking results in high transaction costs for banks: screening and monitoring costs are duplicated and debt renegotiation is more complex because many creditors are involved (Detragiache et al., 2000).

Consistent with the part of the literature that documents the benefits of creditor concentration, it is expected that a lower number of banks and in limit an exclusive relationship, especially in times of crisis, brings the bank to financially support the borrower, increasing credit availability. Thus, the third hypothesis to test is the following:

H₃: In credit crunch periods, the higher the number of lenders is, the lower the credit availability.

The distance is another dimension to measure the strength of the relationship and is considered as a proxy for a lender's informational advantage for nearby competitors, because borrower proximity facilitates the collection of soft information (Agarwal and Hauswald, 2010). Degryse and Ongena (2005) find that a spatial price discrimination characterizes bank lending: it means that when the geographical distance between the firm and the lending bank decreases, loan rates decrease, too; when the distance between the firm and competing banks increase, loan rates increase, too. Agarwal and Hauswald (2010) find that the closer a firm is to its branch office, the more likely the bank is to offer credit (but the more it charges); the closer a firm is to a competitor's branch, the less likely it is to obtain credit (but, if it happens, the loan rate is lower). Banks holding a large share of credit lines to the firm grant more credit, even if at higher cost and banks located geographically closer to the firm grant more credit at a lower cost (De Mitri et al., 2010). DeYoung et al. (2008) theoretically model and empirically test whether and how the distance between bank lenders and small borrowers affects loans' performance, finding that both distance and credit scoring are associated with higher default probabilities.

The geographical distance between bank's branch and bank's headquarter is relevant, too. Cotugno et al. (2012) document that, during the 2007-2009 credit crunch period, banks have reduced the amount of credit available to borrowers, but firms with strong relationships with banks were less exposed to credit rationing; this type of distance, that reflects the geographical and organizational structure of the bank (large vs small, vertical vs horizontal banks) negatively impacts on credit availability, thus proximity facilitates the transmission of soft information, reduces asymmetric information and the consequences of a credit market shock. Liberti and Mian (2009) document that the soft-information sensitivity of credit facilities is significantly lower when the credit line is approved at higher hierarchical levels and geographically distant from the local office that gathered information on the borrower.

Relationship lending requires an organizational structure with few managerial layers, in order to avoid the agency problems between the bank and the loan officer (Berger and Udell, 2002). It is expected that the proximity between bank's branch and bank's headquarter allows to align the

incentives of bank and loan officers and facilitates the monitoring; when the distance increases, loan officers are delegated more authority and agency problems arise, thus resulting in a weaker relationship and reduced credit granted. Thus, the fourth hypothesis to test is the following:

H₄: In credit crunch periods, a high distance between bank's branch and bank's headquarter is associated with a low credit availability.

2.3 Do banks invest in specific knowledge of a firm or an industry?

An emerging stream of the literature in this field discusses about the existence of sector specialization behaviors by banks, that could assume a particular orientation and invest in expertise in the sectors where a significant part of their borrowers operate, and several papers have started to address this issue (Boot, 2000; Boot and Thakor, 2000; Chen et al., 2003; Degryse and Ongena, 2003). When a bank grants a relationship loan, it adds more value to the borrower, but, at the same time, it is costly because it requires the bank to develop expertise; this expertise is called "sector specialization" and is a choice variable for the bank (Boot and Thakor, 2000). Besides offering more loans, banks could choose to focus on the intensity of their relationship loans; intensity means, for example, sector specialization: the more the bank invests in specific knowledge of a firm or an industry, the better it can fine-tune its services to the needs of its relationship borrowers (Boot, 2000).

Boot and Thakor (2000) also analyze the impact of interbank competition on sector specialization, stating that greater competition among banks leads to more relationship lending, but it also reduces lending rents, and thus it reduces the optimal investment in sector specialization. In line with these results, Degryse and Ongena (2003) observe that branches reduce industry specialization as competition intensifies; industry specialization also reduces when firms are located closer to the bank, because borrowers are less discriminate about the choice of the bank.

Sector specialization may be beneficial to the firms, to the extent that the bank may use knowledge accumulated in a sector where the bank holds many loans, to support their borrowers (of that specific industry) to improve their pay-off. Each bank decides its level of sector specialization; the bank's sector-specialization decision determines its effectiveness in relationship lending (Boot and Thakor, 2000) and loan specialization also plays a significant role in determining bank efficiency (Chen et al., 2003).

3. Empirical strategy

3.1 Sample and data

This paper makes use of a unique dataset containing detailed information on all corporate clients of a large banking group operating across Italy. The dataset contains detailed information on the contract terms of commercial loans related to 31,012 firms and referred to two points in time, December 2008 and December 2010. For each firm, we observe the duration of the relationship with the bank, the number of lenders, collateral, the organizational distance inside the bank as well as the total amount of credit granted from the bank to the firm. Further, for each borrower we observe its industry and size; the riskiness of the firm is captured by the internal credit rating provided by the bank.

The banking group operates in 106 out 110 domestic provinces and consists of a parent company and multiple subsidiaries. Data used here are derived exclusively from the borrowers-banks relationship level. This means that we collect some information about the relationship that the firm i ($i=1..31,012$) holds with the bank j, where j indicates the banks of the group (parent company/subsidiaries) that holds firm i as client. We drop those observations, where the same firm holds relationship with more than one bank of the same group (duplicate clients). We also check for inconsistencies, outliers, and random pattern of missing values. Moreover, private and financial societies are dropped from the sample in order to focus only on (non-financial) firms as borrowers. Table 1 provides summary statistics for the sample of firms separating them according to lenders, geographic area and borrowers' size.

[Insert Table 1]

About 73% of the firm in the sample is classified as small and very small size (i.e. total assets lower than 5 million Euro), according to the internal borrower's size map provided by the bank. This data is representative of the size of domestic manufacturing firms that, typically, apply for loans at local bank branches instead of tapping into bond or equity markets for their external financing.

