Relationship lending in a financial turmoil*

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Abstract

This paper sheds new light on the value of relationship lending by studying whether, during the recent financial crisis, banks provided a steadier flow of credit and passed through interest rate cuts more, to those firms they established a closer relation with. We measure the strength of the relation between a bank and a firm through the length of the relationship, a measure of the distance between the firm and the bank, the banks' share of total credit to the firm. By exploiting the presence of multiple banking relationships, we are able to control for firms' and banks' unobserved characteristics. Results show that credit growth has been higher if the relation was longer, the distance between the bank and the firm shorter, the bank held a larger share of total credit. Similarly, banks passed-through interest rate cuts more to firms if the relation with the firm was longer, and the distance shorter. The effect of the duration of the relationship on the interest rate pass-through depends upon firms' riskiness, and upon banks' exposure to the crisis. Our results provide evidence of a causal effect of relationship lending on the bank-lending channel.

Keywords: Relationship lending, Credit supply, Interest rate pass-through, financial crisis.

1 Introduction

This paper studies the role played by relationship lending in the transmission of financial shocks to non-financial firms. As a first step, we study whether, in the year following the default of Lehman Brothers, banks provided a steadier flow of credit to those firms

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they established a closer relation with. Then, we analyze whether, in the same period, banks passed-through interest rate changes differently according to the strength of the relation they had with borrowers. We also test whether the effect of relationship lending depends upon firm or bank characteristics and if there has been any significant change between the post-crisis and a pre-crisis period. We measure the strength of the relation between a bank and a firm through the duration of the relationship, a measure of the physical distance between the firm and the bank, the banks' share of total credit to the firm.

Our empirical analysis is based on information from a sample of more than 30,000 Italian corporate borrowers – mostly small and medium-sized - and their lending banks. The vast majority of the firms in our sample rely only on intermediate loans as a source of external finance and about 90 per cent of them have more than one relation. Multiple banking is a long standing characteristic of bank-firm relationships in Italy (Foglia et. al, 1998; Detragiache et al., 2000). This feature of the sample plays a key role in our identification strategy, as it allows us to control for firms' and banks' unobserved characteristics, using the methodology introduced by Khwaja and Mian (2005). Firm fixed effects control for firm's unobserved heterogeneity (firm level demand for credit, firm's quality, riskiness, etc.) which are key determinants of both the flow and the cost of credit. Bank fixed effects control for the extent to which banks have been hit by the crisis, their lending policy, etc.

We focus on the 12 months following the default of Lehman Brothers, since in Italy this was the time when the crisis exploded in its full force, and its transmission to the real sector effectively began.

Moreover, the focus on the post-Lehman period entails some important advantages. First, the crisis originated in the financial sector, outside Italy, and was largely unexpected, at least in its depth. Therefore, firms did not have time to adjust their borrowing as a function of their expectation of how much each bank was going to be hit by the crisis, which is thus an exogenous shock with respect to the structure of the lending relationships existing at the onset of the crisis. This, together with the inclusion of both firm and bank fixed effects allows us to identify a causal effect of tighter lending relationships on credit growth and on the extent to which banks passed-through interest rate shocks to firms, during a severe turmoil. Then, in essence, our analysis represents a test of the effect of relationship lending on the bank lending channel. Second, focussing on a period of crisis period allows to investigate the effect of relationship lending banks' credit decisions during a financial turmoil. The literature points out that the value of relationship lending should become manifest precisely in times in which firms and banks

are hit by shocks. Third, this enables us to compare the post-crisis to a pre-crisis period, providing evidence on whether relationship lending had a stronger, or a weaker effect in crisis than in non-crisis times.

Finally, Italy is an excellent laboratory for our analysis. Although Italian banks have been affected by the financial crisis, systemic stability has not been endangered and government intervention has been negligible in comparison to other countries (Panetta et. al., 2009). Hence, lending policies of Italian banks were not affected by explicit or implicit constraints imposed by Governments as conditions to receive public support. Moreover, in Italy SMEs are highly bank dependent for their funding, so that the firms included in our sample had little opportunity to get funding from other sources than banks.

Our work contributes to the literature on relationship lending. This has been documented to be an important feature of firm financing in bank oriented financial systems such as Japan (Aoki and Patrick, 1994), Germany (Harhoff and Körting,1998) and Italy (Angelini et al.,1998) as well as in more market oriented ones as the U.S. (Petersen and Rajan, 1994; Berger and Udell, 1995). Boot (2000) and Ongena and Smith (2000) review the first wave of research in this area, Berger and Udell (2006) discuss the role of relationship banking on the background of the far reaching transformations experienced by the financial industry in more recent years.

A large empirical literature provides evidence about the benefits and costs of relationship lending (see Degryse et al. 2009 for an exhaustive review). A first strand of the literature focuses on the effect of closer relations on collateral requirements. The available evidence indicates that relationship borrowers pledge less collateral (recent contributions include Agarwal and Hauswald 2010 and Bharath et al. 2009). Most studies on US data find that tighter relations are associated with lower rates, while the opposite occurs when investigating European data (Degryse et al. 2009). A second strand of the literature investigates the effect of tighter credit relationships on credit availability. Pertersen and Rajan (1994) show that the primary benefit of building close ties with an institutional creditor is that the availability of financing increases. The authors find smaller effects on the price of credit. Elsas (2005) shows that firms that borrow from a small number of banks, or concentrate the bulk of their funding in one relation with an intermediary, and preserve their relation for a relatively long period, face lower financial constraints and experience better credit terms and conditions. Bonaccorsi di Patti and Gobbi (2007) show that it is costly for a firm to interrupt an existing relation and find new sources of finance. Their results indicate that it takes up to three years to a firm to restore the reduction in lending induced by the severance of a credit line. However,

recent evidence indicates that firms switching banks obtain more favorable conditions, in terms of loan amounts, in terms of collateral requirements, or in terms of lower rates (Gopalan et al. 2010, and Ioannidou and Ongena 2010). These papers find evidence of the presence of hold-up costs of relationship lending. A further cost of relationship lending for firms, is lower diversification of bank finance. This has been identified in Detragiache et al. (2000) as a key determinant of the number of relations firm struck with banks.[1]

On banks' side, establishing a relationship requires that banks can extract ex-post rents from firms to ensure the ex-ante investment in collecting and processing soft information is profitable (Petersen and Rajan, 1995). However, establishing closer relations with firms may be costly for banks, as it may lead to sub-optimal portfolio diversification and lock-in the investment in case of firm distress. This seems to have been the case in Japan in the 1990s when banks delayed the restructuring of the corporation with which they had close relationships (Caballero et al., 2008).

A few recent works investigate the degree of cushioning provided to firms by tighter relationships with their banks during a downturn. Bodenhorn (2003) using data from a US bank in mid 19th century shows that borrowers with longer relations were more likely to have loan terms renegotiated during the credit crunch of 1857. Jiangli et al. (2009) use survey data from four Asian countries to investigate whether the intensity of banking relationship ensured greater credit availability to firms during the 1998 Asian financial crisis. Their results show that Korean and Thai firms with looser relationships experienced a higher likelihood of being credit constrained, while the opposite occurred for Philippine firms. Finally, Carvalho et al. (2010) show that listed firms experienced a drop in their stock prices if banks they had a close relation with suffered strong equity losses.

We also contribute to the works studying the effect of the financial crisis, and more generally of banks' balance sheet conditions on loan prices. Santos and Winton (2008) compare the pricing of loans for bank-dependent borrowers with the pricing of loans for borrowers with access to public debt markets. They find that loan spreads rise in recessions, but firms with public debt market access pay lower spreads and their spreads rise significantly less in recessions. Santos (2011) focuses on the impact of banks' exposure to the crisis on loan spreads, and finds that banks more exposed to the crisis increased rates more than those less exposed, and that the effect was stronger for

[1] In this paper we do study the effect of the strength of lending relationships, not of their number. Our identification strategy exploits differences in the strength of relations the same firm has with different banks. This idenfies the effect of closer relations on the local bank lending channel (Mian et al. 2010).

bank-dependent borrowers. Finally, Santos and Winton (2011) show that the relative bargaining power of banks and borrowers plays a crucial role in shaping banks' reactions, in terms of higher spreads on loans, to worsening in borrowers' cash flows.

