Secured Lending and Borrowers' Riskiness

by

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Abstract

This paper investigates the relationship between secured lending and borrowers' riskiness. First it builds a theoretical model showing that banks may find optimal to cover higher credit risk by requiring a guarantee and simultaneously charging higher interest rates. Second, it finds empirical support to the predictions of the model, that banks normally require guarantees on loans that appear to be riskier, because they are larger or because they are granted to borrowers of smaller size, less capitalized, and with multiple banking relationships. It also provides evidence that a bank loan is more likely to be secured when the borrower owns assets that can be posted as collateral. Third, it shows that interest rates on secured loans are higher than on unsecured loans, confirming that guarantees are not sufficient to completely offset their higher riskiness. Finally, it finds no evidence that the higher riskiness of firms operating in the new economy sectors makes it more likely that they obtain bank credit only on a secured basis.

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1 Introduction

A large number of bank loans are backed by real or personal guarantees.[1] Berger and Udell (1990) report that in the United States nearly 70 per cent of all commercial and industrial loans are made on a secured basis. Harhoff and Körting (1998) and Binks, Ennew and Reed (1988) report similar or even larger ratios for Germany and the United Kingdom, respectively.

The consequences of guarantee requirements for the availability of bank financing have been studied in a large number of papers, both theoretical and empirical. Information asymmetries in bank relationships can alter significantly the allocation of credit with respect to what would be socially optimal (i.e., that all projects with a positive net present value – NPV – will be financed; see, e.g., de Meza and Webb, 1987). Backing loans by guarantees may help to alleviate these distortions, by reducing the problems of moral hazard and those of adverse selection among the pool of borrowers. The guarantee transforms borrowers' incentives, alters the risk for the bank and eventually modifies the equilibrium credit allocation. Smith and Warner (1979), for example, argue that "the issuance of secured debt lowers the total cost of borrowing by controlling the incentive for stockholders to take projects that reduce the value of the firm"; Stulz and Johnson (1985) show that in some cases the recourse to secured debt may permit to finance positive NPV projects that otherwise would not be financed.

However, the requirement of a guarantee on a bank loan can also introduce new inefficiencies in credit allocation. For example, banks might devote fewer resources in screening and monitoring projects financed with secured loans, as the guarantee itself helps

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[1] In the banking literature loans backed by a guarantee are normally defined as collateralized. The guarantee itself is generically defined as the collateral. In the following a further distinction is made between personal guarantees (i.e., contractual obligations of third parties to make payments in case of default of the borrower, such as a surentyship) and real guarantees (i.e., physical assets or equities that the lender can sell to obtain the payments in case of default of the borrower), to which the use of the word collateral is here restricted.

reducing the credit risk (see, e.g., Manove, Padilla and Pagano, 2000). If banks are more qualified than the average investor to evaluate projects, credit allocation may be less efficient when there is a larger fraction of loans that are made on a secured basis. Moreover, if banks find it less expensive to require guarantees than to monitor projects, it is possible that investors that cannot provide them will not be financed, even if the NPV of their investment is positive. A further distortion might be introduced if some banks, watching at collateral requirements made by other institutions, free ride on their auditing activity. As Rajan and Winton (1995) have shown, this may lead to too few monitoring with respect to what is optimal.

The consequences of the widespread use of guarantees on bank loans can be particularly relevant for new and small businesses, which are more dependent on bank financing and have relatively fewer resources to post as collateral (see, e.g., Berger and Udell, 2000). Firms with a larger share of immaterial assets and with higher risk of default, such as those operating in the new economy sectors, might be required to post a collateral on their bank loans more frequently than other borrowers. In fact, small and new firms are more likely to be required to pledge some guarantee on bank loans, also because they are typically more informationally opaque than larger enterprises and they are not subject to shareholders' monitoring.

One of the most interesting issues in the analysis of secured bank lending is whether guarantees are required to safer borrowers or riskier borrowers. Many different answers have been given to this question, by considering the predictions of theoretical models, the conventional wisdom among bankers, the results of econometric analyses.

The predictions of the theoretical literature on this issue strongly depend on the informational framework that is adopted.[2] Following the seminal contribution of Stiglitz and Weiss (1981), a large class of models has been developed assuming that banks cannot observe borrowers' characteristics, so that the average interest rate on loans is higher than the rate that would be optimal to require to safe borrowers, if they could be identified. This

creates an adverse selection problem, because only riskier borrowers apply for bank loans. In the original model the equilibrium entails some degree of credit rationing. However, a possible alternative is to allow loan applicants to post a guarantee, so that safer borrowers can credibly signal their characteristics, and banks can screen potential borrowers by their degree of riskiness, and offer better credit conditions to the safer ones. In this framework, secured loans are always those made to the safer borrowers, as shown by Bester (1985 and 1987), Chan and Kanatas (1985) and Besanko and Thakor (1987).

Theoretical models where secured loans are made to riskier borrowers, although less common, have also been proposed in the literature. Boot, Thakor and Udell (1991) work on the hypothesis that bank financing creates a moral hazard problem: with limited liability borrowers have an incentive to choose projects with negative NPV, but higher returns if good states of the world realize. Thus, if banks can observe the borrowers' characteristics, they have an incentive to require guarantees to riskier borrowers, those with a stronger incentive to take on riskier projects.[3] Bester (1994) shows that when the lender cannot credibly commit to impose bankruptcy to a borrower that cheats on the outcome of the project and decides not to repay his debt, the collateral can be used to make the strategic default less attractive. Because in equilibrium the incentives to strategically default are negatively correlated with project riskiness, secured loans will be those made to riskier borrowers. Coco (1999) obtains a similar result under the assumption that borrowers are heterogeneous with respect to their degree of risk aversion, and that the more risk averse are also less willing to post a collateral on their debt. John, Lynch and Puri (2000) consider instead the role of agency problems between managers and claimholders, showing that if collateralized assets are the least risky assets, managers have an incentive to consume more out of them if they are secured than if they are not. As a result, the equilibrium yield of

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[2] For recent surveys of the theoretical literature on the role of collateral in banking see Coco (2000).

[3] On the other hand, Boot, Thakor and Udell (1991) also show that if banks cannot observe borrowers characteristics, agents may post a collateral in order to credibly commit to a virtuous behavior. If, as it is likely, safer borrowers have a stronger incentive to use such a signaling strategy, secured loans will be made to safer borrowers.

collateralized debt is higher than that of uncollateralized debt. Finally, de Meza and Southey (1996) show that when the population is composed of a number of overoptimistic borrowers, projects posting high collateral are more likely to default.

The heterogeneity of results of the theoretical literature on the risk characteristics of secured bank loans is not shared by the conventional wisdom among bankers, as shown by Morsman (1986). Consistent with this, the majority of empirical studies finds that banks typically require a guarantee on loans to riskier borrowers. Berger and Udell (1990) present the most stringent test of the hypothesis that banks require guarantees when financing riskier projects. Using data from the FED survey on Terms of Bank Lending, they show that the interest rates on secured loans are on average higher than those on unsecured loans.[4] This result has two major implications: that secured loans are typically made to borrowers that banks consider ex-ante riskier, and that the presence of guarantees is insufficient to offset the higher credit risk. Berger and Udell (1995) confirm this result using data on lines of credit from the same source.[5] Finally, John, Lynch and Puri (2000), considering a sample of over 1,000 fixed rate straight debt public issues made between 1993 and 1995, find that yield on collateralized debt is higher than on general debt, even after controlling for credit ratings.

Other authors have checked directly whether secured loans have characteristics that plausibly signal them as riskier. A large number of variables related to riskiness have been considered. The neatest result in this literature is that loans with longer duration have a higher probability of being secured, as found by Boot, Thakor and Udell (1991) and Harhoff and Körting (1998). With respect to the size of loans and borrowers, the results are less clear-cut. Harhoff and Körting (1998) and Elsas and Kranen (2000) find a higher incidence of securitization on larger loans, but Boot, Thakor and Udell (1991) find a lower

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[4] This hypothesis is consistent with the results of the model proposed by Barro (1976), who shows that if the value of the collateral on bank loans is stochastic and borrowers strategically default when its realization is lower than the sum of the value of the loan and its service, the equilibrium interest rate on secured loans is higher than that on unsecured loans.