This unique data set allows us to construct several bank and firm specific variables included our key variables, such as: the measure of the change in the amount of credit granted and different measures of relationship lending.

3.2 Interbank competition and bank orientation

In order to test the first hypothesis presented in section 2 (H_1), our basic model (1) estimates, through OLS, the relationship between bank orientation and interbank competition, as follows:

$$LENGTH_{ij} = \alpha + \beta_1 COMPETITION_{ij} + \beta_2 DISTANCE_{ij} +$$

$$+ \beta_3 COLLATERAL_{ij} + \sum_{h=1}^{n} \beta_h CONTROLVAR_{ijh} \qquad (1)$$

where i *(=1 , ..., 31,012)* represents the borrower, j *(=1, ..., 8)* the lender and h *(=1, ..., n)* is the number of control variables (*CONTROLVAR*).

The focus is, in particular, on the impact of the degree of interbank competition in the year 2008 (*COMPETITION*) on the length of the bank-firm relationship as results at the end of 2010 (*LENGTH)*, and we also evaluate whether bank orientation is affected by the geographical distance between the branch and the bank headquarter (*DISTANCE*) and the presence of collateral (*COLLATERAL*). We control for other variables that refer to the firms and the loans as described in the next section. Then, based on this model, we test for non-linearity, introducing quadratic and interaction terms, and we operate some sample splits as robustness checks of results.

3.3 Relationship lending, interbank competition and credit availability

In order to test all the other hypotheses presented in section 2 (H_2, H_3, H_4), the following OLS specification (2) estimates how relationship lending impacts on credit availability:

$$CREDIT_{ij} = \alpha + \beta_1 RELATIONSHIP_{ij} + \beta_2 COMPETITION_{ij}$$

$$+ \beta_3 COLLATERAL_{ij} + \sum_{h=1}^{n} \beta_h CONTROLVAR_{ijh} \qquad (2)$$

where subscripts i, j and h indicate respectively, the borrower, the lender (parent or subsidiaries of the group) and the control variables.

This estimation aims to verify the impact of the strength of lender-borrower relationship (*RELATIONSHIP*), interbank competition (*COMPETITION*) and the presence of collateral (*COLLATERAL*) on the change in credit granted for financially distressed firms. For this end, the analysis is conducted with respect to a subsample of borrowing firms that reported a downgrading in the internal rating assigned by the bank, between 2008 and 2010. Then, we use different values of change in rating (from 2008 to 2010) in the attempt to capture the subsample of firms that is much exposed to the financial crisis and to test, for this specific subsample, the impact of relationship lending and interbank competition on credit granted. Since firms can experience a downgrade of their internal rating both for macro factors (i.e. for the financial crisis) and for specific factors (bad management, low efficiency, low innovation, etc.) we isolate the part of firms that have experienced a credit deterioration mainly due to financial crisis, filtering the overall sample with different criteria.

Then, based on this model, we test for the existence of sector specialization effects, as suggested by Boot and Thakor (2000). To this end, the analysis is replicated looking at the sectors where a significant number of relationships is established.

3.4 Variables

Table 2 describes the variables employed to investigate the phenomenon and provides some descriptive statistics.

[Insert Table 2]

The dependent variable in model (1) measures the length or duration, in years, of the interaction (*LENGTH*) between the firm *i* and the bank *j*, since the date of the first relationship until the end of 2010. The dependent variable in model 2 expresses the change in logarithm in the amount of credit granted (*CREDIT*) from the bank *j* to the firm *i*, between 2008 and 2010.

Consistently with previous research (Petersen and Rajn, 1995; Boot and Thakor, 2000; Degryse and Ongena, 2007; Presbitero and Zazzaro, 2011), the degree of competition among banks in local credit markets is measured though the Herfindahl–Hirschman Index (*HHINDEX*). It is calculated as the sum of the squared market shares of bank, where the market share is measured by the number of branches[3]. We measure this index looking at the province level; this disaggregation allows to capture the diversity in banking structures at province level and provides sufficient cross-sectional variability. The average value assumed by this variable is 13, denoting that, on average, the level of interbank competition is moderate[4].

The characteristics of the lender-borrower relationship are expressed through three key explanatory variables that express the strength of their tie. Besides the *LENGTH* variable introduced above, the second variable is a measure of credit concentration (*NUMBER*) and it indicates the number of banks from which the firm *i* borrows in 2008, based on the information taken from the Italian Credit Register; on average, each firm obtains credit from five banks. As the physical location of banks is relevant in determining the availability and the terms of banking services, we add the variable *DISTANCE* to conclude the set of relationship-based variable. It is constructed in the spirit of the "organizational distance" employed by Jimenez et al. (2009) and represents the

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[3] It was also provided a measure of this index based on the amount of loans granted. The correlation matrix between the two Herfindahl-Hisrchman indices shows a high, positive and significant coefficient of 0.7447 (p-value=0.000), confirming the possibility of using alternatively one of them without any consequence on the results.

[4] According to an interpretation shared in the literature, the level of interbank competition can be analyzed as follows: high competition (HHI<10), moderate competition (10<HHI<18), low competition (HHI>18), monopoly (HHI=1).

value of the distance between the province of the local operating branches that serve borrowers and that originate the loan, and the city where the headquarter of the bank is located.

The presence of collateral is expressed through a dummy variable (*COLLAT*) that assumes value 1 if the loan is secured by collateral. The riskiness of the borrower is measured by the internal rating assigned to each firm both for 2008 and 2010 (*RATING*) that has a range between 1 (the best) and 10 (the worst)[5].