Our paper is also related to a growing literature investigating the working of the bank-lending channel using micro data at the bank-firm relationship level. Jimenez et al. (2010a),and (2010b) show the effect of monetary policy on credit supply and on bank's risk taking. Working on Italian data, Albertazzi and Marchetti (2011) show that, during the subprime crisis, bank capital (computed on an unconsolidated basis) has an effect on credit supply but only for larger banks. Bonaccorsi di Patti and Sette (2010) using a more general setup and working on consolidated data find little evidence of a direct effect of bank capital, but a larger effect of banks' reliance on interbank funding on credit supply. Their results also indicate that loan charge-offs, and the reliance on interbank funding have a significant effect on the interest rate pass-through.

We contribute to the literature in several ways: the inclusion of both bank and firm fixed effects, together with the focus on the crisis period, allows us to achieve a clean identification of the causal effect of tighter lending relationships on banks' credit decisions; we provide first evidence on the effect of relationship lending on interest-rate pass-through; we test the effect of relationship lending on the bank's lending channel during the crisis: a period in which banks need to deleverage, but the need for credit by firms is high, and it is precisely in such circumstances that the value of relationship lending is particularly important.

The paper is structured as follows: section 2 discusses the empirical strategy and the testable hypotheses, section 3 describes the data and contains descriptive statistics, section 4 shows results, section 5 concludes.

2 Empirical strategy

As a first step we investigate the effect of relationship lending on the growth of revolving credit lines, and we estimate the following model:

$$\begin{aligned} \Delta credit\%_{i,j} &= +\beta_1 duration_{i,j} + \beta_2 distance_{i,j} + \beta_3 share_{i,j} + \\ &\quad \beta_4 (drawn/granted)_{i,j} + \beta_5 \log(credit)_{i,j} + \alpha_i + \gamma_j + \varepsilon_{i,j} \end{aligned} \quad (1)$$

The dependent variable, $\Delta credit\%_{i,j}$, is the percentage change in revolving credit lines to firm i from bank j. We limit attention to revolving credit lines because these are

unsecured and can be called at short notice by banks, while other forms of credit such as term loans have defined reimbursement plans which cannot be modified in the short run. Moreover, granted credit decreases mechanically in the case of term loans, as installments are being paid by the firm.

We focus on credit granted and not on credit drawn, although we also show results from a regression for the growth of drawn credit. The two may differ significantly in the case of revolving credit lines, since Italian banks charged fees and commissions mostly on credit drawn.[2] The two provide complementary information for our purpose. The analysis of credit granted tells us about the decision of banks to grant credit to a firm with which it has tighter relations. The analysis of credit drawn tells us about the extent to which a firm draws more credit from banks with which it holds tighter relations. Banks typically use information on the usage of loans (for example the ratio between credit used and credit granted) to assess the fragility of the borrower. This is particularly true for credit lines: an intensive use of a credit line may trigger a renegotiation of the line. Then, firms may want to use more the lines provided by relationship banks, as the latter may not draw much inference on a firm's situation from its usage of credit lines.

We include three controls to capture the strength of the relation between banks and firms. The first is $duration_{i,j}$, the number of years from September 2008 since firm i borrows from bank j. The second is $distance_{i,j}$, a dummy variable taking the value one if at September 2008 bank j has a branch in the same post code in which firm i has its headquarter. This measure is based on the reasonable assumption that if a firm borrows from a bank, it does so through the bank's branch closest to its headquarter. The third is $share_{i,j}$, the share of total revolving credit lines to firm i held by bank j at September 2008. Share, duration and distance represent the main controls for the strength of the credit relationship. These are the variables mostly used in both the theoretical and the empirical literature to capture relationship lending.

We also control for the share of drawn to granted credit at September 2008, which measures the extent to which the firm is using the available credit commitment, and for the initial size of the loan (credit lines, or total loans) by bank j to firm i at September 2008, $\log(credit)$, to capture size effects, which may determine the extent to which a loan may grow further.

Importantly, we always include firm fixed effects α_i.These control for firm-level demand for credit and for other firm's unobservable characteristics such as riskiness, quality, financial fragility, etc. This is very important because their omission could lead to

[2]This has been recently modified by new rules on fees and commissions structure set out by the banking supervisor.

biased estimates: banks may be willing to establish longer relations with better firms, which could also be those suffering less from the impact of the crisis, and thus having a higher credit growth. Hence our identification strategy allows us to obtain estimates of the effect of relationship lending on credit growth during a crisis, conditional on firms' unobservable quality, riskiness, demand for credit, etc.

Finally, we always include a full set of bank fixed effects γ_j.These are important to control for the extent to which different intermediaries have been hit by the financial crisis. It also controls for banks' unobserved characteristics that may influence both the strategies followed by banks in building relations with customers, and the credit policy implemented during the crisis.

As a second step, we study the effect of relationship lending on interest rates. We have data on rates on different types of loans (term loans, revolving credit lines, etc.) which are not easily comparable. Term loans, or loans backed by account receivables are less risky than revolving credit lines, as they are typically collateralized. For this reason, we choose to focus on rates on revolving credit lines, as these are easily comparable across banks, they represent a critical source of finance for firms, and the corresponding spreads (and fees) can be renegotiated by banks at short notice. In this case the equation we estimate is:

$$\begin{aligned} \Delta int\_rate_{i,j} &= +\lambda_1 duration_{i,j} + \lambda_2 distance_{i,j} + \lambda_3 share_{i,j} + \\ &\quad \lambda_4 (drawn/granted)_{i,j} + \lambda_5 \log(credit)_{i,j} + \alpha_i + \gamma_j + \varepsilon_{i,j} \end{aligned} \quad (2)$$

where $\Delta int\_rate_{i,j}$ is the absolute change in the Annualized Percentage Rate (APR) charged by bank j on the credit lines used by firm i between September 2008 and September 2009. We estimate the model for the effective APR, which includes both the rate and the fees and commissions charged for the use of the credit facility, but results are broadly unchanged if we use nominal APR (i.e. net of fees and commissions) instead. The cost of credit is computed as the average interest rate paid by firms on outstanding balances at the end of the quarter, including commissions and fees. We focus on the cost of revolving credit lines as their amount and conditions can be renegotiated at short notice by banks. Changes in the Euribor, the reference rate for loans on the Italian market, are common to all borrowers and are absorbed in the constant.

The other controls are the same as in equation 1, again computed at September 2008. The change in funding costs experienced by banks between September 2008 and September 2009 is controlled for by bank fixed effects. Therefore the model identifies

the causal effect of duration, distance, and share on the extent to which such changes in funding costs are passed-through into changes in the cost of revolving credit lines.

Our empirical models allow us to test the following hypotheses:

H1: the effect of the duration of the relationship on credit growth, and on the interest rate pass-through. The literature proposed two possibilities:

- $\beta_1 > 0$ - the longer the firm has a relation with a bank, the more it grants credit to the firm. This is based on the idea that longer relations allow the bank to obtain more information about the borrower.
- $\beta_1 < 0$ - this is the opposite effect and is based on the idea that a bank has more power to hold firms up by limiting credit growth more to firms with which it has longer relations, since such firms are locked in the relation and would be less able to switch to a different bank.

H2: the effect of distance on credit growth. In this case the literature indicates that we should expect:

- $\beta_2 < 0$ - banks extend more credit the closer the firm is to the banks' branch. This is based on the idea that closer borrowers are easier and cheaper to monitor.

H3: the effect of bank's share of total credit to the firm on credit growth. Here we expect two possibilities:

- $\beta_3 > 0$ - banks provide more credit to firms in which they hold a higher share of total credit. Banks that are more exposed to a firm hold more information about this firm, and thus are more willing to provide credit. Alternatively, a bank is more locked-into the relation as its stake is larger and has to support the firm during a difficult period to reduce the risk the firm does not repay its debt.
- $\beta_3 < 0$ - banks with a higher share tend to grant less credit / allow firms to draw more credit from an existing facility with bigger consequences. Banks with a larger share of total credit may be less willing to hold a large exposure to the same borrower and may actually want to reduce it.