[5] Harhoff and Körting (1998), at the opposite, using data from a survey of small and medium-size German firms find that the interest rates on secured loans are lower than those on secured loans.

incidence. Beger and Udell (1995) find a positive relationship between the size of the borrowing firms, measured by their total assets, and the probability that their lines of credit will be secured; Harhoff and Körting (1998), proxying size with the firm's workforce, also find a positive relationship with the presence of guarantees. However, at the opposite, Elsas and Kranen (2000) find a negative relationship between collateralization and the borrowers' total sales.[6] Harhoff and Körting (1998) also find that the share of collateralized loans decreases with the number of banking relationships, possibly because multi-banking wipes out the incentives to monitor borrowers' behavior or to require a collateral to firms in financial distress, as suggested by Rajan and Winton (1995). Finally, Berger and Udell (1995) and Harhoff and Körting (1998) show that loans to borrowers with longer lending relationships, that they argue to be less risky, are less likely to be secured,[7] but Elsas and Kranen (2000), using data from a survey of German banks, find instead that housebanks have a higher probability of having loans backed by a guarantee.[8]

This paper contributes both to the theoretical and to the empirical literature on secured bank lending. Section 2 presents a simple model showing why banks may prefer to secure the loans made to riskier borrowers. In particular, it shows that if the projects financed by banks can differ with respect to their probability of success, banks will use the guarantees and the level of interest rates as complements: riskier borrowers will be charged higher interest rates and required to post a guarantee on their bank loans. The following two sections present the results of an empirical analysis of secured bank lending. Using high quality data on individual long-term bank loans, it is shown that banks normally require guarantees on loans to those borrowers that can plausibly be identified as riskier, and that

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[6] These differences might be due to the fact the size of the borrower is related to his overall creditworthiness, which implies a negative relationship, but reflects also his availability of assets to post as collateral, which implies instead a positive relationship.

[7] These results are consistent with the predictions of Boot and Thakor (1994), who show that an optimal contract implies that credit conditions become more favorable late in the relationship, after the borrower has shown at earlier stages to be able to fulfill his obligations.

[8] Elsas and Khranen (2000) justify their result with the argument made by Welch (1997) and Longhofer and Santos (2000), who show that it is optimal for bank debt to be more senior when lending relationships are stronger.

they also charge them with higher interest rates. Section 5 focuses on some results specific to firms of the new economy. The final section concludes.

2 A Simple Theoretical Model

Although the theoretical literature has provided a number of reasons why banks require guarantees to riskier borrowers, none of them is so transparent as it seems to be implied by the strength of bankers' conventional wisdom.

In the model presented in this section, two major assumptions drive the results. The first is that the value of the guarantees is not identical for banks and entrepreneurs, consistent with the hypothesis that borrowers have some specific skills that make their assets more valuable to them than to others (see, e.g., Hart, 1995).[9] The existence of such a difference in the valuation of guarantees implies that the schedules describing the trade-off between having a secured loan and paying a higher interest rate are not identical for borrowers and lenders. The equilibrium is therefore at the point where the two schedules intersect. The second major assumption is that borrowers maximize their profits by choosing the level of effort to put in the project. As it will be shown, the optimal level of effort is independent of the sum of the value of the interest rates on the loan and the value of the guarantee. Under these hypotheses, riskier projects are secured, and they are also charged higher interest rates.

Assume that there is an entrepreneur willing to finance a project of size 1. The project is risky: with probability $P(\sigma,e)$ it pays a return $X > 1$, otherwise it fails and pays nothing. The probability of success of the project depends on an exogenously given measure of its riskiness, σ, and on the level of effort that the entrepreneur puts in developing it, e, with $P_e' > 0$ and $P_\sigma' < 0$. The effort of the entrepreneur has a cost that can be expressed in monetary units as $f(e)$, with $f', f'' > 0$. The entrepreneur finances his

[9] An alternative justification for this assumption is that banks incur some fixed costs, such as legal expenses, to have the guarantees fully available for sale.

project with a bank loan, at a given gross interest rate $R > 1$. On the loan it is possible to post a guarantee of value $C \leq 1$, that is lost in case of default. The entrepreneur chooses the level of effort in order to solve the following maximization problem:

$$\max_{e} \Pi(e) = P(\sigma, e)\big(X - R\big) - \big[1 - P(\sigma, e)\big]C - f(e)\,. \tag{1}$$

The first order condition for the solution of this problem gives a relationship between the optimal level of effort, the return of the project in case of success, the return to be paid on the bank loan, and the value of the collateral:

$$g(\sigma, e^*) \equiv \frac{f'(e^*)}{P_e^{'}(\sigma, e^*)} = X - R + C\,, \tag{2}$$

where e^* is the level of effort that maximizes the profits of the entrepreneur. A sufficient condition for a maximum is that $P_e^{''} < 0$. Expression (2) makes it clear that in equilibrium the level of the interest rate is a positive function of the value of collateral.

The banking sector is assumed to be competitive. Risk neutral banks equalize their expected return from financing the project to the exogenously given gross return on a risk-free investment, ρ:

$$P(\sigma, e)R + \big[1 - P(\sigma, e)\big]\alpha C = \rho\,, \tag{3}$$

where $\alpha \in (0,1)$ is the share of the value of collateral that is recovered by the bank when the entrepreneur defaults.

Solving the system of equations (2) and (3) it is possible to obtain two expressions for the gross return on the bank loan and the level of collateral as a function of the optimal level of effort:

$$R = \frac{\rho + \big[1 - P(\sigma, e^*)\big]\alpha\big[X - g(\sigma, e^*)\big]}{P(\sigma, e^*)(1 - \alpha) + \alpha}, \tag{4}$$

$$C = \frac{\rho - P(\sigma, e^*)\big[X - g(\sigma, e^*)\big]}{P(\sigma, e^*)(1 - \alpha) + \alpha}\,. \tag{5}$$

Assume now that the economy is composed by a fixed number of entrepreneurs, n, each one with a project of a different level of riskiness, σ_i (i = 1,…,n). From inspection of equations (4) and (5) it is clear that as long as $P'_{\sigma_i}\left(\sigma_i, e^*(\sigma_i)\right) < 0$ (for all σ_i; i = 1,…,n), riskier projects have both higher interest rates and a higher level of collateral.

The intuition for this result is the following. For a given probability of success, $P(\sigma,e)$, banks face a trade-off between higher interest rates and lower levels of collateral. However, when the probability of success decreases, banks cover the higher credit risk both by augmenting the degree of securitization and charging higher interest rates. These two instruments for reducing credit risk are used as complements, not as substitutes.[10]

The empirical implications of this simple model are that, in a cross section of bank lending relationships (i.e., with different levels of σ_i), one would find that secured loans are used to finance riskier projects and are charged higher interest rates. The following sections tests such predictions.

3 Data and Summary Statistics

The empirical analysis uses information on bank loans to a large sample of Italian non-financial firms. The data are taken from three sources: the Banks' Supervisory Reports to the Bank of Italy (Segnalazioni di Vigilanza), the Central Credit Register (Centrale dei Rischi) and the Company Account Data Survey (Centrale dei Bilanci).[11] The first source is used for data on banks' balance sheets. The second contains information on single bank loans, the interest rates charged and the value of the assets posted as guarantees

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[10] The model considers only the case of collateral not represented by the borrower's assets (external collateral) and that therefore causes a net loss to an entrepreneur that defaults. However, it can be demonstrated that the results carry over also if the collateral is represented by the borrower's assets (internal collateral), as long as its posting reduces the entrepreneur's profits, for example because it "restrains the firm from potentially profitable disposition of collateral "(Smith and Warner, 1979), and the value of $g(\sigma, e^*)$ is sufficiently low.

