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Loan maturity and renegotiation: evidence from the lending practices of large and small banks

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February, 2007

Abstract

Corporate finance theories suggest that problems of asymmetric information and moral hazard in credit markets can be addressed by choosing short-term maturities. Theories of debt renegotiation suggest that the credibility of the implicit commitment to not make concessions to insolvent borrowers, which would undermine the effectiveness of short-term maturities, is related to the characteristics of the lender and in particular to its size. The joint implication of these theories is that, for given borrower's characteristics, small banks should be less willing to issue long-term loans. Using information on Italian banks, this study presents a cross-sectional analysis of the maturity of loans to firms and shows a first evidence consistent with this prediction. With more opaque borrowers, like small and innovative firms, other supply-side features (special regulatory regimes favouring lending relationships and economies of scale in the screening technology) are also shown to be relevant in the determination of loan maturity.

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1 Introduction

The recent and unfinished wave of mergers and acquisition experienced by both the American and the European commercial banking industries has raised questions about its desirability and consequences.

In a recent empirical study, Berger *et al.* (2005a) produce evidence consistent with larger banks having lower incentives to collect soft information and, in particular, to lend to small firms which are typically regarded as relatively opaque borrowers. These findings provide support to theories of incomplete contracts, as those in Grossman and Hart (1986) and Hart and Moore (1990), whose basic insight is that incentives are influenced by the allocation of control. More specifically they validate the predictions of Stein (2002) arguing that large credit institutions, with their centralized organizations, do not incentivize local loan officers to collect soft information, which is necessary to evaluate the creditworthiness of small firms.

Adopting a similar perspective, also this paper looks at how banks differ in their propensity to operate in opaque markets. Instead of considering credit to small firms, however, the focus is on long-term loans whose opaqueness derives from the fact that short-term maturities can be a useful device to address problems of asymmetric information and moral hazard.

The interest in this type of analysis derives from the implications of models on debt renegotiation whose basic insight is that the credibility of the commitment to not make concessions to insolvent borrowers, for example by conceding extensions of the maturity which would undermine the effectiveness of short-term loans, is related to the characteristics of the lender and in particular to its size. The direct implication is that large banks find short-term loans to be relatively ineffective in screening or disciplining borrowers and, therefore, should be more willing to concede long-term maturities.[1]

All existing empirical studies of debt's maturity neglects the importance of bank' size and, more generally, of all supply-side determinants. While this is fully acceptable with some forms of financing, like publicly held bonds, it is much less so in studies of bank credit, characterized by low costs of renegotiation.

Beyond renegotiation there are other reasons why supply-side features might matter. Large banks may benefit from the presence of economies of scale in the technology for screening more technical and innovative projects and the consequent lower opaqueness could be reflected in longer maturities. A similar effect could be produced by some specific regulatory regimes which,

[1] This does not imply that large banks are inefficient since long-term maturity can bring benefits too. As it will be argued below, one is to reduce short-termism.

as will argued below, may encourage relationship lending to small borrowers.

Using information on Italian banks, this work presents a cross-sectional analysis of the maturity of loans to firms, including both demand and supply-side determinants. The main empirical findings provide support to theories on renegotiation suggesting that the benefits of lending at short maturities reduce with increasing bank size. Also as predicted, special regulatory regimes and economies of scale in the screening technology are found to be relevant with specific classes of borrowers, like small and innovative firms respectively.

The remainder of the paper is organized as follows. The next section reviews both the theoretical and the empirical literature on maturity. The third section presents the dataset and a set of descriptive tables. The fourth section discusses the results of the econometric analysis. The last section concludes.

2 The literature on the maturity of debt

2.1 The theory

In a seminal paper, Myers (1977) provides a theory of *debt overhang* and of the associated problem of *under-investment*. The idea is that if before debt is repaid a new profitable project comes out, stockholders or managers might decide not to undertake it if a sufficiently large proportion of its returns will have to be used to repay bondholders. Since short-term debt is repaid, reissued and repriced more often, the main result is that firms for which the problem of under-investment is more acute (those with high growth opportunities) should prefer short maturities. This framework is further generalized in Hart and Moore (1995) and Zwiebel (1996), where short-term reduces under-investment but may imply costs in terms of over-investment, a notion introduced by Jensen (1986). Relatedly, Stulz and Johnson (1985), Berkovitch and Han (1990) and Diamond (1993) show how the maturity of debt is connected with its seniority and covenants.

Berglöf and von Thadden (1994) and, in a dynamic framework, Albuquerque and Hopenhayn (2004) present a model in which *non verifiability of the returns* implies that lenders are willing to lend only if, in case of default, they have the right to liquidate the project. One empirical prediction is that the larger the proportion of the (long-term) returns which is not verifiable (the higher the opacity of the borrower) the larger the share of short-term debt in the optimal capital structure.

One feature which is shared by all these papers is that they are all based on the assumption of *absence of renegotiation*. Indeed, if allowed, renego-

tiation would imply that in any moment an investment project is started, continued or liquidated if and only if in that moment it is efficient to do so, making the issues of over- and under-investment as well as the problem of inefficient liquidation disappear.[2]

A different perspective is offered by Flannery (1986) with the so-called *signalling hypothesis*, according to which the choice of short maturities may help good entrepreneurs to signal their quality to the market. The main idea is that good types may be relatively more willing to incur the liquidation risk which is inherent with short term finance (the possibility that the lender, after having observed the first period results, decide not to renew the funding) and in equilibrium they decide to do so because they get rewarded with lower interest rates or more funds. Diamond (1991) elaborates on the basic framework by analyzing how the equilibrium vary with the (observable) risk and shows that the connection between risk and maturity may be non-monotonic.

Also these models neglect renegotiation. Even if insolvency reveals that the project is a bad one, it does not mean that the optimal strategy is its liquidation. On the contrary, given that losses already realized are sunk, it may be the case that the efficient thing to do is postponing the maturity if not even investing additional money. A short-term loan where liquidation is not implemented is *de facto* a long-term loan and cannot serve as a screening device.

