Multiple Versus Single Banking Relationships

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Abstract

We develop a theoretical model in which firms may choose multiple banking relationships to reduce the risk that financing will be denied by "relationship banks" should the latter experience liquidity problems and refuse to roll over lines of credit. The inability to refinance from relationship banks signals unfavorable information about the quality of the firm's project, which may also prevent the firm from obtaining credit from other banks. We show that if this "lemons" problem is severe, then it is optimal to establish a relationship with more than one bank in spite of higher transaction costs; if it is mild, a single banking relationship is optimal. We find that the severity of the lemons problem depends directly on the inefficiency of bankruptcy procedures and inversely on the "fragility" of the banking system. The paper concludes with a comparison of bank-firm relationships in Italy and the U.S., characterized respectively by multiple and single banking. We present evidence that bankruptcy costs are significantly higher and banks less fragile in Italy than in the U.S., suggesting that the factors identified by the theoretical model are relevant in practice.

Key words: Multiple banking, relationship banking, corporate finance.
JEL *Classification*: G21, G30, G33.

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1. Introduction

Most of the literature on corporate capital structure inquires into why firms should issue both debt and equity. Recently, however, a growing body of research investigates the role of different categories of debt as sources of outside financing. A number of papers have focused on why firms tend to resort to both public and private debt (Diamond, 1991; Rajan, 1992; Detragiache, 1994). A common conclusion of this literature is that while public debt can be placed with a large number of investors, private debt should be held by a single lender. As Repullo and Suarez (1995) put it: "The need for active lenders under informed and mixed finance suggests the desirability of having a single informed lender. On the contrary...the optimal financial contract under uninformed finance may involve a single or multiple lenders (p.35)". Uninformed lenders are then identified as the purchasers of publicly traded securities in the market and informed lenders as banks.

Several factors suggest that a firm should borrow from a single informed lender: multiple banking duplicates processing and administrative costs; it greatly complicates debt renegotiation in case of insolvency; and if monitoring is costly, free-riding among lenders can reduce the amount of monitoring with adverse effects on the debtor. Recently, Petersen and Rajan (1994, 1995) and Berger and Udell (1995) have tested various implications of the theory of banking relationships using U.S. small business data. Among other things, these studies show that U.S. small businesses typically borrow from one bank only, suggesting that a single banking relationship is all they need.

While single banking appears to be broadly characteristic of the U.S., the pattern differs in other countries, where firms often borrow from multiple banks. A striking feature of Italian firms, for instance, is that they ordinarily do business with a variety of different banks. Even quite small firms rarely rely on a single bank. The number of banking relationships maintained by Italian firms is rarely 1 but is often over 30 and averages around 10. Table 1 gives summary statistics on the banking

relationships of small firms in the two countries. The modal number in the United States is 1; in Italy it is 7. And only 1.2 percent of Italian firms obtain credit from a single bank compared to 37 percent among U.S. firms. The contrast is all the more remarkable in that the two countries have similar regulatory environments: in both, the law prohibits direct ownership of shares by commercial banks, precluding the development of German-style “house-banks”.

In this paper we address two questions: what benefits a firm derives from establishing multiple banking relationships and why they outweigh the costs in some countries and not in others. On the first, we show that multiple banking may help secure stable financing for small businesses and reduce the likelihood that long-term projects will have to be liquidated prematurely. To illustrate, we develop a simple model of firm financing decisions, which enables us to relate certain structural characteristics of the financial system to the optimal number of banking relationships. Specifically, we find that for a given range of parameter values characterizing the efficiency of the enforcement mechanism and the stability of the banking system a single banking relation is the optimal outcome; but once certain threshold values are crossed multiple banking becomes desirable. We present empirical evidence suggesting that the structural characteristics associated with single banking relationships are typical of the U.S., while those associated with multiple banking are dominant in the Italian financial system.

The model posits that a firm has a two-stage project. Following Sharpe (1991), banks that become involved in financing the firm in the first stage acquire information about the quality of the firm’s assets; specifically, they learn the probability that the second stage of the project will be successful. This information is unavailable to potential outside investors and cannot be credibly communicated to them. The second key feature of the model is that banks may experience exogenous liquidity problems that cause them to curtail their loan portfolio. This may happen if a bank unexpectedly finds itself with too many risky assets on the books, thus violating capital requirements. In this set-up, there are two circumstances in which the firm will choose to finance the second stage by borrowing from a non-relationship bank: when the project turns out to be bad and

informed banks demand high interest rates; or when all the relationship banks have liquidity problems and cannot lend. Non-relationship banks cannot observe which of the two events has occurred, so they must charge high enough interest rates to cover the risk of the project's being a "lemon". This is consistent with empirical evidence that the failure to roll over a firm's credit reveals adverse information about its profitability (see Lummer and McConnell (1989)). For some parameter values the interest rate that must be charged is so high that it is not credible for the firm to pay it even if the project succeeds. Thus, non-relationship banks may find it optimal to refuse to lend altogether. In this case, if relationship banks are out of the market because of liquidity problems, the project must be liquidated prematurely, with a loss of productive efficiency.

Since liquidity shocks are unlikely to be perfectly correlated across banks, by establishing multiple banking relationships the firm reduces the risk that all of the informed banks will be unable to finance the second stage of the project and therefore reduce the potential losses from early liquidation. Thus multiple banking, by securing more stable financing, creates a benefit that may outweigh the additional transaction costs and other disadvantages discussed above.

Whether loans from non-relationship banks will be unavailable at the intermediate stage - so that multiple banking is indeed beneficial - depends on the parameter values. In particular, the less likely the banking system is to experience liquidity problems, the more likely non-relationship banks are to refuse loans. To understand this result, consider the extreme case in which the probability that a bank faces a liquidity problem is zero. In this case, non-relationship banks can be certain that the firm will seek to borrow from them only if the interest rate that they ask is below that charged by the informed banks, which reflects the true probability of failure. Hence, it is optimal for those banks not to lend at all.

The second parameter relevant to the likelihood of a multiple banking regime is the degree of inefficiency of the bankruptcy system. If bankruptcy is very costly for the creditors, then the promise to pay lenders a high interest rate is not credible because *ex post* the liabilities can be "renegotiated down". For their loans to be profitable, however, non-relationship banks must be able to extract a high interest

rate because of the "lemons" problem. If the bankruptcy regime is inefficient they may be better off not lending, and the firm will be able to refinance the project only from banks that are already exposed.

Our paper is closely related to the literature on relationship banking (see Sharpe, 1991; Greenbaum, Kanatas and Venezia, 1989). One way to view it is as a contribution to the investigation of bank-firm ties; these ties have been shown to have significant effects on firms' investment decisions (Hoshi, Kashyap and Sharfstein, 1991), their access to credit (Petersen and Rajan, 1994) and the interest rate charged (Berger and Udell, 1995). Most of the theoretical literature has focused on the length of the relationship, while the number of relationships has so far been ignored in spite of its accepted empirical relevance (see Petersen and Rajan 1994, 1995). Our model addresses this issue.[1]

Only a few other papers raise the question of why it may be convenient for a firm to borrow from multiple sources. Berglof and von Thadden (1994) show that the trade-off originating from the need to control managers' incentives to strategic default and the desire to limit inefficient liquidation when the firm is cash-constrained can give rise to multiple lenders. However, these authors focus on the simultaneous presence of claims of different maturity rather than on multiple investors with the same type of claim. Using a similar set up, Bolton and Scharfstein (1996) show that it may be optimal for a firm to borrow from multiple creditors, but they interpret this as suggesting the circumstances under which bank debt will be syndicated. As such, their model is more suited to explaining why and when large firms seek multiple lenders. Our model can also explain small business behaviour.

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[1] Bank-firm ties can also be characterized along a third dimension, their intensity, as measured by the concentration of the firm's debt across various lenders. The way the firm distributes its debt among multiple banks can be relevant if monitoring depends on the amount of the loan. Menegotto and Sapienza (1996) rely on heterogeneity in firm quality and in banks' monitoring technology to explain the distribution of debt across lenders. High quality firms will prefer to be monitored and will accordingly tend to concentrate their debt on a bank with efficient monitoring technology. Low quality firms dislike monitoring and thus tend to spread borrowing among various banks. To focus on the determinants of the number of banks we ignore monitoring issues and assume that if the firm borrows from multiple banks the loan is uniformly distributed.

The paper is organized as follows. Section 2 lays out the basic model. Section 3 considers the case in which borrowing from a single bank is optimal, and Section 4 extends the analysis to an equilibrium characterized by multiple relations. Section 5 discusses long-term loan contracts and shows that our results do not depend on contract length. In Section 6 we examine the empirical validity of the model's main prediction, i.e. that a low probability of liquidity shocks to banks and a costly bankruptcy system tend to foster multiple banking relations. To this end, we contrast the dominance of multi-banking in Italy with the prevalence of single relationships in U.S. Section 7 presents evidence that bankruptcy procedures are less efficient and banks are less likely to face liquidity problems in Italy than in the U.S., suggesting that the factors identified by the theoretical model are relevant in practice. In Section 8 we argue that other factors, such bank size, banking concentration, the regulatory environment and access to arm's-length financing are unlikely to explain the difference in the average number of banking relations in the two countries. Section 9 concludes.

2. The theoretical model

2.1 *The basic set-up*

Consider a risk-neutral firm (or entrepreneur) that has no financial means and wants to realize a project. The project starts at date 0 with investment cost I_0. It yields a return (cash flow) *K* at date 2 with probability *p* and a zero return with the complementary probability, 1 - *p*. At an intermediate date 1 the project needs a second allotment of funds, I_1, in order to be completed. If the cost I_1 is not paid, the project must be liquidated at date 1, yielding a liquidation value of zero. The values of I_0 , I_1 and *K*, are publicly known at date 0. At date 0 the value of *p* is yet not known, but it is common knowledge that it results as a random draw from a distribution *F*(*p*), over the interval $[p_\lambda, 1]$, with $p_\lambda > 0$.[2]

[2] In order to highlight the main mechanism leading to multiple banking - i.e. the interim period asymmetry of information between banks that participate in the first round of financing

At date 1 the realization of p is observed by the entrepreneur and by the investors that have financed the project, but not by any outside parties. This is tantamount to assuming that the investors who finance the project at date 0 can closely monitor the actions of the entrepreneur. Such monitoring is undertaken by all participating investors, if there are more than one, and it is assumed to be cost-free[3].

To keep the exposition simple it is assumed that with probability one refinancing at date 1 is more efficient than liquidation.

Assumption 1: $p_\lambda K - I_1 \geq 0$

The entrepreneur has no initial endowment at date 0, so he must borrow an amount $D = I_0$. Outside investors consist of a large number of *ex-ante* identical, perfectly competitive, risk-neutral banks, whose opportunity cost of funds is zero in both periods. Each bank incurs a fixed cost c to process a loan.

The cash-flow at $t = 2$ is observable by all market participants, but it is not verifiable, so no contract can be made contingent upon it; in particular, outside equity contracts are not feasible. With a debt contract, by contrast, creditors can enforce repayment by the threat of bankruptcy proceedings (Jensen, 1986).

Loan enforcement through bankruptcy is assumed to involve a deadweight cost, including lawyers' fees, court fees, the loss of asset value while court proceedings take place, and other costs. In the model, the deadweight costs of bankruptcy are assumed to be a fraction 1 - v (with $0 < v < 1$) of the value of the firm. As is pointed out by Haugen and Senbet (1978), when bankruptcy involves deadweight costs the debtor and the creditors have an incentive to renegotiate the debt contract out of court, and if pre-bankruptcy bargaining can take place without friction, then formal bankruptcy never occurs in equilibrium. In our model we

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and banks that do not - we simplify the bank-firm relations in many respects. In particular we assume that the firm has no informational advantage regarding the probability of success of the project.

[3] In other words, the banks financing a project in the first period have access to a cost-free monitoring technology which is not accessible to the market. Since monitoring is cost-free, the well known free-riding problems associated with it are avoided.

assume that out-of-court bargaining is without friction, and that the debtor can make a take-it-or-leave-it offer to the creditors. Consider the case in which the project succeeds at $t = 2$ so that the value of the firm is K, and let D denote debt service due at $t = 2$ (including interest and principal). The maximum payoff that creditors can get by going to court is vK, so they are willing to accept any offer of partial repayment that is at least equal to vK. Thus, if $D > vK$ in equilibrium the debtor renegotiates the debt contract; he offers to repay only vK and creditors accept. From the point of view of the creditors, expected repayment on a loan contract with debt service equal to D is therefore $p\min[vK, D]$. The less efficient the bankruptcy process (the smaller v is), the smaller the fraction of the value of the firm that creditors can appropriate in equilibrium and the more limited is the set of loan contracts that can be enforced. Thus, the parameter v measures the efficiency of the loan enforcement mechanism.[4]

It is assumed that with probability $\varepsilon > 0$ a bank may refuse to release funds at date 1 independently of the realization of p. The parameter ε is identical across banks, and it captures the possibility that a bank may decide to liquidate some loans to reduce its loan portfolio. This is a realistic possibility when a bank is hit by a "liquidity crisis" due to mismanagement or to unforeseen deposit withdrawals. Banks may also wish to curtail lending when they feel that they have overinvested in risky assets relative to an optimal portfolio balance or to regulatory requirements. A bank is said to be "active" if it is not hit by a liquidity crisis. We assume that liquidity shocks are uncorrelated across banks so that increasing the number of bank relationships is a way of increasing the probability that at least one "active" bank will remain.

The number of banks taking part in the first round of lending is known to all market participants[5]. However, other investors and outside banks do not know whether a first-round bank is having a liquidity crisis or not. As a consequence, if

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[4] None of the results depends on the assumption that bargaining is without friction or that the debtor has all bargaining power. What is crucial is that enforcement is imperfect.

[5] This may seem to be a strong assumption, but actually it is not. In some instances, where public credit registers are available, as in Italy or France, this information is common

at $t = 1$ the borrower seeks to refinance from an uninformed bank, outside investors do not know whether it is because informed banks have all run into a liquidity crisis or because the realization of p is too low.