[11] For a detailed description of the Banks' Supervisory Reports to the Bank of Italy, the Central Credit Register and the Company Account Data Survey see also Pagano, Panetta and Zingales (1998).

(distinguished between real and personal);[12] credits are recorded only when they are above a threshold level of ITL 150 millions (around € 75,000). The third source contains balance sheet information on a large number of non-financial enterprises. In the following the data for 1997 from the Central Credit Register have been used.

For real guarantees, the distinction between internal collateral, which is represented by the debtor's assets (and ultimately only gives a privilege, in the case of default, to the lender who owns it with respect to the other debt holders), and external collateral (that increases the value of the assets that the lenders can repossess in case of default in order to obtain the payment of his debt) is not available. Personal guarantees can only be external.

Tables 1-4 introduce the summary statistics for data from the sample of bank loans obtained from the merge of the information from the Central Credit Register and the Company Account Data Survey. Table 1 presents some basic statistics by type of guarantee. Secured loans are 17.3 per cent of the total number of loans. For long-term loans secured with real guarantees this ratio is 15.0 per cent, for short-term loans it is 3.4 per cent; 5.4 per cent of loans are secured with personal guarantees. The mode of the ratios of the value of the guarantee to that of the loan is zero in all cases. For collateralized long-term loans the value is 100 per cent at the 90th percentile, for short-term loans it is 100 at the 99th percentile, for personal guarantees it is 100 per cent at the 95th percentile. These statistics show clearly that, when present, guarantees normally cover the full amount of the loan. The requirement of guarantees that cover only partially the value of the loan, which is largely suggested by the theoretical literature, seems to be irrelevant from an empirical point of view.[13]

Table 2 presents some summary statistics on the ratio of secured to total loans, with a break down by type of guarantee, size of the lending bank and geographical area of activity

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[12] In the case of personal guarantees the information on whether they are posted on the borrowers' short-term or long-term loans is not available.

[13] In fact, it is to be expected that when collateral does not cover the full value it is either because the price of assets pledged has reduced since the time when the loan was granted or that personal guarantees have also been posted. In the case of personal guarantees, for which this information is available, it is often found that their value exceeds that of the loan.

of the borrower. The ratio of the overall value of guarantees to that of loans is 25.6 per cent: 18.7 per cent for real guarantees (25.9 and 5.1 per cent, respectively, for long-term and short-term loans) and 6.9 per cent for personal guarantees.[14]

For all types of guarantees, the share of secured loans shows a high variability across geographical areas. The value of real guarantees ranges from 14.9 per cent of loans in the Center to 30.2 in the Islands; that of personal guarantees ranges from 6.2 per cent in the North-East to 32.4 in the South. This reflects the higher riskiness of borrowers resident in the Mezzogiorno of Italy. The ratio of secured to total loans varies significantly also with bank size (measured by bank total assets), ranging from 8.7 per cent for smaller banks to 33.0 per cent for banks in the 4th quintile.

Table 3 presents the breakdown by branch of economic activity of the borrower. The ratio of the value of real guarantees to that of loans ranges from 4.8 per cent for energy to 55.8 per cent for hotels. Within the manufacturing sector, the maximum value is 35.2 in metallurgy and transformation of non-metalliferous metals. Ratios above 30 per cent characterize also agriculture and construction. Industries that have traditionally a good export performance, such as textiles, electrical machinery and machinery for industry and agriculture, have lower ratios. Personal guarantees follow a similar pattern across sectors. The ratios range from 2.2 per cent in energy to 11.9 in construction. Values above 10 per cent are registered also in metallurgy and transformation of non-metalliferous metals, electrical machinery and other services.

Table 4 introduces some additional statistics. The first two columns present a breakdown by size of the borrower, measured by the value of total sales, showing that smaller firms are more likely to be required to post a collateral. The ratio of the value of real guarantees to that of loans ranges from 27.8 per cent for borrowers within the 1st quintile of the distribution by total sales to 15.6 per cent for borrowers in the 5th quintile. With respect to personal guarantees, the differences among size classes are much smaller, ranging from 7.6 per cent for the 1st quintile to 6.8 per cent for the 4th. Columns 3 and 4

[14] When the value of the guarantee exceeds that of the loan, the latter is used in calculating the

show that there is no monotone relation between the length of the lending relationship and the share of secured loans. Finally, columns 5 and 6 present a breakdown by size of the borrower's total credit with the bank, showing that larger loans are more likely to be secured.

4 The Empirical Results

4.1 The Characteristics of Lenders and Borrowers with Secured Loans

The first implication of the model presented in section 2 is that banks require guarantees on loans to riskier borrowers. In order to verify this hypothesis it has been tested what characteristics of banks and borrowers make it more likely that a loan will be secured. Only long-term loans are considered in the empirical analysis, due to the low incidence of securitization in short-term credit.

Three groups of explanatory variables have been considered: those describing the characteristics of the lending relationship between the bank and the borrower (such as the size of the loan and its duration), those describing the characteristics of the borrower (such as its capital structure and its profitability) and those proxying for the capability of banks to evaluate the riskiness of a project (such as the size of the bank and its degree of sector and geographic specialization in lending).

In practice, the hypothesis that there exists a correlation between some measures of a borrower's riskiness and the presence of guarantees on his bank debt is tested using the following discrete choice model:

$$Pr\,(Y_{ij} = g) = f\,(X_{ij}, Z_i, W_j, K_i) \qquad g = 1, 2 \qquad (6)$$

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numerator of the ratios.

where: Y_{ij} equals 1 if the loan made by bank i to borrower j is secured with a real guarantee, 2 if it is secured with a personal guarantee and 0 otherwise; X_{ij} is a vector of variables specific of the bank-borrower relationship; Z_i is a vector of characteristics of the lending bank; W_j is a vector of characteristics of the borrower; and K_i is a vector of dummy variables for the sector of operation of the borrower and its geographic location. The adoption of a discrete choice model is justified by the fact that, as it is clear from table 1, the value of the collateral pledged on each loan is not significant information: with the exception of few cases, loans are either fully collateralized or not collateralized.

Equation (6) is estimated using a multinomial logit model.[15] In order to avoid simultaneity problems, lagged averages of the balance sheet information of the borrowers between 1993 and 1996 have been used.[16]

Columns A and B of table 5 report the results of the estimates of the probability of long-term loans being secured. The pseudo R^2 of the regression is 0.10.[17]

A first point that emerges from these results is that not al the explanatory variables have the same effect on the probability of the loan being secured with real or personal guarantees. This mainly happens because real guarantees are likely to be safer than personal guarantees, although more onerous to provide, and because they can be internal, while personal guarantees can only be external. This latter distinction has two major implications. First, that real guarantees are partly required by lenders only to obtain a privilege with

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[15] In order to test the robustness of the results with respect to the econometric model adopted two logit regressions with firm specific fixed effects have also been estimated, respectively for real and personal guarantees. The coefficients of the variables describing the loan and bank characteristics are qualitatively and quantitatively identical to those of the regression reported in table 5.

[16] Each regression was estimated also excluding information on the level of interest rates charged on the loan, as these are reported only by a smaller sample of large and medium size banks. The results, unreported, confirm those of the estimates on the smaller sample.

[17] Columns C and D of table 5 report the results of the estimates on the sample of firms in the first quartile of the distribution by total sales, confirming the basic findings of the regression on the whole sample.

respect to the other debt-holders. Second, that the possibility of providing real guarantees is often linked to the availability of assets to post as a collateral.[18]

Consistent with the findings of Berger and Udell (1990), the level of the interest rate has a positive and significant effect on the probability that the loan on which it is charged will be secured with both real and personal guarantees; this result will be addressed in more detail in the next section.