This type kind of mechanisms is called *soft budget constraint* since it envisages situations where the budget constraint initially established is eventually violated. What is important to point out is that in this case allowing renegotiation does not necessarily make the use of short-term maturities ineffective. The point is that, as shown in Dewatripont and Maskin (1995), the degree of "softness" is likely to depend on bank size. For example, if a loss-making project can be continued only by investing additional funds, if these funds can be brought only by other banks (otherwise the project would become too large for an individual intermediary that is trying to diversify risk) and if the coordination between different lenders is costly (for example, there may be free-riding in the monitoring activity) then the gains from continuation are reduced and liquidation becomes more likely.[3] The conclu-

[2] Note that in Zwiebel (1996) as well as in Berglöf and von Thadden (1994) renegotiation is formally allowed but its efficacy is partial. In this sense, these models can be included in the family of those with no renegotiation.

[3] It is useful to point out that this reasoning does not hold only when additional capital has to be invested at the refinancing stage. Any kind of concession, even a simple time-extension of the repayments, implies some costs for the lender. Depending on the size of the project relative to that of the bank, these costs can make the total exposure toward the borrower too large.

sion is that smaller banks, which are better able to credibly commit not to continue loss-making investment projects and therefore to benefit from the choice of a short-term maturity, can be expected to make a less intense use of long-term loans.

2.2 The empirical evidence

There is a recently growing body of empirical literature on the maturity of debt but only few papers focus on loans and none of them considers the role of the supply side.

Barclay and Smith (1995) study the maturity of *total debt* of firms, using a sample of companies listed on the stock market and provides some empirical evidence about the under-investment problem (firms in non regulated industries or with small sizes or high market-to-book ratios are financed with shorter-term debt). Johnson (2003) extends their analysis by taking into consideration the simultaneity of maturity and leverage. Demirgüç-Kunt and Maksimovic (1999) and Magri (2006) find that maturity is affected by structural factors like the level of financial development and the quality of the legal enforcement. In particular, Magri (2006) shows how the importance of short-term maturities as a tool for facing issues of information asymmetry decreases with the efficiency of local courts. This is an interesting result since it confirms that it makes sense to look at the supply side. The analysis below differ from Magri (2006) since it uncovers differences across banks, rather than across local markets.

Ortiz-Molina and Penas (2005) and Dennis and Sharpe (2005) use data on *individual loans* to small firms to show that short-term loans are used to solve problems of asymmetric information, without taking into consideration possible supply side effects. Berger *et al.* (2005b), using a dataset with individual loans to small firms, produce evidence which is coherent with the signalling hypothesis. Though their regressions also include, as control variables, some measure of the bank's balance sheet (total assets and bad loans), their sample includes only large banks and it is therefore not suitable to understand the role of the supply side.

3 The description of the data

The dataset derives from the Bank of Italy prudential supervision statistical reports (*Matrice dei Conti*) and contains information about the amount of loans to non financial firms of each intermediary in the Italian banking sector, distinguished by maturity (short-term and long-term loans), status

(performing and non-performing loans), type of guarantee, industry, size, location, and other features of the borrower. Long-term loans are defined as those with an initial maturity of more than 18 months. All observations are taken at the end of 2004.[4]

Differently from previous analyses, this work uses information from the balance-sheet of lenders, rather than from those of borrowers or from individual loans. The importance of this peculiarity is connected with the practice of borrowing simultaneously from several banks, very common in Italy as documented by Detragiache *et al.* (2000), which implies that a study on the supply-side determinants is better done with information from the balance-sheet of lenders.

The dataset contains a dummy for small banks, several balance-sheet figures (total intermediated funds, capital, demand deposits, saving accounts, issued bonds) and a set of dummies for special legal forms like, in particular, that of *Banche di Credito Cooperativo* (BCCs). Small banks are defined using the official classification of the Bank of Italy which groups banks into seven categories taking into consideration several criteria. This classification is further simplified by creating a dummy for small banks, who includes the first five categories.[5] BCCs are small cooperatives banks enjoying some fiscal advantages but forced to operate into the province in which they are established. Their borrowers are local entrepreneurs and should be member of the cooperative. Angelini *et al.* (1998) have shown that these features induce BCCs to concentrate on businesses which they can closely monitor through a closer proximity with their borrowers and stimulate relationship-lending, mostly to the advantage of small firms.

Table 1 contains few summary statistics. The number of banks in the dataset is 711, including 438 BCCs.[6] The market shares of large credit institutions is equal to 71 per cent. The size difference between large and small banks is substantial (total lending to non financial firms by a large institution is on average almost 30 times the value for a small one). The large number of very small banks implies a certain degree of skewness of the

[4]The process of deregulation which brought in 1993 the new banking law (*Testo Unico Bancario*) allowed, among other things, any bank to make long-term loans and started a process of convergence toward an equilibrium with a more intense use of long-term loans (Albertazzi *et al.*, 2006). These temporary dynamic aspects are neglected by taking observations at the end of 2004. It is worthwhile to mention that all qualitative results have been found to hold even including observations from previous years.

[5]Details can be found in Banca d'Italia (2004).

[6]The total number of banks in Italy at the end of 2004 was equal to 778. The missing intermediaries are mainly foreign banks from EU countries other than Italy, which are not requested to supply these statistics to Banca d'Italia. Other foreign banks are included in the dataset but they count for only 0.3 per cent of total lending to non financial firms.

distribution which is reflected in the even larger differences between large and small banks, if median values are considered; it is for this reason that the econometric analysis will consider the ratio of long-term to total loans which does not present this feature.

As shown in Table 2, there is a large variation in the ratio of long-term to total loans across different sectors, probably reflecting differences in asset duration which will have to be taken into account in the estimates.

Small firms are often viewed as opaque borrowers demanding shorter-term loans (signalling hypothesis). The raw data in table 3, showing that 55 per cent of loans to small firms have a long-term maturity against 48 for larger ones, suggest that other mechanisms can be at work. One possibility is given by the notion of *short-termism*, denoting the behavior of borrowers that, in order to distort lender's beliefs about their quality, inflate short-term results even if this reduces total profitability. If dimensional growth takes place through investments in new plants or technologies, usually long-term projects, then smaller firms with a potential for growth will demand longer-term loans. Depending on whether the effects of short-termism dominate those of opacity, in equilibrium we may observe small firms demanding more or less long-term loans.