We will assume that the borrowers capture all the rents when at the refinancing stage. If $n \geq 2$, this assumption is justified by Bertrand competition among informed banks. If $n = 1$, the borrower and the lender are in a situation of bilateral monopoly, and the lender may extract some rents in equilibrium. For simplicity, we neglect this possibility.[6]

We limit our analysis to short-term debt contracts, with maturity at date 1, which must be rolled over. If the debt is not rolled over at $t = 1$ the firm is in default and must be liquidated. In Section 5 we briefly discuss the extension of our results to long term-contracts.

2.2. *The refinancing decision at* $t = 1$.

Consider first the borrowing decision at the intermediate date $t = 1$. To complete the project and service its first period debt at $t = 1$ the firm must borrow $D + I_1$. Suppose that from date 0 there are n banks that have lent to the firm, and, therefore, know the realization of p at date 1. Then, with probability $1 - \varepsilon^n$ at least one informed bank is active. Because of the fixed cost of lending, c, at $t = 1$ it is optimal to refinance from one bank only. Therefore, in equilibrium total transaction costs from the refinancing decision are equal to c. To economize on notation it is here assumed that the amount I_1 is inclusive of this transaction cost c.

Let R^i denote the interest factor charged by an informed bank in equilibrium; that is, let R^i satisfy the expected zero profit condition

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knowledge. In others, it is likely that it can be acquired at low cost from private credit bureaus, as in the U.S.

[6] There could be an advantage in borrowing from multiple lenders stemming from competition at date 1, but we do not want to base our analysis of multiple relationships on this. Rajan (1992) argues that borrowing from multiple inside banks is unlikely to solve the hold up problems that borrowing from a single lender may give rise to.

$$p\min\left[R^i(D+I_1), vK\right]-(D+I_1)=0 \qquad (1)$$

It follows that if the probability p of success is such that $p < \frac{D+I_1}{vK}$, informed creditors will not find it profitable to refinance at any interest rate, while for $p \geq \frac{D+I_1}{vK}$ they will be willing to refinance, and the break-even interest factor is

$$R^i(p)=\frac{1}{p}. \qquad (2)$$

Given the behaviour of informed banks, if uninformed banks lend at an interest factor R, then the firm will take their loan under two circumstances: (i) when no informed bank is active; (ii) when at least one informed bank is active but $R < R^i = 1/p$. The first event occurs with probability ε^n; thus the probability that a borrower will accept a loan from uninformed creditors if these lend at a factor R is

$$\varepsilon^n + (1-\varepsilon^n)F(1/R),$$

and the expected probability of success of the project, conditional on the event that refinancing is taken from an uninformed lender, is

$$E^u(p|R)=\frac{\varepsilon^n E(p)+(1-\varepsilon^n)\int_{p_\lambda}^{1/R} pf(p)dp}{\varepsilon^n+(1-\varepsilon^n)F(1/R)}, \qquad (3)$$

where $E(p)$ denotes the unconditional expected value of p. Since $E^u(p|R) < E(p)$, the recourse to refinancing from banks that were not previously exposed signals

unfavorable information about p. The expected zero-profit condition for an uninformed lender is thus

$$R(D+I_1)E^u(p|R)-(D+I_1)=0 \tag{4}$$

Thus R^u must be the solution to

$$R^u=\frac{1}{E^u(p|R^u)} \tag{5}$$

Note also that with no informed creditors, i.e. when $\varepsilon^n=1$, the two expectations on p coincide: $E^u(p|R)=E(p)$. Accordingly, when $0<\varepsilon^n<1$ the uninformed creditors demand a higher interest rate than they would if there were no informed creditors, because they know that in the states in which the probability of success is high the firm will be refinanced by the informed creditors, provided at least one of them is active.

Uninformed lenders will never refinance the project if they cannot expect any gain even by lending at the highest enforceable rate, namely $\frac{vK}{D+I_1}$. The following proposition derives the parameter values for which uninformed lenders are willing to provide refinancing and show that if a break-even interest factor exists it is unique.

Proposition 1: (*a*) *If* $(D+I_1)<vK$, *a necessary and sufficient condition for uninformed lenders to be willing to refinance the project is*

$$\left(\frac{vK}{D+I_1}\right)E^u\left(p|\frac{vK}{D+I_1}\right)-1\geq 0 \tag{6}$$

(*b*) *If an equilibrium factor* $R^u = \dfrac{1}{E^u(p|R^u)}$ *exists then it is unique.*

Proof: *See Appendix* 1.

The intuition behind Proposition 1 is as follows: when the debtor must refinance from uninformed creditors, he will do so at a high interest rate because of the adverse selection problem. If the break-even interest rate for uninformed lenders is so high that it requires the borrower to repay more than the maximum enforceable repayment *vK*, then refinancing from uninformed banks is impossible.

3. A regime with a single banking relationship

Consider now the decision whether to borrow from one or more banks at date 0 on the hypothesis that condition (6) holds. Since on this condition the project is refinanced at date 1 whether or not there is an active bank, then the first-period loan is safe, i.e. it is expected to be repaid with probability equal to 1. Since the interest rate on risk-free assets is zero, in equilibrium the amount repaid at date 1 is equal to the amount borrowed at date 0, which is the sum of the funds needed to cover the investment, I_0, plus the transaction costs *nc*. Hence if the firm borrows from *n* creditors

$$D = I_0 + nc.$$

The firm's expected profit at $t = 0$, is the difference between the expected cash flow at date 2 and the sum of expected payments to creditors. The latter differ depending on whether refinancing is provided by an active bank or by the market. Letting $Y \equiv (I_0 + nc + I_1)$, the firm's expected profit as of date 0 is:

$$\pi_0(n) = E(p)K - Y\left[R^u \varepsilon^n E(p) + (1-\varepsilon^n)\left(R^u \int_{p_\lambda}^{\frac{1}{R^u}} pdF(p) + \int_{\frac{1}{R^u}}^{1} pR^i(p)dF(p)\right)\right]$$

which, using (3)-(5), reduces to

$$\pi_0(n) = E(p)K - (I_0 + I_1 + nc) \tag{7}$$

This last expression is obviously minimized by setting n=1. When condition (6) is satisfied, increasing the number of banks does not increase the probability of refinancing the project and it therefore only results in an increase in transaction costs. Hence in equilibrium n = 1 and the amount of debt service due at t = 1 is $D = I_0 + c$. Substituting in condition (6) of Proposition 1 leads to the following:

Proposition 2 : *If*

$$\left(\frac{vK}{I_0 + c + I_1}\right) E^u\left(p \middle| \frac{vK}{I_0 + c + I_1}\right) - 1 \geq 0 \tag{6'}$$

then in equilibrium the firm borrows from a single bank at date 0.

If condition (6') fails to hold, then this first best outcome cannot be achieved. Note that if condition (6') is not satisfied for n=1, then it cannot be satisfied for any larger n either, since increasing n increases D (because of higher transaction costs), further reducing the left-hand side of (6').

Furthermore, the following proposition shows that the less efficient the enforcement system (i.e. the smaller the parameter v) and the more "solid" the banking system (the smaller the parameter ε), the less likely the uninformed creditors will be to provide refinancing at date 1.

Proposition 3: *Condition* (6') *is less likely to be satisfied, the smaller are the values taken by* ε *and v.*

Proof: *See Appendix* 1.

When the probability of a liquidity crisis ε is low, the adverse selection problem is very severe, because firms that try to borrow from uninformed lenders are very likely to have a low probability of success. Hence, other things being equal, the interest rate demanded by uninformed banks is very high, and it may be higher than what the borrower can credibly precommit to repay. Similarly, for a given ε a lower value of *v*, the fraction of cash-flow that can be extracted from the debtor in default, also makes it less likely that the borrower can precommit to repay the interest rate required by uninformed lenders. Under these circumstances the market is not willing to refinance and, as we shall see in the next section, multiple banking may arise.

4. An equilibrium with multiple banking relationships

Suppose that condition (6') of Proposition 2 does not hold, so that at date $t = 0$ the firm anticipates that uninformed creditors will not refinance the loan at date $t = 1$. Thus, if n is the number of initial creditors, with probability ε^n the project will not be refinanced because none of the informed creditors is active. Consider a state of nature in which at least one informed creditor is active at $t = 1$, and define

$$\tilde{p} \equiv \frac{D + I_1}{vK}. \tag{8}$$

If the realized probability of success of the project is $p > \tilde{p}$, then refinancing is profitable for an informed bank. The new loan at $t = 1$ is extended at the interest factor $R^i(p) = 1/p$ as in the previous section. Consider states in which $p < \tilde{p}$:

now the second stage of the project is very risky, and, because of limited enforcement, refinancing yields an expected loss whatever the interest rate charged. However, in these circumstances creditors who are already exposed will incur a loss even if they refuse to refinance, because the liquidation value of the project at $t = 1$ is zero. Thus, creditors who are already exposed must choose the lesser of two evils: refinancing the project ('throwing good money after bad'), which involves disbursing I_1 in exchange for an expected return *pvK*, or refusing to refinance and loose their initial investment. Defining

$$\bar{p} = \frac{I_1}{vK}, \tag{9}$$

exposed creditors are better off refinancing the project when $\bar{p} \le p \le \tilde{p}$, while they are better off liquidating the firm if $p < \bar{p}$. Notice that while banks compete for the privilege of lending to the firm for realizations of p such that new lending is profitable ($p > \tilde{p}$), they would be willing to step aside and let another creditor shoulder the burden of refinancing when $\bar{p} \le p \le \tilde{p}$ and a loss is expected. The game that exposed banks play in these circumstances has many interesting aspects but it lies outside the scope of the present paper, so we simply assume that if $\bar{p} \le p \le \tilde{p}$ the project is refinanced by exposed creditors, that each creditor contributes to the new loan in equal proportion, and that the indebted firm captures all the rents. Accordingly, when $\bar{p} \le p \le \tilde{p}$, each exposed bank receives a net payoff equal to zero.[7]

To sum up, when condition (6') fails to hold, the project is refinanced at date $t = 1$ if two conditions are satisfied: i) at least one bank that lent at $t = 0$ is active; and, ii) the probability of success of the second stage of the project is $p \ge \bar{p}$. When these conditions obtain, the expected payoff for the creditors who refinance the project at $t = 1$ is $p[(1/p)(I_1 + D)] - I_1 = D$ if $p > \tilde{p}$, and zero if $\bar{p} \le p \le \tilde{p}$.

[7] To keep things simple, we implicitly assume that banks participate in the bail out even if they are experiencing liquidity problems. This may be possible if, for example, active banks

Let us now consider the initial lending decision at $t = 0$. Suppose that the firm chooses to borrow from n creditors, and that the loan is shared in equal proportion. Then the expected zero-profit condition for each individual bank is:

$$-(\frac{I_0}{n}+c)+(1-\varepsilon^n)[1-F(\tilde{p})](\frac{D}{n})=0, \qquad (10)$$

hence:

$$(1-\varepsilon^n)(1-F(\tilde{p})D = I_0 + cn \qquad (11)$$

Expected profit for the borrower at the initial date is:

$$\pi_0(n) = (1-\varepsilon^n)\left\{\int_{\bar{p}}^{1}(pK - I_1)f(p)dp - [1-F(\tilde{p})]D\right\}$$

Using (11) and rearranging,

$$\pi_0(n) = (1-\varepsilon^n)\left\{\int_{\bar{p}}^{1}(pK - I_1)f(p)dp\right\} - (I_0 + cn) \qquad (12)$$

This expression shows that, when the parameters are such that uninformed banks are unwilling to refinance the second stage of the project, then increasing the number of initial banks affects expected profit in two ways: lowering it by increasing transaction costs but improving it by increasing the probability that the project will be refinanced.

4.1 *The optimal number of banking relations*

Maximizing (12) by choice of n yields:

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extend a loan to banks with liquidity problems to allow them to provide their share of the new

$$n^* = (\ln \varepsilon)^{-1}\left[\ln c - \ln(-Z \ln \varepsilon)\right], \qquad (13)$$

where

$$Z \equiv \int_{\bar{p}}^{1} (pK - I_1) f(p) dp .$$

Since $0 < \varepsilon < 1$, $-\ln \varepsilon > 0$ and the right hand side of (13) is well defined.[8] To sum up the results obtained so far, if the parameters are such that condition (6') of Proposition 2 holds, then a single banking relationship is optimal. But, if (6') fails to hold, the optimal number of banking relationships is n^* which may be a number greater than 1.[9] In these circumstances, while a single banking relationship allows the firm to minimize transaction costs, it may force the firm to liquidate the project prematurely at t = 1. Thus, multiple banking is desirable. [10] Not surprisingly, (13)

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loan.

[8] For $n^* > 0$ it must be that $c < -Z \ln \varepsilon$ in (13), which we assume to hold.

[9] For simplicity we are neglecting the fact that n^* must be an integer.

[10] In deriving the optimal number of relationships we have ignored that when distressed firms engage in debt restructuring they find it more difficult to arrive at Pareto-efficient solutions if a large number of creditors are involved, as the latter will try to free-ride. This is a well established point in the literature (Gertner and Scharfstein, 1991; Detragiache and Garella, 1996). Socially desirable refinancing of viable projects may then fail without debt forgiveness (Myers, 1977). That debt renegotiation is hard when debt is dispersed is also an argument used to explain multiple lenders (Bolton and Scharfstein, 1996). Our explanation of multiple banks does not conflict with this view, although we have not incorporated an analysis of free-riding by lenders. The free riding problem only appears for values of p in the interval $[\bar{p}, \tilde{p}]$ when creditors expect a loss from refinancing the firm (when $p > \tilde{p}$ creditors will not free-ride but, on the contrary, they will be willing to compete to refinance the firm). For values of p in that interval we have assumed away any free-riding problem by imposing that banks share the burden of the expected loss equally. Note, however, that reintroducing an explicit analysis of the refinancing game with free-riding might possibly modify the situation in only one of three possible ways. The first possibility is that the project is not refinanced whenever $p < \tilde{p}$ at date 1. Then our calculations for the continuation value of the firm should take $\tilde{p}$ instead of $\bar{p}$ as the lower bound of integration; n would still have two types of effects on the firm's expected profit and the analysis would go through substantially unmodified. The second possibility is that banks do not take all the burden of the expected loss and succeed in extracting some extra-payment from shareholders. Then one should subtract this expected liability from the expected profit of firms and add it to the expected profit of banks. Recalling that first stage competition at date 0 sweeps away the lender's expected profits, this change would only have a minor impact on the form of

implies that the optimal number of banking relationships is larger, the smaller are transaction costs and the larger the expected value of the second stage of the project at $t = 1$ (the term Z in equation (13)).