A first measure of the borrowers' riskiness included among the explanatory variables is the ratio of capital to total assets. The negative coefficients in both regressions for real and personal guarantees confirm that loans to riskier borrowers are more likely to be secured. The firm's performance, measured by its past returns on equity (ROE), also has a negative effect on the probability that its loans will be secured with personal guarantees, consistent with previous findings, but it has a positive effect on the probability of its loans being secured with real guarantees. However, a number of factors can influence the sign of this relationship. For example, more profitable firms could be in reality riskier, and simply have happened to survive default. In fact, the previous evidence by Berger and Udell (1995) and Harhoff and Körting (1998) is also bewildering. Finally, the coefficient of the firms' leverage is negative and significant in the case of personal guarantees, but it is not significantly different from zero for real guarantees, possibly because the larger availability of resources to post as collateral that characterizes less indebted firms counterbalances their lower riskiness.

The positive coefficient of the logarithm of the value of the bank's total credit to the borrower shows that larger loans have a higher probability of being secured with both real and personal guarantees. These finding, confirming the evidence by Harhoff and Körting (1998), are consistent with the interpretation that larger expositions entail higher risk.[19] A possible interpretation is that when loans are large, the bargaining power of the borrowers is

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[18] In terms of the model presented in section 2, this result could be accounted for by allowing for the cost of posting the collateral to differ across entrepreneurs.

[19] Boot, Thakor and Udell (1991) find, at the opposite, that larger loans are less likely to be secured. However, their result may depend on the fact that they do not control for the borrowers' size.

harmed, and the banks' preference for reducing the riskiness of large expositions prevails. Consistent with the interpretation that collateralization depends in part on the relative bargaining power of banks and borrowers, the coefficient of a measure of the size of the borrower, the logarithm of its total sales, is negative and significant for both real and personal guarantees.[20]

The results on measures of the strength of the lending relationships are not easy to interpret, because the final effect often results from the summation of opposing forces. The dummy for housebank relationships has a positive and significant coefficient in both regressions for real and personal guarantees, similar to what is found by Elsas and Kranen (2000), but opposite to Harhoff and Körting (1998).This result is consistent with the argument of Longhofer and Santos (2000), who show that borrowers have an incentive to post collateral when lending relationships are stronger, because in this case banks are more prone to help them in case of financial distress.[21] However, when the strength of a lending relationship is measured instead by its time length, different results obtain distinguishing between real and personal guarantees, and depending on whether the loan is granted by the borrower's main bank or not. If borrowers with stronger lending relationships are considered safer by banks, as it seems likely to be the case, one would expect that they are required to post fewer guarantees. Indeed, this result is found for personal guarantees on loans made by a borrower's main bank, although not for real guarantees. Consistent with this result is the finding that older firms have a progressively lower probability of securing their loans with personal guarantees. At the opposite, loans made by non main banks to borrowers with longer lending relationships are more likely to be secured, possibly because

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[20] The coefficient of the logarithm of total assets, an alternative measure of the size of the borrower, is negative in the case of real guarantees, but it is instead positive for personal guarantees. This probably happens because, for given size, it is easier for firms with large total assets to find external guarantees.

[21] Welch (1997) also suggests that because banks are better equipped to contest priority in financial distress, it is more efficient to give them ex-ante higher seniority. Extending this reasoning one could say that banks with a stronger lending relationship are also in a better position than others to contest priority.

in this case lenders have stronger incentives to rebalance their position relative to that of the main bank.

The number of lending relationships of the borrower also has a positive and significant impact on the probability of loans being secured with real guarantees, consistent with the findings of Harhoff and Körting (1998). In fact, banks have a stronger incentive to hold internal guarantees when the number of debt holders is larger, as they give them a privilege in case of default. An additional reason might be that multiple banking relationships wipe out the incentive for banks to monitor their borrowers, that then turn out being riskier. In the case of personal guarantees, the coefficient of the number of lending relationships is also positive, but it is not significantly different from zero, suggesting that the result for real guarantees is more likely to depend on the desire of lenders to increase the seniority of their debt than on the need to balance lower monitoring.

The positive coefficients on the shares of physical and liquid assets and the negative coefficient on the share of immaterial assets show that borrowers with a larger availability of resources that can be posted as collateral are more likely to secure their loans, despite the fact that it is plausible to expect them to be less risky. Furthermore, the result that older firms have a higher probability of having collateralized loans, but only for enterprises that are more than 60 years old, is also likely to be explained by the fact that they probably have more assets to post as collateral. These variables have instead an opposite effect on the probability that loans will be secured with personal guarantees. Firms with a higher share of liquid assets and a lower share of immaterial assets are less likely to have loans covered with personal guarantees, most likely because they are considered less risky by banks. The fact that a potentially fraudulent borrower can more easily divert liquid funds is probably more than offset by the higher market value of his assets, that are less specific to the firm's activity.

Finally, a number of variables describing the characteristics of the credit market and of the lending banks also affect the probability of loans being secured. Competition in the loan market is negatively correlated with the probability of loans being secured with real and personal guarantees, as shown by the positive coefficient of the Herfindhal index in the province of activity of the borrowing enterprise. This is consistent with the view that the

requirement of a guarantee is a burden that banks are more likely to impose when their market power is higher.

The ratio of the value of the bank's loans to the branch and the province receiving the largest share of its total credit and the total value of loans, two measures of bank credit concentration, have a negative coefficient, although not always significantly different form zero. Banks that have a more concentrated loan portfolio are typically more likely to have developed specific skills in evaluating their borrowers, as they know better the functioning of the economic environment where they operate. Henceforth, they grant credit on the basis of more precise analyses of the expected performance of the borrower, and are less likely to require collateral as a general way of covering credit risk.

Smaller banks, with higher unit labor costs and larger branches (measured by of the logarithm of the average number of workers in each bank's dependency) are more likely to have secured loans, most likely because these characteristics signal lower efficiency in screening loan applications and making a correct evaluation of their riskiness.

4.2 Loan riskiness and guarantees

The second implication of the model presented in section 2 is that riskier projects are not only backed by guarantees, but they also have higher interest rates. This, in turn, implies a positive relationship between the level of interest rates and the incidence of securitization. Following the approach of Berger and Udell (1990), this hypothesis can be tested by regressing the interest rate charged on each bank loan on two dummies, taking the value of 1 if, respectively, real or personal guarantees are present. If the level of interest rates and the presence of guarantees are both driven by the riskiness of the project that is financed, the coefficient of the dummies for secured loans should be positive. In practice, the following model can be estimated:

$$i_{ij} = f(S_{ij}, X_{ij}, Z_i, W_j) \qquad (7)$$

where i_{ij} is the interest rate on the loan made by bank i to borrower j; S_{ij} are two dummy variables taking the value of 1 if the loan is secured, respectively, with real and personal

guarantees and 0 otherwise; X_{ij} is a vector of variables describing characteristics of the lending relationship; Z_i is a vector of variables describing characteristics of the lending bank; W_j is a vector of variables describing characteristics of the borrower.

Column A of table 6 reports the results of the estimation of equation (7) for long-term loans with fixed effects on banks, but without any other control for characteristics of the lending relationship or of the borrower. In this way, the effect of loan's and borrower's riskiness on the interest rate should be entirely captured by the coefficients of the dummy variables for the presence of guarantees. As expected, these coefficients are both positive and significantly different from zero, confirming the hypothesis that banks consider secured loans as riskier. Moreover, the coefficient of the dummy variable for the presence of real guarantees is larger than that for personal guarantees, suggesting that banks consider the latter as less useful than the former in reducing loan riskiness.

The model in section 2 predicts that in a cross section of bank lending relationships one should find that secured loans are charged higher interest rates because they are riskier. Therefore, if one could control perfectly for differences in the degree of riskiness, the coefficients of the dummy variables for the presence of real and personal guarantees should be zero. Column B of table 6 presents the results of the estimation of equation (7) with fixed effects on banks and controlling for characteristics of the lending relationship and of the borrower. As expected, the coefficient of the dummy variables for the presence of real guarantees, although still positive and significantly different from zero, is lower than in the regression without controls. In the case of personal guarantees the coefficient is not significantly different in the two regressions.