A further distinction is between innovative and traditional firms. Given that understanding innovative investment projects may require a high level of technical knowledge, it follows that innovative firms are likely to be relatively opaque and to make a less intense use of long-term loans. The descriptive statistics in table 3 (57 per cent of the loans to innovative firms have long-term maturities, against 49 for traditional ones) do not provide support to this conjecture. At the same time, table 4 implies that the share of large banks in this market segment is relatively large and that is even more so when only long-term loans are considered. On one hand, this is coherent with the idea that large banks might be better able to deal with these firms (for example, only the credit volumes of large intermediaries may justify the hiring of specialized experts in the evaluation of more technical projects). On the other hand, this might explain why looking at raw data it is not possible to detect shorter-term loans for innovative firms.

Firms can differ in their location. The vastly documented poorer legal enforcement and larger black economy of Southern Italy make local borrowers more opaque, a prediction coherent with the descriptive statistics of table 3 where firms located in this area show a smaller ratio of long-term to total loans than that of the other borrowers (47 and 50 per cent, respectively).

With regard to the size of the bank, the focus of the analysis, table 4 shows that the ratio of long-term to total loans for small banks is larger than that of the other credit institutions, 52 and 49 per cent and this seems to

contradict the conjecture that the benefits of lending at short maturities are larger with smaller intermediaries. Again, this finding could just be due to composition effects as suggested by table 4 where the difference between the market share of large and small banks (71 and 29 per cent, respectively) almost disappears by considering only loans to small firms, those making a more intense use of long-term loans (table 3).

Another interesting distinction is between BCCs and other banks. As already argued, if these institutions may obtain project screening through long-term relationships, they should show a higher propensity to lend long-term and such effect should be more visible with small borrowers.[7]. In Table 4 BCCs show an average ratio of long-term to total loans which is slightly smaller than that of the remaining banks although, for loans to small firms only, the reverse is true. Even in this case the true differences might be hidden by composition effects and, in particular, by the fact the BCCs are also all small banks.

4 The econometric analysis

4.1 The benchmark model

The benchmark model is given by the following regression equation.

$$\begin{aligned} Long_{i,j} = \beta_0 + \beta_1\, Smallf_i + \beta_2\, South_i + \beta_3\, Inno_i + \beta_4'\, Sector_i + \\ + \beta_5\, Smallb_j + \beta_6\, Bcc_j + \ \beta_7\, Ics_j + \eta_j + \varepsilon_{i,j} \end{aligned} \tag{1}$$

The variable on the left-hand side, $Long_{i,j}$, is the ratio of long-term to total loans granted by bank j to category of borrowers i. $Smallf_i$ is a dummy equal to one when category i is composed of small borrowers. $South_i$ indicates borrowers located in Southern Italy. $Inno_i$ denotes technologically innovative borrowers while $Sector_i$ is a vector of dummies for the corresponding industrial sector.

A second group of regressors concerns the characteristics of the bank: $Smallb_j$ is a dummy equal to one when bank j is small; Bcc_j is a dummy for BCCs. An important control is given by Ics_j, a dummy for former *istituti di credito speciale.* These are banks with a historical vocation to make long-term loans since they were the unique institutions which could do so even

[7]Firms with other ways to address asymmetric information may prefer to avoid being involved in the informational capture of lending relationships (the increase of a bank's market power deriving from the presence of a long-term relationship).

before the introduction of the new banking law in 1993.[8]

Finally, η_j represents a standard fixed effect for bank j, controlling for possible unobservable differences in the behavior of banks (like managers preferences), while $\varepsilon_{i,j}$ is an error component which is assumed to satisfy the usual regularity conditions.[9]

The results are shown in column 1 of table 6. The reported and not reported diagnostic tests do not detect mis-specification issues. Almost 20 per cent of the variance of the dependent variable is connected with the fixed effects, confirming the usefulness of the panel specification adopted. The coefficients of all the regressors turn out to be statistically significant, thanks also to the large sample size, and imply quantitatively important effects.

A first interesting result is that loans to small borrowers tend to have a longer maturity. The coefficient for $Smallf_i$ is equal to a sizeable 16 per cent. As previously argued, a possible way to interpret this result is that short-termism more than compensates the effect of opacity. The evidence available so far is mixed: Berger *et al.* (2005b) find no significant effect of the loan size; Ortiz-Molina and Penas (2005) find a positive effect.[10]

The coefficient for $Inno_i$, -4 per cent, is significant and negative, coherently with the view that these firms tend to be relatively opaque. Similarly, the coefficient for the dummy $South_i$, -5 per cent, is significant and negative.

The most important results concerns $Smallb_j$. The estimated coefficient, -9 per cent, is significant and has the predicted negative sign, coherently with the idea that the tougher stance of small banks at the refinancing stage makes them more credibly committed to short-term loans.

The coefficient for Bcc_j, 4 per cent, is positive and significant, validating the hypothesis that these intermediaries can more easily develop lending relationships sheltering them from the consequences of information asymmetries and moral hazard. However, it should be noted that all BCCs are also small banks and that the total effect of the two dummies is negative.[11]

[8] Former *istituti di credito speciale* still have non-negligible market shares (9 per cent of total lending, 15 per cent of total long-term lending).

[9] The model requires a GLS estimator based on the hypothesis that the individual unobservable components are uncorrelated with the remaining regressors. Relaxing these assumptions would prevent an estimation of the regression coefficients for the supply-side determinants.

[10] The picture is even more mixed for papers not exclusively dealing with bank loans. Barclay and Smith (1995) and Dennis and Sharpe (2005), looking at total debt of firms, find a non monotonic effect of size on maturity; Magri (2006) finds a postive correlation; Demirgüç-Kunt and Maksimovic (1999) find a negative one, though only in countries with a large banking sector. Guedes and Opler (1996), using bond issues, get a negative sign.

[11] A statistical test confirms that their sum turns out to be significantly different from zero at a 5 per cent level of sigificance.