Notice that n^* is also a function of ε, the fragility of the banking system, and (through $\bar{p}$) of v, the efficiency of the enforcement mechanism. Specifically, in the Appendix 1 it is shown that n^* is increasing in both parameters. The intuition for these results is the following. In the regime in which uninformed lenders do not refinance the second stage of the project, the firm expects to realize a profit only if the project succeed and at least one informed lender is active (equation (12)). The larger is ε, the larger is the effect of an increase in n on the probability that at least one informed firm will be active, and - in turn - the larger is the effect on expected profits. With regard to v, a higher v means a smaller value of $\bar{p}$ (see equation (9)). Thus, the expected return from the project at $t = 0$ is increasing in v. But the more profitable is the project, the stronger are the incentives to ensure refinancing at $t = 1$ by increasing the number of banking relationships. Thus, while high values of v and ε make it more likely that the project will be refinanced by uninformed banks in the second period so that multiple banking is not necessary (Proposition 3), small values of v and ε also mean that the benefits from increasing the number of banking relationships are small. The model therefore predicts that the largest number of banking relationships should be observed for financial systems where ε and v are in an intermediate range.

Figure 1 offers a graphical illustration of the model's solution in terms of the relation between the optimal number of credit relationships, n_{ott}, and the probability that a bank will be hit by a liquidity shock. For values of ε below the lower bound ε^-, or above the upper bound ε^+, the optimal number of banks is 1. The upper limit ε^+ is determined by condition (6') holding with equality. The lower bound ε^- results from the fact that for sufficiently low values of ε,

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the firm expepected profit at date 0. Third, the banks refinance the firm but debt is unequally shared (e.g. it may be concentrated in one bank). This is obviously of no consequence.

transaction costs, *cn*, exceed the benefits of risk diversification through multiple credit relations and, using (13), is determined by

$$(\ln \varepsilon^{-})^{-1}\left[\ln c - \ln(-Z \ln \varepsilon^{-})\right] = 1.$$

For $\varepsilon^{-} < \varepsilon < \varepsilon^{+}$, multiple banking is the optimal solution and the number of relationships increases with ε according to (13). Changes in the parameters of the model, such as *c* and *v*, affect the solution in two ways: i) they alter the area of multiple banking by changing the thresholds ε^{-} and ε^{+}; and ii) they shift the upward-sloping portion of the relation between the optimal number of relationships and ε. Table 2 shows the value of n_{ott} (simulation values are rounded to the closest integer) for three different values of ε (0.2, 0.3 and 0.5) together with the thresholds ε^{-} and ε^{+} for a set of values of the parameters of the model. While ε^{-} shows little sensitivity to changes in the various parameters, ε^{+} increases sharply as *v* drops and as the required investment in the project increases, enlarging the area of multiple banking. This implies that even among countries where banks face similar chances of being subject to liquidity shocks, some can fall into the regime of multiple banking and others into that of single banking if they differ sufficiently in the efficiency of the bankruptcy procedures. As we will show in section 7, the lower and upper values of *v* assumed in the simulations (i.e. 0.5 and 0.9) are a good representation of recovery rates on defaulted loans in Italy and respectively the U.S.

If multiple banking is indeed optimal, a decrease in the transaction cost, *c*, raises the number of relationships; the latter is also sensitive to increases in ε but not to changes in *v*. Depending on the combination of the parameters the optimal number of banking relationships can be as high as 10.

The last row of Table 2 reports the simulation results of a doubling of the size of the firm (i.e. doubling the return from the project, K, and the required investment I_0 and I_1 while holding the other parameters constant). While the thresholds defining the area of multiple banking are unaffected, an increase in size raises the number of relationships when multiple banking prevails. This follows from the fact that the continuation value of the firm (Z in equation (13)) is

homogeneous of degree 1 in K and I_1. Thus, as size increases the payoff from insuring against earlier liquidation also increases, raising the number of banks.[11] As we will show in Section 6 this is indeed a feature of the data.

5. Long-term contracts

In our model the maturity structure of the debt is exogenously fixed and it implies a sequence of short-term debt contracts. It could be argued that the multiple banking result is driven by this assumption: if long-term contracts were available, firms could insure against premature liquidation by shifting the maturity structure of their debt. Consider then a long-term contract that provides the firm with the amount needed for the initial investment plus an option to obtain I_1 at the interim date against the promise to repay a sum, say Q (with $Q \leq vK$), at date 2. This contract gives rise to a long-term commitment of $I_0 + I_1$ for the lender. We distinguish two cases: in one a secondary market for the firm's debt may exist, in the other there is no such market. Consider the first case. If the bank observes p at date 1, then it will try to sell the debt if the observed value of p is below the threshold $\frac{D + I_1}{vK}$ (as in Section 2.2), and it must sell the claim if it incurs a liquidity shock. The pricing of the firm's debt by the market will then reflect the same lemons problem that hampers refinancing when the debt is short-term. The only difference is that with this contract it is the lender who bears the cost of adverse selection at date 1 and sells the debt at a discount. In this framework it can be shown that the date-zero maximization of the value of the debt implies two regimes as much as in the previous section: one with single banking and one with multiple banks. The prevalence of one or the other of the two regimes hinges again upon whether the market is willing or not to refinance (buy the debt back). If uninformed investors are willing to buy informed debt second-hand, this insures informed banks against the illiquidity risk and makes recourse to multiple relations

[11] It is interesting to notice that when multiple banking prevails the marginal effect on the optimal number of relationships of an increase in size is higher the higher the value of ε.

unnecessary. If, on the other hand, uninformed banks are not willing to buy debt second-hand, then there is clearly scope for increasing the number of lenders so as to create an internal market of informed investors who can exchange debt quotas at date 1. The analysis provided for the case where debt is assumed to be short-term then essentially goes through without changes.

If for institutional reasons there is no secondary market for private debt (irrespective of the lemons problem) then, under one-bank financing, the bank would bear the whole risk of illiquidity at date 1 with adverse consequences for the firm borrowing cost. In this case there would be scope for introducing covenants that reduce banks' exposure by giving them the right to liquidate at date 1. Indeed, as Gorton and Kahn (1993) point out, bank loan contracts contain a number of covenants that give the lender the right to force the borrower to repay the loan early on demand.[12] For our purpose it is clear that "callable" long term debt is amenable to the same frame of analysis as short-term debt.

6. Empirical evidence

In this section we supplement the theoretical model developed in the previous sections with empirical evidence. As we have seen, the model obtains rather sharp predictions of the institutional variables affecting the optimal number of banks.

The first such variable is the "fragility" of the banking sector, i.e. the probability that a bank will refuse refinancing to a firm irrespective of the latter's viability. Fragility has implications for firms' behaviour only if refinancing from outside investors is difficult after the original bank's refusal; otherwise firms are little affected. The key element, then, is the market's view of informed bank's refusal. If banks frequently run into "liquidity" problems (i.e. if the banking system is "fragile") a bank's refusal does not necessarily convey bad information to the

[12] In Italy the general conditions for loan contracts suggested by the Italian Banking Association establish that "the bank has faculty to recede, limit, reduce or suspend the line of credit in any moment, even through verbal communication and even when the loan was extended without a specific temporal limit".

market. If liquidity crises are rare, it does. This means that in a very fragile system there is little need for multiple banking. By contrast, a system where banks seldom incur a liquidity crisis is one in which the market may not be willing to take up refinancing of rejected firms at any interest rate. Resorting to multiple banks may thus work as insurance against premature liquidation.

The other variable that appears to have behavioral consequences is the degree of efficiency of the bankruptcy procedures. If in insolvency a high proportion of the value of the assets in place is lost, external investors will be less willing to provide refinancing in fear of costly bankruptcy. The amount that an investor is actually able to collect under bankruptcy determines the maximum rate at which he is willing to lend, as higher rates imply non-compliance of the contract by the debtor with probability one. The lower the share of the debt that the creditor can recover in bankruptcy, the lower this maximum rate. The inability to extract a high rate from the borrower is constraining, in particular, when due to the adverse selection problem mentioned above, the required rate is higher than it would be under full information.

6.1. *Multiple banking relations in Italy and in the United States*

We check the model's predictions, comparing the extent of multiple credit relations in two countries, Italy and the U.S. These countries represent two polar cases in terms of the number of bank relations that firms entertain: in Italy, firms tend to spread borrowing over a multitude of banks; in the U.S., normally, they borrow from a single bank or from just a few. Tables 3 and 4 document multiple banking by a sample of firms in each of the two countries. For Italy we rely on the Survey on Investment in Manufacturing (SIM) run yearly by the Bank of Italy on a sample of about 1,000 manufacturing firms with more than 50 employees. We pool the cross-sections for the years 1989-1993 and link them to Credit Register information; the latter allows a full account of the credit relationships entertained

by each firm.[13] For the U.S. we use the 1987 National Survey of Small Business Finances (NSSBF) run by the Federal Reserve System: the survey contains a detailed description of the sources of finance (up to 24) for a sample of 3,346 small firms (firms with fewer than 500 employees). A firm is said to have a banking relationship if it raises funds from a commercial bank, a savings and loans association, a savings bank, a credit union or a mortgage bank.

The difference between the two countries could not be more striking: in Italy, in the whole sample, the average number of relations is 16.4 and the mode is 12 (Table 3, column 1). In the U.S. the average is 1.6 and the mode 1. Furthermore, while in Italy only 1.2 percent of the firms in the sample have a single banking relation, in the U.S. 61 percent do. The two samples are not strictly comparable, however. While the NSSBF collects information for small firms (1 to 500 employees), the SIM collects data for firms with more than 50 employees. Since larger firms have more banks (Table 3, column 1), the number of relations in Italy may be biased upwards compared to the U.S. sample. To control for this bias we exclude from the Italian sample firms with more than 500 employees and from the U.S. sample those with fewer than 50. The second columns of Tables 3 and 4 show the cumulative distribution for firms with 50-500 employees. The average number of relations among Italian firms drops to 12.3 and that of U.S. firms rises to 2.3, but the gap remains remarkable. Looking more closely at the distributions, only 9 percent of the Italian firms have 3 or fewer relationships, compared to 83.7 percent in the U.S.; in the U.S. only 4.5 percent have more than 6 relations; in Italy 86 percent have relations with more than 6 banks and 27 percent with more than 15. The range is 1-12 in the U.S. and 1-50 in Italy; the modes of the distribution, 1 and 7. Even in this restricted sample, however, Italian firms are on average larger than U.S. firms (202 and 125 employees respectively). This difference is partly due to the fact that the SIM sample is not randomly selected, and compared with the size distribution of the firms in the population, larger firms are over-represented

[13] For a given firm and for various categories of loans, the Credit Register reports information on the value of the loan outstanding, the maximum loan extended and the effective interest rate charged by each bank. The SIM survey reports the Credit Register code of each firm, allowing the merger the two data sets.

(see the Appendix 2). This, again, could bias the number of relations in Italy upward relative to the U.S. To account for this, Figure 2 compares the median number of relations in the two countries while holding firm size constant: in both countries there is a positive relation between the number of banks and firm size but in Italy the number of relations is still considerably higher at all values of firm size.[14]

The difference is not limited to small firms. Houston and James (1996) report that in a randomly selected sample of 250 large listed companies with average assets equal to $1.8 billion (at 1980 prices) about 34 percent have a borrowing relationship with a single bank, while 66 percent report multiple borrowing relations; the average number of relations is 5.2 and for over a third of the firms with multiple banks, this is because they borrow through syndicates of banks. As Table 3 shows, in Italy in the whole sample the share of firms with only one bank is a tiny 0.8 percent; that with multiple relations is thus 99.2 percent. The average number of relations is three times as high as in the Houston and James sample; and multiple banking is normally due to firms having separate loans from several banks.

It is interesting that while the number of relations increases with firm size, as predicted by equation (13), firms with a very large number of banks still include some small firms (those with about 50 employees). For example, among firms with 16-20 relations the number of employees ranges from 57 to 9,850, and among those with 21-25 relations staff size ranges from 50 to 108,555 (Table 3, total sample). Thus, while firm size is likely to be an important determinant of the number of relations, it is by no means the only one and other firms' specific characteristics are likely to matter.

In summary, multiple banking appears to be the rule in Italy; borrowing from one or just a few banks is the mode in the US. In the next section we argue that our theoretical model sheds light on the factors that account for this difference.

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[14] The NSSBF is not limited to manufacturing but includes firms in mining, construction, wholesale trade, retail trade, services, transportation, communication and public utilities. Considering only firms in manufacturing does not alter the picture. In the size class 50-500 employees, the average number of relations is 1.6 and the mode 1. About 85 percent of the firms have 3 relations or fewer and 95.4 percent no more than 5, essentially the same figures as in the whole sample of firms with 50 to 500 employees.

7. Italy versus the United States

As we have argued, our model predicts that firms are the more likely to entertain multiple relations, the less probable it is that individual banks will incur a liquidity shock and the greater the inefficiency of liquidation procedures. The following two sections compare Italy and the United States along these two dimensions.

7.1. *Banks' fragility*

Table 5 shows the frequency of bank failure in Italy and in the U.S. over the past three decades; the number of bank failures in each year is divided by the total number of banks at the beginning of the year and this figure is then averaged across years. The probability is calculated distinctly for commercial banks and savings and loans associations in the U.S. and commercial banks and rural banks - small, local banks specialized in credit to agriculture - in Italy. Over the whole period the probability of bank failure is 4.1 per mille among U.S. commercial banks and 16.9 per mille among savings and loan associations; in Italy, 2.4 per mille for commercial banks and 2.9 for rural banks. From 1960 through 1994 the total number of commercial bank failures in the U.S. was 1,591; in Italy (1963-1994) it was just 36. These figures correspond respectively to 11.4 and 7.3 percent of the number of chartered banks at the beginning of the period. The number of S&L failures over the 1960-1990 period in the U.S. was 1,358 (33.1 percent of the number of S&L at the beginning of 1960) compared to 68 failures among Italian rural banks from 1963 through 1994 (8.9 percent of the number of rural banks at the start of 1963). These figures are consistent with Italian banks' having a lower probability of incurring serious liquidity crisis; they also raise a number of problems, however.

