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The Role of Guarantees in Bank Lending

by

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THE ROLE OF GUARANTEES IN BANK LENDING

By Alberto Franco Pozzolo[*]

Abstract

Guarantees play an important role in debt contracts. They alter the risk for the lender, transform borrowers' incentives and, possibly, modify the equilibrium allocation of financial resources. This paper studies the role of guarantees on bank loans, using a sample of over 50,000 individual lines of credit granted by Italian banks. Two empirical models are used. The first directly verifies the relationship between ex-ante publicly available information on borrowers' default riskiness and the presence of guarantees on their bank loans; the second compares the interest rates charged on secured and unsecured loans made by different banks to the same borrower, thus perfectly controlling for idiosyncratic riskiness and singling out the direct effect of the presence of guarantees on credit risk. The empirical results show that real guarantees (physical assets or equities that the lender can sell if the borrower defaults), which are often internal, are mainly used to provide a priority to some creditors. Personal guarantees (contractual obligations of third parties to make payments in case of default, e.g. suretyships), which can only be external, are used instead as incentive devices against moral hazard problems. Controlling for borrowers' characteristics, both real and personal guarantees reduce ex-ante credit risk.

JEL-classification: *G21, G32*

Keywords: Bank loans, collateral, guarantee

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1.Introduction[1]

A large number of bank loans are backed by collateral or guarantees.[2] 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 et al. (1988) report similar or even higher ratios for Germany and the United Kingdom, respectively.

The consequences of warranty requirements for the availability of bank financing have been examined in numerous theoretical and empirical studies. Information asymmetries in bank relationships can significantly alter the allocation of credit with respect to what would be socially optimal (i.e. all projects with a positive net present value – NPV – would be financed; see, e.g., de Meza and Webb, 1987). Warranties may help to alleviate these distortions by reducing moral hazard and adverse selection problems. They transform borrowers' incentives, alter the risks for the banks and eventually modify 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 recourse to secured debt may make it possible to finance positive NPV projects that otherwise would not be financed.

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[2] There is no complete agreement in the literature on the definitions of guarantee and collateral. In the following I will use: a) guarantee for contractual obligations of a third party to make payments in case of default of the borrower (e.g. a suretyship), b) collateral for physical assets or a securities – posted either by the borrower or by a third party – which the lender can realize in case of default and c) warranty as a generic word indicating indifferently collateral and guarantees.

However, warranties can also introduce new inefficiencies in credit allocation. For example, banks might devote less resources to screening and monitoring projects financed with secured loans, as the warranties themselves help to reduce credit risk (see, e.g., Manove et al., 2000). Consequently, if banks are more qualified than the average investor to evaluate projects, credit allocation may be less efficient when a larger proportion of loans is made on a secured basis. Moreover, if banks find it less expensive to require warranties than to monitor projects, investors who cannot provide them possibly may not be financed, even if the NPV of their investment is positive. Further, additional distortions might be introduced if some banks, observing warranty demands of other institutions, free-ride on their auditing activity. As shown by Rajan and Winton (1995), this may lead to sub-optimal monitoring.

One of the crucial issues in the analysis of secured bank lending is whether secured debt is requested at safer or riskier borrowers. This question has been answered in different ways in the light of the predictions of theoretical models, the conventional wisdom among bankers, and the results of econometric analyses. This paper provides some additional empirical evidence on the relationship between risk and warranties on bank loans, using high quality data on over 50,000 individual lines of credit granted by a large sample of Italian banks. It arrives at two main findings. First, borrowers with higher ex-ante probability of default are more likely to be required to post guarantees – which can only be offered by an external grantor – but not collateral – which is typically owned by the borrower. Second, controlling for borrowers' risk, secured loans carry lower rates than unsecured loans. This result is novel to the literature,[3] but it is consistent with the predictions of a large body of theoretical research and with the received view within the banking community.

The rest of the paper is organized as follows. The next section briefly summarizes the theoretical and empirical results of the literature on the relationship between borrowers' risk and secured bank loans. Section 3 discusses the hypotheses under scrutiny and the empirical models adopted. Section 4 describes the data used in the empirical analysis. Section 5 presents the results of the empirical analysis. Section 6 concludes.