The variable *RATIONING* represents the ratio between credit used and credit granted from the bank *j* to the firm *i*. It is usually considered as a metric of credit rationing. The ratio is higher than one when firm has drawn more credit than its commitments and it is interpreted as an inverse measure of credit availability and is typically used by bank to assess firm's fragility: the higher the ratio, the higher the likelihood that the firm is liquidity constrained[6].

The size of firms is captured by a categorical variable provided by the banks and that classify firms each year. This variable assigns firms in, at least, four categories of size: very small, small, medium-sized and large. Other classes (i.e. individuals and financial institutions), are excluded by the sample. While the size of firms is captured by yearly sales too, we prefer to employ this four-size classification since it considers both sales and other variables, such as asset size and number of workers (that we cannot observe in their direct form). We then proceed to generate four binary variables representative of each value of the firm size. Dummies variables are employed to control for industry (19 dummies) and lenders (8 dummies) of firms.

A final appendix reports the correlation matrix among the variables.

4. Interbank competition and bank orientation: empirical results

4.1 Interbank competition and bank orientation: the basic model

Table 3 reports the results about the basic model (1) that investigates the determinants of the length of lender-borrower relationships, paying particular attention to the impact of interbank

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[5] The original range of ratings, as provided by the banks, is lightly different from the one presented; we have decided to standardize the original ratings in a range 1-10 in order to preserve the privacy of banks providing data.

[6] Data of this study cannot be matched with firm balance-sheet data, for example, since for confidentiality purposes the banking group altered the borrower identities before providing us the data.

competition. We estimate (1) using ordinary least squares with White's (1980) adjustment for heteroskedasticity .

[Insert Table 3]

Looking at the results (Table 3, column 1), the *HHINDEX* coefficient is negative and highly statistically significant, confirming the first hypothesis presented (*H$_1$*): an increase in the degree of concentration in the banking system is associated with a reduction in the length of the relationship. Consistent with part of the literature summarized above (e.g., Boot and Thakor, 2000; Degryse and Ongena, 2007), this result confirms the fundamental role of interbank competition in determining the intensity of the relationship. Since data are pooled cross-sectional at 2010, it seems that also during difficult financial times and in presence of increasing interbank competition, bank-firm relationships last more. From the banks' point of view, it means that banks engage in long-term relationship lending and try to avoid switching choices by borrowers, thus to increase market power, extract future rents and have competitive advantage[7]. From the borrower' point of view, this result means that they tend to preserve the relationship over time, than to switch to a new lender due to the difficult situation in the environment in which they operate. So, banks react to increased competition strengthening the relationship, through a long-term approach, also to avoid that borrowers could switch to another bank before the benefits of the relationship materialize.

A higher distance (*DISTANCE*) between bank branches and headquarters negatively (and significantly) impacts on the length of the relationship, confirming that relationship lending requires a specific organizational structure with few managerial layers (Boot, 2000). The presence of collateral (*COLLAT*) favors long relationships: the coefficient of collateral is positive and significant; collateral signals high quality borrowers, mitigates the adverse selection problems due to information asymmetries, incentives a reduction in the soft-budget constraint problem in relationship lending. Collateral could be provided by risky borrowers (who need collateral to obtain credit) or by non-risky borrowers (who provide collateral just to obtain better credit terms). In both cases, the presence of collateral leads to longer relationships, but banks could be exposed to lower or higher risk depending on the borrowers' riskiness and the information available ex ante.

The results also show that a better position along the rating scale (*RATING*) favors longer relationships and that in presence of a tension of liquidity (*RATIONING*) relationships last less.

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[7] This result also confirms Presbitero and Zazzaro (2011), who observe that smaller banks deal with soft information and have competitive advantage through establishing close lending relationships.

Non-linearity effects are tested in separated regressions (Table 3, columns 3, 4 and 5). We estimate a basic model where we introduce the Herfindahl-Hirschman index both linearly and squared to control for possible non-monotonicity. The coefficients of HHINDEX and HHINDEX^2 are jointly significant and are, respectively, negative and positive. It means that the marginal effect of interbank competition on the duration of bank-firm relationship is greater at intermediate than that at high competition levels.

We add the interaction terms between *HHINDEX* and, alternatively, *DISTANCE* (positive and highly significant coefficient) and *COLLAT* variables (negative and highly significant coefficient). It means that, when the distance between bank's branch and headquarter is high, a marginal increase in credit market concentration positively affect the relational orientation: a complex organizational structure with headquarters geographically distant and reduced interbank competition favors long relationships. Moreover, looking at *HHINDEX *COLLAT*, when the loan is guaranteed by the presence of collateral, an increase in interbank competition is associated with longer relationships. Thus, an higher distance makes competition inimical to relationship lending, whereas the presence of collateral makes concentration inimical to relationship lending.

When we interact HHINDEX with COLLAT and with DISTANCE, the coefficient of the squared variable is still significant. The other regressors confirm in sign and significance what just observed in the basic model.

4.2 Interbank competition and bank orientation: sample splits

We split the sample according to several criteria in order to better investigate the phenomenon. The first sample split aims to verify whether the banks providing funds are characterized by different orientation towards firms. The results observed in the subsample composed of loans granted by the parent bank (Table 4, column 2) and in the subsample composed of loans granted by the other lending banks (Table 4, column 3) are the same and confirm what observed for the full sample (Table 4, column 1).

The second sample split aims to check for bank orientation in subsamples identified based on the degree of competition. The results of the basic model (Table 5, column 1) are confirmed in sign and significance in the subsamples characterized by high competition (Table 5, column 2) and medium competition (Table 5, column 3) levels. Some different results are found when we look at low competition levels (Table 5, column 4) where *HHINDEX* variable has a positive sign: it means that, when competition is low, a further reduction in competition leads to an increase in the length.