Finally, and not surprisingly, the coefficient for ICS_j is a sizeable 50 per cent confirming that these intermediaries have remained highly specialized in long-term lending.

4.2 The interaction terms

Column 2 of Table 6 presents the results for the model with interaction terms, given by the following regression equation:

$$\begin{aligned} Long_{i,j} = \beta_0 + \beta_1\, Smallf_i + \beta_2\, South_i + \beta_3\, Inno_i + \beta_4'\, Sector_i + \\ + \beta_5\, Smallb_j + \beta_6\, Bcc_j + \ \beta_7\, Ics_j + \\ + \beta_8\, Inno_i * Smallb_j + \beta_9\, Smallf_i * Bcc_j + \eta_j + \varepsilon_{i,j} \end{aligned} \tag{2}$$

The coefficient for $Inno_i * Smallb_i$, -3 per cent, is negative and significant, consistent with the idea of economies of scale in the technology for screening more technical and innovative firms. The interaction term $Smallf_i * Bcc_j$ has a positive and significant coefficient, 6 per cent, and its presence eliminates the statistical significance of Bcc_j, suggesting that only small borrowers can considerably benefit from lending relationships. The sign and the statistical significance of all other coefficients for the non-interacted variables remain unaltered.[12]

4.3 The role of guarantees

The previous findings do not take into consideration that loans are often collateralized and that guarantees can be used by banks to address issues of asymmetric information and moral hazard and, in this way, to lengthen the maturity. It follows that differences in loans' maturity across banks could in principle reflect differences in the use of guarantees rather than differences in the benefits of lending at short maturities.

As shown in Table 5 only 42 per cent of total loans have been issued in the absence of any kind of guarantee and that these are made by less than one third of long-term loans. Symmetrically, 33 per cent of total loans are assisted by real guarantees and almost 90 per cent of them have a long-term maturity.

It is therefore natural to ask whether the above results hold even after controlling for the presence and the type of the guarantee assisting the loan.

[12] It is important to point out that all possible interaction terms between demand and supply-side characteristics have been considered and that only these two turn out to be significant.

Denoting with index h the type of guarantee, this can be done by adding to the set of regressors a vector of dummies denoting the type of guarantee, $Guar_h$. The regression equation becomes:

$$Long_{i,j,h} = \beta_0 + \beta_1\, Smallf_i + \beta_2\, South_i + \beta_3\, Inno_i + \beta_4'\, Sector_i + \\ + \beta_5\, Smallb_j + \beta_6\, Bcc_j + \beta_7\, Ics_j + \beta_8'\, Guar_h + \eta_j + \varepsilon_{i,j} \qquad (3)$$

Column 3 of table 6 shows that the dummies for all types of collateral are highly significant and with the predicted pattern: the presence of a real collateral (the dummy omitted in the regression) is associated with the highest proportion of long-term loans and the effect decreases monotonically if less and less valuable guarantees are supplied, reaching the minimum with loans without guarantee whose long-term to total loan ratio is 60 per cent lower.[13] The high explanatory power of $Guar_h$ determines a slight reduction of the absolute value of the coefficients for the other regressors. Nonetheless, all the other coefficients preserve sign and statistical significance. This is true also in the specification with the interaction terms (column 4), with the only exception of $Inno_i * Smallb_j$ which loses significance. This last result suggests that, although large banks are less reluctant to lend long-term to innovative firms, they do not give up requiring additional guarantees.[14]

4.4 The effect on bad loans

Some of the results presented above may be subject to different interpretations. In particular, the explanation supplied of the negative coefficient for $Smallb_j * Inno_i$, based on the idea of scale-economies in the activity of monitoring and screening innovative firms, could in principle justify even the negative coefficient for $Smallb_j$ which, on the contrary, has been interpreted

[13] The sample size increases considerably form 34911 to 91481 observations. The dataset used for the benchmark model has been derived from that used in the regression with guarantees by reaggregating observations across all different values taken by $Guar_h$ (so to make the index h disappear). This was done in order to avoid an artificial duplication of observations but it is irrelevant for the results. The estimation of the benchmark model with the disaggregated dataset gives virtually the same coefficients but an R-square which is halved.

[14] It is important to point out that $Guar_h$ is possibly endogenous since maturity and guarantees are likely to be chosen simultaneously. For this reason it has been excluded from the benchmark equation which is meant to be a reduced form model. The fact that all main results from the benchmark equation are true in the specification with $Guar_h$ suggests that they would be robust even if such simultaneity were explicitely modeled (an analysis which is beyond the scope of this paper).

as showing the effects of the higher level of commitment that small banks can achieve.

In order to tell apart these two alternative interpretations it is useful to look at their implications for non performing loans. If the negative coefficient for $Smallb_j$ were connected with economies of scale in the technology for screening and monitoring all projects (and not just innovative ones), then large banks would be likely to show lower amounts of bad loans. The opposite is true if the mechanism behind the negative coefficient for $Smallb_j$ is, as claimed above, that short maturities are a more useful disciplining and screening device for small banks which can credibly commit to them.

It is therefore interesting to check what is the effect on the amount of bad loans of the variables already used to explain $Long_{i,j}$. Denoting $Bloan_{i,j}$ the proportion of loans to firms' class i from bank j which are classified as non performing, this can be done by estimating the following equation:

$$\begin{aligned} Bloan_{i,j} = \gamma_0 + \gamma_1\, Smallf_i + \gamma_2\, South_i + \gamma_3\, Inno_i + \gamma_4'\, Sector_i + \\ + \gamma_5\, Smallb_j + \gamma_6\, Bcc_j + \ \gamma_7\, Ics_j + \eta_j + \varepsilon_{i,j} \end{aligned} \tag{4}$$

The results from this estimation are displayed in table 7. Again, reported and non-reported diagnostic tests do not detect mis-specification issues.[15]

The most important result of column 1 of table 7 concerns $Smallb_j$. If large banks made a more intense use of long-term loans because they have a better monitoring and screening technology, then they should show less bad loans than small intermediaries. The significant and negative coefficient estimate for $Smallb_j$, -4 per cent, does not support this alternative interpretation while it is coherent with the idea that large banks are more subject to issues of soft budget constraints.