2.Risk and warranties on bank loans

2.1 Theoretical results

The predictions of the theoretical literature on the relationship between risk and warranties strongly depend on the informational framework adopted.[4] Following the seminal contribution of Stiglitz and Weiss (1981), many models have been developed that assume that banks cannot observe borrowers' characteristics, so that the average interest rate on loans is higher than the rate that would be optimal for 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 use warranties as a signaling device: by providing them, safer borrowers can credibly show their characteristics. Banks can therefore screen applicants by their degree of riskiness, offering 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).

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[3] One notable exception is Harhoff and Körting (1998). However, these authors do not expand in their finding.

The positive relationship between borrowers’ riskiness and the presence of warranties on bank loans is a general result in models where they are used as a signaling device. Theoretical models where secured loans are made to riskier borrowers typically build on different assumptions. The most common, and probably the most compelling, is that warraranties are used as incentive devices in the presence of moral hazard problems. Boot et al. (1991) show that if the returns from the project that is financed depend, at least in part, on the degree of effort provided by the borrower – which is unobservable by the bank – and riskier applicants have a higher return from effort, then it is optimal for the bank to require a warranty from the riskier borrowers in order to limit moral hazard. Similarly, a moral hazard problem lies at the root of the results in Bester (1994), who shows that when the lender cannot credibly commit to forcing the bankruptcy of a borrower who cheats on the outcome of his investment, not repaying his debt, a warranty can be used to make the strategic default less attractive, therefore forcing the borrower to truly report his status. Because in equilibrium the incentives to strategically default are negatively correlated with project risk, banks will grant secured loans to riskier borrowers.

John et al. (2002) point to a different implication of the agency problems between managers and claimholders. Building on the seminal paper of Jensen and Meckling (1976), they show that if, in the event of default, the value of the assets posted as collateral is more stable than that of the other assets owned by the firm, managers have a stronger incentive to perk-consume secured than unsecured properties. As a result, equilibrium yields will be higher on collateralized than on uncollateralized debt, in order to compensate for the greater risk of “asset substitution”.

Other authors have developed models where a positive relationship between borrowers’ riskiness and the presence of warranties does not depend on moral hazard

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[4] For a recent survey of the theoretical literature on the role of collateral in banking, see Coco (2000).

problems. Coco (1999), for example, shows that, even with ex-ante asymmetric information between borrowers and lenders as in Stiglitz and Weiss (1981), if borrowers are heterogeneous in their degree of risk aversion and those more risk averse are less willing to provide warranty, a screening equilibrium where guarantees are used as a signaling device is not possible and only risky borrowers may be requested to post collateral. de Meza and Southey (1996) show that when the population is composed of a number of overoptimistic borrowers, projects backed by high warranties are more likely to default. Finally, Barro (1976) shows that if the value of the warranty 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, implying a positive correlation between risk and warranty. As suggested by Coco (1999), the same result can be explained by the presence of a ceiling on bank interest rates, for example due to usury laws.

2.2 Empirical evidence

The heterogeneity of results of the theoretical literature is shared only in part by the results of the empirical studies. Moreover, it is completely at odd with the conventional wisdom among bankers, who believe that banks typically require warranties on loans made to riskier borrowers.[5]

Some authors have checked whether secured loans have characteristics that plausibly signal them as riskier, considering a large number of variables.[6] The neatest result is that loans of longer duration are more likely to be secured, as found by Boot et al. (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 – as one would expect considering that they typically entail a higher risk for the bank – but Boot et al. (1991) find a lower incidence. Beger and Udell (1995) find a positive relationship between the size of borrowing firms, measured by their total assets, and the probability that their lines of credit will be secured, and Harhoff and Körting (1998), proxying size with the firm's workforce, also find a positive relationship with the presence of warranties. On the other hand, the results of Elsas and Kranen (2000), showing a negative relationship between the presence of warranties and borrowers' total sales, are more in line with the conventional wisdom that smaller borrowers entail higher risk.[7] Harhoff and Körting (1998) also find that the share of secured loans decreases with the number of banking relationships, possibly because multi-banking wipes out the incentives to monitor borrowers' behavior or to require warranties of 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 – typically considered to be less risky – are less likely to be secured.[8] However, Elsas and Kranen (2000), using data from a survey of German banks, find that housebanks are more likely to have secured loans.[9]

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[5] See, for example, Morsman (1986).