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The third sample split is based on borrowers' size, distinguished among large, medium sized, small and very small borrowers. Interesting results are found in the subsample composed of large firms (Table 6, column 2), for which interbank competition and collateral are found no significant in determining the length of the relationship. The results of the basic model (Table 6, column 1) are instead confirmed in sign and significance in the subsamples composed of medium sized (Table 6, column 3), small (Table 6, column 4) and very small (Table 6, column 5) firms.

Thus, lending banks are found as adopting the same orientation towards firms, that is not conditioned by control levels among them (first sample split). The results do not depend on the different degree of competition, except for lower levels of competition that report no significant results (second sample split). Results do not change based on the borrowers' size, except for large firms subsample where some key variables lose significance (third sample split).

5. Relationship lending, interbank competition and credit availability: empirical results

Table 7 reports the results for the second model (2). This basic model investigates the determinants of the change in credit availability. We employ an ordinary least squared regression and we are particularly interested to observe the determinants of the change in the amount of credit granted between 2008 and 2010, and whether and what role relationship lending plays in supporting firms that encountered a credit risk deterioration due to the financial crisis. The standard errors reported are robust for heteroskedacity.

We estimate the model (2) exclusively for the subsample A which consists of firms that experienced a downgrading between 2008 and 2010.

The results (Table 7, column 1) show that the length of lender-borrower relationships (*LENGTH*) has a positive impact on the change in the amount of credit granted, whereas the number of banks with which the relationship is built (*NUMBER*) has a negative effect. These findings confirm the second (H_2) and the third (H_3) hypotheses presented in section 2 and are fully consistent with the existence of beneficial effects of relationship lending (from a borrower's point of view) in times of recession.

A long relationship allows the bank to observe, learn, acquire and utilize private information about the firm, so that lenders are more likely to extend credit to the firm; the results show that for financially distressed firm the phenomenon is the same: lenders become riskier benefit from an increased amount of credit available. An increase in the number of bank relationships generate risk sharing but, at the same time, monitoring problems and high transaction costs, leading to a

reduction in the amount of credit granted; moreover, if firms are facing distress, multiple lenders may have serious coordination problems.

Differently from part of the literature, the distance between bank branch and bank headquarter (*DISTANCE*) is not relevant in determining the change in credit granted, thus the fourth (H_4) hypothesis presented in section 2 is not confirmed by results.

The *HHINDEX* coefficient is positive and statistically significant: an increase in the degree of competition is associated to a reduction of credit granted. Since the sample consists of firms that experienced a downgrading during the 2008-2010 period, the latter result suggests that when firms' riskiness increase and, at the same time, banks have to face a fiercer competition, they tend to reduce the amount of credit granted to financially distressed firms (probably in favor of higher credit granted to more reliable ones), as a way to improve the quality of their client portfolio. Surprisingly, the presence of collateral (*COLLAT*) reduces the credit granted from the bank. While the determinants of collateral is beyond the scope of this paper, it's worth note a part of literature about collateralization of loans (Boot et al., 1991; Jimenez et al., 2009) that highlight that collateral potentially helps to mitigate moral hazard problems in contexts where banks are able to distinguish the credit quality across borrowers, but suffer information asymmetries with regard to borrower's behavior after the loan is granted.

Positive and significant coefficient of *RATING* indicates that low quality of credit (high value of RATING) rating increases the credit growth. This finding raises a main concern related to the issue of evergreening of loans (Peek and Rosengren, 1995): lenders could have a perverse incentive to (*mis*)allocate additional credit to the firms that are in poor financial condition in order to avoid the realization of losses in their own balance sheet. To detect the plausibility of this concern we estimate a non-linear effect of *RATING* adding a quadratic terms to the basic model. The results are reported in column 2 of Table 7. While the linear term holds a positive sign, the quadratic term is negative. This indicates that as the credit quality decreases, credit first rises and then contracts. While the poor statistical significance of quadratic term does not allow to reject without caution the evergreening hypothesis, it's worth to note that, since RATIONING has a coefficient negative and statistical significant (at 1% level) value, firms that increase their demand of credit respect to the credit line available (a behavior consistent with the onset of financial troubles) receives less credit. Further, the results of RATING reported in Table 3 of the previous section, point out that lenders hold long relationship only with customers characterized by a good credit quality. Thus, the sum of these mixed findings allow us to refute the hypothesis of credit misallocation.

However, the results shown in Table 7 related to the subsample A tell a part of the story. We have the aim to detect the role of relationship lending for those borrowers that have been more negatively affected by the financial crisis. Generally speaking, factors that expose firms to financial difficulty are twofold: *i*) internal/specific factors, such as the lack of management skills, strategic errors, cost inefficiency, etc., and *ii*) external/systematic factors such as the global recession. Since we need to test the role of relationship lending exclusively for borrowers related to the latter case, subsample A appears partially weak for our scope. We then proceed to extend the basic specification to two subsamples, B and C, obtained after some sample restrictions. The subsample B consists of 9,528 firms that respect the following two requirements: *i*) firms have experienced a downgrading from 2008 to 2010 and *ii*) had a good internal rating in 2008 (1<Rating≤4). We believe that these filters improve the probability that firms of the subsample B suffered financial difficulty mainly for external factors. However, in the attempt to add a more severe sample restriction, we filtered firms both by rating and industry, obtaining the subsample C. This subsample consists of 6,620 firms that respect the following requirements: *i*) firms are included in subsample B and *ii*) firms operate in the industries with the highest number of downgrading in the 2008-2010 period[8].

We then extend our basic model (2) to the subsamples B and C reporting the results in Table 8. Not surprisingly the results are similar to the previous regression. All the variables holds the sign and statistical significance remain unchanged (with the exception of constant term) confirming the above interpretations about the positive role of relationship lending (from a borrower's point of view) also during times of recession.