The fact that, even controlling for the characteristics of the lending relationships and of the borrowers, the coefficients of the dummy variables are still positive and significantly different from zero is likely to be due to the difficulties in measuring adequately the degree of riskiness. A confirmation of this interpretation comes from the results of a regression including fixed effects on both bank and borrowers characteristics. This estimation is made possible by the fact that a large number of borrowers have more than one bank relationship. Column C of table 6 shows that in this case the coefficients of the dummy variables for the

presence of real and personal guarantees are still positive and statistically different from zero, but their size is less than one half that of the original regression.

Table 7 reports the results of a regression on a sample of smaller firms (defined as those below the first quartile in the ranking by total sales) that, as argued by Berger and Udell (1998 and 2000), are more likely than others to have stronger lending relationships with banks. The estimated coefficients are qualitatively similar to those obtained from the whole sample. However, the absolute value of the coefficient of the dummy variables for secured loans is lower than in the previous regression, in particular that for personal guarantees. This suggests that banks consider loans to smaller firms secured with personal guarantees as relatively safer.

5 The specific riskiness of new economy firms

The analysis of the previous sections shows that bank lending to riskier borrowers is often made on a secured basis. As argued before, the requirement of guarantees on bank loans may reduce the ability of the banking sector to finance small start-ups, in particular if they are operating in risky sectors, such as those of the new economy. This aspect should be of foremost importance in particular in countries like Italy, where the venture capital industry is not yet developed, and the financial needs of firms operating in the hi-tech sectors are mainly fulfilled by internal funds and bank credit (Bugamelli *et al*., 2001).

Many authors have argued that lending to firms producing Information and Telecommunication Technologies (ICT) is indeed riskier than financing other types of investment. In fact, new economy start-ups typically have a larger share of intangibles out of total assets and, more importantly, these assets are very likely to be highly specific to the firm, and its entrepreneur. In fact, some of the characteristics that make the firms of the new economy riskier than others are not well measured by the explanatory variables included in the regressions commented in the previous section. As a result, the estimates of the probability that loans to new economy firms will be secured could be biased downwards. In order to account for this problem, equation (6) has been estimated including a dummy

variable for telecom service providers, telecom equipment manufacturers, computers and semiconductors manufacturers and internet related companies.[22]

The results, reported in table 8, show that the coefficients of a dummy variable that takes the value of 1 when the borrower is a firm of the new economy and 0 otherwise is not significantly different from zero, providing evidence that these firms have the same probability of being granted bank loans on a secured basis as other borrowers with similar characteristics. The hypothesis that the potential lack of guarantees to back bank loans might be a problem for the financing of new economy firms in Italy seems therefore not supported by that data.

These results do not imply the absence of a specific type of risk for this category of borrowers, that banks may want to account for. In fact, table 9 shows that, in a regression on the determinants of the interest rates on bank loans, the coefficient of the dummy variable for new economy firms is positive and significantly different from zero. Indeed, this is evidence that banks consider these firms as riskier borrowers, even if they do not make use of real or personal guarantees to cover their higher riskiness.

6 Conclusions

This paper has analyzed the relationship between secured lending and borrowers' riskiness by building a simple model and testing its implications. The theoretical model predicts that banks cover the higher credit risk associated with loans to riskier borrowers by simultaneously requiring a guarantee and charging higher interest rates. In a cross-section of borrowers of different riskiness one would therefore find that banks charge higher interest rates on secured loans than on unsecured loans. This result does not depend on the existence of information asymmetries between borrowers and lenders, but on two other very plausible hypotheses. The first is that the value of the guarantee is lower for the bank than for the entrepreneur that posts it. The second is that entrepreneurs maximize their profits

[22] The choice of the sectors has been proposed by Antoniewicz (2001), and is adopted by the

with respect to the effort that they put in developing the project that is financed by the bank, for any given level of the interest rate on the loan and of the collateral.

The empirical analysis shows that the predictions of the model are indeed met by the data: banks normally require guarantees on loans that can be considered ex-ante as riskier. In particular, larger loans and those made to borrowers of smaller size, less capitalized, and with multiple banking relationships have a higher probability of being secured. Another important set of characteristics that make it more likely that a bank loan will be secured with real guarantees is the availability for the borrowers of assets that can be posted as collateral. In fact, these borrowers have a lower cost of using the collateral, and therefore stronger incentives to substitute it for lower interest rates. Moreover, measures of the ability of banks to screen loan applications, such as the sector concentration of credit, and of its efficiency also reduce the incidence of guarantees.

Interest rates on secured loans are on average higher than those on unsecured loans, confirming that guarantees are indeed required to ex-ante riskier borrowers, and that their presence is not sufficient to completely offset the higher credit risk of the loan. However, controlling for borrowers' riskiness, the relationship between the presence of guarantees and the interest rate on bank loans is weaker, consistent with the predictions of the theoretical model.

Finally, no evidence is found that firms operating in the new economy sectors are more likely to have secured loans than other borrowers with the same characteristics.

BIS Working Group on the Financing of the New Economy.

References

Antoniewicz, R. L. (2001), "Financing of 'New Economy' Firms in the United States", Federal Reserve Board, mimeo.

Barro, R. J. (1976), "The Loan Market, Collateral, and Rate of Interest", *Journal of Money Credit and Banking*, 8, 839-856.

Berger, A. N. and G. F. Udell (1990), "Collateral, Loan Quality, and Bank Risk", *Journal of Monetary Economics*, 25, 21-42.

Berger, A. N. and G. F. Udell (1995), "Relationship Lending and Lines of Credit in Small Firms Finance", *Journal of Business*, 68, 351-81.

Berger, A. N. and G. F. Udell (1998), "The Economics of Small Business Finance: the Roles of Private Equity and Debt Markets in the Financial Growth Cycle", *Journal of Banking and Finance*, 22, 613-673.

Berger, A. N. and G. F. Udell (2000), "Small Business and Debt Finance", in Zoltan, J. A and D. B. Audretsch (eds.), *Handbook of Entrepreneurship,* forthcoming.

Besanko, D. and A. V. Thakor (1987), "Collateral and Rationing: Sorting Equilibria in Monopolistic and Competitive Credit Markets", *International Economic Review*, 28, 671-690.

Bester, H. (1985), "Screening vs. Rationing in Credit Markets with Imperfect Information", *American Economic Review*, 57, 850-855.

Bester, H. (1987), "The Role of Collateral in Credit Market with Imperfect Information", *European Economic Review*, 31, 887-99.

Bester, H. (1994), "The Role of Collaterl in Model of Debt Renegotiation", *Journal of Money Credit and Banking*, 26, 72-86.

Binks, M., C. Ennew and G. Reed (1988), "Small Business and Banks: A Two Nation Perspective", prepared for the Forum of Private Business, UK and the National Federation of independent Business, USA.

Boot, A. W. A. and A. V. Thakor (1994), "Moral Hazard and Secured Lending in an Infinitely Repeated Credit Game", *International Economic Review*, 35, 899-920.

Boot, A. W. A., A. V. Thakor and G. F. Udell (1991), "Secured Lending and Default Risk: Equilibrium Analysis, Policy Implications and Empirical Results", *Economic Journal*, 101, 458-72.

Bugamelli. M. , P. Pagano, F. Paternò, A. F. Pozzolo, S. Rossi and F. Schivardi (2001), "Ingredients for the New Economy: How Much Does Finance Matter?", Banca d'Italia, Temi di Discussione, no. 418.

Chan, Y. and G. Kanatas (1985), "Asymmetric Valuations and the Role of Collateral in Loan agreements", *Journal of Money Credit and Banking*, 17, 84-95.

Coco, G. (1999), "Collateral, Heterogeneity in Risk Attitude and Credit Market Equilibrium", *European Economic Review*, 43, 559-574.

Coco, G. (2000), "On the Use of Collateral", *Journal of Economic Surveys*, 2, 191-214.

de Meza, D. and D. C. Webb (1987), "Too Much Investment: A Problem of Asymmetric Information", *Quarterly Journal of Economics*, 102, 281-92.

de Meza, D. and C. Southey, (1996), "The Borrowers Curse: Optimism, Finance and Entrepreneurship", *Economic Journal*, 106, 375-386.