First of all, measuring the chances of failure by the share of failed banks over existing banks offers only a partial indication of the differences in the fragility of

two banking systems, since failures of larger banks are given the same weight as failures of small banks. If larger banks are more likely to fail in one country than in the other, then the reported probability offers a misleading picture of the chances that bank assets will be hit by adverse shocks.[15] To take this into account we report in Table 5 the assets of failed banks as a share of total assets. This is a measure of the probability of failure of each dollar intermediated by a bank. Over the period 1970-1994, the average annual share of the assets of failed U.S. commercial banks in the total assets of the sector was 3.7 per mille, compared to 0.67 per mille among Italian banks.[16]

Second, what we really want to measure is the risk that a bank in a given system will run into problems and consequently be led to call loans in early. Liquidation of the bank is only an extreme possibility and is likely to depend not only on the frequency and severity of shocks, but also upon differences in the "willingness" of supervisory authorities to let banks fail: if supervisory authorities intervene to find a solution for seriously compromised banks, for instance through mergers with other banks, failures would be avoided. Thus, the observed difference might simply reflect a lower propensity of U.S. banking supervisors to intervene.[17] Ideally, we would like to compare the share of banks in the two countries that - according to some criterion - are facing a precarious situation. It is customary in the U.S. to identify a commercial bank as a "problem" when, according to the Federal Deposit Insurance Corporation (FDIC), the institution has "severe

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[15] From 1979 through 1994 the total number of commercial bank failures in the U.S. was 1,475; 1,148 (77.8 percent) concerned banks with less than $100 million in assets (at 1994 prices) two years prior to failure, 295 (20 percent) concerned banks with assets of $100 million to $1 billion, 27 (1.8 percent) banks with assets of $1 billion to $10 billion and 5 (0.3 percent) banks with assets from $10 to $100 billion (see Berger, Kashyap and Scalise, 1996).

[16] From 1960 through 1969 in the U.S. the share was 0.8 per mille. Including this decade would lower the annual average to 2.9 per mille. We have no comparable information for Italian banks for the 1960s. The figure for Italy refers to commercial and rural banks.

[17] This does not actually seem to be the case. White (1992, Table 3) reports that of the 586 commercial banks that on average were absorbed every year through mergers between 1985 and 1991, 25 percent (i.e. 1.1 percent of the average number of banks over the same period) were insolvent banks placed by the FDIC with healthy acquirers. Over the same period the average number of mergers in Italy was 19.7 per year (Banca d'Italia, *Annual Reports*); although no official figure is available on the mergers prompted by the Bank of Italy, a reasonable figure is that around a quarter concerned insolvent banks. This corresponds to less than 0.5 percent of the average number of banks.

financial, operational and managerial weaknesses". U.S. banks are rated by the FDIC on the basis of five criteria: bank capital, asset quality, management performance, earnings and liquidity. Banks scoring a low grade in one or more of the listed criteria are classified as "problem banks".[18] As such they are subject to restrictions, including more stringent capital requirements,[19] "cease and desist" orders that can force management to take actions to reduce exposure to risky activities, and limits on expansion. Using this definition, the average annual number of problem banks over the 1970-1989 period in the U.S. was 642, amounting to 4.4 percent of the average total number of banks.[20]

We do not have directly comparable figures for Italy. The closest approximation to the concept of "problem bank" we can think of is the number of banks in financial distress that have been forced into a formal reorganization procedure, whereby the bank's management has been replaced by an administrator appointed by the Ministry of the Treasury. Measured in this way, the average annual number of "problem banks" in Italy over the 1970-1992 period is 6.5, corresponding to 0.6 percent of the average number of banks over the same period. Thus, according to this broader measure too, Italian banks appear to be less fragile than U.S. banks. Admittedly, however, the two figures are not strictly comparable and the difference might actually reflect broader criteria for defining a problem bank in the U.S. than those used in forcing an Italian bank into formal reorganization. This is consistent with the fact that the average annual share of U.S. problem banks that failed over the 1970-1992 period was 10.6 percent, while the equivalent share in Italy was 21 percent. However, even assuming that the ratio between failed and problem banks was as low in Italy as in the U.S. and using this assumption to generate the number of problem banks, the resulting share of problem banks is 1.4 percent per year over the period 1970-1992, well below that observed in the U.S.

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[18] Grades range from 1 to 5, 1 being the highest. A sound bank scores 1 in each of the five items and is called a CAMEL.

[19] While for CAMEL banks a capital ratio of 3 percent is required, a problem bank is required to raise its capital ratio to 4 or 5 percent, depending on how bad its rating is. As a consequence, if they cannot raise capital problem banks may be forced to reduce loans to comply with required ratios.

To avoid some of the difficulties in assessing bank fragility highlighted above we also rely on indirect indicators of the probability of a bank failing that are less subject to problems of comparability. Buchinsky and Yosha (1995) develop a dynamic model of the probability of failure of an infinitely-lived bank that reacts optimally - in terms of interest rates charged and portfolio composition - to idiosyncratic shocks. They show that the *ex-ante* probability of survival of a banking firm depends upon two crucial parameters: the bank's size and the reserve requirement. The smaller the bank and the lower the reserve requirement, the lower - ceteris paribus - the probability of survival. Italian banks appear to be safer on both grounds: in Italy the required reserve ratio for 1960-1994 has ranged from 3.5 times that in the U.S. (in the 1960s) to 12.5 times (in the 1980's). On average, over the period 1960-1994 required reserves were 3 percent of deposits in the U.S. and 16.3 percent in Italy. As far as size is concerned, U.S. commercial bank assets in 1989 averaged $260 million (in 1989 prices) while Italian bank assets (including rural banks) averaged $904 million (1990 figures at 1989 prices; see Table 8). Thus, both in terms of average size and reserve requirements, U.S. banks appear more vulnerable to failure.

A final objection to the use of the frequency of failures as an indicator of banks' fragility is that if banks react to a liquidity shock by cutting investment in risky projects and moving into safer assets, then the probability of failure need not increase and may actually remain constant. If this is the case a higher frequency of failures need not imply a higher probability of a firm's project not being refinanced when the informed bank is hit by a shock. However, Buchinsky and Yosha (1995) show that while banks do respond to an increase in the riskiness of projects by shifting resources from risky projects to a safer market portfolio, this is not enough to lower or keep constant the *ex-ante* probability of failure, which in fact increases.

To conclude, on the basis of both direct indicators of bank distress and indirect proxies of the fragility of the banking industry, Italian banks seem less likely than American to be subject to liquidity shocks.

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[20] Data are from various years of the Annual Report of the FDIC.

7.2. *Loan recovery and the efficiency of bankruptcy procedures*

The second institutional parameter on which the optimal number of bank relationships depends is the share of assets that banks can recover in case of default. If excessive regulation, cumbersome legal procedures or judicial malfunction makes loan recovery difficult and costly and if credit losses are large, external investors will be less willing to provide refinancing. As a consequence, a firm will spread borrowing among many banks in order to avoid early liquidation.

Table 6 compares the time needed to recover loan claims following default in Italy and in the U.S., the idea being that the faster the recovery, the lower the costs to the lender.[21] Data for Italy come from a survey conducted in 1994 by the Bank of Italy on a sample including all banks except mutual banks (see Generale and Gobbi, 1996 for a description of the results). Each reported the average time necessary to recover both secured and unsecured loans according to the type of the procedure followed. For the U.S. we rely on information on loan recovery contained in studies of debt restructurings. There is little difference in the average time to recover loans after default in case of informal agreements between the insolvent firm and the bank (16.2 months in the US and 19 months in Italy on average), but legal proceedings, i.e. formal bankruptcy and asset liquidation, are much slower in Italy. When, following default, the Italian firm enters the equivalent of U.S. Chapter 11 and emerges from it as a going concern, loan recovery takes an average of 50 months; for the U.S. we have no general information on the time that firms in reorganization spend in Chapter 11; estimates vary according to sample but all indicate that the recovery process is markedly faster. In a sample of 37 NYSE firms the average time spent in reorganization after default was 30 months (Weiss, 1990); Franks and Torous (1994) reach a similar conclusion using a sample of 37 firms that reorganized between 1983 and 1991. An earlier study (Franks and Torous ,1989) found an average of 44 months for a sample of 30 firms that had

[21] Costs from delays may be due to bargaining costs, administrative expenses or - if the debt is secured - because the lender's liens are disrupted as time elapses.

defaulted on bonds outstanding from 1970 through 1984.[22] Gilson, John and Lang (1990) report an average length of bankruptcy proceedings of 20.4 months in a sample of 89 firms. Combining these figures into a single estimate, average time in reorganization in the U.S. would come to 27 months, about half the figure for Italy. However, while the estimate for Italy refers in principle to the population of defaulting firms, the U.S. estimates are based on samples of large firms; average size in the Gilson, John and Lang sample was about 3,000 employees and average assets in the Weiss sample were $262 million. Time spent in Chapter 11 is an increasing function of firm size, because it depends on the complexity of the financial claims and the number of creditors, which are positively correlated with the size of the firm (Franks and Torous, 1989). Thus, the U.S. estimate is surely biased upwards. White (1984), finds that a sample of 64 smaller firms that filed to reorganize spent an average of 17 months in the bankruptcy process. Since in both countries the reorganization procedure imposes an automatic stay on the assets, the more time needed to reorganize, the higher the costs incurred by individual lenders, even when loans are collateralized.

The liquidation of the defaulter's assets is likely to be more important than reorganization. White (1989, p. 129) reports that two thirds of bankrupt firms in 1984 entered liquidation and one third filed for reorganization under Chapter 11; the corresponding figures for Italy are three fourths and one fourth (Generale and Gobbi, 1996). The difference between the two countries is even more marked with regard to liquidation procedures (Chapter 7). In Italy the average formal legal liquidation procedure takes 72 months; in the U.S. just 14 months (Ang, Chua and McConnell, 1982). The difficulty that Italian banks encounter in recovering loans in case of default is even more evident if one considers the time necessary to execute a repossession order, which ranges from 21 months for machinery to 66 months for real estate. We have no data on the execution of repossession orders for the U.S., but it is certainly faster than that on liquidation of a firm.

Table 7 shows recovery rates in the two countries for secured and unsecured loans. The share of the debt recovered is much lower in Italy than in the U.S.

[22] This sample includes three large railroad companies. Excluding them would lower the

Under informal agreements the banks recover 86.6 percent of the loan value in the U.S. and 52 percent in Italy. If formal bankruptcy is declared, Italian banks recover 23 percent of their unsecured loans and 50 percent of secured loans; U.S. banks get back more than 80 percent in both instances. [23] Finally, if the firm is liquidated, the recovery rate in Italy is 50 percent if the loan is secured and only 10 percent if unsecured.[24]

To summarize, Italian banks face a lower risk of bankruptcy and a much more costly process of loan recovery. The latter is not due to lesser legal protection to creditors than in U.S. law. As La Porta et al. (1996) document, in both countries creditors' rights are in principle the same: secured creditors are paid first, the management stays in reorganization, and both feature an automatic stay on assets. The difference is essentially due to Italy's less efficient and slower judicial process: As Mauro (1995, Table A3) reports, Italy scores only 6.7 in the index of efficiency of the judiciary system constructed by Business International for a large set of countries (the lowest among industrial countries), whereas the U.S. scores 10, the top grade, corresponding to a "smoothly functioning system".[25]

In conclusion, Italian firms are likely to assign a lower value than U.S. firms to the probability of their bank being hit by an adverse liquidity shock that makes them cautious in extending loans; this, in turn, leads uninformed banks to judge it very likely that a firm rejected by an informed lender is a "lemon", deterring them

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sample mean to 35 months.

[23] Part of the difference in recovery rates under formal procedures is likely due to higher bankruptcy costs in Italy than in the U.S., which absorb a larger share of the liquidation value of the firm. Belcredi (1996) estimates that the administrative costs of bankruptcy are about 20 percent of the liquidation value of the firm's assets; the estimates for the U.S. range from 3.1 percent (Weiss, 1989) to 7.5 percent (Ang, Chua and McConnell, 1982).

[24] In Italy, the recovery rate in case of repossession orders is 62 per cent if the order refers to secured real estate (32 if unsecured) and 20 percent if it concerns secured machinery (10 percent if unsecured; Generale and Gobbi, 1996).

[25] One objection to this interpretation is that recovery procedures are more cumbersome in Italy because there are multiple lenders and not the otherway round, as we have so far argued. Notice however that if informal agreements are followed, recovery time is only slightly larger in Italy (19 months compared to 16.2 in the U.S.; Table 6) whereas the difference is considerable when formal procedures are used. Yet, if this objection were valid, one should observe that multiple lenders slow down the recovery process independently of the type of procedure. Second, in the case of a household defaulting on its mortgage, in Italy the time to repossess is 65 months on average when the repossession order is executed by the courts. In this case there is usually a single lender, but nevertheless this figure is well above all estimates of the time large U.S. companies spend in reorganization under Chapter 11 (Table 6).

from refinancing rejected firms. This unwillingness is further reinforced by the lengthy and costly liquidation procedures, which make enforcement of creditor's rights difficult. As a consequence, if Italian firms want to avoid premature liquidation, they need to borrow from many different banks. Naturally, there are also other possible explanation of the difference in multiple banking between the two countries. A number of these alternatives are considered and dismissed in the next section.

8. Alternative explanations

It might be argued that multiple banking relations in Italy arise because concentration in the banking industry is relatively low and, as a consequence, banks tend to spread loans across many firms in order to diversify their exposure to risky projects. If loanable funds were all held by a single bank, multiple banking would obviously not be observed, while if funds were evenly distributed over a very large number of banks, portfolio diversification could be attained only if each bank participated with a small share in the debt of each firm.[26] Actually, Italian banking is more concentrated than American. Table 8 shows the size distribution and concentration of Italian and American commercial banks. While in the U.S. 24 percent of the banks are large (assets above $100 million, at 1990 prices), and account for 89 percent of the assets in the banking industry, in Italy large banks are 38 percent of the total and account for 97.4 percent of the assets. In the U.S. small banks (assets less than $50 million) make up 55 percent of the total and manage 5.3 percent of total assets, compared with 44 percent and just 1.1 percent in Italy. Average bank assets are $903.8 million in Italy, 3.5 times as much as in the U.S. Finally, banking industry concentration is markedly higher in Italy: the share in total assets of the top five banks has ranged between 32 and 40 percent since 1970 while in the U.S. it has ranged between 15 and 18 percent.[27]

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[26] Clearly, this depend on the size of banks relative to firms.