5.1 Sector specialization

The last step in the research consists in testing for the existence of sector specialization effects. We want to check whether banks tend to assume peculiar behaviors when they relate to sectors where a large number of borrowers operate. To this scope, first of all we replicate the analysis reported above (Table 8, column 1) looking at the first ten sectors for number of borrowers included in the data set (Table 9, column 2) and the sectors characterized by at least 1.000 borrowers (Table 9, column 3)[9]. The regression results confirm what observed for the full sample. It means that banks

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[8] The second condition is realized as follows: firstly, we order industry in our dataset by number of downgrading in descending order. Industry positioned on the top has the highest ratio between the number of sample firms downgraded at 2010 and the total downgraded cases. Second we consider firms that operate in the two industries positioned to the top of this list.

[9] We look at the RAE codes associated to each firm, so a total of 189 different codes is identified.

assume a crucial role in supporting financial distressed firms and tend to be specialized in the sectors where a high number of borrowers operate.

Then, we pay particular attention on investigating bank orientation in the first ten sectors identified based on the number of borrowers and we introduce interaction terms between *LENGTH* (Table 9, column 4) and *NUMBER* variables (Table 9, column 5). Looking at the coefficient of these variables considered alone, the *NUMBER* variable continues to be negative and significant whereas the *LENGTH* is not significant. It means that in the sectors where a high number of borrowers operate, differently from the full sample, the number of years during which bank and firm entertain a relationship is not relevant in determining the amount of credit granted when we jointly test interaction effects; it means that maybe there is a specialization effect that prevails on the length of the interaction. The number of banks from which the firm borrows negatively affect the amount of credit granted, confirming that credit concentration has a positive impact on the amount of credit granted by each bank.

Looking at the interaction terms[10], in presence of long relationships, the effect of *NUMBER* is positive: it means that, when the relationship lasts a lot in time, a high number of banks is not seen as a threat and it favors an increase in the credit granted, probably because it ensures risk sharing among banks. At the same time, in presence of a high number of lending banks, the length of the relationship positively and significantly impact on the amount of credit granted, confirming what just widely observed about the *LENGTH* variable.

It is possible to state that these results document the existence of a sector specialization effect in bank-firm relationships: banks tend to assume more relational behaviors in the sectors where a high number of borrowers operate, so that, when the relationship lasts in time, even if firms borrow from multiple banks, they benefit from an increase in the credit granted; at the same time, when they borrow from a high number of banks, the length positively impact on credit availability.

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[10] The first interaction term is *D_LENGTH*NUMBER*, where *D_LENGTH* is a dummy variable that assumes value 1 if the length is higher than 7. The second interaction term is *D_NUMBER*LENGTH* where *D_NUMBER* is a dummy variable equal to 1 when the number of banks is higher than 3.

6. Concluding remarks

In the Italian financial system, banks represent a fundamental partner in providing funds to firms, that are mainly small or medium-sized and do not directly access the capital market. However, as a consequence of the recent financial crisis, that has gradually involved the economy worldwide and is affecting the local credit market, too, Italian banks are facing a very difficult macroeconomic scenario characterized by low growth, sovereign debt, new rules and, above all, a very weak local market. In such a complex scenario, it is interesting to investigate relationship lending issues and verify whether and how banks' behavior changes when they relate to firms who are experiencing a financial distress.

This research investigates the relationship between interbank competition, bank orientation and credit availability in the Italian banking system; it refers to past findings about relationship lending issues, it enriches them and provides new evidences looking at the current credit crunch period. To this scope, first of all this paper tests whether and how, in times of crisis, the degree of interbank competition impacts on the strength of bank-firm relationships; thus, it investigates the relationship between interbank competition and bank orientation for a sample of more than 30,000 Italian bank-firm relationships, controlling for non-linearity effects. The main results show that relationships last more years when interbank competition increases, when the loan is guaranteed by collateral and when the distance between banks' branch and headquarters is reduced. Several sample splits based on the type of lending bank, the degree of interbank competition and the borrowers' size confirm these results.

The second part of the paper wonders whether the strength of relationships and interbank competition could mitigate credit crunch problems; thus, it analyzes the relationship between interbank competition, bank orientation and credit availability, looking at the subsample of firms that experienced a downgrading between the year 2008 and the year 2010 and, thus, are particularly exposed to the financial crisis. The main results document a positive impact of length and exclusivity of relationships on credit availability, whereas the degree of interbank competition and the presence of collateral show a negative effect. The same orientation by banks is observed towards the most reliable firms, that were assigned a good rating in 2008, and in the sectors characterized by the highest number of default cases.

Finally, this research tests for the existence of sector specialization effects, finding that banks invest in specific knowledge of industries where a significant part of their borrowers operate; when the relationship lasts more, even if firms borrow from multiple banks, they benefit from an increase

in the credit granted, and when they borrow from a high number of banks, the length positively impact on credit availability.

This research use data collected from the credit files of an Italian banking group, containing a wide set of loan contract information. Consistent with literature that document the beneficial effects derived from bank-firm relationships, this research shows that past findings about relationship lending issues are confirmed and, in some cases, are strengthened during difficult financial times; under relationship lending, a bank is expected to lean against the wind and accommodate its debtors during difficult financial times (Ongena and Smith, 2000), thus banks assume a fundamental role in the Italian credit market and relationship lending is crucial in supporting firms that are facing distress, during credit crunch periods.