Diamond, D. W. (1084), "Financial Intermediation and Delegated Monitoring", *Review of Economic Studies*, 51, 393-414.

Elsas, R. and J. P. Krahnen (2000), "Collateral, Default Risk, and Relationship Lending: An Empirical Study on Financial Contracting", CEPR Discussion Paper n. 2540.

Greenbaum, S. I. , G. Kanatas and I. Venezia (1989), "Equilibrium Loan Pricing under the Bank-Client Relationship", *Journal of Banking and Finance*, 13, 221-235.

Harhoff, D. and T. Körting (1998), "Lending Relationship in Germany – Empirical Evidence from Survey Data", *Journal of Banking and Finance*, 22, 1317-53.

Hart, O. (1995), *Firms, Contracts, and Financial Structure*, Oxford, Clarendon Press.

John, K., A. W. Lynch and M. Puri (2000), "Credit Ratings, Collateral and Loan Characteristics: Implications for Yield", mimeo, available from www.ssrn.com.

Longhofer, S. D. and J. A. Santos (2000), "The Importance of Bank Seniority for Relationship Lending", *Journal of Financial Intermediation*, 9, 57-89.

Manove, M., A. J. Padilla and M. Pagano (2000), "Collateral vs. Project Screening: A Model of Lazy Banks", CEPR Discussion Paper no. 2439.

Morsman, E. Jr. (1986), "Commercial Loan Structuring", *Journal of Commercial Bank Lending*, 68, 2-20.

Pagano, M., F. Panetta and L. Zingales (1998), "Why Do Companies Go Public? An Empirical Analysis", *Journal of Finance*, 53, 27-64.

Rajan, R. (1992), "Insiders and Outsiders: The Choice Between Informed and Arm's-Length Debt", *Journal of Finance*, 47, 1367-1400.

Rajan, R. and A. Winton (1995), "Covenants and Collateral as Incentives to Monitor", *Journal of Finance*, 50, 1113-46.

Sharpe, S. A. (1990), "Asymmetric Information, Bank Lending, and Implicit Contracts: A Stylized model of Customer Relationships", *Journal of Finance*, 45, 1069-1087.

Smith, C. W. and J. B. Warner (1979), "On Financial Contracting. An Analysis of Bond Covenants", *Journal of Financial Economics*, 7, 117-161.

Stiglitz, J. E. and A. Weiss (1981), "Credit Rationing in Markets with Imperfect Information", *American Economic Review*, 71, 393-410.

Stulz, R. M. and H. Johnson (1985), "An Analysis of Secured Debt", *Journal of Financial Economics*, 14, 501-22.

Welch, I. (1997), "Why is Bank Debt Senior? A Theory of Asymmetry and Claim Priority Based on Influence Costs", *Review of Financial Studies*, 10, 1203-1236.

Table 1

Secured loans: summary statistics
(percentage values)

Long-term loans have original length of more than 18 months. Real guarantees are physical assets or equities; personal guarantees are contractual obligations of third parties to make payments in case of default of the borrower. Source: Italy's Bank Credit Register, 1997.

	Real guarantees			Personal guarantees
	Total loans	Long-term loans	Short-term loans	
Share of secured loans	12.9	15.0	3.4	5.4
Mode value across single loans	0	0	0	0
Value at 90th percentile	100	100	0	0
Value at 95th percentile	100	100	0	100
Value at 99th percentile	100	100	100	100

Table 2

Value of guarantees relative to that of total loans by duration, size of the lending bank, area and type of guarantee
(percentage values)

Ratio of the value of guarantees to that of total loans in the class. For guarantees exceeding the value of the loan, the latter value has been used in the numerator. Bank size is measured by total assets. For variables' definitions see also the note to table 1. Source: Italy's Bank Credit Register, 1997.

	Real guarantees			Personal guarantees	Real and personal guarantees
	Total loans	Long-term loans	Short-term loans		
Bank size					
Below 20th percentile	5.1	6.4	3.6	3.6	8.7
Between 20th and 40th percentile	10.7	15.8	6.3	4.3	15.0
Between 40th and 60th percentile	11.8	18.1	7.0	4.3	16.1
Between 60th and 80th percentile	27.6	37.7	11.1	5.4	33.0
Above 80th percentile	18.2	25.3	4.7	7.0	25.2
Area					
North-West	18.4	25.1	5.4	6.8	25.2
North-East	20.7	28.9	5.4	6.2	26.9
Center	14.9	20.6	4.3	5.8	20.7
South	22.5	31.5	5.1	13.2	35.7
Islands	30.2	50.0	5.7	8.2	38.4
Total	18.7	25.9	5.1	6.9	25.6

Table 3

Value of guarantees relative to that of total loans by branch of economic activity of the borrower
(percentage values)

Ratio of the value of guarantees to that of total loans in the class. For guarantees exceeding the value of the loan, the latter value has been used in the numerator. For variables' definitions see also the note to table 1. Source: Italy's Bank Credit Register, 1997.

Branch of activity	Real guarantees	Personal guarantees	Branch of activity	Real guarantees	Personal guarantees
Agriculture	30.9	9.2	Machinery for industry and agriculture	18.9	7.3
Energy	4.8	2.2	Electrical machinery	17.2	10.4
Food and tobacco products	18.8	5.2	Motor-cars and other transport equipment	9.5	8.2
Textiles	18.1	6.6	Other manufactures	25.1	3.2
Leather and footwear	14.5	6.0	Construction	30.0	11.9
Wood and furniture	25.8	6.1	Commerce	12.7	4.6
Paper and publishing	29.4	9.5	Hotels	55.8	4.1
Chemicals	18.0	6.1	Transports	25.9	8.6
Rubber and plastic products	25.5	6.3	Communication	29.9	3.8
Metallurgy and transf. of non metalliferous minerals	35.2	11.2	Other services	16.9	10.2
Metals	22.3	8.1	Total	18.7	6.9

Table 4

Value of guarantees to that of total loans by size of the borrower, length of the lending relationship and size of the loan
(percentage values)

Ratio of the value of guarantees to that of total loans in the class. For guarantees exceeding the value of the loan, the latter value has been used in the numerator. Firm size is measured by total sales. For variables' definitions see also the note to table 1. Source: Italy's Bank Credit Register, 1997.

Percentiles	Size of borrower		Length of lending relationship (1)		Size of loan	
	Real Guarantees	Personal guarantees	Real guarantees	Personal guarantees	Real guarantees	Personal guarantees
Below 20th	27.8	7.6	18.1	6.9	6.7	3.8
Between 20th and 40th	22.1	5.5	15.3	5.8	8.2	4.1
Between 40th and 60th	22.0	5.2	21.1	9.0	9.5	4.5
Between 60th and 80th	22.7	6.8	21.6	8.7	14.5	5.2
Above 80th	15.6	6.7	20.9	7.0	20.8	7.5
Total	18.7	6.9	18.7	6.9	18.7	6.6

(1) The classes considered for the length of the lending relationship are 1-2, 3-4, 5-6, 7-8 and more than 9 years.

Table 5

Determinants of secured lending on long-term loans

The dependent variable equals 1 if the loan is secured with real guarantees, 2 if it is secured with personal guarantees and 0 otherwise (see equation 6). Borrowers' balance sheet variables, except immobilized assets and capital, are four years averages between 1992 and 1996. The housebank dummy is equal to 1 for banks with more then 50 per cent of total bank debt of the borrower, 0 otherwise. Geographical and sector dummies, not reported, are included in the regression. For variables' definitions see also the note to table 1. *** indicates significance at 1 per cent level. ** at 5 per cent and * at 10 per cent.