As expected, the coefficients for $Inno_i$, $South_i$, and $Smallf_i$, all dummies denoting opaque borrowers, are all significantly greater than zero.[16]

If the presence of lending relationships benefiting small firms more than others is what drive the positive sign for both for Bcc_j and $Bcc_j * Smallf_i$ in the equations for $Long_{i,j}$, then these regressors should exert a negative effect on $Bloan_{i,j}$. These predictions are both validated in columns 1 and 2 of table 7 displaying the specifications with and without the interaction term $Bcc_j * Smallf_i$.

Focussing on loans to innovative firms, the coefficient for $Inno * Smallb_j$, not significantly different from zero, suggests that large banks fully use their

[15] The low explanatory power of these regressions does not seem worrying given the nature of the dependent variable which is subject to some degree of subjectivity.

[16] Short-termism does not have direct implications for the amount of bad laons. Accordingly, $Smallf_i$ is expected to capture just the effect of opaqueness.

technological advantage in order to lengthen the maturity with no beneficial effects on the level of risk taken.

Finally, it is interesting to point out that virtually identical conclusions can be drawn from columns 3 and 4 of table 7 reporting the estimation outcome for analogous regressions including also controls for the type of guarantee.

4.5 Robustness checks

A first check consisted in verifying if the results are influenced by the exclusion of the observations concerning loans to state owned firms, to non financial holdings and loans issued by subsidiaries of foreign banks. State owned firms were excluded in order to clean the dataset from borrowers whose behavior may be driven by considerations other than profit maximization. Non financial holdings were excluded because for these firms it is not possible to determine without ambiguity which industrial sector they belong to. Subsidiaries of foreign banks were excluded because their balance sheet does not reflect the real characteristics of these intermediaries, often belonging to large international groups. The benchmark model has been re-estimated including also these observations and, as shown in column 1 of Table 8, with no appreciable changes of the results.[17]

The variable $Long_{i,j}$ neglects bad loans, for which the original maturity is unknown. One may therefore wonder if the results hold even if the amount of non performing loans of bank j with borrowers' type i is added to its denominator. Column 2 shows that this change is immaterial to the results.[18]

It could be argued that the negative coefficients for $Smallb_j$ may just capture differences in the ability to raise long-term funds, by issuing bonds, shares or long-term deposits, rather than differences in the ability to commit. It is therefore interesting to check if the results hold even controlling for the structure of banks' liabilities. The benchmark model has been by adding the ratio between long-term liabilities (capital, issued bonds and long-term deposits) and short-term ones (demand deposits and net position on the interbank market). Column 3 shows that although the new variable, as expected, has a significant and positive effect, it does not significantly alter the coefficients for the other variables.[19]

[17] This holds both including or excluding in the specification a vector of dummies for these three categories.

[18] A related check consists in adding $Bloan_{i,j}$ to the eqation for $Long_{i,j}$. Even this extension does not alter the results.

[19] Given that banks control the maturity mismatch existing between assets and liabilities, this type of variable is potentially endogenous in an equation for $Long_{i,j}$. Again, the fact

Column 4 displays a specification including a dummy for cooperative banks which, contrary to BCCs, are not subject to a specific regulatory and fiscal regime (*banche popolari).* The new dummy turns out to have no effects on $Long_{i,j}$ suggesting that the ability to develop lending relationships is specific to the regulatory regime of BCCs rather than to their governance.[20]

It has been argued that a possible interpretation of the positive coefficient for $Smallf_i$ is connected with the notion of short-termism. An alternative explanation is that large firms do not borrow long-term simply because they issue bonds or equity on the market. A way to check this consists in splitting small firms into two categories, very small and intermediate ones.[21] Given that none of these is able to raise funds on the financial market, if intermediate borrowers show a smaller ratio of long-term to total loans than very small ones, then such difference can not be ascribed to a more intense use of bonds or outside equity. The result presented in column 5 do no provide support to this view: large firms have 11 per cent less of long-term loans than intermediate ones, while very small ones have 8 per cent more. Also, both interactions with the dummy for BCCs turn out to be positive and significant.

The last column of table 8 estimate the benchmark model excluding all banks with less than 50 million euros of capital which, even with the last banking law, are still subject to some limitations in lending at long maturities. Even in this case, the results are unchanged.

The results are extended and confirmed by several other non reported regressions. One adds a dummy for small banks belonging to banking groups, with the idea that these intermediaries tend to be halfway between independent small intermediaries and large institutions. As expected, this dummy turns out to significantly increase the ratio of long-term to total loans and to not affect sign and significance of the other coefficients. Another regression tests the robustness of the results with respect the choice of the variable capturing the effect of bank size. In particular, $Smallb_j$ has been substituted by: (the logarithm of) total funds intermediated; the number of employees; the number of branches; the vector of seven dummies from which $Smallb_j$ has been computed; the bank's share in the market for loans or in the market for deposits (the weighted average across provinces).

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that its introduction does not alter the other coefficients confirms that all results would be robust to specifications where such simultaneity is explicitely modeled.

[20] The finding that *banche popolari* do not behave differently from corporations is in line with those of Cau *et al.* (2004).

[21] Firms with up to 5 employees and firms with 6-20 employees, respectively. Note that the number of observations increase for the same reasons described when discussing the regressions with guarantees.

A potentially important limitation of the dataset is that it does not allow to control for endogenous matching. However, it is important to emphasize that neglecting this aspect goes against finding the results which, without this simplification, would turn out to be even stronger.[22]

Finally, the robustness of the results has been checked even with respect to the econometric modelling strategy. For example, results remain unaltered even considering possible heteroskedasticity of the standard errors across banks. More importantly, the results hold even considering the possibility of censoring, which would arise if, before deciding how much to lend long-term (or short-term), a bank decides whether to do so at all. The maximum likelihood estimation of a fixed-effect TOBIT model, providing estimates which are robust to possible censoring, produces virtually identical results.

5 Conclusions

Using information on Italian banks, this work presents a cross-sectional analysis of the maturity of loans to firms aimed at establishing whether small and large banks have different incentives to lend long term.