[6] With a few exception (e.g., John et al., 2002), the theoretical literature does not distinguish between borrowers' and loans' riskiness. By contrast, the empirical literature takes account of loan-specific characteristics (e.g., size and duration), which are likely to affect credit risk for any given borrower.

Probably the most compelling results on the relationship between risk and warranties are those testing for differences in the interest rate spreads on secured versus unsecured loans. In a seminal contribution, using data from the FED survey on Terms of Bank Lending, Berger and Udell (1990) show that the interest rates on secured loans are on average higher than those on unsecured loans. This result has two major implications: that secured loans are typically made to borrowers considered ex-ante riskier by banks, and that the presence of warranties is insufficient to offset such higher credit risk. Berger and Udell (1995) confirm this result using data on credit-lines from the same source. John et al. (2002), considering a sample of over 1,000 public issues of fixed-rate straight debt made between 1993 and 1995, find that yield on collateralized debt is higher than on general debt, even after controlling for credit ratings. Casolaro et al. (2002), studying a large sample of syndicated credit facilities between 1990 and 2001, also find that secured loans have larger interest rate spreads than unsecured loans.[10]

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

[8] 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 already his ability to fulfill his obligations.

[9] 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.

3.Hypotheses under scrutiny and empirical modeling

The theoretical literature yields straight testable hypotheses concerning the relationship between the riskiness of borrowers and loans and the presence of warranties. From the discussion above it is clear that when warranties are used in order to address adverse selection problems engendered by information asymmetries, their presence should have no relationship with the borrowers' default risk, because this information is not asymmetric. On the other hand, if warranties are used mainly to provide incentives to riskier borrowers in the face of moral hazard problems – and riskier applicants have a higher return from effort – their presence should be positively correlated with ex-ante measures of borrowers' default risk.

Two strictly related empirical models are used in order to test these hypotheses.[11] The first directly verifies the relationship between ex-ante publicly available information on borrowers' default risk and the presence of warranties on their bank loans, thus discriminating between adverse selection and moral hazard theories of secured lending. The second singles out the direct effect of the presence of warranties on credit risk, by comparing the interest rates on secured and unsecured loans made by different banks to the same borrower. Clearly, this measure is untouched by the indirect effect on interest rates originating from the differences in the characteristics of borrowers with secured and unsecured loans.

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

[11] These models are derived from very simple theoretical assumptions. Disregarding agency problems, bank profits, π^B, are an increasing function of the interest rate, R, of the value of guarantees, C, and of the probability of repayment, p: $\pi^B = f(R, C, p)$ with $f'_R, f'_C, f'_p > 0$. Assuming zero profits in the banking sector, the previous expression implies: i) a positive relationship between the presence of collateral and loan riskiness (measured by one minus the probability of repayment), controlling for the

An important distinction to be made when testing the relationship between risk and collateralization is whether the collateral is owned by the borrower (inside collateral) or by an external grantor (outside collateral). As pointed out by Berger and Udell (2000), inside collateral simply reorders creditor priority in case of bankruptcy, giving secured lenders a specific claim on the pledged assets. By contrast, outside collateral is similar to an infusion of equity by the grantor, because it exposes him to the potential losses of the business.

The relationship between collateralization and borrower and loan riskiness differs depending on whether inside or outside collateral is provided. The theoretical literature shows that inside collateral is not a good signaling device, because it does not increase the potential loss for the borrower if he gets bankrupt. The only exception is if the pledge of his assets results in a welfare or profit loss for the borrower, for example because this limits his possibility to dispose of the assets in order to pursue new investment opportunities (as suggested by Smith and Warner, 1979) or for perk consumption (as suggested by John et al., 2000). A similar argument applies to collateral used as a tool to limit moral hazard on the part of borrowers. Therefore, any relationship between risk and the presence of collateral – , independent on whether positive or negative – can be expected to be stronger in the case of outside collateral.

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interest rate; ii) a negative relationship between the level of the interest rate and the value of collateral, controlling for loan riskiness. Agency problems alter the previous relationship by introducing indirect effects, with the probability of default being made dependent on the presence of collateral: $p = g(C)$ with $g'_C > 0$ or $g'_C < 0$ depending on the mechanism at work.