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Table 1

Distribution of the observations: by Bank, Geographic Area and Borrowers' size

This table reports loan contract information, organized by bank (the first one is the *Parent bank*), geographic area (*North East*, *North West*, *Centre*, *South & Isle*) in which each bank operates and the size of the borrowers (*Large*, *Medium sized*, *Very small*, *Small*). It also provides the percentage of equity capital held by the parent bank in each of the other lending banks in 2010 (*Control*).

| Bank | Obs. | % | Control | Geographic Area | | | | Borrowers' size | | | |
				North East	North West	Centre	South &Isle	Large	Medium sized	Very small	Small
Parent bank	20,204	65.15	-	17,558	1,837	809	0	518	5,997	4,505	9,184
Bank 1	5,667	18.27	51	32	283	730	4,622	22	307	4,634	704
Bank 2	1,235	3.98	63.64	0	0	0	1,235	6	326	306	597
Bank 3	3,248	10.47	89.15	0	0	41	3,207	39	1,007	817	1,385
Bank 4	250	0.81	55.01	0	0	250	0	4	75	41	130
Bank 5	92	0.30	54.02	0	0	10	82	1	20	25	46
Bank 6	70	0.23	93.80	0	0	2	68	2	12	23	33
Bank 7	246	0.79	79.92	0	0	87	159	3	61	61	121
Total	31,012	100	-	17,590	2,120	1,929	9,373	595	7,805	10,412	12,200

Table 2

Summary of variables

This table contains a description of the variables included in the analysis and reports some descriptive statistics: mean, standard deviation, minimum, median and maximum.

| Variable | Description | Descriptive statistics | | | | | |
		Mean	St.Dev.	Min.	Median	Max.	Obs.
Characteristics of the relationship							
$LENGTH_{ij}$	is the length or duration of the interaction (in years) between the firm i and the bank j, since the first relationship until the end of 2010	9.13	6.82	0	6.11	28	31,012
D_LENGTH	dummy variable, =1 if the length is higher than 7	-	-	-	-	-	31,012
$NUMBER_i$	is the number of banks from which the firm i borrows in 2008	5.01	4.09	1	4	68	31,012
D_NUMBER	dummy variable, =1 if the number is higher than 3	-	-	-	-	-	31,012
DISTANCE	is the geographical distance between bank's branch and bank's headquarter	110.68	173.95	1	49	1242	31,012
Credit availability							
$CREDIT_{ij}$	is the change in logarithm in the amount of credit granted, between 2008 and 2010, by the bank j to the firm i	-0.45	1.26	-11.15	-0.09	7.86	28,151
Interbank competition							
HHINDEX	sum of the squared market shares of banks, where the market share is measured by the number of branches	12.98	9.30	3.54	9.59	61.59	31,012
Collateral							
COLLAT	dummy variable, =1 if the loan is secured by collateral	-	-	-	-	-	31,012
Other explanatory variables							
RATING	is the internal rating assigned in 2008, with a range between 1 (the best) and 10 (the worst)	4.47	3.07	1	4	10	31,012
RATING^2	is the square of the rating variable	43.20	41.55	1	25	169	31,012
SALES	is the logarithm of sales, as of the balance sheet 2008	14.00	1.70	6.91	13.91	20.71	31,012
RATIONING	is the ratio between credit used and granted in 2008	0.62	0.43	0	0.68	29.46	31,012
Bank	8 dummies capturing the lending bank	-	-	-	-	-	-
Industry	19 dummies capturing the industry where firms operate	-	-	-	-	-	-
Borrowers' size	4 dummies capturing borrowers' size	-	-	-	-	-	-

Table 3

Regression results of the first model

This table reports the results of the OLS estimation referred to the first regression model. Variables are described in Table 2. Robust standard error are reported in parentheses. *, **, *** denote significance levels.

Dep. Variable: *LENGTH*	Model 1			
	Basic model	Non-linearity effects		
Estimator: OLS	column 1	column 2	column 3	column 4
	coeff.	coeff.	coeff.	coeff.
HHINDEX	-0.050***	-0.208***	-0.240***	-0.205***
	(0.003)	(0.016)	(0.018)	(0.016)
HHINDEX^2		0.003***	0.003***	0.003***
		(0.0002)	(0.0002)	(0.0002)
DISTANCE	-0.005***	-0.006***	-0.007***	-0.006***
	(0.0002)	(0.0002)	(0.0004)	(0.0002)
*HHINDEX*DISTANCE*			0.0002***	
			(0.00003)	
COLLAT	1.348***	1.357***	1.355***	2.335***
	(0.195)	(0.195)	(0.195)	(0.315)
*HHINDEX*COLLAT*				-0.075***
				(0.012)
RATING	-0.311***	-0.307***	-0.307***	-0.308***
	(0.013)	(0.013)	(0.013)	(0.013)
RATIONING	-0.241**	-0.230***	-0.233**	-0.231***
	(0.088)	(0.086)	(0.086)	(0.086)
Bank dummies	Yes	Yes	Yes	Yes
Industry dummies	Yes	Yes	Yes	Yes
Borrowers' size dummies	Yes	Yes	Yes	Yes
Constant	7.536	9.576	9.973	9.538
Observations	31,012	31,012	31,012	31,012
R-square	0.2501	0.2519	0.2523	0.2522

* significance at the 10% level; ** significance at the 5% level; *** significance at the 1% level.

Table 4

First sample split: parent bank and other banks

This table reports the OLS estimation results of the first sample split, obtained starting from the basic model (table 3, column 1). The results are provided for two subsamples identified based on the bank providing loans; thus, it distinguishes between the parent bank (column 2) and the other lending banks (column 3), and compared with the full sample results (column 1), already reported in table 3.

	Model 1 - First sample split		
Dependent variable: *LENGTH*	Basic model	*Parent bank*	*Other banks*
Estimator: OLS	column 1	column 2	column 3
	coeff.	coeff.	coeff.
HHINDEX	-0.050***	-0.187***	-0.011***
	(0.003)	(0.022)	(0.002)
DISTANCE	-0.005***	-0.007***	-0.002***
	(0.0002)	(0.0003)	(0.0001)
COLLAT	1.348***	1.764***	0.464**
	(0.195)	(0.265)	(0.223)
RATING	-0.311***	-0.395***	-0.095***
	(0.013)	(0.018)	(0.016)
RATIONING	-0.241***	-0.424***	-0.061
	(0.088)	(0.152)	(0.066)
Bank dummies	Yes	No	Yes
Industry dummies	Yes	Yes	Yes
Borrowers' size dummies	Yes	Yes	Yes
Constant	7.536	11.163***	8.848***
		(1.193)	(1.205)
Observations	31,012	20,204	10,808
R-square	0.2501	0.1071	0.4086

* significance at the 10% level; ** significance at the 5% level; *** significance at the 1% level.