H4: the effect of the relationships' length on the cost of credit. The literature proposes two possibilities:

- $\lambda_1 < 0$, banks pass-through an interest rate rise less to borrowers with which they have a longer relation with. This, again, is consistent with the idea that longer relations allow the bank to obtain more information about the borrower.

- $\lambda_1 > 0$, banks pass-through an interest rate rise more to borrowers with which they have a longer relation with. This is consistent with the idea that banks hold relationship borrowers up more.

H5: the effect of distance on the cost of credit. We expect:

- $\lambda_2 > 0$, so that banks pass-through interest rate increases more to borrowers who are more distant from a bank's branch.

H6: the effect of bank's share of total credit on the cost of credit. Again, we expect two possibilities:

- $\lambda_3 < 0$ - banks pass-through interest changes less to firms to which they hold a larger share. Again, this may be due to the bank holding more information about the firm, or to the bank being "forced" to price loans less aggressively to firms which they are more exposed to.

- $\lambda_3 > 0$ - banks pass-through interest rate changes more as a large exposure to the same borrower entails higher risk.

We also study whether the effect of relationship lending is heterogenous across different subsamples of firms (riskier, more leveraged, smaller, etc.) and banks (less capitalized, more reliant on interbank funding, etc.).

3 Data and descriptive statistics

We work on data on credit to Italian corporations from the Italian Credit Register ("Centrale dei Rischi", CR). This is maintained by the Bank of Italy (the central bank) and collects from all intermediaries operating in Italy individual information on borrowers with outstanding exposure (credit commitments, credit drawn, guarantees) above 75,000 Euros with a single intermediary. The database includes all different forms of bank debt (loans backed by account receivables, term loans, revolving credit lines) together with information about the granting institution and the identity (tax code) of the borrower. From the Credit Register we obtain the total outstanding debt of a firm, and we identify

the five intermediaries with the highest shares of granted credit.[3] The relationships with each of these intermediaries represent our observational unit. We compute all credit received from banks[4] in September 2008 and September 2009, and we compute its growth rate. The financial crisis in Italy exploded after the default of Lehman Brothers: disruptions in interbank markets precipitated and credit started decelerating at a fast pace since September 2008 (Figure 1).

For interest rates, we again use data from a special section of the CR (the Taxia database), which contains information on the interest rate and the fees and commissions charged on different forms of loans. This register includes data from a subset of about 130 Italian banks accounting for more than 80 percent of total bank lending in Italy.

Individual intermediaries may be part of a banking group. Typically, both lending and funding policies are decided at the banking group headquarters. Therefore, we aggregate the credit to any firm from all banks belonging to the same banking group. Hence, the controls for relationship lending are computed on the basis of the relationship between a firm and a banking group. In the paper "bank" should therefore be understood as "banking group".

The sample used in the estimation includes relationships from Italian banks with non-financial corporations included in the Company Account Data System (CADS) data base. The initial sample counts about 34,000 firms. However, we select firms that have granted revolving credit lines from at least two banks to be able to include firm-fixed effects in the estimation. This reduces significantly the sample size, as banks may get a term loan, or a credit line for factoring from a bank, and a revolving credit line (overdraft) from another bank. In this case, for the purpose of our analysis, the firm has only one relationship, and it thus dropped.

Moreover, we drop firms that are not using available revolving credit lines at September 2008, because it is hard to think that such credit lines will grow if they are unused. This occurs because of the fee structure prevailing in the Italian market in our sample period, according to which firms were charged mostly for their actual usage of credit lines (peaks of use were particularly penalized), and little for the availability of the line. Finally, we exclude firms that have bad loans at September 2008.

Overall, our sample includes 78,432 credit relationships by about 25,500 firms. For

[3] This choice is motivated by the need to compute the duration of the relationship. This requires downloading several years of the CR database, month by month. Doing that for all relationships would yield an enormous and difficult-to-handle database. We chose to focus on the 5 largest relations as this is the median number of relations in our sample.

[4] We exclude financial companies, as we do not have information about the location of their branches and we cannot create the variable "distance".

the analysis of interest rates, the sample is smaller, as it includes information by about 130 intermediaries. In this case, the main sample includes 50,809 relationships.[5]

Table 1 shows balance sheet indicators of the firms in the sample (these data are from December 2007, the latest balance sheet available at the onset of the crisis). The median value of assets is 9.2 Million Euros, Leverage is around 75%, ROE is 3.6%. These features reflect structural characteristics of Italian firms, which are on average smaller and are more leveraged than their European counterparts. Table 2 shows the distribution of firms according to size, riskiness (measured by Altman Z-score), sector, geographical location. More than 50 percent of the sample is made by micro and small firms[6], 45 per cent are industrial firms, about 38 percent operate in the service sector; more than 60 percent of them are located in the North, the richest area of the country. Finally, about 60 percent of the firms have the six highest Z-scores (measured on a scale from 1 to 9 according to the methodology developed by Altman et al. 1994), while about one third are classified as risky.

We examine only existing relationships at September 2008 (as otherwise we do not observe the structure of the relation at the onset of the crisis). We include both relations still in place at September 2009, and relations which have been terminated. In such a case granted credit is set to zero at September 2009.[7]

The average size of a relationship (granted credit for a revolving credit line) at September 2008 was 566,000 Euros, the median 135,000. At September 2009 these were 444,000 and 100,000, respectively.[8]

Table 3 shows the distribution of the growth rate of credit, both granted and drawn, in each relationship. As credit growth of revolving credit lines has a lot of variability, we winsorize the rate of growth of credit at the 5th and 95th percentile. Revolving credit lines have a very large rate of change, since the start of a new line may lead to growth rates above 1,000 percent. However, all results hold if we winsorize the data at the first top and bottom percentiles and if we use the difference in log credit between September 2009 and September 2008 as a dependent variable without winsorizing the

[5] Again, since we include firm fixed effects, we require that firms have at least two credit relationships using revolving credit lines. If a firm gets a term loan from a bank and a revolving credit line from another bank, that counts as only one relationship.

[6] This follows the European Union definition, based on both the number of employees and revenues. Small and micro firms have less than 50 employees, and revenues are below 10 million Euros.

[7] In a robustness check, we also run regressions on the sample of relationships that were in place at both September 2008 and September 2009, thus excluding relationships that have been terminated.

[8] A borrower is included in the CR if its total exposure towards an intermediary is above 75,000 Euros. Therefore, there are granted revolving credit lines below that limit as borrowers also get term loans, or loans backed by account receivables from the same bank.

data.[9] The median growth rate of granted credit is about -66 percent, indicating that credit decreased in most of the relations. The mean is slightly positive instead, 0.31 percent, also reflecting the fact that the distribution of credit growth is truncated at -100 percent, as credit cannot be negative.

Table 3 also shows the distribution of the change in the APR on revolving credit lines, gross of fees and commissions. We winsorize changes in the gross APR at the 5th and 95th percentile, as it displays some very large changes.[10] It can be seen that rates decreased on average by about 3.6 percentage points, reflecting the cuts in the policy rates implemented by the ECB between September 2008 and September 2009, and the easing of the tensions in the interbank markets.

The distribution of the control variables is shown in Table 4. About one third of the relations are with a bank that does not have branches in the same postcode as the firms' headquarters. The duration of each relation is on average 5.9 years (the variable is truncated at 7 years). To compute the duration of the relationship between a firm and a bank, we take into account mergers and acquisition among banks, so that if a bank is acquired by another bank we are table to track the original relation and correctly compute its duration.[11] The average share of credit held by a bank in a relationship is around 24-28% depending on whether this is computed over credit granted, or credit drawn.

The correlation among the control variables is not large (Table 5). The most correlated variables are the share of credit held by the bank and the size of the loan from the bank. Their correlation at around 0.4 does not pose multicollinearity problems.