Unfortunately, the distinction between internal and external collateral has not been considered adequately in the empirical literature, mainly because of the unavailability of data discriminating between the two types.

A further distinction, which is partly related to that between internal and external collateral, is between real and personal warranties. Real warranties (collateral) are typically physical assets or equities that the lender can sell if the borrower defaults, while personal warranties (guarantees) are contractual obligations of third parties to make payments if the borrower defaults (e.g., a suretyship). As pointed out by Berger and Udell (2000), guarantees typically operate like external collateral, only that they do not give control over specific assets but represent a generic claim on the entire wealth of the grantor, who thus has a large degree of freedom in using and possibly neglecting it.

The potentially different role of real and personal warranties depends on the outcome of two opposing forces. Collateral is potentially more powerful, because it is less easy to dispose of, but if it is inside, it does not increase the value of assets that the lender can withhold in case of default. Guarantees are less powerful because they can be more easily disposed of, but they are more powerful because they can only be external. An a priori ranking of these two effects is impossible; which one will dominate is therefore an empirical issue. The empirical analysis that follows does not discriminate between inside and outside guarantees, because this information is not available, but makes a distinction between real and personal warranties.

As anticipated above, the first model directly verifies the borrower and loan characteristics most often associated with secured lending, controlling for the interest rate on the loan. Two sets of control variables are included in the regression, describing the characteristics of the borrowers and of the lending relationship. The first set consists of a measure of each borrower’s probability of default, other characteristics that might influence his riskiness (such as his share of physical over total assets and the number of his banking relationships) and proxies for the degree of information available on his creditworthiness (e.g. firm size and age). The second set consists of measures of loan-specific riskiness (such as its size) and the strength of the lending relationship (e.g. its duration). In order to control for characteristics specific to the lenders, dummy variables for each bank are introduced. In practice, the following discrete choice specification is assumed:

$$Pr\,(Y_{ij} = g) = f\,(X_{ij}, W_j, Z_i, K_j) \qquad g = 0, 1, 2 \qquad (1)$$

where: Y_{ij} equals 0 if the loan made by bank i to borrower j is unsecured, 1 if it is secured with real but not personal guarantees, 2 if it is secured with personal guarantees; X_{ij} is a vector of variables specific to the bank-borrower relationship; W_j is a vector of characteristics of the borrower; Z_i is a vector of bank-specific dummies; and K_j is a vector of dummy variables for the borrower's branch of economic activity and geographic location. The adoption of a discrete choice model is justified by the fact that the value of the collateral pledged on each loan is not significant information: except for very few cases, loans are either fully secured or unsecured.[12] Equation (1) is estimated using a multinomial logit specification.

The second model, inspired by Berger and Udell (1990), provides an indirect test of the relationship between riskiness and the presence of warranties. In particular, it verifies whether, controlling for borrower and loan riskiness, the interest rates on secured loans are systematically different from those on unsecured loans. Clearly, as discussed above, a negative relationship between interest rates and the presence of warranties is to be expected, because the lender's loss in case of default is reduced by the value of the collateral.

This second model is tested with a regression of each bank loan on two dummies, taking the value of 1 the loan is secured with real or personal guarantees, respectively:

$$i_{ij} = f(S_{ij}, X_{ij}, Z_i, W_j) \qquad (2)$$

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[12] See, in particular, Section 4 and Table 1.

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 bank-specific dummy variables; W_j is a vector of borrower-specific dummy variables.

4.Data and summary statistics

The empirical analysis uses information on lines of credit to a large sample of Italian non-financial firms. The data are taken from three sources: banks' supervisory reports to the Bank of Italy (*segnalazioni di vigilanza*), the Central Credit Register (Centrale dei Rischi) and the Company Accounts Data Service (Centrale dei Bilanci).[13] 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 pledged as warranties (distinguishing between real and personal); loans are recorded only when they are above a threshold level of ITL 150 million (around €75,000). The third source contains balance sheet information on a large number of non-financial enterprises. In particular, it includes a measure of the risk profile of the borrower – obtained, following Altman et al. (1994), as a numerical score from two discriminant functions – accessible to all banks affiliated with the Company Accounts Data Service. According to their score, firms are grouped into seven classes, from low risk (high security) to high risk (risk of bankruptcy).[14] Data for 1997 from the Central Credit Register have been used. In order to avoid simultaneity problems, lagged averages of the balance sheet information of the borrowers between 1993 and 1996 have been used.