[27] Among the seven largest industrial countries banking concentration is lowest in the U.S., while the top five banks' share of total assets in Italy is larger than in Germany (26 percent), Japan (31.1 percent) and the U.K. (31.4 percent) but smaller than in France (48.8 percent) and Canada (82 percent); Edey and Hviding (1995), Table A2.

A second possibility is that legal restrictions inhibit Italian banks from establishing close ties. Italy's 1936 Banking Law, which prohibited direct ownership of firms' shares by commercial banks, may well have precluded the development of German-style "house banks"; but, the Glass Steagall Act subjects U.S. banks to the same kind of restriction.[28]

Third, it may be that the banking industry is in Italy more competitive than in the United States. Petersen and Rajan (1995) argue that credit market competition can limit the ability of banks to share in the future surplus of the firm and thus reduce the value of credit relationships. As a consequence, competitive credit markets may be detrimental to the formation of strong bank-firm ties, as characterized by single banking. But, as shown above, concentration in the banking industry, in so far as is an indicator of competition, is higher in Italy than in the US. This conclusion is further reinforced by the average spread between the interest rate on loans and that on deposits in the two countries: over the period 1978-95 the spread is 6.47 percentage points in Italy but only 2.54 in the U.S., suggesting that, if anything, ties should be stronger in Italy. [29]

Fourth, it might be that Italian banks are more specialized than U.S. banks. If banks specialize in one kind of loan, firms may need multiple relations in order to meet all their borrowing needs or obtain specific banking services. The separation between long-term lending institutions and commercial banks specialized in short-term credit that Italy enacted in 1936 might account for some of the difference, but it is unlikely to be able, by itself, to explain such widespread multiple relations with commercial banks. To further check this explanation, we have computed the number of bank relations that small and medium sized Italian firms (staff of 50-500) have if the type of loan is restricted to lines of credit. Excluding all other types of lending[30] does not alter the picture on multiple banking in Italy: the

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[28] Conti (1996) reports that multiple banking was a feature of borrowing relations in Italy well before the 1936 banking legislation.

[29] Data are from IMF *International Financial Statistics.*

[30] For each firm that is indebted with at least one bank for more than a certain threshold, the Credit Register collects information on the amounts owed by the firm to each bank distinctly for 5 categories of loan, including bill portfolios, foreign currency loans, unsecured lines of credit, secured loans and medium and long-term loans.

median firm continues to have a relation with 9 banks, only 3 less than when all types of loans are considered.

A fifth possible alternative explanation is that in Italy muliple banking compensates for the lack of a well-developed market for corporate bonds.[31] However, while access to a deep bond market can explain why large U.S. firms do not rely on multiple banking, it can hardly account for the difference in the number of banking relationships among small and medium-sized firms in the two countries, since these firms have little access to the corporate bond market in either country. Petersen and Rajan (1994) show that bank lending is the main source of finance among firms in the NSSBF. Depending on size, bank debt accounts for 50 to 70 percent of firms' debt; the remainder comes mainly from the owners and their families (from 11 percent among larger firms to 30 percent among smaller firms) and from non-bank financial institutions (from 11 to 15 percent). Thus, among U.S. small firms financing from the placement of bonds in the market seems negligible.

Finally, it could be that multiple banking in Italy arises because of the large presence of state-owned banks: lacking incentives to maximize profits, these banks may be unwilling to screen and monitor their customers, and prefer to reduce aggregate risk by spreading loans over many borrowers.[32] If this explanation is true, we should find that firms that borrow from state-owned banks have a larger number of banking relationships. To test this hypothesis, we split the sample of Italian commercial banks in 1993 between private and state-owned. Then we compute the number of relationships entertained by each firm that borrows from each bank and average out across firms.[33] Results are as follows: the number of relations per borrower from private banks (which are 62 percent of the sample and

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[31] From 1975 to 1990, outstanding corporate bonds amounted to 15.6 percent of GDP in the U.S. and 0.5 percent in Italy (Edey and Hvinding, 1995; Table 5).

[32] We are indebted to Andrei Shleifer for suggesting this possible explanation.

[33] Let i (i = 1, I) index the banks, j (j = 1, ..J) index the firms and let R_j denote the number of relationships entertained by firm j and q_{ij} the share of bank i loans extended to firm j. The average number of relations among the firms that borrow from bank i is computed as $R_i = \sum_{j=1}^{J} q_{ij} R_j$. We thank Giovanni Ferri for kindly providing these indicators; notice that their computation makes use of all the information in the Credit Register;

account for 36 percent of total assets) is 11.6; that for state-owned banks is 12.6. Thus, multiple banking appears to be a feature of both types of banks. A difference in the extent of multiple banking between private and state-owned banks could emerge if proper account weres taken of differences in bank size and in the average size of its clients. To check for this possibility, we run a regression of the average number of relations in each bank (*Number*) against the size of the bank (*Bsize*), the average size of the loan extended (*Lsize*, as a proxy of the size of the bank's clients) and a dummy for state-owned banks (*State*), with the following result (*t*-statistics in brackets):

$$\underset{}{Number} = \underset{(12.9)}{9.122} + \underset{(3.75)}{2.17E\text{-}4\ Bsize} \underset{(-2.80)}{-1.88E\text{-}9\ Bsize^2} + \underset{(2.67)}{30.07\ Lsize} + \underset{(1.24)}{0.749\ State}$$

All coefficients are statistically significant except for the indicator for state-owned banks, which is not significantly different from zero. Thus, we find no evidence that private and public status is a significant factor in explaining multiple banking.[34]

9. Conclusions

According to the theory of corporate finance, banks differ from other financial institutions in their ability to monitor their borrowers, thereby acquiring privileged information about the credit risk associated with each. Because of monitoring and information acquisition, banks and their customers tend to form long-term relationships instead of meeting anonymously in the marketplace. An

[34] An alternative theory of the benefits of multiple banking can be derived from the model developed by Rajan (1992) to explore the choice between bank debt and arm's-length financing. In Rajan's model, borrowing from a bank is better than arm's-length credit because the bank, being informed, can refuse to refinance the firm when the second stage of the project has become too risky. Bank borrowing, however, is costly in terms of entrepreneurial incentives to exert effort because, due to its information advantage over other potential lenders, the bank extracts most of the rents in the second stage of the project. In this set up, the entrepreneur may be able to reduce rent extraction *ex post* by establishing multiple banking relationships at the beginning and exploiting competition among banks in the refinancing game. Thus, the costs of multiple banking may be offset by the benefits in terms of increased entrepreneurial effort. While this explanation has no logical flaw, it is not clear what its empirical prediction would be; in particular, it is hard to see how it could explain the difference between the U.S. and the Italian data, since it would be difficult to argue that entrepreneurs are less in need of appropriate incentives in the former country than in the latter. This issue, however, deserves further study.

implication of this theory, which has found empirical support in a study by Lummer and McConnell (1989), is that when a bank chooses to break its relationship with a customer the market interprets this as unfavorable information about the latter's creditworthiness. This unfavorable signal makes it more difficult for the customer to find financing elsewhere. In our model, we show that this is true even if, occasionally, credit lines may be cut off because of problems internal to the bank (for instance, the need to reduce the size of the loan portfolio due to temporary liquidity problems) and not because the borrower is uncreditworthy. Furthermore, the signal may be so bad that the borrower is forced to liquidate a profitable project for lack of funding.

In this paper we have argued that this potential inefficiency can explain why firms may choose to establish multiple banking relationships despite increased transaction costs and other drawbacks. Specifically, we have shown that multiple banking is useful because, by reducing the probability that the firm will have to refinance its project from uninformed lenders, it ensures a stable supply of credit and reduces the likelihood that profitable projects will have to be liquidated prematurely.

Multiple banking is rare in the U.S. but widespread in Italy even among small and medium sized firms. Our theory indicates that multiple banking should be more advantageous in countries where the banking system is less fragile and where the loan recovery process in case of default is less efficient. Simulations indicate that the choice between single and multiple banking is particularly sensitive to the efficiency of loan recovery. Comparing various indicators for the two countries, we find that in Italy banks do indeed appear to be less fragile and loan recovery more difficult than in the U.S. Thus, the choice of the number of banking relationships seems to be directly related to the structural characteristics of the financial system. An immediate policy implication of these findings is that improving the bankruptcy law and, more generally, the loan collection mechanism would improve efficiency both directly (by reducing the deadweight cost of bankruptcy) and indirectly, by allowing firms to decrease the number of banking relationships.

Our work also suggests various directions for future research. On the theory side, it is possible that the distortion identified in our theoretical model (i.e. the potential loss of external financing for good projects when a banking relationship breaks down) may alone explain other aspects of bank-firm relations and of the choice of financial structure. On the empirical front, an interesting question is what factors explain the variation in the number of banking relationships across firms within each country. Some of the relevant parameters in our model are likely to be affected by firm-specific or sector-specific characteristics and not only by country-specific institutional factors. For instance, the cost of loan recovery may be smaller for firms that have large tangible assets that can be resold easily. Also, less profitable firms may be the first to have their credit cut off when banks must reduce their loan portfolios because of liquidity problems. Thus, our model can be used to formulate hypotheses on the factors that may explain the cross-sectional variation. We plan to pursue this line of research in future work.

Another empirical issue that deserves more study is the number of banking relationships in countries other than the U.S. and Italy; gathering information on this front would shed more light on the phenomenon of multiple banking and allow testing the predictions of our theory more rigorously. Finally, our study has documented considerable differences in the cost of loan recovery between the U.S. and Italy; these differences could perhaps be exploited to test other aspects of the theory of corporate financial structure, such as the choice between debt and equity.

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Appendix 1

Proof of Proposition 1

The left-hand side of (6) is the expected profit of an uninformed lender when the interest factor charged is the maximum enforceable rate $R = \frac{vK}{D + I_1}$. We first prove that (6) is sufficient. If R = 1, expected profit is negative. Since the LHS of (4) is a continuous function of R for all $R \geq 1/p_\lambda$, then if (6) holds equation (4) must have at least one solution. To prove necessity, it is sufficient to show that the LHS of (4) is strictly increasing in R whenever it is non-negative, so that if expected profit is negative for R = 1 and $R = \frac{vK}{D + I_1}$, then it must be negative for all $1 \leq R \leq \frac{vK}{D + I_1}$. Rewrite (3) as

$$\frac{a(R)}{b(R)} - 1 = 0$$

where

$a(R) = R\varepsilon^n Ep + R(1 - \varepsilon^n) \int_{p_\lambda}^{1/R} pf(p)dp$, and $b(R) = \varepsilon^n + (1 - \varepsilon^n)F(1/R).$

Since $b(R) > 0$, the LHS of (4) is increasing iff

$$a'(R) - b'(R)\left[\frac{a(R)}{b(R)}\right] > 0. \qquad \text{(A1)}$$

Since

$$a'(R) = \varepsilon^n Ep + (1 - \varepsilon^n) \int_{p_\lambda}^{1/R} pf(p)dp - (1 - \varepsilon^n) f(1/R)(1/R)^2$$

and

$$b'(R) = -(1-\varepsilon^n) f(1/R)(1/R)^2,$$

(A1) can be rewritten as

$$\varepsilon^n Ep + (1-\varepsilon^n)\int_{p_\lambda}^{1/R} pf(p)dp - (1-\varepsilon^n) f(1/R)(1/R)^2\left[1-\frac{a(R)}{b(R)}\right] > 0 \text{ .}$$

(A2)

But when expected profit is non-negative, it must be that $\frac{a(R)}{b(R)} \geq 1$, hence (A2) is strictly positive. This proves that (6) is necessary and it also proves that if a solution exists it must be unique. ð

Proof of Proposition 3

Recall condition (6′): $\left(\frac{vK}{I_0 + c + I_1}\right) E^u(p|\frac{vK}{I_0 + c + I_1}) - 1 \geq 0.$

Let $z = \frac{vK}{I_0 + c + I_1}$,

and let $q = \frac{1}{z}$. The condition can be rewritten, using the expression for E^u, as:

$$z\varepsilon^n\left[\int_{p_\lambda}^{1} pf(p)dp - \int_{p_\lambda}^{q} pf(p)dp\right] - \varepsilon^n\left[\int_{p_\lambda}^{1} f(p)dp - \int_{p_\lambda}^{q} f(p)dp\right] - z\int_{p_\lambda}^{q}(1-p) f(p)dp \geq 0,$$

hence as

$$S(\varepsilon, v) = z\varepsilon^n\int_{q}^{1} pf(p)dp - \varepsilon^n\int_{q}^{1} f(p)dp - z\int_{p_\lambda}^{q}(1-p) f(p)dp \geq 0. \qquad \text{(A3)}$$

Calculating the partial derivative with respect to ε for n = 1 one gets

$$\frac{\partial S(\varepsilon, v)}{\partial \varepsilon} = \int_{q}^{1}(p-q) f(p)dp,$$

which is always positive.

The partial derivative of $S(\varepsilon, v)$ with respect to v has the opposite sign as the derivative of S with respect to q. From (A3)

$$\frac{\partial S(\varepsilon, n)}{\partial q} = -\varepsilon^n \int_q^1 f(p)dp - (1-q) f(q).$$

Since $q < 1$ (because $z > 1$), the expression above is always negative, and $\frac{\partial S}{\partial v} > 0.$

Proof that n^* is increasing in ε and v.

From equation (13) in the text

$$\frac{\partial n^*}{\partial(\ln\varepsilon)} = -(\ln\varepsilon)^{-2} - n^*(\ln\varepsilon)^{-1} > 0,$$

which will be positive if $n^* > -(\ln\varepsilon)^{-1}$. Using equation (13) this requires that

$$\frac{c}{Z} < (-\frac{\ln\varepsilon}{e})$$

i.e. that in the relevant range of definition of n^* transaction costs do not exceed a certain value. Since $-\ln\varepsilon$ is strictly decreasing, a sufficient condition for $\frac{\partial n^*}{\partial \varepsilon} > 0$ is

$$\frac{c}{Z} < (-\frac{\ln\varepsilon^+}{e})$$

a relatively mild condition that we assume to hold (for instance for $\varepsilon^+ = 0.9$ it requires that $c/Z < 0.0387$.