4 Results

4.1 Credit Quantity

Results from the estimation of equation (1) are shown in Table 6. Column 1 shows estimates of the baseline regression on the main sample which includes relationships with positive drawn credit at September 2008, and relationships that are dead at September

[9] We prefer to use the true percentage change, instead of the delta log as the latter is not a good approximation of the former when growth rates are very large, which occurs in our data.

[10] This is due to the fact that rates are obtained by dividing cumulative interest rates paid by products (amount outstanding times days). Then credit lines used for only a few days, for example to pay wages, or taxes, may give rise to a few very large gross APRs, due to fees and commissions, which are reflected in large changes.

[11] Suppose bank B acquires bank A in, say, 2006. If we observe that a firm had a relation with bank A in 2004 and 2005, and then with bank B in 2006, 2007 and 2008, we attribute a duration of 5 years to the relation.

2009. First, distance has a negative and significant coefficient, indicating that banks that are geographically closer to the firm increase credit commitments more (contract them less). In particular, the growth rate of credit from closer banks is about 2.9 percentage points higher than that of credit from more distant banks. Second, the duration of the relationship has a positive and significant coefficient, indicating that banks increase credit commitments more if they have a longer relationship with the firm. In particular, one more year into the relationship ensures a higher credit growth of about 0.8 percentage points. Third, the share of revolving credit lines to the firm committed by the bank has a positive and significant coefficient, indicating that credit from banks that are more exposed to the firm grows more (contracts less). In particular, credit growth from banks with a one percent larger share is 0.5 percentage points higher. The latter result holds when controlling for the size of the credit line at the beginning of the period and for the ratio between drawn and granted credit, and both controls have the expected sign. The magnitude of the coefficient of the initial size of the credit line imply that credit lines that are 10 percent larger have a -4.85 percentage points lower credit growth; the coefficient of the latter imply that if drawn to granted credit is one percentage point higher, credit grows by 6 basis points more.

Column 2 shows estimates of equation (1) on a sample including credit relationships with zero drawn credit at September 2008. Coefficients for distance, duration, and share are smaller, and the coefficient for distance is now not significantly different from zero, while the other coefficients remain statistically significant.

Column 3 shows results from the base regression estimated on the sample of relationships that are still alive at September 2009 (the intensive margin). There is little difference with respect to the baseline regression: distance is negative and significant (p-value 0.08), duration and share are positive and highly significant.

In column 4, as a further robustness check, we shows estimates for a version of equation (1) in which the dependent variable is the growth rate of drawn credit, and results are analogous to those of the baseline model. In column 5, we estimate the model for the rate of growth of credit winsorized at the 1st and at the 99th percentiles of its distribution, and results are unchanged. Coefficients are larger in size because there the rate of growth of revolving credit lines is now much larger, with the 99th percentile of the distribution being around 1,000 per cent.

Finally, column 6 displays estimates from a linear regression model for the probability that a relationship in place at September 2008 is terminated by September 2009. The dependent variable here is a dummy variable taking the value one if a relationship has positive credit granted at September 2008 and has no credit granted at September 2009.

Estimates are consistent with previous results: relationships with more distant banks are more likely to be terminated, longer relations and relations in which the bank has a larger share of total credit are less likely to be terminated. In particular, banks that are geographically distant have a 1.1 percent higher probability of terminating a relationship, banks having a one year older relationship are 0.3 percent less likely to terminate the relationship, and banks holding a one percentage point larger share of total credit are 0.08 percent less likely to terminate the credit relationship.

All regressions control for both firm and bank fixed effects. Hence, coefficients capture the behavior of banks lending to the same firm as a function of characteristics of the relationship, controlling for the impact of the crisis on the bank.

Overall these results are consistent with H1, H2, and H3: tighter bank-firm relationships have a positive, causal, effect on the availability of credit.

4.2 Interest rates

In this section we study whether banks pass-through interest changes to firms differently as a function of the strength of the lending relationship they have with firms. We estimate equation 2, and results are shown in Table 7. Column 1 displays estimates from the baseline model. Distance increases the extent to which banks pass-through interest rate changes (absolute change of the gross APR): more distant banks charge firms 17 basis points more than closer banks (on revolving credit lines). The duration of the relation is negative and significant. If a relation is one year older, banks charge firms about 22 basis points less. Finally, the share of credit drawn is positive and significant,although the effect is small: banks holding a share of total credit (drawn) one percentage points larger, raise interest rates by 0.7 basis points less.

These results confirm hypotheses H4, H5, H6: banks pass through interest rises (cuts) less (more) to firms they have a longer relation with, and they are closer to. The level of credit drawn at the beginning of the period is positive and significant as the cost of revolving credit lines is increasing in the usage of the line.

Columns 2 and 3 shows results from regressions including a dummy variable taking the value one if credit granted (column 2) or credit drawn (column 3) increased in the sample period. These may be controls for relation level demand (although they may be somewhat endogenous). Coefficients of distance and duration of the relationship are unchanged, that of the share of total credit to the firm changes sign, although it remains statistically insignificant. Column 4 shows a further robustness check, which consists in including the share and the initial level of the credit line computed on the credit

granted, and again results are unchanged. Column 5 shows results from a regression cutting observations were the absolute change in the ΔAPR is above 50 percentage points. This is a very large value, and the presence of observations even larger than that value is due to the fact that we compute the interest rate as the ratio between the flow of interests paid and the products. The latter may be very small if credit lines are used for a few days in a month, possibly just to pay wages, or taxes, giving rise to extremely large values of gross interest rates due to the presence of fixed commissions. It can be seen that all results hold, and coefficients change little.

Finally, column 6 shows results from a regression in which the dependent variable is a dummy taking the value one if the gross APR increased in the sample period. It can be seen that results are qualitatively the same as in the base model. Distance increases the probability the gross APR goes up (is reduced by less) by about 2 percentage points, one more year into the relationship reduces that probability by 0.8 percentage points; the other controls are not statistically significant.

All regressions control for firm and bank fixed effects. The latter capture changes in banks' unobserved characteristics between September 2008 and September 2009, including bank-specific changes in the cost of funding and in general in balance sheet conditions, as well as changes in banks' appetite for risk.

4.3 Firm Heterogeneity

In this section we explore whether the effect of relationship lending is heterogenous across firms. To do so, we interact regressors of the base model with dummy variables identifying whether a firm is riskier, or more opaque. As measures of firms' riskiness we use the Z-score, firms' leverage, firms' ROE. For the Z-score, the dummy for riskier firms take the value one if firm's Z-score is greater or equal than 7; for leverage, the dummy for high leverage firms takes the value one if firm's leverage is in the top quartile of the distribution; the sample for less profitable firms takes the value one if firm's ROE is in the bottom quartile of the distribution; for size, the dummy takes the value one if firm have less than 49 employees and sales below 10 million Euros;[12] finally the dummy for firms with a low share of tangible to total assets takes the value one if firm's ratio of tangible to total assets lies in the bottom quartile of the distribution. All these variables are taken from December 2007 balance sheets (thus they are predetermined with respect to the crisis).

[12] In other words, small firms include "micro" and "small" firms according to the European Union statistical classification.

Results are shown in Table 8[13], and indicate little evidence of heterogeneity in the effect of both distance and duration of the relationship. None of the interaction terms with the dummy capturing firm heterogeneity is statistically significant. The share of total credit to the firm held by the bank has a stronger effect for riskier firms and for smaller firms. This is consistent with the hypothesis that banks holding a larger share of total credit to the firm acquire more information and are thus more willing to provide more credit to the firm in times of trouble (possibly because the superior information allows the firm to better price credit). The value of such information is particularly important if firms are smaller or riskier. It is also consistent with a "captured lender" story, in which banks have to support borrowers that are less able to get credit from other sources (this is particularly true for smaller and riskier firms) to avoid reducing the chances that previous credit will be repaid.