The motivation for this analysis relates to the idea that the effectiveness of short-term maturities in screening and monitoring borrowers is related to the credibility of the implicit commitment to not renegotiate the original maturity, for example by granting new loans once payments are due, and that large banks may find it more difficult to maintain a tough stance at the refinancing stage and stick to the original contract.

The empirical evidence is consistent with these predictions and shows that, for given borrowers' characteristics, larger banks issue loans with longer maturities and have higher ratios of non-performing loans, even controlling for the type of guarantee supplied.

The analysis shows that also special banks' regulatory regimes stimulating lending relationships and peer monitoring play a role by allowing small borrowers in traditional sectors to lengthen the maturity of their liabilities. Finally, the evidence is also consistent with large banks benefiting of scale economies in the technology for monitoring and screening more innovative firms.

[22] If for given observable borrower's characteristics (industrial sector, size, innovative content and location) there are firms with different levels of (unobservable) opaqueness then the most transparent ones do not need to go to large banks to get long-term loans. If the number of these borrowers is sufficiently large and if they decide to borrow from small banks (perhaps because these intermediaries have less bargaining power), then small credit institutions might not show smaller amounts of long-term loans even though it is true that they benefit more in terms of screening and monitoring from choosing short maturities.

These findings are consistent with the predictions of the vast literature on dynamic commitment and, more in detail, on soft budget constraints for which empirical evidence is still scarce. At a more general level, they provide support to the view that the organizational structure shapes the functioning of banks so that different types of credit intermediaries carry out different functions. For example, one policy implication is that large intermediaries are important players stimulating the dimensional growth of firms and the more so in countries with underdeveloped stock market and venture capital.[23] On the other hand, the presence of small intermediaries turns out to be important for an efficient allocation of credit to small firms in traditional sectors, which is more likely to be a priority in less advanced economies.

[23] For example, investments in R&D are typically characterized by a low level of liquidity and by a high remunerative levels (delayed but high expected returns). This kind of investment is more likely to be undertaken if the lender understands better the project and if it is more willing not to use short-maturities to screen out bad projects.

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Table 1

LOANS TO NON FINANCIAL FIRMS:
SUMMARY STATISTICS[1]

	Number of banks	Long-term loans	Short-term loans	Total [2]
All banks	711			
Market share [3]		100.0	100.0	100.0
Mean		451	403	910
1st quartile		13	15	34
Median		45	47	104
3rd quartile		163	149	348
Large banks	56			
Market share [3]		69.9	72.9	71.4
Mean		3,999	3,729	8,248
1st quartile		1,410	352	2,956
Median		2,421	2,324	5,708
3rd quartile		4,764	4,007	7,548
Small banks	655			
Market share [3]		30.1	27.1	28.6
Mean		147	118	283
1st quartile		11	13	31
Median		39	42	89
3rd quartile		119	115	251

Source : Banca d'Italia.

'(1) Outstanding loans of the italian banking sector to domestic borrowers at the end of 2004. Long-term loans are those with an original maturity of more than 18 months. Millions of euro. '(2) This item includes non performing loans (in the original dataset these are recorded without the indication of the maturity). (3) Market share of the group of banks considered, in the relevant market segment. Percentages.

Table 2

LOANS TO NON FINANCIAL FIRMS BY INDUSTRIAL SECTOR [1]

(millions of euro and percentages)

	Long-term loans (a)	Short-term loans	Total (b)[2]	*as a percentage of the total amount*	(a/b)*100
Telecommunications	6,138	1,590	7,800	1.2	78.7
Maritime and air transportations	3,395	1,077	4,745	0.7	71.6
Agriculture	17,003	9,613	29,332	4.5	58.0
Energy	11,903	7,982	19,971	3.1	59.6
Buildings and real estate	43,444	31,203	83,116	12.8	52.3
Rails and highways	7,313	5,274	13,195	2.0	55.4
Auto	4,895	3,684	9,061	1.4	54.0
Retail trade	20,215	20,704	44,849	6.9	45.1
Food, beverages and tobacco	10,349	13,211	26,992	4.2	38.3
IT and technological machineries	1,781	2,306	4,311	0.7	41.3
Chemicals	4,250	5,513	10,128	1.6	42.0
Textiles	8,784	15,536	26,523	4.1	33.1
Wholesale trade	17,671	40,167	61,852	9.6	28.6

Source : Banca d'Italia.

(1) Outstanding loans of the Italian banking sector to domestic borrowers at the end of 2004. Long-term loans are those with an original maturity of more than 18 months. (2) This item includes non performing loans (in the original dataset these are recorded without the indication of the maturity).

Table 3

LOANS TO NON FINANCIAL FIRMS BY BORROWER'S SIZE, LOCATION AND INTENSITY OF INNOVATION [1]

(millions of euro and percentages)

	Long-term loans (a)	Short-term loans	Total (b)[2]	*as a percentage of the total amount*	(a/b)*100
			by size		
Large firms	239,842	232,404	499,493	77.2	48.0
Small firms	80,686	53,914	147,503	22.8	54.7
			by intensity of innovation		
Traditional sector	295,069	269,403	602,525	93.1	49.0
Innovative sector	25,460	16,915	44,471	6.9	57.2
			by location		
Centre-North of Italy	277,796	250,536	555,245	85.8	50.0
South of Italy	42,733	35,782	91,751	14.2	46.6
Total	320,528	286,318	646,996	100.0	49.5

Source : Banca d'Italia.

'(1) Outstanding loans of the Italian banking sector to domestic borrowers at the end of 2004. Long-term loans are those with an original maturity of more than 18 months. (2) This item includes non performing loans (in the original dataset these are recorded without the indication of the maturity).