Also from (13)

$$\frac{\partial n^*}{\partial v} = (\frac{\partial Z}{\partial v})(-\frac{1}{Z \ln \varepsilon}),$$

which has the same sign of $\frac{\partial Z}{\partial v}$. From the definition of Z,

$$\frac{\partial Z}{\partial v} = -\frac{\partial \bar{p}}{\partial v}(\bar{p}K - I_1 - L) f(\bar{p}).$$

Using the definition of $\bar{p}$,

$$\frac{\partial Z}{\partial v} = -\frac{\partial \bar{p}}{\partial v}(\frac{1-v}{v}) f(\bar{p}) > 0,$$

since $\frac{\partial \bar{p}}{\partial v} < 0$. ð

Appendix 2: Data sources

Three sources have been used in the construction of Tables 1, 3 and 4: The Bank of Italy Survey of Investment in Manufacturing (SIM), The Italian Credit Register (CR) and the Federal Reserve System National Survey of Small Business Finances (NSSBF).

1. The Survey of Investment in Manufacturing (SIM)

Since 1984 the Bank of Italy has run a yearly survey on a sample of manufacturing firms, collecting information on investment effected and investment and employment plans. It also reports a set of characteristics of the firms (location, ownership structure, industrial sector, year of foundation). The number of firms in each cross-section is around 1,000. In order to ensure representativeness, the sample is stratified by sector of activity, firm size and region. Small firms (under 50 employees) are excluded in order to keep sample size under control. In the construction of Table 1 we have pooled the surveys for the years

1989 trough 1993. The SIM collects no information on bank-firm relations, nor on firms' assets and liabilities. It is however possible to merge the SIM data with the Company Accounts Data Set (CADS), which is the principal source of information on the balance sheets and income statements of firms. These data have been collected since 1982 by a consortium of banks interested in pooling information on their clients. As such they report for each firm the Credit Register code and can consequently be merged with the information from the Credit Register. The CADS sample, however, is not randomly drawn, since a firm enters only by borrowing from one of the banks in the consortium. In particular, relatively to the population, larger firms tend to be overrepresented. Thus, firm size in the merged sample (which includes about 80 percent of the SIM sample) is somewhat overestimated (796 employees compared to 719 in the SIM sample).

2. The Credit Register (CR)

The Credit Register pools information on the debt position and on non-performing loans of the clients of Italian banks. For each firm that is indebted with at least one bank for more than a certain threshold (80 million lire until 1994, about $53,000), the Credit Register collects information on the amounts owed by the firm to each bank distinctly for 5 categories of loans, including bill portfolios, foreign currency loans, unsecured lines of credit, secured loans and medium and long-term loans. For a given firm and for various categories of loans, the Credit Register reports information on the value of the loan outstanding, the maximum loan extended and the effective interest rate charged by each bank.

3. The National Survey of Small Business Finances (NSSBF)

The National Survey of Small Business Finances is a survey of small business firms conducted by the Federal Reserve System and the US Small Business Administration in 1988-89. It collects detailed information on the use of financial services, sources of finance and firm's business relationships with financial institutions for a representative sample of 3,404 small (fewer than 500 employees) firms, together with information on firm's characteristics (type of organization, ownership, employees, activity, location, year of foundation, number of sites). Survey collects also balance sheet information and data on sales and expenses. The unit of observation is the enterprise and the target population is all nonfinancial, nonfarm small business firms. A detailed description of the sampling frame, interviewing and response rate is provided by Cox, Elliehausen and Wolken (1989).

Table 1. Number of banking relations among small firms in the United States and Italy

	United States	Italy
Mode	1	7
Median	2	9
Share of firms with one relationship (percent)	37.4	1.2

Notes: The data refer to firms with 50 to 500 employees. For the United States they are drawn from the National Survey of Small Business Finances; for Italy from the Survey of Investment in Manufacturing and the Credit Register. Details on the data sources are provided in Section 6.1.

Table 2. Regions of multiple banking and optimal number of relations for selected values of ε.

		c = 1/100					**c = 1/1000**			
		ε^-	ε^+	n_{ott}			ε^-	ε^+	n_{ott}	
				ε = 0.2	ε = 0.3	ε = 0.5			ε = 0.2	ε = 0.3	ε = 0.5
K=3	v = 0.5	0.0132	0.53	3	4	6	0.0133	0.51	5	6	10
	0.6	0.0132	0.36	3	4	1	0.0133	0.34	5	6	1
$I_0 = I_1$ = 0.2	0.8	0.0134	0.18	1	1	1	0.0133	0.17	1	1	1
	0.9	0.0134	0.13	1	1	1	0.0133	0.11	1	1	1
K=3	0.5	0.0510	0.85	3	4	6	0.0140	0.83	5	6	10
	0.6	0.0520	0.58	3	4	6	0.0140	0.56	5	6	10
$I_0 = I_1$ = 0.25	0.8	0.0530	0.30	3	4	1	0.0139	0.29	5	1	1
	0.9	0.0530	0.23	3	1	1	0.0139	0.22	5	1	1
K=3	0.5	0.0540	1.00	3	4	6	0.0160	1.00	5	6	10
	0.6	0.0540	1.00	3	4	6	0.0160	1.00	5	6	10
$I_0 = I_1$ = 0.33	0.8	0.0550	0.56	3	4	6	0.0180	0.54	5	6	10
	0.9	0.0550	0.43	3	4	1	0.0180	0.43	5	6	1

K=6 $I_0 = I_1$ = 0.66	v = 0.5	0.05 40	1.00	4	5	7	0.01 60	1.00	5	7	11
	v = 0.8	0.05 50	0.55	4	5	7	0.01 80	0.54	5	7	11

Note: All simulations assume that p is distributed uniformly in the interval [0.1, 1].

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Table 3. Cumulative distribution of the number of banking relationships in Italy

Number of banking relation ships	Total sample (3,622 obs.)		Firms with up to 500 employees (2,391 obs.)	
	Cumulative frequency (percent)	Firm size (Min-Max)	Cumulative frequency (percent)	Firm size (Min-Max)
1	0.83	207 (50-515)	1.21	196 (54-470)
2	1.99	319 (54-2,168)	2.76	184 (54-470)
3	3.78	267 (55 -1,884)	5.27	184 (55-450)
4	6.62	282 (54-2,601)	8.99	149 (54-491)
5	10.29	273 (52-5,685)	13.97	140 (52-489)
6 - 10	34.89	288 (46-7,631)	46.09	151 (46-499)
11 -15	59.57	468 (50-7,980)	73.94	221 (50-500)
16 - 20	74.01	717 (57-9,850)	88.03	237 (57-480)
21 - 30	90.08	1,840 (50-108,555)	98.19	294 (50-500)
over 30	100.0	3,512 (102-101,360)	100.0	365 (102-488)
Number of relation ships:				
mean	16.4		12.3	
median	13		11	
mode	12		7	
min-max	1 - 146		1 - 50	

Firm

size:		
mean	926.0	202.0
median	293	167

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Table 4. Number of banking relationships among small US firms

Number of banking relationships	Total sample (a) (3,345 firms)		Firms with 49 to 500 employees (521 firms)	
	Cumulative frequency (percent)	Firms' size (b) (Min - Max)	Cumulative frequency (percent)	Firms'size (b) (Min - Max)
1	61.2	16.8 (1-450)	37.4	113.1 (50 -450)
2	87.0	27.2 (1-475)	67.0	113.1 (49-475)
3	95.5	50.3 (1-450)	84.0	138.9 (50-450)
4	98.2	66.6 (1-450)	92.3	126.9 (50-450)
5	99.2	93.0 (1-350)	95.9	143.5 (57-350)
6	99.6	140.6 (8-468)	97.8	190.9 (55-468)
7	99.8	248.9 (92-400)	98.8	248.9 (92-400)
> 7	100.0	315.8 (165-487)	100.0	315.8 (165-480)
Number of relationships:				
mean	1,6		2.3	
median	1.0		2.0	
mode	1.0		1.0	
min - max	1 - 12		1 - 12	
Firm size:				
mean		26.0		125.4

median	5.0	90.5

Notes: A firm is said to have a relationship with a bank if it raises funds from one of the following institutions: commercial banks, savings and loans associations, saving banks and credit unions. a) includes firms with 1-100 employees; b) number of full time equivalent employees.

Table 5. Probability of bank failure in the United States and Italy

	Frequency of bank failures (annual average; per mille)				Failed commercial bank assets as a share of total assets (annual average; per mille)	
	U.S.		Italy		U.S.	Italy
Time period	Commercial banks	Saving and Loans	Commercial banks	Rural banks (2)		
1960-1969	0.50	1.00	2.93	3.99	0.80	-
1970-1979	0.54	1.00	3.39	3.41	0.80	0.43
1980-1984	3.83	61.08	1.95	1.16	4.62	1.14
1985-1989	15.86	36.37	1.08	0.82	8.03	0.80
1990-1994	6.96	-	1.73	2.97	4.20	0.46
Overall average	4.09	16.91	2.44	2.93	2.90	0.67
Total number of failures	1,591	1,358 (3)	39	75		
Percentage cumulative failures	11.4 (4)	33.1 (5)	7.4 (6)	10.1 (6)		

Notes: The probability of a bank failure is computed dividing the number of commercial bank failures in each year by the total number of chartered banks and averaging

across years. (1) Commercial banks' equity capital-to-assets. (2) Rural banks are small banks that can operate only at local level. (3) over the 1960-1990 period. (4) As a share of the number of commercial banks at the beginning of 1970. (5) as a share of S&Ls at the start of 1960, equal to 4,098 (see White (1991), Table 4-2 p. 58). (6) As a share of the number of banks at the beginning of 1960.

Sources: For the US: the data on the number of commercial banks and failures over the 1979-1994 period are taken from Berger, Kashyap and Scalise (1996), Tables A1 and A9; for the 1960-1979 period, from White (1992), Table 1. The data on the failures of S&Ls over the 1979-1990 period are from Helwege (1992), Table1; the probabilities of a failure for the 1960-1979 and 1970-1989 periods are from White (1991), Table 4-3, p. 60. The figures on the asset share of failed banks up to and including 1989 are computed using the FDIC Annual Report, various issues; for the 1990-1994 period we have used data reported in Berger, Kashyap and Scalise (1996), Tables A1 and A9. For Italy : Banca d'Italia, Bollettino Statistico, various issues, and unpublished data supplied by the Banca d'Italia. The share of the assets of failed banks has been estimated using the share of deposits of banks that have been forced into formal reorganization (a set which is larger than the set of failed banks) and multiplying the latter by 0.42, the ratio of failed banks to banks in formal reorganization over the 1970-1994 period.

Table 6. Length of time to recover loans after default (No. of months)

	Informal agreements (a)		Formal legal procedures			
			Reorganization (Chapter 11)		Liquidation (Chapter 7)	
	U.S.	Italy	U.S.	Italy	U.S.	Italy
Estimate1	-	-	30 (37; 16.8)	-	-	-
Estimate 2	15.4 (80;-)	-	20.4 (89;-)	-	-	-
Estimate 3	17.7 (45;11.	-	29.6 (37;13.	-	-	-

	8)		9)			
Estimate 4	-	-	44.0 (30;34.6)	-	-	-
Estimate 5	-	-	-	-	14.0	-
Overall	16.2	19.0	27.6	50.0	14.0	72.0

Notes: (a)The average time necessary to recover credit in case of informal exchange refers to loans recovered through a mutual agreement between the creditors and the firm to restructure the firm's debt. The average time in case of legal procedure refers to the time spent under Chapter 11 for US firms that emerge from Chapter 11; firms that exit Chapter 11 and are liquidated under Chapter 7 are excluded. For Italy it is the time necessary to conclude a "concordato preventivo". *Sources*. For the US we report five estimates: *Estimate* 1 is from: Weiss (1990), p. 288; sample period :1979-1986; *Estimate* 2 is from: Gilson, John and Lang (1990), Table 5, p. 335; sample period : 1978-1987; *Estimate* 3 is from: Frank and Torous (1994), Table 2, p.354; sample period: 1983-1991; *Estimate* 4 is from: Frank and Torous (1989), Table II, p.753; sample period: 1970-1985). The estimate in line "Overall" is the average of the four estimates; *Estimate* 5 refers to the average time for liquidation in the U.S. and is taken from Ang, Chua and McConnell (1982). The first number in brackets is the size of the sample on which the estimate is based, the second the standard deviation. For Italy: Generale and Gobbi (1996). The data reported in Generale and Gobbi are based on a survey of loan recovery procedures run by the Bank of Italy on a sample of 269 banks. Each bank was asked to report information on the average time necessary to recover loans according to the type of procedure followed both for secured and unsecured loans.

Table 7. Recovery rates for bank loans in case of default
(percent)

Informal agreements (a)				Formal legal procedures: Bankruptcy							
				Reorganization (Chap. 11)				Liquidation (Chap. 7)			
USA (b)		Italy (c)		USA (d)		Italy (c)		USA		Italy (c)	
Secured	Unsec.	Secured	Unsec.	Secured	Unsec.	Secured	Unsec.	Secured	Unsec.	Secured	Unsec.
-	86.6	60.0	52.0	80.1	86.4	50.0	23.0	-	-	50	10

Notes: a) Mutual agreements between creditors and debtors. b) Share of bank credit recovered in the sample of 45 firms that restructured their debt through informal agreements with borrowers analyzed by Frank and Torous (1994) , Table 4, p. 359. c) Average share of loans recovered by the banks in the sample analyzed by Generale and Gobbi (1996). d) Share of secured debt and bank debt recovered in the sample of 37 firms that formally reoganized under Chapter 11 analyzed by Frank and Torous (1994) , Table 4, p. 359.