We repeat the same analysis to test whether the effect of relationship lending on the interest rate pass-through is heterogenous across firms. Results are shown in Table 9. Distance has a weaker effect if firms have high leverage, and the total effect for highly leveraged firms is not statistically different from zero. By contrary, the duration of the relationship has a stronger effect if firms are riskier (higher Z-score, more leveraged, less profitable). The total effect for high-risk firms is almost double that for safer firms, that for more leveraged and less profitable firms is about 50 percent larger than that for less leveraged or more profitable firms. As regressions control for firm fixed effects, this suggests that the information embedded in longer relationships is useful for banks to price risk, especially for riskier borrowers. The share of total credit is not statistically significant and there is no heterogeneity across firms.

4.4 Bank Heterogeneity

As a further test of our results, we investigate whether our controls for relationship lending have a different effect as a function of banks' exposure to the crisis. Again, we interact regressors with dummy variables capturing the extent to which banks were able to stand the crisis. To do this, we consider bank capitalization, bank reliance on interbank funding, bank reliance on securitization prior to the crisis, bank's loan charge-offs (a measure of prospective capital), and bank size. All these variables come from banks' consolidated balance sheets at June 2008, with the exception of securitizations, which are the cumulative flow of securitizations done by banks in 2004-2006.[14] For lowly

[13] The sample size is somewhat smaller since there is not complete balance sheet information at December 2007 for all firms in the sample.

[14] We do this since the market for securitizations dried up in 2007.

capitalized banks, we use a dummy variable taking the value one if the banks has a capital ratio below 10 per cent (this corresponds to a capital in excess of the regulatory minimum of 2 per cent); for reliance on interbank funding, we use a dummy variable taking the value one if bank's share of interbank borrowing to total assets is in the top quartile of the distribution; for reliance on securitization, we use a dummy variable taking the value one if the ratio of cumulative securitizations in 2004-2006 to total assets is in the top quartile of the distribution; for loan charge-offs we use a dummy taking the value one if the ratio of bank's loan charge-offs in June 2008 income statement to loans is above the median; finally, for bank size, we use a dummy variable taking the value one if a bank is in the 10 largest banking groups measured by consolidated assets. We prefer to use dummy variables for bank characteristics instead of continuous variables since the effect of balance sheet variables may be non-linear, and it may be difficult to identify any effect in a model also including a full set of bank and firm fixed effects. However, this is not innocuous, since changing the definition of low capital banks, or of banks highly reliant on interbank funding may affect thousands of observations, as a bank, especially if large, has many credit relationships.

Results for credit quantity are shown in Tables 10.[15] There seems to be little evidence of heterogeneity across banks. Distance seems to have a positive effect for banks with a low ratio of loan charge-offs to total loans, and a negative effect in the opposite case, although the total effect of distance in the latter case is not statistically significant. Distance has a negative and marginally significant effect for banks belonging 10 largest banking groups. For such banks, the effect of the duration of the relationship is negative, too, and stronger than for smaller banks.

Table 11 displays estimates for the regressions on changes in the gross APR. In this case, there is some evidence of bank heterogeneity in the effect of duration. That is larger if banks were more reliant on securitization before the crisis, if banks have a larger share of loan charge-offs, and for larger banks. Reliance on securizations may capture both the extent to which banks had access to a cheaper source of funding which dried up during the crisis, and the extent to which it relied on the originate-to-distribute business model prior to the crisis. A stronger effect of duration for such banks may indicate that they placed more attention to relationship lending during the crisis. A similar argument may explain the results for larger banks. Loan charge-offs are a measure of

[15] The sample size is smaller than for the full sample because we do not have consolidated balance sheet information for Italian branches of foreign banks. Hence, we cannot know whether these banks truly have low capital, high reliance on interbank funding, etc. In this case, the balance sheet conditions of their parent company are very relevant for their lending policy, and we prefer to exclude them from the sample. This also applies to the sample size of regressions for interest rates.

prospective capital, as they include future losses that can be reasonably expected given current information, and banks with more loan charge-offs are likely those that will have to restore capital the most in the future. The latter result is consistent with Santos (2011) who finds that increases in loan spreads is higher if the lending bank has higher loan charge-offs.

4.5 Comparing the post-crisis to pre-crisis period

In this section we investigate the effect of relationship lending in the pre-crisis period, and we test whether this has changed between the pre- and the post-crisis period. To this aim, we add to our dataset credit relationship of non-financial corporation between December 2005 and December 2006, a year in which Italy experienced a moderate economic expansion and financial market did not suffer any special tension. Overall credit to non-financial firms grew at a fast pace in 2006 (12 per cent on average over the previous year).

To test whether the role of relationship lending on the supply of credit and on the interest rate pass-through, changed during the crisis, we estimate the following models

$$\begin{aligned} \Delta credit\%_{i,j} &= +\beta_1 duration_{i,j} + \beta_2 distance_{i,j} + \beta_3 share_{i,j} + \\ &\quad \beta_4 (drawn/granted)_{i,j} + \beta_5 \log(credit)_{i,j} + \alpha_i + \gamma_j + \\ D(crisi &= 1) * (\delta_1 duration_{i,j} + \delta_2 distance_{i,j} + \delta_3 share_{i,j} + \\ &\quad \delta_4 (drawn/granted)_{i,j} + \delta_5 \log(credit)_{i,j} + \alpha_i + \gamma_j) + \varepsilon_{i,j} \end{aligned}$$

where, importantly, we add firm*period and bank*period fixed effects, so as to control for firm specific and bank specific factors in each period. The model for the regression on the Δ APR is analogous. The dummy $D(crisi = 1)$ takes value one if data refer to the September 2008-September 2009 (post-crisis) period; it takes value zero if data refer to the December 2005-December 2006 (pre-crisis) period.

Results for credit quantity are shown in Table 12. Distance is negative and in the pre-crisis period, the estimated coefficient is -1.95, while in the post-crisis period, it is -2.89. While we cannot reject the hypothesis that the effect of distance is the same in both periods, it is statistically different from zero only after the crisis. As regards duration, the effect is positive and statistically significant both in the pre- and in the post-crisis period, although in the latter the effect is weaker, and significantly so. The share of total credit to the firm held by the bank is positive and significant in both

periods, and the effect is not statistically different across periods.

Estimates for the regression on ΔAPR are shown in column 2 of Table 12. Distance is not significant in the pre-crisis period, but it becomes positive and significant in the post-crisis period. By contrary, the length of the relationship has the same effect in both periods and it is negative and significant.

Overall, this evidence suggests that distance has a stronger effect in the crisis period for the cost of credit. As regards quantity, the effect is not statistically different in both periods. The length of the relationship has a weaker effect during the crisis than in the pre-crisis period on credit quantity, while it has the same effect in the pre- as in the post-crisis period for what concerns the interest rate pass-through.

5 Conclusion

This paper investigates whether, during the recent financial crisis, banks provided a steadier flow of credit to those firms they established a closer relation with. The main results show that the longer the relation and the shorter the distance between the bank and the firm, the higher credit growth. Moreover, banks holding a larger share in total credit to the firm increased credit more. Results for distance and the length of the relation hold when analyzing revolving credit lines, a form of credit for which soft information is especially important as they are most often unsecured. We also show that banks passed-through interest cuts more to closer firms and to firms they had a longer relation with.

The effect of relationship lending on the growth of credit commitments does not change as a function of firms' riskiness or opacity. However, the effect of the length of the relationship on the interest rate pass through is stronger if firms are riskier, more leveraged, less profitable.

The effect of relationship lending on the growth of granted credit and on the interest rate pass-through depends upon bank characteristics. Distance has a stronger effect on credit granted if banks have a larger share of loan charge-offs and if they are larger, in which case duration has a weaker effect. By contrast, duration has a stronger effect in mitigating the pass-through of interest rate shocks if banks are more reliant on securitizations, have a larger share of charge-offs to total loans, if they are larger.

We also study whether the effect of relationship lending changed after the crisis, compared to a pre-crisis period, and find that distance has a stronger effect period on the cost of credit in the post-crisis, while duration has a weaker effect on the growth of credit commitments in the post-crisis period.