VARIABLES	All firms				Small firms			
	Real guarantees (A)		Personal guarantees (B)		Real guarantees (C)		Personal guarantees (D)	
	Coeff. *std. err.*	Sign.	Coeff. *std. err.*	Sign.	Coeff. *std. err.*	Sign.	Coeff. *std. err.*	Sign.
Loan's interest rate	0,193	***	0,062	***	0,177	***	0,009	
	0,009		*0,012*		*0,019*		*0,028*	
Number of banking relationships	0,028	***	0,005		0,058	***	-0,029	
	0,003		*0,004*		*0,013*		*0,020*	
Housebank (dummy variable)	1,145	***	1,956	***	-0,011		2,430	**
	0,351		*0,482*		*0,682*		*1,010*	
Relationship length with main bank (logs – years)	0,028		-0,760	***	0,418		-1,086	**
	0,167		*0,253*		*0,318*		*0,521*	
Relationship length with non main banks (logs – years)	0,411	***	0,083	*	0,309	***	0,075	
	0,041		*0,044*		*0,093*		*0,121*	
Loan's value (logs – millions of lire)	0,603	***	0,149	***	0,854	***	0,276	***
	0,024		*0,020*		*0,058*		*0,063*	
Total sales (logs – millions of lire)	-0,332	***	-0,135	***	-0,525	***	-0,385	***
	0,036		*0,048*		*0,109*		*0,131*	
Total assets (logs – millions of lire)	-0,168	***	0,369	***	0,105		0,607	***
	0,041		*0,049*		*0,098*		*0,120*	
Physical assets (share of total assets)	2,094	***	0,663	***	1,919	***	0,496	
	0,122		*0,175*		*0,270*		*0,420*	
Immaterial assets (share of total assets)	-2,936	***	0,877		-5,965	***	3,316	**
	0,636		*0,536*		*1,548*		*1,314*	
Age of borrower (20 to 40 years dummy variable)	0,048		-0,496	***	0,015		-0,367	***
	0,038		*0,048*		*0,090*		*0,127*	
Age of borrower (40 to 60 years dummy variable)	-0,042		-0,541	***	-0,163		-1,005	***
	0,068		*0,088*		*0,171*		*0,315*	
Age of borrower (more than 60 years dummy variable)	0,246	***	-0,661	***	0,459	***	-0,064	
	0,069		*0,108*		*0,146*		*0,222*	
Capital (ratio to total assets)	-0,935	***	-3,056	***	-1,097	***	-4,213	***
	0,187		*0,262*		*0,405*		*0,848*	
Liquid assets (share of total assets)	2,665	***	-2,258	***	2,078	***	-3,970	***
	0,254		*0,471*		*0,632*		*1,239*	
Leverage	0,002		0,022	**	0,003		0,461	
	0,014		*0,011*		*0,010*		*0,315*	
ROE	0,303	**	-0,283	*	0,779	***	0,436	
	0,125		*0,157*		*0,298*		*0,399*	
Competition in loan market (Province Herfindhal index)	2,866	***	4,393	***	3,373	**	5,781	***
	0,747		*0,840*		*1,652*		*1,949*	
Bank's unit labor costs (millions of lire)	17,591	***	2,818		25,759	***	-6,113	
	1,917		*2,266*		*4,327*		*6,264*	
Average number of workers in each bank dependency (logs)	0,666	***	-0,135		0,789	***	-0,523	
	0,096		*0,119*		*0,220*		*0,336*	
Bank credit concentration within branches (ratio)	-10,066	***	-0,133		-9,572	***	-5,557	**
	0,852		*0,948*		*1,912*		*2,532*	
Bank credit concentration within provinces (ratio)	-0,170		-0,388	**	-0,297		-0,562	
	0,151		*0,185*		*0,344*		*0,533*	
Bank's total assets (logs – billions of lire)	-0,180	***	0,042		-0,304	***	-0,022	
	0,030		*0,039*		*0,071*		*0,104*	
No. of observations	55,045				9,653			
Pseudo R-squared	0.10				0.17			

Table 6

Guarantees and interest rates on long-term loans – all firms

The dependent variable is the level of the interest rate on the loan (see equation 7). Geographical and sector dummies, not reported, are included in the regression. For variables' definitions see also the notes to tables 1 and 5. *** indicates significance at 1 per cent level, ** at 5 per cent and * at 10 per cent.

VARIABLES	(A)		(B)		(C)	
	Coeff. *std. err.*	Sign.	Coeff. *std. err.*	Sign.	Coeff. *std. err.*	Sign.
Real guarantees (dummy variable)	0,727 *0,032*	***	0,648 *0,032*	***	0,302 *0,030*	***
Personal guarantees (dummy variable)	0,142 *0,040*	***	0,150 *0,038*	***	0,093 *0,047*	**
Housebank (dummy variable)			0,087 *0,046*	*	0,135 *0,047*	***
Relationship length (log – years)			0,006 *0,015*		0,126 *0,017*	***
Loan's value (logs – millions of lire)			-0,112 *0,006*	***	-0,092 *0,007*	***
Number of banking relationships			0,005 *0,002*	***		
Total sales (logs – millions of lire)			-0,341 *0,019*	***		
Total assets (logs – millions of lire)			0,005 *0,021*			
Physical assets (share of total assets)			0,182 *0,059*	***		
Immaterial assets (share of total assets)			2,953 *0,256*	***		
Age of borrower (20 to 40 years dummy variable)			0,048 *0,016*	***		
Age of borrower (40 to 60 years dummy variable)			0,137 *0,028*	***		
Age of borrower (more than 60 years dummy variable)			0,307 *0,035*	***		
Capital (ratio to total assets)			-1,632 *0,080*	***		
Liquid assets (share of total assets)			-1,774 *0,118*	***		
Leverage			0,002 *0,012*			
ROE			-0,537 *0,054*	***		
Competition in loan market (Province Herfindhal index)			-0,279 *0,339*			
Bank's unit labor costs (millions of lire)			-12,038 *0,774*	***		
Average number of workers in each bank dependency (logs)			0,772 *0,044*	***		
Bank credit concentration within branches (ratio)			-0,228 *0,348*			
Bank credit concentration within provinces (ratio)			0,145 *0,068*	**		
Bank's total assets (logs – billions of lire)			0,037 *0,015*	**		
No. of observations	55,045		55,045		55,045	
Adjusted R-squared	0.08		0.19		0.52	

Table 7

Guarantees and interest rates on long-term loans – small firms

The dependent variable is the level of the interest rate on the loan (see equation 7). Geographical and sector dummies, not reported, are included in the regression. For variables' definitions see also the notes to tables 1 and 5. *** indicates significance at 1 per cent level, ** at 5 per cent and * at 10 per cent.

VARIABLES	(A)		(B)		(C)	
	Coeff. *std. err.*	Sign.	Coeff. *std. err.*	Sign.	Coeff. *std. err.*	Sign.
Real guarantees (dummy variable)	0,630 *0,072*	***	0,583 *0,074*	***	0,174 *0,074*	**
Personal guarantees (dummy variable)	0,071 *0,104*		-0,040 *0,103*		0,128 *0,124*	
Housebank (dummy variable)			0,043 *0,102*		0,039 *0,098*	
Relationship length (log – years)			0,006 *0,040*		0,145 *0,046*	***
Loan's value (logs – millions of lire)			-0,152 *0,018*	***	-0,137 *0,019*	***
Number of banking relationships			-0,003 *0,006*			
Total sales (logs – millions of lire)			-0,284 *0,074*	***		
Total assets (logs – millions of lire)			0,312 *0,053*	***		
Physical assets (share of total assets)			0,165 *0,136*			
Immaterial assets (share of total assets)			2,343 *0,700*	***		
Age of borrower (20 to 40 years dummy variable)			0,166 *0,042*	***		
Age of borrower (40 to 60 years dummy variable)			0,306 *0,079*	***		
Age of borrower (more than 60 years dummy variable)			0,301 *0,083*	***		
Capital (ratio to total assets)			-1,844 *0,183*	***		
Liquid assets (share of total assets)			-1,498 *0,310*	***		
Leverage			-0,008 *0,010*			
ROE			-0,255 *0,147*	*		
Competition in loan market (Province Herfindhal index)			0,115 *0,828*			
Bank's unit labor costs (millions of lire)			-9,979 *2,004*	***		
Average number of workers in each bank dependency (logs)			1,061 *0,115*	***		
Bank credit concentration within branches (ratio)			0,869 *0,857*			
Bank credit concentration within provinces (ratio)			-0,010 *0,174*			
Bank's total assets (logs – billions of lire)			0,031 *0,038*			
No. of observations	9,563		9,563		9,563	
Adjusted R-squared	0.11		0.20		0.54	

Table 8

Determinants of secured lending on long-term loans – new economy firms

The dependent variable equals 1 if the loan is secured with real guarantees, 2 if it is secured with personal guarantees and zero otherwise (see equation 6). New economy firms are defined as telecom service providers, telecom equipment manufacturers, computers and semiconductors manufacturers and internet related companies (see Antoniewicz , 2001). Geographical and sector dummies, not reported, are included in the regression. For variables' definitions see also the notes to tables 1 and 5. *** indicates significance at 1 per cent level. ** at 5 per cent and * at 10 per cent.