Table 8. Size distribution and concentration of the banking industry: United States and Italy

Size distribution

Asset size (in millions of dollars) (a)	U.S.				Italy			
	No of banks	% of total	Assets (b)	% of total	No of banks	% of total	Assets (b)	% of total
0 - 2	26	0.2	34	0.001	0	0	0	0
2 - 10	747	5.9	5,337	0.162	54	5.2	377	0.042
10 - 50	6,204	48.8	168,861	5.117	400	38.5	10,689	1.138
50 - 100	2,744	21.6	192,282	5.827	187	18.0	13,540	1.443
over 100	2985	23.5	2,933,455	88.893	399	38.3	914,285	97.379
Total	12,706	100.0	3,299,969	100.0	1,040		938,891	100.0
Mean size (b)			259.8				903.8	

Concentration

Year	Share of top 5 banks (percent) (b)	
	USA	Italy
1970	15	40
1980	18	32
1990	18.3	37.8

Notes: a) For the U.S. assets of commercial banks in 1989; for Italy, assets of commercial banks and rural banks in 1990 at 1989 prices. The data have been converted into 1989 prices using the GDP deflator and then expressed in US dollars using the average 1989 Lira/Dollar exchange rate. *b*) Millions of 1989 dollars; *c*) share of total deposits accounted for by the top five banks.
Sources: The US data on the size distribution are from Department of the Treasury (1991), Chapter 13, Table 4, p. XIII-4; for Italy they have been provided by the Bank of Italy. The data on the share of deposits in the US for the 1970 and the 1980 are from Baer and Mote (1985); the share for 1990 is computed using 1991 figures from Tables A1 and A2 in Berger *et. al* (1996). The 1970 and 1980 shares for Italy are taken from Conegliani (1990), Table 7, p. 66; the figure for 1990 is from Edey and Hviding (1995), TableA2.

Figure 1. The optimal number of banking relationships

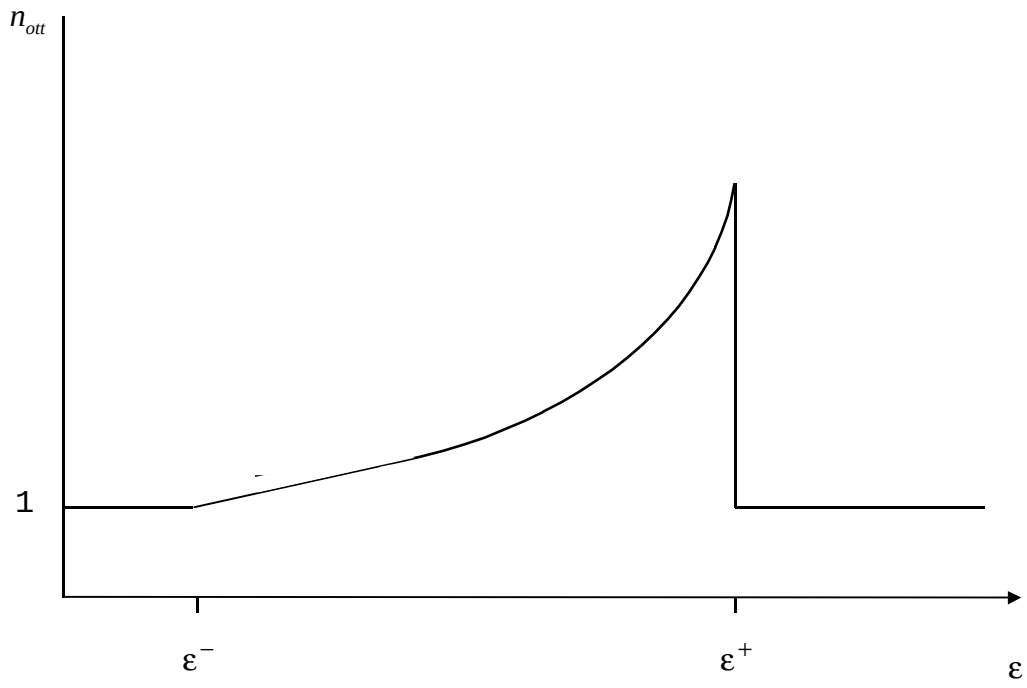
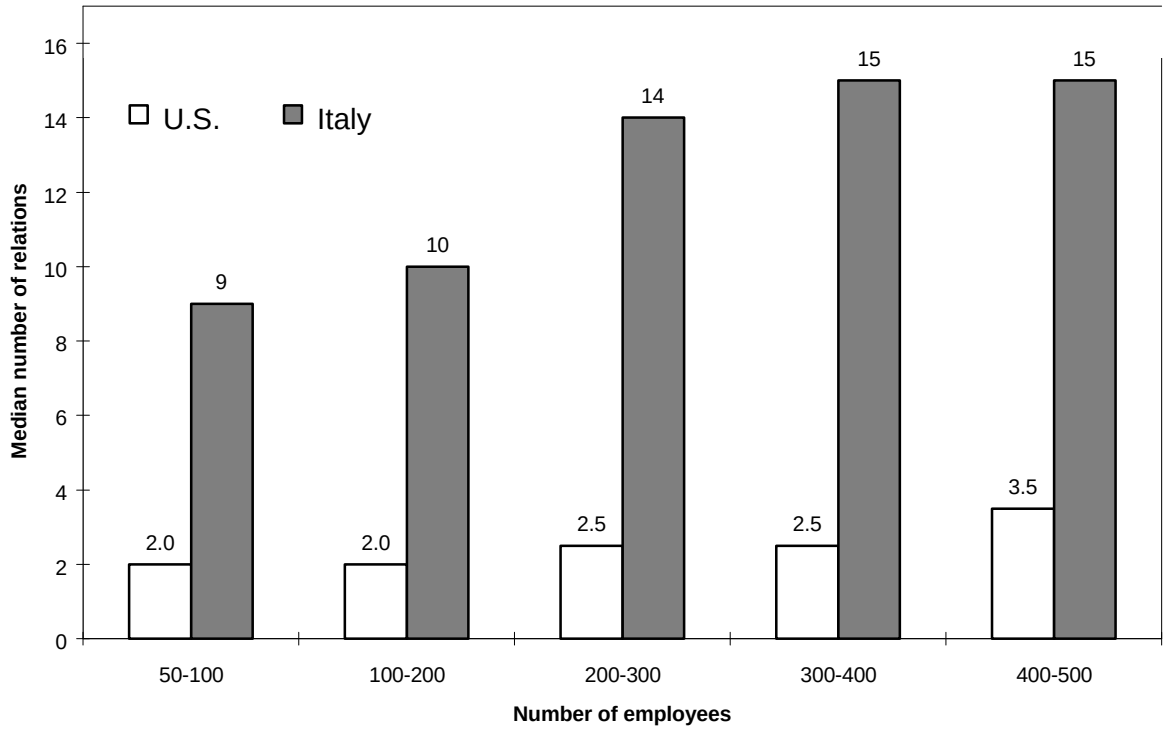


Figure 2. Credit relations by firm size in the United States and Italy



Appendix 1

Proof of Proposition 1

The left-hand side of (6) is the expected profit of an uninformed lender when the interest factor charged is the maximum enforceable rate $R = \frac{vK}{D + I_1}$. We first prove that (6) is sufficient. If *R* = 1, expected profit is negative. Since the LHS of (4) is a continuous function of *R* for all $R \geq 1/p_\lambda$, then if (6) holds equation (4) must have at least one solution. To prove necessity, it is sufficient to show that the LHS of (4) is strictly increasing in *R* whenever it is non-negative, so that if expected profit is negative for *R* = 1 and $R = \frac{vK}{D + I_1}$, then it must be negative for all $1 \leq R \leq \frac{vK}{D + I_1}$. Rewrite (3) as

$$\frac{a(R)}{b(R)} - 1 = 0$$

where

$a(R) = R\varepsilon^n Ep + R(1 - \varepsilon^n) \int_{p_\lambda}^{1/R} pf(p)dp$, and $b(R) = \varepsilon^n + (1 - \varepsilon^n)F(1/R).$

Since *b*(*R*) > 0, the LHS of (4) is increasing iff

$$a'(R) - b'(R)\left[\frac{a(R)}{b(R)}\right] > 0. \qquad \text{(A1)}$$

Since

$$a'(R) = \varepsilon^n Ep + (1 - \varepsilon^n) \int_{p_\lambda}^{1/R} pf(p)dp - (1 - \varepsilon^n) f(1/R)(1/R)^2$$

and

$$b'(R) = -(1-\varepsilon^n) f(1/R)(1/R)^2,$$

(A1) can be rewritten as

$$\varepsilon^n Ep + (1-\varepsilon^n)\int_{p_\lambda}^{1/R} pf(p)dp - (1-\varepsilon^n) f(1/R)(1/R)^2\left[1-\frac{a(R)}{b(R)}\right] > 0 \text{ .}$$

(A2)

But when expected profit is non-negative, it must be that $\frac{a(R)}{b(R)} \geq 1$, hence (A2) is strictly positive. This proves that (6) is necessary and it also proves that if a solution exists it must be unique. ð

Proof of Proposition 3

Recall condition (6′): $\left(\frac{vK}{I_0 + c + I_1}\right) E^u(p|\frac{vK}{I_0 + c + I_1}) - 1 \geq 0.$

Let $z = \frac{vK}{I_0 + c + I_1}$,

and let $q = \frac{1}{z}$. The condition can be rewritten, using the expression for E^u, as:

$$z\varepsilon^n\left[\int_{p_\lambda}^{1} pf(p)dp - \int_{p_\lambda}^{q} pf(p)dp\right] - \varepsilon^n\left[\int_{p_\lambda}^{1} f(p)dp - \int_{p_\lambda}^{q} f(p)dp\right] - z\int_{p_\lambda}^{q}(1-p) f(p)dp \geq 0,$$

hence as

$$S(\varepsilon, v) = z\varepsilon^n\int_{q}^{1} pf(p)dp - \varepsilon^n\int_{q}^{1} f(p)dp - z\int_{p_\lambda}^{q}(1-p) f(p)dp \geq 0. \qquad \text{(A3)}$$

Calculating the partial derivative with respect to ε for n = 1 one gets

$$\frac{\partial S(\varepsilon, v)}{\partial \varepsilon} = \int_{q}^{1}(p-q) f(p)dp,$$

which is always positive.

The partial derivative of $S(\varepsilon, v)$ with respect to v has the opposite sign as the derivative of S with respect to q. From (A3)

$$\frac{\partial S(\varepsilon, n)}{\partial q} = -\varepsilon^n \int_q^1 f(p)dp - (1-q) f(q).$$

Since $q < 1$ (because $z > 1$), the expression above is always negative, and $\frac{\partial S}{\partial v} > 0.$

Proof that n^* is increasing in ε and v.

From equation (13) in the text

$$\frac{\partial n^*}{\partial(\ln\varepsilon)} = -(\ln\varepsilon)^{-2} - n^*(\ln\varepsilon)^{-1} > 0,$$

which will be positive if $n^* > -(\ln\varepsilon)^{-1}$. Using equation (13) this requires that

$$\frac{c}{Z} < (-\frac{\ln\varepsilon}{e})$$

i.e. that in the relevant range of definition of n^* transaction costs do not exceed a certain value. Since $-\ln\varepsilon$ is strictly decreasing, a sufficient condition for $\frac{\partial n^*}{\partial \varepsilon} > 0$ is

$$\frac{c}{Z} < (-\frac{\ln\varepsilon^+}{e})$$

a relatively mild condition that we assume to hold (for instance for $\varepsilon^+ = 0.9$ it requires that $c/Z < 0.0387$.

Also from (13)

$$\frac{\partial n^*}{\partial v} = (\frac{\partial Z}{\partial v})(-\frac{1}{Z \ln \varepsilon}),$$

which has the same sign of $\frac{\partial Z}{\partial v}$. From the definition of Z,

$$\frac{\partial Z}{\partial v} = -\frac{\partial \bar{p}}{\partial v}(\bar{p}K - I_1 - L) f(\bar{p}).$$

Using the definition of $\bar{p}$,

$$\frac{\partial Z}{\partial v} = -\frac{\partial \bar{p}}{\partial v}(\frac{1-v}{v}) f(\bar{p}) > 0,$$

since $\frac{\partial \bar{p}}{\partial v} < 0$. ð

Appendix 2: Data sources

Three sources have been used in the construction of Tables 1, 3 and 4: The Bank of Italy Survey of Investment in Manufacturing (SIM), The Italian Credit Register (CR) and the Federal Reserve System National Survey of Small Business Finances (NSSBF).

1. The Survey of Investment in Manufacturing (SIM)

Since 1984 the Bank of Italy has run a yearly survey on a sample of manufacturing firms, collecting information on investment effected and investment and employment plans. It also reports a set of characteristics of the firms (location, ownership structure, industrial sector, year of foundation). The number of firms in each cross-section is around 1,000. In order to ensure representativeness, the sample is stratified by sector of activity, firm size and region. Small firms (under 50 employees) are excluded in order to keep sample size under control. In the construction of Table 1 we have pooled the surveys for the years

1989 trough 1993. The SIM collects no information on bank-firm relations, nor on firms' assets and liabilities. It is however possible to merge the SIM data with the Company Accounts Data Set (CADS), which is the principal source of information on the balance sheets and income statements of firms. These data have been collected since 1982 by a consortium of banks interested in pooling information on their clients. As such they report for each firm the Credit Register code and can consequently be merged with the information from the Credit Register. The CADS sample, however, is not randomly drawn, since a firm enters only by borrowing from one of the banks in the consortium. In particular, relatively to the population, larger firms tend to be overrepresented. Thus, firm size in the merged sample (which includes about 80 percent of the SIM sample) is somewhat overestimated (796 employees compared to 719 in the SIM sample).

2. The Credit Register (CR)

The Credit Register pools information on the debt position and on non-performing loans of the clients of Italian banks. For each firm that is indebted with at least one bank for more than a certain threshold (80 million lire until 1994, about $53,000), the Credit Register collects information on the amounts owed by the firm to each bank distinctly for 5 categories of loans, including bill portfolios, foreign currency loans, unsecured lines of credit, secured loans and medium and long-term loans. For a given firm and for various categories of loans, the Credit Register reports information on the value of the loan outstanding, the maximum loan extended and the effective interest rate charged by each bank.

3. The National Survey of Small Business Finances (NSSBF)

The National Survey of Small Business Finances is a survey of small business firms conducted by the Federal Reserve System and the US Small Business Administration in 1988-89. It collects detailed information on the use of financial services, sources of finance and firm's business relationships with financial institutions for a representative sample of 3,404 small (fewer than 500 employees) firms, together with information on firm's characteristics (type of organization, ownership, employees, activity, location, year of foundation, number of sites). Survey collects also balance sheet information and data on sales and expenses. The unit of observation is the enterprise and the target population is all nonfinancial, nonfarm small business firms. A detailed description of the sampling frame, interviewing and response rate is provided by Cox, Elliehausen and Wolken (1989).