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[13] For a detailed description of the banks' supervisory reports to the Bank of Italy, the Central Credit Register and the Company Accounts Data Service see also Pagano et al. (1998).

[14] For a similar classification, see Sapienza (2003).

Tables 1-3 introduce the summary statistics for data from the sample of bank loans obtained by merging the information from the Central Credit Register and the Company Accounts Data Service. Table 1 presents some basic statistics by type of warranty. Loans secured with collateral are 2.1 per cent of all lines of credit; those secured with guarantees are 5.4 per cent.[15] The mode of the ratios of the value of the warranty to that of the loan is zero in all cases.[16] The value is 0 at the 95th percentile for collateral and 94.6 for guarantees; it is 99.4 per cent for collateral at the 99th percentile. These statistics show clearly that, when present, warranties normally cover the full amount of the loan. The requirement of warranties 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.[17]

Table 2 presents summary statistics on the ratio of the value of warranties to that of loans, with a breakdown by type of warranty, size of the lending bank, geographical area of activity and size of the borrower. The ratio of the overall value of collateral to that of loans is 5.2 per cent; it is 7.2 per cent for guarantees.[18] Larger banks make less recourse to collateral, and make a wider use of guarantees. Small borrowers have a larger share of loans covered by collateral, while the differences are smaller for guarantees. Finally, the share of secured loans shows a high variability across geographical areas.

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[15] Unfortunately, information is only available on whether a guarantee is posted on a given banking relationship, but not on which loan is actually secured. In order to avoid attributing a guarantee to an unsecured line of credit made to a borrower that has another type of secured loan with the same bank (e.g., a term loan), banking relationships involving loans other than lines of credit are excluded from the sample used to construct Tables 1-3. On the contrary, they are included in the data used in the econometric analysis.

[16] For guarantees exceeding the value of the loan, the latter value has been used in the numerator.

[17] In fact, it is to be expected that when the warranty does not cover the full value it is either because the price of assets pledged has fallen in the meantime or because guarantees have also been provided. In the case of guarantees, for which this information is available, it is often found that their value exceeds that of the loan.

[18] These ratios are larger than those referring to the number of secured and unsecured loans, showing that larger loans are on average more likely to be secured.

Table 3 presents the breakdown by branch of economic activity of the borrower. The ratio of the value of collateral to that of loans ranges from 0.0 per cent for communication services to 10.5 per cent for rubber and plastic products. Corresponding ratios for guarantees ranges from 0.0 per cent for communication services to 16.0 per cent for construction.

5. Empirical results

5.1 Guarantees and ex-ante riskiness of borrowers

Table 4 reports the results of the estimates of the probability of loans being secured, distinguishing between the cases when only real guarantees are posted and when personal guarantees are present.

Estimates are performed on a sample of 52,359 loans; bank dummies and dummies for the area and the sector of activity of the borrower, included in the regression, are not reported in order to save space. The test for the independence of irrelevant alternatives (IIA), verifying that the multinomial logit framework is to be preferred to standard binomial logit regressions, is unable to reject the null hypothesis that the remaining alternative is irrelevant in the choice of whether or not to post collateral or a guarantee, respectively, on the loan.[19] The pseudo R-squared of the regression is 0.09.

In the case of collateral, the coefficient of the score on the borrower's probability of default is not significantly different from zero. This result is potentially consistent with models motivating the use of warranties with adverse selection problems, which imply no relationships between warranties and information available ex-ante to lenders, such as the score. By contrast, it is not consistent with the hypothesis that collateral is used as an incentive device in the presence of moral hazard problems, as in Boot et al. (1991).

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[19] The test is an application of the Hausman specification test and verifies whether removing one option from the set of choices available (i.e., considering two separate logit regressions) systematically changes the parameter estimates; it is distributed as a χ^2 with as many degrees of freedom as parameters to be estimated (see Hausman and McFadden, 1984).

Although the supposition cannot be directly verified, the absence of a significant relationship between ex-ante riskiness and the presence of collateral is probably due to the fact that collateral is mainly represented by assets internal to the borrowing firm. As such, it does not increase the loss suffered in case of default, and therefore has little effect on borrowers' incentives.