All regressions control for firm and bank fixed effects, so that results hold conditional on firm unobservable quality, riskiness, demand for credit, and for the impact of the crisis on banks, as well as for other banks' unobservable characteristics.

References

[1] Agarwal, S., Hauswald, R. (2010). "Distance and Private Information in Lending", Review of Financial Studies 23, 2757-2788.

[2] Angelini, P., Di Salvo R., Ferri G. (1998), "Availability and cost of credit for small business: Customer relationships and credit cooperatives", Journal of Banking and Finance, 22, pages 925-954.

[3] Aoki, M., Patrick, H. eds. (1994), The Japanese Main Bank System: Its Relevance for Developing and Transforming Economies. Oxford: Oxford Univ. Press.

[4] Beck, T., Demirgüç-Kunt, A., Maksimovic, V. (2008), "Financing patterns around the world: Are small firms different?", Journal of Financial Economics, 89, pages 467–487.

[5] Berger, A., Udell, G. (1995), "Relationship Lending and Lines of Credit in Small Firm Finance," Journal of Business, 68, pages 351-379.

[6] Berger, A., Udell, G. (2002), "Small Business Credit Availability and Relationship Lending: The Importance of Bank Organisational Structure", The Economic Journal, 112, pages F32-F53

[7] Berger, A., Udell, G., (2006) "A More Complete Conceptual Framework for SME Finance", Journal of Banking and Finance, 30, pages 2945-2966.

[8] Berger, A., Miller, N.H., Petersen, M., Rajan, R., Stein, J. (2005), "Does Function Follow Organizational Form? Evidence from the Lending Practices of Large and Small Banks", Journal of Financial Economics, 76, pages 237-269.

[9] Bharath, S., Dahiya, S., Saunders, A. , Srinivasan, A. (2009), "Lending Relationships and Loan Contract Terms", Review of Financial Studies, forthcoming.

[10] Bodenhorn, H. (2003), "Short-Term Loans and Long-Term Relationships: Relationship Lending in Early America", Journal of Money, Credit and Banking, 35, pages 485-505

[11] Bonaccorsi di Patti, E., Gobbi G. (2007), "Winners or Losers? The Effects of Banking Consolidation on Corporate Borrowers", Journal of Finance, 62, pages 669-695

[12] Bonaccorsi di Patti, E., Sette, E. (2010), "Bank balance sheets and the transmission of financial shocks to borrowers: Evidence from the 2007-2008 Crisis", Bank of Italy, mimeo.

[13] Boot, A. (2000), "Relationship banking: What do we know?", Journal of Financial Intermediation, 9, pages 7-25.

[14] Caballero, R., Hoshi, T., Kashyap, A. (2008), "Zombie Lending and Depressed Restructuring in Japan," American Economic Review, 98, pages 1943-77.

[15] Degryse, H., Kim, M., Ongena, S. (2009), "Microeconometrics of Banking", Oxford University Press.

[16] Detragiache, E., Garella, P., Guiso, L. (2000), "Multiple versus Single Banking Relationships: Theory and Evidence." Journal of Finance, 55, pages 1133-1161.

[17] Elsas, R. (2005) "Empirical Determinants of Relationship Lending", Journal of Financial Intermediation, 14, pages 32-57.

[18] Foglia, A., Laviola, S. Marullo Reedtz, P. (1998), "Multiple Banking Relationships and the Fragility of Corporate Borrowers." Journal of Banking and Finance 22, pages 1441-1456.

[19] Gopalan, R., Udell, G., Yerramilli, V. (2010), "Why do firms form new banking relationships?", Journal of Financial and Quantitative Analysis, forthcoming.

[20] Harhoff, D, Körting T. (1998), "Lending relationships in Germany – Empirical evidence from survey data", Journal of Banking and Finance, 22, pages 1317-1353.

[21] Ioannidou, V. and Ongena, S. (2010). "'Time for a Change': Loan Conditions and Bank Behavior when Firms Switch Banks", Journal of Finance, forthcoming.

[22] Jiangli, W., Unal, H., Yom, C. (2009), "Relationship Lending, Accounting Disclosure, and Credit Availability during Crisis", Journal of Money, Credit, and Banking, forthcoming.

[23] Khwaja, A, Mian, A. (2005), "Do Lenders Favor Politically Connected Firms? Rent Provision in an Emerging Financial Market". Quarterly Journal of Economics, 120, 1371-1411.

[24] Ongena, S., Smith, D. (2000), "Bank relationships: a Review," in Harker Patrick T., Stavros A. Zenios (eds.), Performance of Financial Institutions: Efficiency, Innovation, Regulation, pages 221-258.

[25] Panetta, F., Angelini P. (coordinators), Albertazzi, U., Columba, F., Cornacchia, W., Di Cesare, A., Pilati, A., Salleo, C., Santini, G., (2009), "Financial sector pro-cyclicality: lessons from the crisis", Bank of Italy Occasional Papers Series, n. 44.

[26] Petersen, M., Rajan, R. (1994), "The Benefits of Lending Relationships: Evidence From Small Business Data", Journal of Finance, 49, pages 3-37.

[27] Petersen, M., Rajan, R. (1995), "The effect of credit market competition lending relationships", The Quarterly Journal of Economics, CX, pages 407-443.

[28] Santos, J. (2011), "Bank loan pricing following the subprime crisis", Review of Financial Studies, Forthcoming

[29] Santos, J. and Winton, A. (2008), "Bank loans, bonds, and information monopolies across the business cycle", Journal of Finance 63, 1315-1359.

[30] Santos, J. and Winton, A. (2011), "Bank Capital, Borrower Power, and Loan Rates", mimeo.