Table 4

LOANS TO NON FINANCIAL FIRMS
BY BANK'S SIZE AND LEGAL FORM [1]

(millions of euro and percentages)

		Long-term loans (a)	Short-term loans	Total (b)[2]	*as a percentage of the total amount*	(a/b)*100
				by size		
Large banks		223,923	208,830	461,861	71.4	48.5
	to traditional firms	203,591	195,800	426,907	66.0	47.7
	to innovative firms	20,332	13,029	34,953	5.4	58.2
	to small firms	44,769	32,688	85,757	13.3	52.2
	to large firms	179,153	176,141	376,104	58.1	47.6
Small banks		96,606	77,488	185,135	28.6	52.2
	to traditional firms	91,478	73,603	175,617	27.1	52.1
	to innovative firms	5,128	3,886	9,518	1.5	53.9
	to small firms	35,917	21,226	61,747	9.5	58.2
	to large firms	60,689	56,263	123,389	19.1	49.2
				by legal form		
BCC [3]		24,207	24,877	50,615	7.8	47.8
	to small firms	13,068	9,653	23,583	3.6	55.4
	to large firms	11,139	15,225	27,032	4.2	41.2
Others		296,321	261,441	596,381	92.2	49.7
	to small firms	67,619	44,262	123,920	19.2	54.6
	to large firms	228,703	217,179	472,461	73.0	48.4
Total		320,528	286,318	646,996	100.0	49.5

Source : Banca d'Italia.

'(1) Outstanding loans of the italian banking sector to domestic borrowers at the end of 2004. Long-term loans are those with an original maturity of more than 18 months. (2) This item includes non performing loans (in the original dataset these are recorded without the indication of the maturity). (3) Small cooperative banks, with particular fiscal treatment and a regulatory regime.

Table 5

LOANS TO NON FINANCIAL FIRMS
BY TYPE OF GUARANTEE[1]

(millions of euro and percentages)

	Long-term loans (a)	Short-term loans	Total (b)[2]	*as a percentage of the total amount*	(a/b)*100
No guarantee	85,888	166,936	270,174	41.8	31.8
Personal guarantee from third parties other than firms[3]	31,338	82,335	123,458	19.1	25.4
Personal guarantee from firms other than banks	10,412	16,994	30,072	4.6	34.6
Personal guarantee from banks	5,790	1,862	7,744	1.2	74.8
Personal guarantee from the State[4]	4,214	128	4,370	0.7	96.4
Real guarantee[5]	182,886	18,063	211,178	32.6	86.6
Total	320,528	286,318	646,996	100.0	49.5

Source : Banca d'Italia.

'(1) Outstanding loans of the italian banking sector to domestic borrowers at the end of 2004. Long-term loans are those with an original maturity of more than 18 months. (2) This item includes non performing loans (in the original dataset these are recorded without the indication of the maturity).
(3) Contractual obligations of third parties to make payments in case of default. (4) Personal guarantee from central or local governments, government agencies or state owned entreprises. (5) Physical assets or equities that the lender can sell if the borrower defaults.

Table 6

REGRESSION RESULTS: THE MODEL FOR LONG-TERM LOANS

The dependent variable is the ratio of long-term to total loans (only performing loans). All regressors are dummy variables. BCC is a dummy for small cooperative banks which are subject to a specific regulatory and fiscal regime favouring lending relationships. ICS denotes institutions specialized in long-term credit. Small firms have no more than 20 employees. Innovative firms are those working in high-tech industries.

Dependent variable: *Long* [(a)]	(1) Basic model		(2) Model with interactions		(3) Model with guarantees		(4) Model with guarantees and interactions	
Borrowing firm's features								
Small size (Smallf)	0.161	***	0.130	***	0.139	***	0.121	***
	0.000		*0.000*		*0.000*		*0.000*	
Innovative firm (Inno)	-0.042	***	-0.019	**	-0.008	*	-0.013	**
	0.000		*0.034*		*0.067*		*0.039*	
Location in Southern ltaly (South)	-0.045	***	-0.046	***	-0.028	***	-0.028	***
	0.000		*0.000*		*0.000*		*0.000*	
Bank's features								
Small size (Smallb)	-0.093	***	-0.085	***	-0.062	**	-0.063	**
	0.001		*0.002*		*0.018*		*0.017*	
Special legal forms								
BCC	0.037	**	0.007		0.027	*	0.008	
	0.025		*0.670*		*0.082*		*0.634*	
ICS	0.545	***	0.543	***	0.449	***	0.447	***
	0.000		*0.000*		*0.000*		*0.000*	
Interaction terms								
*Smallf * BCC*			0.059	***			0.036	***
			0.000				*0.000*	
*Inno * Smallb*			-0.028	***			0.006	
			0.003				*0.378*	
Type of guarantee								
No guarantee					-0.596	***	-0.596	***
					0.000		*0.000*	
Personal guarantee from third parties other than firms					-0.533	***	-0.533	***
					0.000		*0.000*	
Personal guarantee from firms other than banks					-0.364	***	-0.365	***
					0.000		*0.000*	
Personal guarantee from banks					-0.265	***	-0.266	***
					0.000		*0.000*	
Personal guarantee from the State					-0.171	***	-0.171	***
					0.001		*0.000*	
Constant	0.503	***	0.506	***	0.864	***	0.871	***
	0.000		*0.000*		*0.000*		*0.000*	
Number of observations	34911		34911		91481		91481	
Number of groups	701		701		701		701	
R-square (overall)	0.179		0.180		0.446		0.446	
Rho (proportion of variance due to f.e.)	0.204		0.200		0.158		0.149	

(a) Numbers in italics are p-values and have been computed with robust standard errors. Coefficients for industrial sector dummies have been omitted. All models have been estimated with a GLS estimator. ***, ** and * indicates coefficients different from zero at 1, 5 and 10 per cent level of significance, respectively.

Table 7

REGRESSION RESULTS: THE MODEL FOR BAD LOANS

The dependent variable is the ratio of bad to total loans (bad loans are also included in the denominator). All regressors are dummy variables. BCC is a dummy for small cooperative banks which are subject to a specific regulatory and fiscal regime favouring lending relationships. ICS denotes institutions specialized in long-term credit. Small firms have no more than 20 employees. Innovative firms are those working in high-tech industries.