A justification for the use of collateral, consistent with the absence of a relationship with borrower's riskiness but not based on adverse selection problems, is that it provides a priority to some creditors; in case of default, a bank whose loan is secured with an internal warranty is more likely than other lenders to recover its assets.

The positive and significant coefficients of the length of the lending relationship and of the dummy variable for companies that are more than 20 years old are indeed consistent with the hypothesis that collateral is used to provide a priority. Moreover, they are consistent with the argument made by Longhofer and Santos (2000), that borrowers have an incentive to post collateral when lending relationships are stronger, because in this case banks are more inclined to help them in situations of financial distress.[20] Furthermore, one can expect that the need to put a specific creditor in a better position than others is likely to be lower when the borrower owns a large share of assets that can be withheld in the event of default. Consistent with this interpretation, the coefficient of the borrower's share of physical over total assets is negative and significantly different from zero in the case of collateral.

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

In the case of guarantees, the coefficient of the score on the borrowers' probability of default is positive, and significantly different from zero. This is consistent with the hypothesis that banks use guarantees as incentives, in the presence of moral hazard problems. On the other hand, it is not consistent with the hypothesis that banks use guarantees in order to address adverse selection problems.

Additional evidence of the fact that ex-ante riskier borrowers are more likely to be granted loans secured with guarantees is given by the negative and significant coefficients of the length of the lending relationship and of the dummy variable for companies that are more than 20 years old. In fact, older borrowers and those with a longer lending relationship are typically less risky, because they have a longer record – public and bank-specific – on which their expected performance can be judged.

The coefficients of the other control variables, with few exceptions, are consistent with the predictions of the theoretical literature.

Larger loans typically imply a higher credit risk for the bank. Table 4 shows that the coefficient of loan size is positive for both collateral and guarantees, confirming that real and personal warranties are used to reduce credit risk.

If warranties were used to give some creditors a better position in case of default, one would expect a positive coefficient of the number of banking relationships. In fact, the estimated coefficient is negative and significantly different from zero for both real and personal guarantees. As suggested by Rajan and Winton (1995), this apparently counterintuitive result is consistent with the hypothesis that banks are unwilling to require a warranty on their loans if this has the side effect of making the result of their screening activity implicitly available to competing lenders.

Loans to larger borrowers are more likely to be secured with guarantees and less likely to be secured with collateral. These results are likely to be the effect of opposing forces. On one side, a number of factors suggest that larger borrowers should be less likely to have secured loans. For example, they have more market power than smaller debtors when contracting loan conditions and they are normally less risky, because they are more subject to market's scrutiny and their balance sheets data are more easily available to outside observers. On the other side, smaller borrowers have a better ability to establish sound lending relationships, which often make it unnecessary to require warranties. Moreover, larger borrowers, which often belong to groups, are likely to have lower costs in using guarantees, because these are provided by the holding company or its subsidiaries.

Finally, the coefficient of the interest rate is positive in the case of collateral and negative for guarantees; in both cases it is significantly different from zero. The positive correlation between interest rates and the presence of collateral is probably due to a common factor, not adequately controlled for, driving both variables. A likely candidate is unobservable risk, coming from banks' private information about their borrowers' characteristics. In the following section this issue will be addressed in greater detail.[21]

5.2 Ex-ante riskiness of secured vs. unsecured loans

The results of the estimates verifying the borrower and loan characteristics most often associated with secured lending provide evidence in favor of the hypotheses that collateral is used primarily to provide a priority to some creditors over others, probably because it is largely internal, while guarantees, which are necessarily external, are used as an incentive device to reduce moral hazard problems.

The estimates of the model in equation (2), reported in Table 5, provide some additional evidence on the effect of warranties on loan riskiness. Clearly, a major problem in estimating the effect of warranties on a loan's interest rate is the potential endogeneity; it is likely that riskier borrowers not only have higher interest rates but are required to back their loans with a warranty. If riskiness was not adequately controlled for (for example because banks have private information), this would lead to a positive relationship between interest rates and the presence of guarantees, a result in fact found by the vast majority of the empirical studies.[22]

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[21] Clearly, the presence of an uncontrolled common factor might also bias the estimates of the coefficients of the other explanatory variables (see Yatchew and Griliches, 1985, for a discussion of specification problems in discrete choice models). In particular, the bias should be positive for the coefficient of the borrower's probability of default, which is likely to be positively correlated with unobserved risk. As such, the effect of the score, the observable measure of borrowers' risk, would partly incorporate unobservable risk too. The bias should instead be negative for all the other coefficients, because loan's value, relationship length, company's age, number of banking relationship, borrower's total sales and borrower's share of physical to total assets are all likely to be negatively correlated with unobservable risk.