Table 5

Second sample split: degree of interbank competition

This table reports the OLS estimation results of the second sample split, obtained starting from the basic model (table 3, column 1). The results are provided for three subsamples identified based on the degree of interbank competition, distinguishing between "high competition" (column 2), "medium competition" (column 3), "low competition" (column 4), and compared with the full sample results (column 1), already reported in table 3.

	Model 1 - Second sample split			
Dependent variable: *LENGTH*	Basic model	*High competition*	*Medium competition*	*Low competition*
Estimator: OLS	column 1	column 2	column 3	column 4
	coeff.	coeff.	coeff.	coeff.
HHINDEX	-0.050***	-0.697***	-0.290***	0.007***
	(0.003)	(0.107)	(0.048)	(0.002)
DISTANCE	-0.005***	-0.003***	-0.015***	-0.004***
	(0.0002)	(0.0003)	(0.001)	(0.0004)
COLLAT	1.348***	1.998***	1.299***	0.634***
	(0.195)	(0.373)	(0.325)	(0.240)
RATING	-0.311***	-0.411***	-0.328***	-0.053***
	(0.013)	(0.028)	(0.019)	(0.018)
RATIONING	-0.241***	-0.609**	-0.232*	0.020
	(0.088)	(0.221)	(0.140)	(0.095)
Bank dummies	Yes	Yes	Yes	Yes
Industry dummies	Yes	Yes	Yes	Yes
Borrowers' size dummies	Yes	Yes	Yes	Yes
Constant	7.536	16.337***	19.692***	2.337***
		(2.347)	(2.081)	(0.326)
Observations	31,012	7,728	15,524	7,760
R-square	0.2501	0.1321	0.1985	0.3535

* significance at the 10% level; ** significance at the 5% level; *** significance at the 1% level.

We refer to the distribution of the *HHINDEX* variable; so, "high competition" is identified by values lower than the first quartile (HHINDEX<=8.18); "low competition" is identified by values higher than the third quartile (HHINDEX>=12.67); "medium competition" is identified by the observations between the first and the third quartile (8.18<HHINDEX<12.67).

Table 6

Third sample split: borrowers' size

This table reports the OLS estimation results of the third sample split, obtained starting from the basic model (table 3, column 1). The results are provided for four subsamples identified based on the borrower's size, as classified by banks, distinguishing between "large" (column 2), "medium sized" (column 3), "very small" (column 4), "small" (column 5), and compared with the full sample results (column 1), already reported in table 3.

		Model 3 - Third sample split			
Dependent variable: *LENGTH*	Basic model	*Large*	*Medium sized*	*Very small*	*Small*
Estimator: OLS	column 1	column 2	column 3	column 4	column 5
	coeff.	coeff.	coeff.	coeff.	coeff.
HHINDEX	-0.050***	0.0005	-0.065***	-0.026***	-0.084***
	(0.003)	(0.091)	(0.015)	(0.6003)	(0.009)
DISTANCE	-0.005***	-0.007***	-0.008***	-0.003***	-0.006***
	(0.0002)	(0.002)	(0.001)	(0.0002)	(0.0004)
COLLAT	1.348***	1.713	2.121***	0.811***	0.066
	(0.195)	(1.088)	(0.359)	(0.260)	(0.402)
RATING	-0.311***	-0.750***	-0.477***	-0.166***	-0.295***
	(0.013)	(0.148)	(0.029)	(0.017)	(0.025)
RATIONING	-0.241***	-0.042	0.122	-0.199*	-0.509**
	(0.088)	(0.763)	(0.214)	(0.113)	(0.232)
Bank dummies	Yes	Yes	Yes	Yes	Yes
Industry dummies	Yes	Yes	Yes	Yes	Yes
Borrowers' size dummies	Yes	No	No	No	No
Constant	7.536	10.255	11.074	5.954***	7.215***
		(5.795)	(3.578)	(0.135)	(0.219)
Observations	31,012	595	7,805	10,412	12,200
R-square	0.2501	0.1493	0.1347	0.372	0.1521

* significance at the 10% level; ** significance at the 5% level; *** significance at the 1% level.

Table 7

Regression results of the second model: subsample A

This table reports the results of the OLS estimation of the second regression model, referred to the subsample A composed of companies that experienced a downgrading between 2008 and 2010. Variables are described in Table 2. Robust standard error are reported in parentheses. *, **, *** denote significance levels. The regression in column 1 identifies the basic model.

	Model 2	
Sample restrictions	Subsample A: companies experienced a downgrading between 2008 and 2010	
Dep. Variable: CREDIT	column 1	column 2
Estimator: OLS	coeff.	coeff.
LENGTH	0.007***	0.007***
	(0.001)	(0.001)
NUMBER	-0.062***	-0.062***
	(0.004)	(0.004)
DISTANCE	0.000	0.00003
	(0.000)	(0.00007)
HHINDEX	0.009***	0.009***
	(0.002)	(0.002)
COLLAT	-0.234***	-0.233***
	(0.064)	(0.063)
RATING	0.025***	0.052***
	(0.005)	(0.016)
RATING^2		-0.002*
		(0.001)
RATIONING	-0.232***	-0.237***
	(0.050)	(0.051)
Bank dummies	Yes	Yes
Industry dummies	Yes	Yes
Borrowers' size dummies	Yes	Yes
Constant	-0.199	-0.180
	(1.036)	(1.038)
Observations	13,429	13,429
R-square	0.3158	0.3160

* significance at the 10% level; ** significance at the 5% level; *** significance at the 1% level.