Tables and Figures

Figure 1: Growth rate of loans to non financial firms

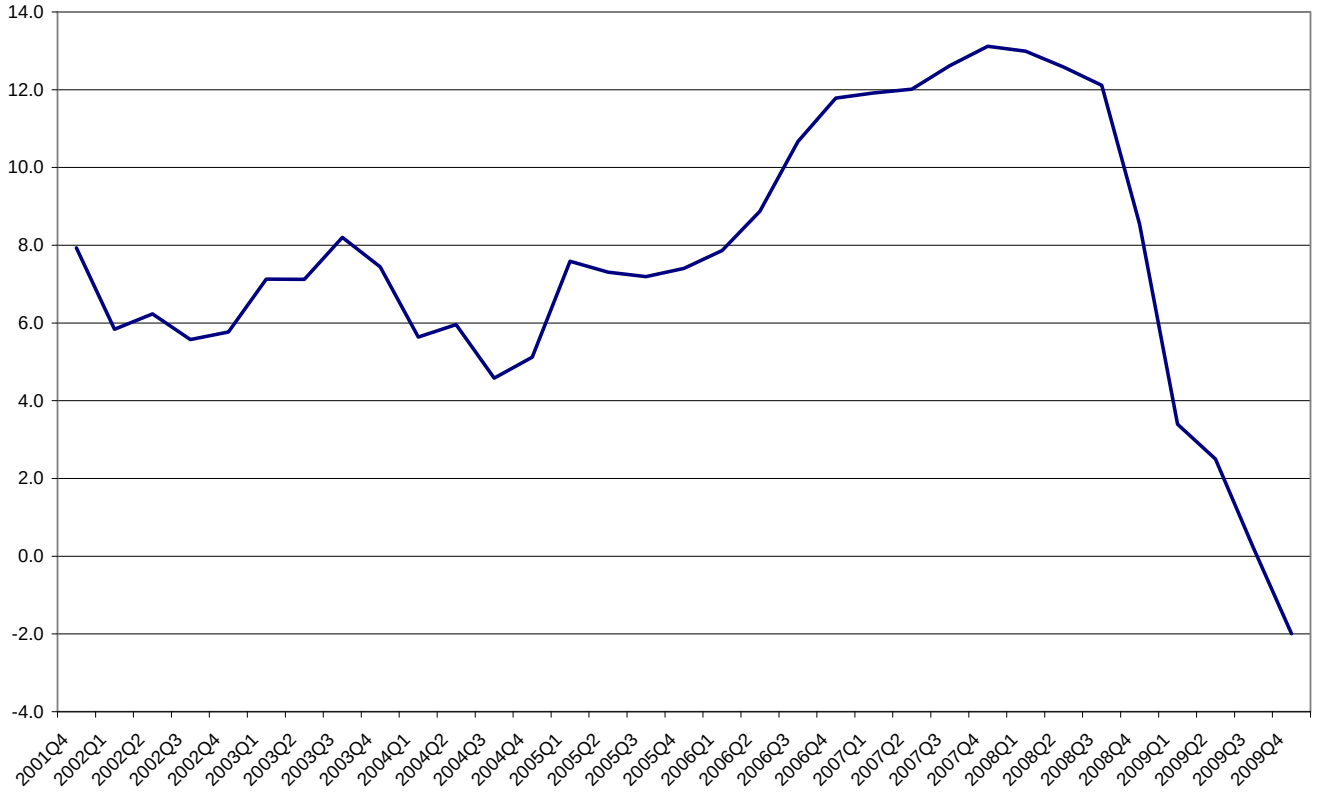

Table 1: Descriptive Statistics of firms

Firms in the sample	Mean	Median	p25	p75
Total assets (Mln Euros)	35.9	9.2	5.1	18.4
ROE	5.9	3.6	0	12.6
Leverage	70.5	74.6	58.3	85.9

Table 2: Descriptive Statistics: characteristics of firms (percentages)

SIZE		SECTOR	
Micro	4.8	Industry	45.4
Small	48.6	Services	38.1
Medium	38.0	Construction	9.1
Large	8.5	Other	7.4
LOCATION		**RATING**	
North	63.7	Sound ($1 \leq$ Z-score ≤ 3)	26.3
Center	20.1	Vulnerable ($4 \leq$ Z-score ≤ 6)	40.3
South	16.2	Risky ($7 \leq$ Z-score ≤ 9)	33.3

Table 3: Descriptive Statistics: distribution of interest rate changes

	Δ GRANTED CREDIT (%)	ΔGross APR
Mean	0.31	-3.61
Median	0	-2.78
p25	-65.78	-4.92
p75	0	-0.30
Std. Dev.	95.63	6.32

Table 4: Descriptive statistics: regressors

	Mean	Median	p25	p75
Distance (dummy)	0.33	0	0	1
Duration	5.9	7	5	7
Share_credit lines_granted	24.4	18.5	10.2	32.9
Share_credit lines_drawn	28.5	20.3	8.5	41.4
Drawn/Granted	68.9	70.8	25.4	98
Log credit_lines_granted	11.9	11.8	10.8	12.7
Log credit_lines_drawn	10.9	11.1	9.8	12.2

Table 5: Descriptive statistics: correlation matrix of regressors

	Distance	Duration	Share (granted)	Drawn/Granted	Log(credit)
Distance	1				
Duration	-0.1616	1			
Share (granted)	-0.0572	0.0771	1		
Drawn/Granted	0.0251	-0.0285	-0.0305	1	
Log credit_granted	-0.0539	0.1092	0.4113	-0.2120	1

Table 6: Credit quantity: main regressions

Dependent variable - column 1-5: $\Delta credit$ (%); column 6: Dummy(credit line cut=1)						
	(1)	(2)	(3)	(4)	(5)	(6)
VARIABLES	base	including drawn=0	intensive margin	drawn	winsorize 1-99	
distance	-2.895***	-0.602	-2.105*	-8.723*	-5.215**	1.108***
	(1.109)	(0.810)	(1.208)	(5.070)	(2.164)	(0.376)
duration	0.792***	0.831***	0.759***	5.383***	2.145***	-0.297***
	(0.268)	(0.196)	(0.292)	(1.220)	(0.510)	(0.0926)
share	0.526***	0.0616	0.702***	3.002***	2.813***	-0.0818***
	(0.0699)	(0.0467)	(0.0849)	(0.1689)	(0.164)	(0.0153)
drawn/granted	0.0680***	0.0592***	0.0746***	-0.635***	0.158***	-0.0135***
	(0.00967)	(0.00791)	(0.0111)	(0.0499)	(0.0213)	(0.00313)
$\log(\text{credit})_{t-1}$	-48.10***	-40.54***	-64.00***	-165.85***	-126.7***	-0.781**
	(1.684)	(1.138)	(1.988)	(3.576)	(4.063)	(0.314)
Observations	78432	153934	65946	65946	78432	78432

Robust standard errors in parentheses - All regressions include firm and bank fixed effects.
*** p<0.01, ** p<0.05, * p<0.1

Table 7: Interest rates - Base regression

Dependent variable - column 1-5: Δ Gross Annual Percentage Rate; column 6: Dummy(ΔAPR>0)						
	(1)	(2)	(3)	(4)	(5)	(6)
	base				-50<ΔAPR<50	
distance	0.169*	0.168*	0.167*	0.181**	0.173	2.354***
	(0.0880)	(0.0880)	(0.0880)	(0.0882)	(0.112)	(0.616)
duration	-0.223***	-0.224***	-0.223***	-0.236***	-0.251***	-1.093***
	(0.0207)	(0.0207)	(0.0207)	(0.0210)	(0.0265)	(0.152)
share	0.00770***	0.00727***	0.00741***		0.00900***	-0.0220
	(0.00246)	(0.00246)	(0.00246)		(0.00325)	(0.0149)
drawn/granted	-0.00522***	-0.00483***	-0.00547***	0.00458***	-0.00517***	-0.00967*
	(0.000876)	(0.000887)	(0.000880)	(0.000778)	(0.00113)	(0.00561)
log(credit)$_{t-1}$	0.398***	0.388***	0.386***		0.329***	0.0269
	(0.0453)	(0.0455)	(0.0455)		(0.0602)	(0.254)
dummy(Δgranted credit>0)		-0.231***				
		(0.0731)				
dummy(Δdrawn credit>0)			-0.234***			
			(0.0678)			
share (granted credit)				0.00504		
				(0.00399)		
log(granted credit)$_{t-1}$				0.580***		
				(0.0890)		
Observations	50809	50809	50809	50809	48486	50809

Robust standard errors in parentheses - All regressions include firm and bank fixed effects.
*** p<0.01, ** p<0.05, * p<0.1

Table 8: Firm Heterogeneity - Risk. Credit quantity

Dependent variable : $\Delta credit$ (%)					
	(1)	(2)	(3)	(4)	(5)
VARIABLES	High risk	High lever.	Low ROE	Small	Low Tangible
distance	-2.747*	-1.898	-2.792**	-2.834*	-2.459*
	(1.454)	(1.531)	(1.406)	(1.712)	(1.295)
duration	0.745**	0.665*	0.624*	0.674	0.446
	(0.356)	(0.382)	(0.347)	(0.479)	(0.330)
share	0.336***	0.343***	0.377***	0.305***	0.467***
	(0.0970)	(0.0949)	(0.0933)	(0.112)	(0.0909)
drawn/granted	0.0803***	0.0844***	0.0640***	0.0569***	0.0690***
	(0.0138)	(0.0145)	(0.0128)	(0.0153)	(0.0120)
$\log(\text{credit})_{t-1}$	-48.73***	-47.96***	-47.47***	-43.14***	-46.98***
	(2.267)	(2.206)	(2.166)	(2.422)	(2.146)
distance*dummy	-0.268	-0.0843	0.209	0.0210	1.015
	(0.590)	(0.589)	(0.609)	(0.581)	(0.667)
duration*dummy	-1.123	-3.682	-0.904	-0.487	-3.214
	(2.314)	(2.328)	(2.374)	(2.236)	(2.792)
share*dummy	0.312*	0.274	0.257	0.431***	0.00493
	(0.161)	(0.170)	(0.167)	(0.153)	(0.171)
drawn/granted*dummy	-0.0256	-0.0355*	0.00640	0.0181	-0.0137
	(0.0212)	(0.0215)	(0.0222)	(0.0209)	(0.0244)
$\log(\text{credit})_{t-1}$*dummy	4.619	2.460	1.197	-11.53***	-1.494
	(3.793)	(3.962)	(3.980)	(3.593)	(3.972)
Observations	67213	64105	67312	67321	67321