In order to take care of the endogeneity problem, the regression presented in Table 5 controls for borrower and lender-specific characteristics, by introducing bank and firm-specific dummies, as well as for some characteristics specific to each lending relationship (its duration and the size of the loan). With this procedure, made possible by the large number of multiple relationships that distinguish the Italian banking system,[23] borrowers' characteristics – including unobservable risk – are perfectly controlled for.

The results show that, controlling better for borrower and loan riskiness than was possible in previous empirical studies, the presence of warranties reduces the interest rate on bank loans. In Table 5 both coefficients of the dummy variables for secured loans are negative and significantly different from zero.

This result is quite novel to the literature, but it is not unexpected: controlling for borrowers' risk, the first order effect of the presence of a warranty is to reduce the loss for the lender in case of default.[24] In fact theoretical explanations of a positive relationship between warranties and the interest rate charged build on the assumption that their presence has unobservable effects on loan riskiness. Controlling better for loan riskiness, it is therefore to be expected that the intuitive negative relationship between warranties and the interest rate is recovered.

Clearly, even when borrower-specific fixed effects are introduced, the control for loan riskiness is far from perfect, because the amount of private information on a borrower (and therefore his perceived riskiness) is idiosyncratic to each bank, hence to each lending relationship. However, the presence of unmeasured loan riskiness introduces a positive bias in the estimate of the coefficient of the dummies for the presence of warranties. In its absence, the negative coefficients reported in Table 5 should be even larger in absolute value.

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[22] As mentioned above, one notable exception is Harhoff and Körting (1998).

[23] On this issue see, in particular, Ongena and Smith (2000) and Detragiache et al. (2000).

6.Conclusions

The empirical evidence presented in this paper sheds some new light on the determinants of banks' secured lending, partly reconciling academic research and the conventional wisdom of practitioners.

Using unique data on lending relationships it has been possible: first, to discriminate between adverse selection and moral hazard theories of secured lending, by verifying the relationship between ex-ante publicly available information on borrowers' default riskiness and the presence of warranties on their bank loans; second, to single out the direct effect on credit risk of the presence of warranties, by comparing the interest rates charged on secured and unsecured loans made by different banks to a same borrower.

The evidence presented is consistent with the view that collateral and guarantees have a different role in loan contracts. Collateral is mainly internal and is therefore used essentially to provide a priority to some creditors with respect to others. On the other hand, it is less likely to be used as an incentive device in the presence of moral hazard problems, as the latter case would imply a positive relationship between their presence and borrowers' ex-ante riskiness, which is not found. Still, the presence of internal warranties reduces banks' credit risk, as is shown by the fact that, once other sources of riskiness are adequately controlled for, secured loans are charged lower interest rates.

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[24] See the discussion in footnote 11.

Guarantees, which are mainly external, are typically used as incentive devices in the presence of moral hazard problems. They are more likely to be found in loans made to borrowers with an ex-ante higher probability of default. Like collateral, guarantees reduce credit risk, as is shown by the fact that secured loans are charged lower interest rates.

Table 1

Secured loans: summary statistics

(percentage values)

Collateral is typically represented by physical assets or equities; guarantees are contractual obligations of third parties to make payments in case of default of the borrower, such as a suretyship. Due to the absence of information on the type of loan that is secured with guarantees, banking relationships involving loans other than lines of credit are excluded. Source: Italy’s Bank Credit Register, 1997.