Table 8

Regression results of the second model: subsample B

This table reports the results of the OLS estimation of the second regression model, referred to the subsample B composed of companies with a very good rating assigned in 2008 but that experienced a downgrading between 2008 and 2010 (column 2) and referred to the subsample C composed of companies with a very good rating assigned in 2008 but that experienced a downgrading between 2008 and 2010, in the first two sectors for number of downgrading (column 3). Results are compared to the basic model (column 1) taken from table 7. Variables are described in Table 2. Robust standard error are reported in parentheses. *, **, *** denote significance levels. The regression in column 1 identifies the basic model.

	Model 2		
Sample restrictions	Basic model	_Subsample B: companies with high rating in 2008, experienced a downgrading between 2008 and 2010_	_Subsample C: companies with high rating in 2008, experienced a downgrading between 2008 and 2010, in sectors with high downgrading_
Dep. Variable: _CREDIT_	column 1	column 2	column 3
Estimator: OLS	coeff.	coeff.	coeff.
LENGTH	0.007***	0.007***	0.007***
	(0.001)	(0.001)	(0.002)
NUMBER	-0.062***	-0.058***	-0.052***
	(0.004)	(0.005)	(0.005)
DISTANCE	0.000	-0.00003	-0.00005
	(0.000)	(0.00008)	(0.00010)
HHINDEX	0.009***	0.010***	0.009**
	(0.002)	(0.003)	(0.004)
COLLAT	-0.234***	-0.220***	-0.258***
	(0.064)	(0.081)	(0.089)
RATING	0.025***	0.040***	0.042***
	(0.005)	(0.008)	(0.010)
RATIONING	-0.232***	-0.362***	-0.369***
	(0.050)	(0.046)	(0.061)
Bank dummies	Yes	Yes	Yes
Industry dummies	Yes	Yes	Yes
Borrowers' size dummies	Yes	Yes	Yes
Constant	-0.199	-0.874	-0.730**
	(1.036)	(0.853)	(0.310)
Observations	13,429	9,528	6,620
R-square	0.3158	0.3697	0.4109

* significance at the 10% level; ** significance at the 5% level; *** significance at the 1% level.

Table 9

Regression results of the second model: sector specialization

This table reports the results of the OLS estimation of the second regression model implemented to test sector specialization effects. Results from the basic model (column 1) from the table 7 are compared with results in the first ten sectors for number of borrowers (column 2), in the sectors with at least 1,000 borrowers (column 3); in columns 4 and 5, interaction terms are introduced looking at the subsample identified in column 2. Variables are described in Table 2. Robust standard error are reported in parentheses. *, **, *** denote significance levels. The regression in column 1 identifies the basic model.

	Model 2				
Sample restrictions	Basic model	*Sector specialization effects*			
Dep. Variable: *CREDIT*	column 1	column 2	column 3	column 4	column 5
Estimator: OLS	coeff.	coeff.	coeff.	coeff.	coeff.
LENGTH	0.007***	0.006***	0.006***	0.003	0.003
	(0.001)	(0.001)	(0.001)	(0.002)	(0.002)
NUMBER	-0.062***	-0.049***	-0.055***	-0.062***	-0.043***
	(0.004)	(0.006)	(0.004)	(0.007)	(0.006)
*D_LENGTH*NUMBER*				0.028***	
				(0.009)	
D_LENGTH				-0.038	
				(0.042)	
*D_NUMBER*LENGTH*					0.006***
					(0.003)
D_NUMBER					-0.111***
					(0.038)
DISTANCE	0.000	0.00008	0.00006	0.0001	0.00009
	(0.000)	(0.00006)	(0.0005)	(0.00006)	(0.00006)
HHINDEX	0.009***	0.007***	0.007***	0.007***	0.007***
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
COLLAT	-0.234***	-0.157***	-0.127***	-0.160***	-0.155***
	(0.064)	(0.047)	(0.040)	(0.047)	(0.047)
RATING	0.025***	0.015**	0.012*	0.015**	0.015**
	(0.005)	(0.007)	(0.005)	(0.007)	(0.007)
RATIONING	-0.232***	-0.059	-0.059	-0.059	-0.059
	(0.050)	(0.084)	(0.067)	(0.084)	(0.085)
Bank dummies	Yes	Yes	Yes	Yes	Yes
Industry dummies	Yes	Yes	Yes	Yes	Yes
Borrowers' size dummies	Yes	Yes	Yes	Yes	Yes
Constant	-0.199	0.100	-0.648***	0.151	0.126
	(1.036)	(0.356)	(0.239)	(0.358)	(0.349)
Observations	13,429	13,477	21,944	13,477	13,477
R-square	0.3158	0.2467	0.2665	0.2477	0.2473

* significance at the 10% level; ** significance at the 5% level; *** significance at the 1% level.

Appendix
Correlation matrix

	CREDIT	LENGTH	NUMBER	DISTANCE	HHINDEX	RATIONING	RATING
CREDIT	1.000						
LENGTH	0.148	1.000					
	(0.000)						
NUMBER	-0.102	-0.044	1.000				
	(0.000)	(0.000)					
DISTANCE	-0.059	-0.108	0.066 (0.000)	1.000			
	(0.000)	(0.000)					
HHINDEX	0.105	0.161	-0.169	0.054 (0.000)	1.000		
	(0.000)	(0.000)	(0.000)				
RATIONING	-0.009	-0.002	-0.002	-0.002 (0.648)	-0.001	1.000	
	(0.028)	(0.558)	(0.653)		(0.738)		
RATING	-0.079	-0.141	-0.131	0.069 (0.000))	0.021 (0.000)	0.375	1.000
	(0.000)	(0.000)	(0.000)			(0.000)	