Robust standard errors in parentheses - All regressions include firm and bank fixed effects.
*** p<0.01, ** p<0.05, * p<0.1

Table 9: Firm Heterogeneity - Interest rate

Dependent variable: Δ Gross Annual Percentage Rate					
	(1)	(2)	(3)	(4)	(5)
VARIABLES	High risk	High lever.	Low ROE	Small	Low Tangible
distance	0.207*	0.265**	0.170	0.192	0.182*
	(0.113)	(0.120)	(0.112)	(0.131)	(0.101)
duration	-0.161***	-0.196***	-0.198***	-0.239***	-0.224***
	(0.0273)	(0.0293)	(0.0268)	(0.0350)	(0.0250)
share	0.00444	0.00620*	0.00520*	0.00526	0.00562*
	(0.00312)	(0.00331)	(0.00312)	(0.00381)	(0.00293)
drawn/granted	-0.00367***	-0.00311**	-0.00561***	-0.00381***	-0.00479***
	(0.00123)	(0.00129)	(0.00112)	(0.00131)	(0.00106)
$\log(\text{credit})_{t-1}$	0.352***	0.340***	0.441***	0.377***	0.394***
	(0.0556)	(0.0587)	(0.0559)	(0.0630)	(0.0529)
distance*dummy	-0.124	-0.322*	-0.0174	-0.0552	-0.0832
	(0.184)	(0.184)	(0.185)	(0.177)	(0.223)
duration*dummy	-0.206***	-0.0976**	-0.123***	0.0107	-0.0369
	(0.0458)	(0.0456)	(0.0459)	(0.0442)	(0.0531)
share*dummy	0.00556	0.00282	0.00431	0.00126	0.00352
	(0.00575)	(0.00563)	(0.00568)	(0.00525)	(0.00649)
drawn/granted*dummy	-0.00229	-0.00424**	0.00344*	-0.00182	0.000754
	(0.00189)	(0.00191)	(0.00201)	(0.00186)	(0.00222)
$\log(\text{credit})_{t-1}$*dummy	0.142	0.137	-0.165	0.0604	0.00605
	(0.107)	(0.104)	(0.105)	(0.0960)	(0.119)
Observations	44023	42137	44081	44084	44084

Robust standard errors in parentheses - All regressions include firm and bank fixed effects.

*** p<0.01, ** p<0.05, * p<0.1

Table 10: Bank Heterogeneity - Credit quantity

Dependent variable : $\Delta credit$ (%)					
	(1)	(2)	(3)	(4)	(5)
VARIABLES	Low capital	High Interb.	High Securit.	Hi Ch-offs	Top10
distance	-1.957	-1.035	-0.739	6.244*	1.586
	(1.464)	(2.487)	(1.783)	(3.481)	(1.632)
duration	-0.619*	-0.923	-0.184	-0.173	0.106
	(0.374)	(0.622)	(0.449)	(0.885)	(0.379)
share	-0.433***	-0.552***	-0.437***	-0.337***	-0.440***
	(0.0355)	(0.0583)	(0.0422)	(0.0728)	(0.0393)
drawn/granted	0.482***	0.434***	0.480***	0.501***	0.455***
	(0.0153)	(0.0288)	(0.0203)	(0.0450)	(0.0188)
$\log(\text{credit})_{t-1}$	-11.30***	-10.38***	-12.47***	-11.00***	-11.58***
	(0.630)	(0.990)	(0.729)	(1.250)	(0.680)
distance*dummy	1.840	0.0618	-0.351	-7.771**	-3.911**
	(1.784)	(2.643)	(2.039)	(3.597)	(1.946)
duration*dummy	0.121	0.437	-0.555	-0.427	-1.229**
	(0.505)	(0.680)	(0.544)	(0.924)	(0.519)
share*dummy	0.0402	0.160***	0.0456	-0.0820	0.0443
	(0.0379)	(0.0579)	(0.0421)	(0.0727)	(0.0401)
drawn/granted*dummy	-0.0377**	0.0291	-0.0264	-0.0407	0.00495
	(0.0174)	(0.0290)	(0.0213)	(0.0450)	(0.0200)
$\log(\text{credit})_{t-1}$*dummy	1.487***	-0.0734	2.598***	0.623	1.709***
	(0.496)	(0.893)	(0.604)	(1.175)	(0.570)
Observations	76837	76837	76837	76820	76837

Robust standard errors in parentheses - All regressions include firm and bank fixed effects.
*** p<0.01, ** p<0.05, * p<0.1

Table 11: Bank Heterogeneity - Interest rate changes

Dependent variable: Δ Gross Annual Percentage Rate					
	(1)	(2)	(3)	(4)	(5)
VARIABLES	Low capital	High Interb.	High Securit.	Hi Ch-offs	Top10
distance	0.102	-0.0862	0.222*	0.0819	0.171
	(0.121)	(0.212)	(0.125)	(0.290)	(0.125)
duration	-0.215***	-0.247***	-0.109***	0.0321	-0.171***
	(0.0307)	(0.0495)	(0.0325)	(0.0728)	(0.0291)
share	0.0108***	0.00645	0.00942***	-0.00907	0.00648*
	(0.00325)	(0.00542)	(0.00337)	(0.00671)	(0.00333)
drawn/granted	-0.00298**	-0.0102***	-0.0119***	-0.00425	-0.00613***
	(0.00126)	(0.00247)	(0.00152)	(0.00421)	(0.00157)
$\log(\text{credit})_{t-1}$	0.344***	0.601***	0.302***	0.399***	0.386***
	(0.0550)	(0.0852)	(0.0559)	(0.116)	(0.0552)
distance*dummy	0.133	0.295	-0.0602	0.108	0.0299
	(0.139)	(0.222)	(0.147)	(0.297)	(0.147)
duration*dummy	-0.0208	0.0229	-0.173***	-0.273***	-0.103***
	(0.0393)	(0.0533)	(0.0404)	(0.0756)	(0.0388)
share*dummy	-0.00492	0.00130	-0.00123	0.0177***	0.00199
	(0.00334)	(0.00540)	(0.00346)	(0.00675)	(0.00348)
drawn/granted*dummy	-0.00374***	0.00537**	0.00840***	-0.00100	0.00110
	(0.00142)	(0.00253)	(0.00164)	(0.00423)	(0.00168)
$\log(\text{credit})_{t-1}$*dummy	0.0898**	-0.214***	0.115**	-0.00147	0.0213
	(0.0443)	(0.0794)	(0.0481)	(0.113)	(0.0487)
Observations	50567	50567	50567	50567	50567

Robust standard errors in parentheses - All regressions include firm and bank fixed effects.

*** p<0.01, ** p<0.05, * p<0.1

Table 12: Pre-Post-Crisis

	$\Delta credit$ (%)	Δ Gross APR
	(1)	(2)
distance	-1.956	-0.0827
	(1.361)	(0.0932)
duration	2.420***	-0.192***
	(0.874)	(0.0568)
share	0.477***	0.00419*
	(0.0914)	(0.00232)
drawn/granted	0.0896***	-0.00379***
	(0.0131)	(0.00101)
log(credit)$_{t-1}$	-50.91***	0.332***
	(2.287)	(0.0449)
distance*crisis	-0.941	0.251*
	(1.767)	(0.129)
duration*crisis	-1.628*	-0.0310
	(0.915)	(0.0606)
share*crisis	0.0487	0.00352
	(0.116)	(0.00340)
drawn/granted*crisis	-0.0169	-0.00143
	(0.0166)	(0.00135)
log(credit)$_{t-1}$*crisis	2.816	0.0662
	(2.856)	(0.0642)
Observations	145760	97248

Robust standard errors in parentheses- All regressions include firm and bank fixed effects.
*** p<0.01, ** p<0.05, * p<0.1