VARIABLES	All firms				Small firms			
	Real guarantees (A)		Personal guarantees (B)		Real guarantees (C)		Personal guarantees (D)	
	Coeff. *std. err.*	Sign.	Coeff. *std. err.*	Sign.	Coeff. *std. err.*	Sign.	Coeff. *std. err.*	Sign.
New economy firms (dummy variable)	-0,309 *0,201*		0,065 *0,198*		0,091 *0,469*		-0,180 *0,500*	
Loan's interest rate	0,193 *0,009*	***	0,062 *0,012*	***	0,177 *0,019*	***	0,009 *0,028*	
Number of banking relationships	0,028 *0,003*	***	0,005 *0,004*		0,058 *0,013*	***	-0,028 *0,020*	
Housebank (dummy variable)	1,142 *0,351*	***	1,955 *0,482*	***	-0,008 *0,682*		2,449 *1,009*	**
Relationship length with main bank (logs – years)	0,029 *0,167*		-0,760 *0,253*	***	0,417 *0,318*		-1,095 *0,520*	**
Relationship length with non main banks (logs – years)	0,410 *0,041*	***	0,083 *0,044*	*	0,309 *0,093*	***	0,076 *0,122*	
Loan's value (logs – millions of lire)	0,604 *0,024*	***	0,149 *0,020*	***	0,854 *0,058*	***	0,276 *0,063*	***
Total sales (logs – millions of lire)	-0,332 *0,036*	***	-0,135 *0,048*	***	-0,525 *0,109*	***	-0,384 *0,131*	***
Total assets (logs – millions of lire)	-0,167 *0,041*	***	0,369 *0,049*	***	0,105 *0,098*		0,609 *0,120*	***
Physical assets (share of total assets)	2,086 *0,122*	***	0,665 *0,176*	***	1,921 *0,271*	***	0,488 *0,421*	
Immaterial assets (share of total assets)	-2,880 *0,638*	***	0,859 *0,538*		-5,978 *1,552*	***	3,340 *1,319*	**
Age of borrower (20 to 40 years dummy variable)	0,048 *0,038*		-0,495 *0,048*	***	0,015 *0,090*		-0,368 *0,126*	***
Age of borrower (40 to 60 years dummy variable)	-0,044 *0,068*		-0,540 *0,088*	***	-0,163 *0,171*		-1,005 *0,315*	***
Age of borrower (more than 60 years dummy variable)	0,245 *0,070*	***	-0,661 *0,108*	***	0,459 *0,146*	***	-0,063 *0,222*	
Capital (ratio to total assets)	-0,927 *0,187*	***	-3,060 *0,262*	***	-1,097 *0,404*	***	-4,220 *0,850*	***
Liquid assets (share of total assets)	2,661 *0,254*	***	-2,255 *0,471*	***	2,078 *0,632*	***	-3,968 *1,245*	***
Leverage	0,003 *0,014*		0,022 *0,011*	**	0,003 *0,010*		0,461 *0,316*	
ROE	0,304 *0,125*	**	-0,283 *0,157*	*	0,777 *0,299*	***	0,444 *0,397*	
Competition in loan market (Province Herfindhal index)	2,876 *0,747*	***	4,395 *0,840*	***	3,372 *1,652*	**	5,797 *1,950*	***
Bank's unit labor costs (millions of lire)	17,560 *1,917*	***	2,831 *2,267*		25,770 *4,328*	***	-6,078 *6,270*	
Average number of workers in each bank dependency (logs)	0,665 *0,096*	***	-0,134 *0,119*		0,789 *0,220*	***	-0,522 *0,337*	
Bank credit concentration within branches (ratio)	-10,064 *0,853*	***	-0,135 *0,948*		-9,577 *1,912*	***	-5,561 *2,533*	**
Bank credit concentration within provinces (ratio)	-0,166 *0,151*		-0,389 *0,186*	**	-0,298 *0,344*		-0,566 *0,534*	
Bank's total assets (logs – billions of lire)	-0,179 *0,030*	***	0,042 *0,039*		-0,304 *0,071*	***	-0,022 *0,105*	
No. of observations	55,044				9,563			
Pseudo R-squared	0.10				0.17			

Table 9

Guarantees and interest rates on long-term loans – specific riskiness of new economy firms

The dependent variable is the level of the interest rate on the loan (see equation 7). Geographical and sector dummies, not reported, are included in the regression. For variables' definitions see also the notes to tables 1, 5 and 8. *** indicates significance at 1 per cent level, ** at 5 per cent and * at 10 per cent.

VARIABLES	All firms (A)		Small firms (B)	
	Coefficient *standard error*	Significance	Coefficient *standard error*	Significance
Real guarantees (dummy variable)	0,649 *0,032*	***	0,583 *0,074*	***
Personal guarantees (dummy variable)	0,150 *0,038*	***	-0,040 *0,103*	
New economy firms (dummy variable)	0,222 *0,082*	***	-0,075 *0,227*	
Housebank (dummy variable)	0,087 *0,046*	*	0,044 *0,102*	
Relationship length (log – years)	0,005 *0,015*		0,006 *0,040*	
Loan's value (logs – millions of lire)	-0,112 *0,006*	***	-0,152 *0,018*	***
Number of banking relationships	0,005 *0,002*	***	-0,003 *0,006*	
Total sales (logs – millions of lire)	-0,341 *0,019*	***	-0,284 *0,074*	***
Total assets (logs – millions of lire)	0,004 *0,021*		0,312 *0,053*	***
Physical assets (share of total assets)	0,188 *0,059*	***	0,163 *0,137*	
Immaterial assets (share of total assets)	2,924 *0,255*	***	2,355 *0,701*	***
Age of borrower (20 to 40 years dummy variable)	0,048 *0,016*	***	0,166 *0,042*	***
Age of borrower (40 to 60 years dummy variable)	0,138 *0,028*	***	0,307 *0,079*	***
Age of borrower (more than 60 years dummy variable)	0,308 *0,035*	***	0,302 *0,082*	***
Capital (ratio to total assets)	-1,637 *0,080*	***	-1,845 *0,183*	***
Liquid assets (share of total assets)	-1,770 *0,118*	***	-1,498 *0,310*	***
Leverage	0,002 *0,012*		-0,008 *0,010*	
ROE	-0,539 *0,054*	***	-0,253 *0,147*	*
Competition in loan market (Province Herfindhal index)	-0,270 *0,339*		0,122 *0,829*	
Bank's unit labor costs (millions of lire)	-12,019 *0,773*	***	-9,982 *2,004*	***
Average number of workers in each bank dependency (logs)	0,773 *0,044*	***	1,061 *0,115*	***
Bank credit concentration within branches (ratio)	-0,225 *0,348*		0,871 *0,858*	
Bank credit concentration within provinces (ratio)	0,144 *0,068*	**	-0,010 *0,174*	
Bank's total assets (logs – billions of lire)	0,037 *0,015*	**	0,031 *0,038*	
No. of observations	55,044		9,563	
Adjusted R-squared	0.19		0.17	