Dependent variable: *Bloan* [(a)]	(1) Basic model		(2) Model with interactions		(3) Model with guarantees		(4) Model with guarantees and interactions	
Borrowing firm's features								
Small size (Smallf)	0.013	***	0.021	***	0.009	***	0.016	***
	0.000		*0.000*		*0.000*		*0.000*	
Innovative firm (Inno)	0.008	**	0.005		0.003		0.002	
	0.038		*0.422*		*0.264*		*0.674*	
Location in Southern Italy (South)	0.037	***	0.037	***	0.030	***	0.030	***
	0.000		*0.000*		*0.000*		*0.000*	
Bank's features								
Small size (Smallb)	-0.040	**	-0.041	**	-0.037	**	-0.038	**
	0.012		*0.010*		*0.016*		*0.014*	
Special legal forms								
BCC	-0.023	***	-0.016	*	-0.017	**	-0.010	
	0.005		*0.065*		*0.033*		*0.227*	
ICS	0.066	**	0.066	**	0.078	**	0.078	**
	0.033		*0.031*		*0.017*		*0.016*	
Interaction terms								
*Smallf * BCC*			-0.015	***			-0.014	***
			0.000				*0.000*	
*Inno * Smallb*			0.003				0.002	
			0.587				*0.615*	
Type of guarantee								
No guarantee					0.049	***	0.048	***
					0.000		*0.000*	
Personal guarantee from third parties other than firms					0.008	***	0.007	***
					0.000		*0.000*	
Personal guarantee from firms other than banks					0.005	**	0.005	**
					0.022		*0.016*	
Personal guarantee from banks					-0.036	***	-0.036	***
					0.000		*0.000*	
Personal guarantee from the State					0.006		0.006	
					0.494		*0.478*	
Constant	0.079	***	0.077	***	0.062	***	0.061	***
	0.000		*0.000*		*0.000*		*0.000*	
Number of observations	35779		35779		94235		94235	
Number of groups	704		704		704		704	
R-square (overall)	0.034		0.035		0.038		0.038	
Rho (proportion of variance due to f.e.)	0.234		0.235		0.203		0.203	

(a) Numbers in italics are p-values and have been computed with robust standard errors. Coefficients for industrial sector dummies have been omitted. All models have been estimated with a GLS estimator. ***, ** and * indicates coefficients different from zero at 1, 5 and 10 per cent level of significance, respectively.

Table 8

REGRESSION RESULTS: ROBUSTNESS CHECKS

'The dependent variable is the ratio of long-term to total loans; bad loans are not considered in this definition with the only exception of column 2 where they are added to the denominator. All regressors are dummy variables. BCC is a dummy for small cooperative banks which are subject to a specific regulatory and fiscal regime favouring lending relationships. ICS denotes institutions specialized in long-term credit. Very small firms are those with no more than 5 employees. Small firms have no more than 20 employees. Innovative firms are those working in high-tech industries. Cooperative banks other than BCCs are "banche popolari" which are not subject to any specific regulatory and fiscal regime. The structure of the liabilities is the ratio

Dependent variable: *Long* (*)	(1) Subsidiaries of foreign banks		(2) *Long* = L/(L+S+B)		(3) Bank's long-term liabilities (**)		(4) Other cooperative banks		(5) Small and very small firms		(6) No regulatory constraints	
Borrowing firm's features												
Small size (Smallf)	0.136	***	0.106	***	0.139	***	0.130	***			0.130	***
	0.000		*0.000*		*0.000*		*0.000*				*0.000*	
Very small size (Vsmallf)									0.147	***		
									0.000			
Intermediate size (Intermf)									0.085	***		
									0.000			
Innovative firm (Inno)	-0.017	*	-0.020	**	-0.014		-0.019	**	-0.027	***	-0.018	**
	0.071		*0.034*		*0.195*		*0.034*		*0.000*		*0.048*	
Location in Southern Italy (South)	-0.045	***	-0.060	***	-0.059	***	-0.046	***	-0.059	***	-0.046	***
	0.000		*0.000*		*0.000*		*0.000*		*0.000*		*0.000*	
Bank's features												
Small size (Smallb)	-0.082	***	-0.062	**	-0.037	**	-0.085	***	-0.088	***	-0.057	**
	0.003		*0.018*		*0.047*		*0.002*		*0.000*		*0.045*	
Special legal forms												
BCC	0.011		0.012		-0.004		0.007		-0.017		-0.008	
	0.510		*0.438*		*0.705*		*0.717*		*0.285*		*0.661*	
ICS	0.548	***	0.436	***	0.549	***	0.543	***	0.500	***	0.542	***
	0.000		*0.000*		*0.000*		*0.000*		*0.000*		*0.000*	
Cooperative banks other than BCCs							-0.003					
							0.916					
Structure of liabilities					0.016	***						
					0.003							
Interaction terms												
*Smallf * BCC*	0.054	***	0.071	***	0.046	***	0.059	***			0.053	***
	0.000		*0.000*		*0.000*		*0.000*				*0.000*	
*Inno * Smallb*	-0.029	***	-0.028	***	-0.045	***	-0.028	***	-0.013	**	-0.027	***
	0.003		*0.003*		*0.000*		*0.003*		*0.045*		*0.006*	
*Vsmallf * BCC*									0.053	***		
									0.000			
Intermf BCC*									0.045	***		
									0.000			
Constant	0.496	***	0.472	***	0.449	***	0.506	***	0.480	***	0.509	***
	0.000		*0.000*		*0.000*		*0.000*		*0.000*		*0.000*	
Number of observations	37099		35779		29756		34911		122698		24515	
Number of groups	708		704		564		701		701		410	
R-square (overall)	0.173		0.145		0.190		0.180		0.096		0.208	
Rho (proportion of variance due to f.e.	0.193		0.184		0.097		0.200		0.101		0.238	

(a) Numbers in italics are p-values and have been computed with robust standard errors. Coefficients for industrial sector and year-dummies have been omitted. All models have been estimated with a GLS estimator. ***, ** and * indicates coefficients different from zero at 1, 5 and 10 per cent level of significance, respectively. (b) This estimate excludes observations with negative values for the indicator of the liabilities structure (due to possible large net creditor positions on the interbank market). It also excludes observations with vary large values of such ratio (the threshold is 5, its 95th percentile). (c) The estimation excludes banks with less than 50 milion euros of capital which, even with the last banking law, can lend at long maturities only with some limitations.