	Collateral	Guarantees
Share of secured loans	2.1	5.4
Value at 95th percentile	0	94.6
Value at 99th percentile	99.4	100

Table 2

Value of warranties relative to that of total loans by duration, size of the lending bank, geographical area and type of warranty

(percentage values)

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

	Collateral	Guarantees
Bank size		
Below 20th percentile	8.3	6.7
Between 20th and 40th percentile	6.9	6.6
Between 40th and 60th percentile	5.5	7.4
Between 60th and 80th percentile	3.4	7.4
Above 80th percentile	3.0	9.1
Borrower size		
Below 20th percentile	9.2	7.7
Between 20th and 40th percentile	7.6	6.3
Between 40th and 60th percentile	6.7	6.1
Between 60th and 80th percentile	6.8	8.1
Above 80th percentile	2.9	6.2
Area		
North-West	6.3	5.9
North-East	6.3	7.7
Center	2.7	7.8
South	6.7	9.7
Islands	4.6	6.1
Total	5.2	7.2

Table 3

Value of warranties relative to that of total loans by branch of economic activity of the borrower

(percentage values)

Ratio of the value of warranties to that of total loans in the class. For waranties exceeding the value of the loan, the latter value has been used in the numerator. For variable and sample definitions, see also the note to table 1. Source: Italy’s Bank Credit Register, 1997.

Branch of activity	Collateral	Guarantees
Agriculture	2.8	13.4
Energy	0.6	1.8
Food and tobacco products	7.5	4.4
Textiles	8.2	3.9
Leather and footwear	5.6	10.3
Wood and furniture	6.9	2.2
Paper and publishing	3.4	7.4
Chemicals	3.8	2.5
Rubber and plastic products	10.5	5.7
Metallurgy	4.1	11.3
Metals	4.8	7.2
Machinery for ind. and agr.	6.4	8.6
Electrical machinery	2.0	5.0
Motor-cars and other transp. eq.	1.1	4.6
Other manufactures	7.5	1.2
Construction	8.7	16.0
Commerce	5.0	5.0
Hotels	6.5	8.6
Transports	3.7	7.9
Communication	0.0	0.0
Other services	5.2	8.0

Table 4

Determinants of secured lending

The dependent variable equals 0 if the loan is unsecured, 1 if it is secured with collateral and 2 if it is secured with guarantees (see footnote 1 and equation 1 in the text). Borrowers' total sales are four years averages between 1992 and 1996. Geographical, sector and bank dummies, not reported, are included in the regression. For variable and sample definitions, see also the note to table 1. The test for independence of irrelevant alternatives (IIA) is distributed as a chi-squared under the null hypothesis of no systematic differences between logit and multinomial logit estimate, with as many degrees of freedom as parameters to be estimated. *** indicates significance at 1 per cent level. ** at 5 per cent and * at 10 per cent.

VARIABLES	Collateral		Guarantees	
	Coef. *Std err.*	Sign.	Coef. *Std err.*	Sign.
Risk	-0.01		0.04	***
(index)	*0.02*		*0.01*	
Loan's value	0.72	***	0.15	***
(logs – millions of lire)	*0.03*		*0.01*	
Relationship length	0.17	***	-0.14	***
(log – years)	*0.04*		*0.03*	
Borrower's age	0.09	*	-0.38	***
(dummy variable)	*0.06*		*0.04*	
Number of banking relationships	-0.05	***	-0.01	***
	0.01		*0.00*	
Borrower's total sales	-0.47	***	0.11	***
(logs – millions of lire)	*0.03*		*0.02*	
Borrower's share of physical to	-0.70	***	-0.04	
total assets	*0.15*		*0.13*	
Loan interest rate	0.06	***	-0.02	***
	0.01		*0.01*	
Test of IIA (p-value)	0.00	1.00	4.78	0.99
No. of observations	52,359			
Pseudo R-squared	0.09			

Table 5

Warranties and interest rates on bank loans

The dependent variable is the level of the interest rate on the loan. Bank and borrower dummies, not reported, are included. For the definition of the variables and of the sample, see also the note to tables 1 and 4. *** indicates significance at 1 per cent level, ** at 5 per cent and * at 10 per cent.

VARIABLES	Coef. *Std. Err.*	Sign.
Collateral	-0.59	***
(dummy variable)	*0.09*	
Guarantees	-0.11	*
(dummy variable)	*0.08*	
Loan's value	-0.30	***
(logs – millions of lire)	*0.01*	
Relationship length	0.43	***
(log – years)	*0.03*	
No. of observations	67,829	
Adjusted R-squared	0.50	

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