Table 1. Number of banking relations among small firms in the United States and Italy

	United States	Italy
Mode	1	7
Median	2	9
Share of firms with one relationship (percent)	37.4	1.2

Notes: The data refer to firms with 50 to 500 employees. For the United States they are drawn from the National Survey of Small Business Finances; for Italy from the Survey of Investment in Manufacturing and the Credit Register. Details on the data sources are provided in Section 6.1.

Table 2. Regions of multiple banking and optimal number of relations for selected values of ε.

		c = 1/100					**c = 1/1000**				
		ε^-	ε^+	n_{ott}			ε^-	ε^+	n_{ott}		
				ε = 0.2	ε = 0.3	ε = 0.5			ε = 0.2	ε = 0.3	ε = 0.5
K=3	v = 0.5	0.0132	0.53	3	4	6	0.0133	0.51	5	6	10
	0.6	0.0132	0.36	3	4	1	0.0133	0.34	5	6	1
$I_0 = I_1$ = 0.2	0.8	0.0134	0.18	1	1	1	0.0133	0.17	1	1	1
	0.9	0.0134	0.13	1	1	1	0.0133	0.11	1	1	1
K=3	0.5	0.0510	0.85	3	4	6	0.0140	0.83	5	6	10
	0.6	0.0520	0.58	3	4	6	0.0140	0.56	5	6	10
$I_0 = I_1$ = 0.25	0.8	0.0530	0.30	3	4	1	0.0139	0.29	5	1	1
	0.9	0.0530	0.23	3	1	1	0.0139	0.22	5	1	1
K=3	0.5	0.0540	1.00	3	4	6	0.0160	1.00	5	6	10
	0.6	0.0540	1.00	3	4	6	0.0160	1.00	5	6	10
$I_0 = I_1$ = 0.33	0.8	0.0550	0.56	3	4	6	0.0180	0.54	5	6	10
	0.9	0.0550	0.43	3	4	1	0.0180	0.43	5	6	1

K=6 $I_0 = I_1$ = 0.66	v = 0.5	0.05 40	1.00	4	5	7	0.01 60	1.00	5	7	11
	v = 0.8	0.05 50	0.55	4	5	7	0.01 80	0.54	5	7	11

Note: All simulations assume that p is distributed uniformly in the interval [0.1, 1].

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Table 3. Cumulative distribution of the number of banking relationships in Italy

Number of banking relation ships	Total sample (3,622 obs.)		Firms with up to 500 employees (2,391 obs.)	
	Cumulative frequency (percent)	Firm size (Min-Max)	Cumulative frequency (percent)	Firm size (Min-Max)
1	0.83	207 (50-515)	1.21	196 (54-470)
2	1.99	319 (54-2,168)	2.76	184 (54-470)
3	3.78	267 (55 -1,884)	5.27	184 (55-450)
4	6.62	282 (54-2,601)	8.99	149 (54-491)
5	10.29	273 (52-5,685)	13.97	140 (52-489)
6 - 10	34.89	288 (46-7,631)	46.09	151 (46-499)
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21 - 30	90.08	1,840 (50-108,555)	98.19	294 (50-500)
over 30	100.0	3,512 (102-101,360)	100.0	365 (102-488)
Number of relation ships:				
mean	16.4		12.3	
median	13		11	
mode	12		7	
min-max	1 - 146		1 - 50	

Firm

size:		
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Number of banking relationships	Total sample (a) (3,345 firms)		Firms with 49 to 500 employees (521 firms)	
	Cumulative frequency (percent)	Firms' size (b) (Min - Max)	Cumulative frequency (percent)	Firms'size (b) (Min - Max)
1	61.2	16.8 (1-450)	37.4	113.1 (50 -450)
2	87.0	27.2 (1-475)	67.0	113.1 (49-475)
3	95.5	50.3 (1-450)	84.0	138.9 (50-450)
4	98.2	66.6 (1-450)	92.3	126.9 (50-450)
5	99.2	93.0 (1-350)	95.9	143.5 (57-350)
6	99.6	140.6 (8-468)	97.8	190.9 (55-468)
7	99.8	248.9 (92-400)	98.8	248.9 (92-400)
> 7	100.0	315.8 (165-487)	100.0	315.8 (165-480)
Number of relationships:				
mean	1,6		2.3	
median	1.0		2.0	
mode	1.0		1.0	
min - max	1 - 12		1 - 12	
Firm size:				
mean		26.0		125.4

median	5.0	90.5

Notes: A firm is said to have a relationship with a bank if it raises funds from one of the following institutions: commercial banks, savings and loans associations, saving banks and credit unions. a) includes firms with 1-100 employees; b) number of full time equivalent employees.

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	U.S.		Italy		U.S.	Italy
Time period	Commercial banks	Saving and Loans	Commercial banks	Rural banks (2)		
1960-1969	0.50	1.00	2.93	3.99	0.80	-
1970-1979	0.54	1.00	3.39	3.41	0.80	0.43
1980-1984	3.83	61.08	1.95	1.16	4.62	1.14
1985-1989	15.86	36.37	1.08	0.82	8.03	0.80
1990-1994	6.96	-	1.73	2.97	4.20	0.46
Overall average	4.09	16.91	2.44	2.93	2.90	0.67
Total number of failures	1,591	1,358 (3)	39	75		
Percentage cumulative failures	11.4 (4)	33.1 (5)	7.4 (6)	10.1 (6)		

Notes: The probability of a bank failure is computed dividing the number of commercial bank failures in each year by the total number of chartered banks and averaging

across years. (1) Commercial banks' equity capital-to-assets. (2) Rural banks are small banks that can operate only at local level. (3) over the 1960-1990 period. (4) As a share of the number of commercial banks at the beginning of 1970. (5) as a share of S&Ls at the start of 1960, equal to 4,098 (see White (1991), Table 4-2 p. 58). (6) As a share of the number of banks at the beginning of 1960.

Sources: For the US: the data on the number of commercial banks and failures over the 1979-1994 period are taken from Berger, Kashyap and Scalise (1996), Tables A1 and A9; for the 1960-1979 period, from White (1992), Table 1. The data on the failures of S&Ls over the 1979-1990 period are from Helwege (1992), Table1; the probabilities of a failure for the 1960-1979 and 1970-1989 periods are from White (1991), Table 4-3, p. 60. The figures on the asset share of failed banks up to and including 1989 are computed using the FDIC Annual Report, various issues; for the 1990-1994 period we have used data reported in Berger, Kashyap and Scalise (1996), Tables A1 and A9. For Italy : Banca d'Italia, Bollettino Statistico, various issues, and unpublished data supplied by the Banca d'Italia. The share of the assets of failed banks has been estimated using the share of deposits of banks that have been forced into formal reorganization (a set which is larger than the set of failed banks) and multiplying the latter by 0.42, the ratio of failed banks to banks in formal reorganization over the 1970-1994 period.

Table 6. Length of time to recover loans after default (No. of months)

	Informal agreements (a)		Formal legal procedures			
			Reorganization (Chapter 11)		Liquidation (Chapter 7)	
	U.S.	Italy	U.S.	Italy	U.S.	Italy
Estimate1	-	-	30 (37; 16.8)	-	-	-
Estimate 2	15.4 (80;-)	-	20.4 (89;-)	-	-	-
Estimate 3	17.7 (45;11.	-	29.6 (37;13.	-	-	-

	8)		9)			
Estimate 4	-	-	44.0 (30;34.6)	-	-	-
Estimate 5	-	-	-	-	14.0	-
Overall	16.2	19.0	27.6	50.0	14.0	72.0

Notes: (a)The average time necessary to recover credit in case of informal exchange refers to loans recovered through a mutual agreement between the creditors and the firm to restructure the firm's debt. The average time in case of legal procedure refers to the time spent under Chapter 11 for US firms that emerge from Chapter 11; firms that exit Chapter 11 and are liquidated under Chapter 7 are excluded. For Italy it is the time necessary to conclude a "concordato preventivo". *Sources*. For the US we report five estimates: *Estimate* 1 is from: Weiss (1990), p. 288; sample period :1979-1986; *Estimate* 2 is from: Gilson, John and Lang (1990), Table 5, p. 335; sample period : 1978-1987; *Estimate* 3 is from: Frank and Torous (1994), Table 2, p.354; sample period: 1983-1991; *Estimate* 4 is from: Frank and Torous (1989), Table II, p.753; sample period: 1970-1985). The estimate in line "Overall" is the average of the four estimates; *Estimate* 5 refers to the average time for liquidation in the U.S. and is taken from Ang, Chua and McConnell (1982). The first number in brackets is the size of the sample on which the estimate is based, the second the standard deviation. For Italy: Generale and Gobbi (1996). The data reported in Generale and Gobbi are based on a survey of loan recovery procedures run by the Bank of Italy on a sample of 269 banks. Each bank was asked to report information on the average time necessary to recover loans according to the type of procedure followed both for secured and unsecured loans.

Table 7. Recovery rates for bank loans in case of default
(percent)

Informal agreements (a)				Formal legal procedures: Bankruptcy							
				Reorganization (Chap. 11)				Liquidation (Chap. 7)			
USA (b)		Italy (c)		USA (d)		Italy (c)		USA		Italy (c)	
Secured	Unsec.	Secured	Unsec.	Secured	Unsec.	Secured	Unsec.	Secured	Unsec.	Secured	Unsec.
-	86.6	60.0	52.0	80.1	86.4	50.0	23.0	-	-	50	10

Notes: a) Mutual agreements between creditors and debtors. b) Share of bank credit recovered in the sample of 45 firms that restructured their debt through informal agreements with borrowers analyzed by Frank and Torous (1994) , Table 4, p. 359. c) Average share of loans recovered by the banks in the sample analyzed by Generale and Gobbi (1996). d) Share of secured debt and bank debt recovered in the sample of 37 firms that formally reoganized under Chapter 11 analyzed by Frank and Torous (1994) , Table 4, p. 359.

Table 8. Size distribution and concentration of the banking industry: United States and Italy

Size distribution

Asset size (in millions of dollars) (a)	U.S.				Italy			
	No of banks	% of total	Assets (b)	% of total	No of banks	% of total	Assets (b)	% of total
0 - 2	26	0.2	34	0.001	0	0	0	0
2 - 10	747	5.9	5,337	0.162	54	5.2	377	0.042
10 - 50	6,204	48.8	168,861	5.117	400	38.5	10,689	1.138
50 - 100	2,744	21.6	192,282	5.827	187	18.0	13,540	1.443
over 100	2985	23.5	2,933,455	88.893	399	38.3	914,285	97.379
Total	12,706	100.0	3,299,969	100.0	1,040		938,891	100.0
Mean size (b)			259.8				903.8	

Concentration

Year	Share of top 5 banks (percent) (b)	
	USA	Italy
1970	15	40
1980	18	32
1990	18.3	37.8

Notes: a) For the U.S. assets of commercial banks in 1989; for Italy, assets of commercial banks and rural banks in 1990 at 1989 prices. The data have been converted into 1989 prices using the GDP deflator and then expressed in US dollars using the average 1989 Lira/Dollar exchange rate. *b*) Millions of 1989 dollars; *c*) share of total deposits accounted for by the top five banks.
Sources: The US data on the size distribution are from Department of the Treasury (1991), Chapter 13, Table 4, p. XIII-4; for Italy they have been provided by the Bank of Italy. The data on the share of deposits in the US for the 1970 and the 1980 are from Baer and Mote (1985); the share for 1990 is computed using 1991 figures from Tables A1 and A2 in Berger *et. al* (1996). The 1970 and 1980 shares for Italy are taken from Conegliani (1990), Table 7, p. 66; the figure for 1990 is from Edey and Hviding (1995), TableA2.

Figure 1. The optimal number of banking relationships

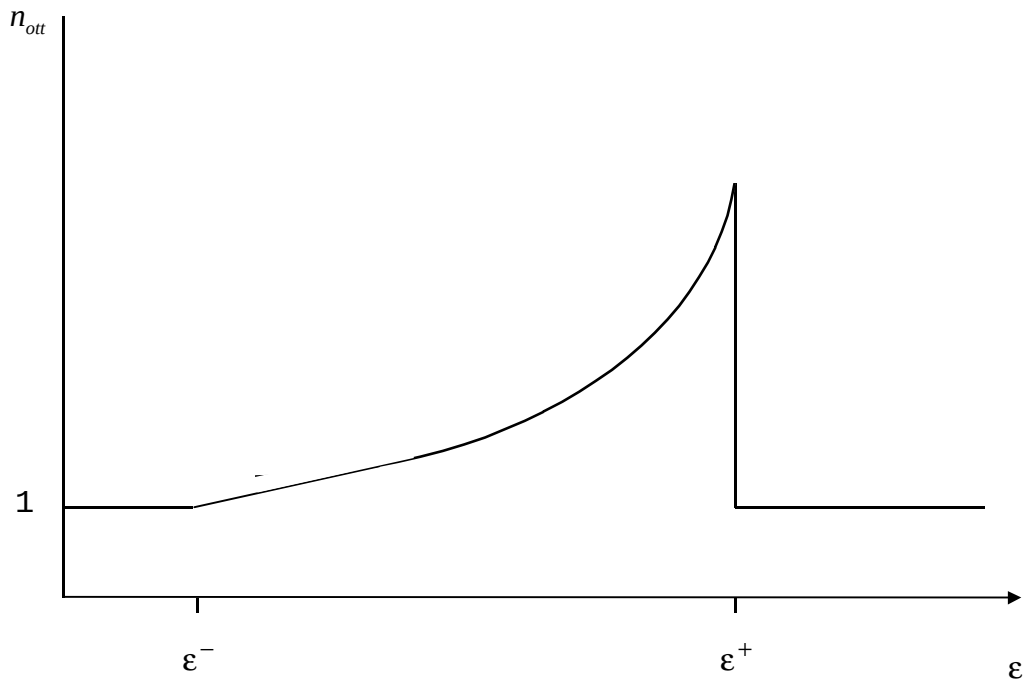

Figure 2. Credit relations by firm size in the United States and Italy