The Impact of Bank-firm Relations on the Propagation of Monetary Policy Squeezes: An Empirical Assessment for Italy *

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1. Introduction

Evidence that the effects of a monetary policy shock sometimes proved stronger than the initial impulse led a mainstream of research[1] to suppose the existence of a transmission mechanism further to the monetary one, which operates on the side of the liabilities of banks, acting on their capacity in creating deposits.

The existence of a "lending channel" through which a monetary restriction is transmitted to the economy – assuming that banks *i*) are not able to absorb fully and rapidly the reduction in deposits and *ii*) are not indifferent about whether to hold Government bonds or private loans in their portfolio – is essentially based on the imperfect substitutability between borrowing from banks and raising funds on the capital markets. Empirical evidence for the United States indicates that the effects of a monetary restriction seem to weigh above all on small firms[2] which – owing to their inability to issue commercial paper – depend almost completely upon bank loans.

[1] Bernanke and Gertler (1995), Hubbard (1994), Bagliano and Favero (1995).
[2] Gertler and Gilchrist (1994).

The Italian case seems to be of particular interest in order to test the existence of a lending channel in the transmission of monetary policy, besides the monetary channel.[3] On the one hand, the Italian manufacturing system is characterized for the diffuse presence of small- and medium-sized firms (Padoan, Pezzoli and Silva 1989). On the other hand, the inadequate development of capital markets and, above all, the lack of a wide market for commercial paper limit the substitutability of bank loans with the direct placement of securities in the markets. For Italian firms, drawing on external sources of finance means, in practice, applying to banks.

Moreover, the fact that the bank-firm relationship appears to be less close and intense than in other financial systems makes Italian firms particularly vulnerable to the effects of monetary restrictions, above all after the significant decrease in the incidence of banks' securities portfolios that occurred in the latter half of the past decade.

The first empirical research on the Italian case led to results differing from those of the United States. In fact, in Italy, the interest rates charged by large banks seem to increase more than those applied by small banks in periods of monetary tightening. This circumstance might, among other factors, derive from the closer customer relationship characterizing the small banks; these latter seem to be more inclined to cushion the effects of a monetary squeeze.[4]

The main aim of this paper is to analyze the bank-firm relationship in Italy, in order to verify its impact on the behaviour of the bank towards its customers and the effects on the transmission of monetary policy impulses. To this purpose, we will try to single out a sub-group of borrowers whose dependence upon banks seems to be particularly close, given the lack of alternative sources of financing and the kind of relationship they have with the lending banks, and will examine the banks' behaviour towards this sub-group *vis-à-vis* other groups of firms.

The analysis differs in many ways from previous empirical research on the same issue: namely, we use (Section 2) a wider sample of non-financial firms registered in the Central Credit Register in order to avoid the biases implicit in considering only large-sized firms; among the explanatory variables we also employ a stability index which captures the length of the bank-firm relationship; the import-

ance of customer relationships is tested with reference not only to the interest rates applied by banks, as already assessed in the work of D'Auria and Foglia (1997), but to the response of these rates in the episode of the severe 1992 monetary restriction.

Section 3 deals with the relation between the closeness of bank-firm relations and the probability of being rationed. The empirical evidence shows that the intensity of this relation – as measured by the stability and the concentration of credit indexes – reduces the probability that a firm will be rationed.

Section 4 deals with multiple borrowing by firms and makes a comparison, for the first time, of the extent of that practice in France, Germany and Italy. The concentration of credit in Italy proves distinctly lower than in the former countries even though traces of multiple borrowing can be also detected in France and Germany. A larger portion of the Italian firms would therefore seem to have relatively looser relationships with the lending banks and could easily come up against a sudden increase in the interest rates, due to monetary restriction, with possible negative consequences on their economic results.

Section 5 deals with the possibility that two recent developments which occurred in Italy, namely, the consolidation of the banking system and the shift in intermediation towards the medium and long term, is bound to determine a strengthening in customer relationships. It can be observed that, in recent years, for each class of loan size, the average number of lending banks has progressively fallen while the concentration of credit between lending banks has increased. Section 6 concludes.

The relevance of the results may perhaps be appreciated from the beginning by observing that the variables which proxy for the intensity of the bank-firm relationship show a considerable variability according to the loan size. Even though the Italian firms do depend, generally speaking, on bank financing, it may be argued, considering the variability of these proxies, that significant differences exist in the intensity of the bank-firm relationship.

Table 1 shows, for a wide sample of the non-financial firms registered in the Central Credit Register, according to a breakdown by classes of total loan size, the frequency of the borrowers in each class as of the end of 1994, the credit drawn, the credit granted, the ratio between the latter two values, the average values of the

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[3] Angeloni *et al.* (1995); Buttiglione and Ferri (1994).
[4] Angeloni *et al.* (1995); Ferri and Pittaluga (1996).

TABLE 1

FREQUENCY OF BORROWERS, VOLUME OF CREDIT AND VALUES
OF THE HERFINDAHL INDEX, BREAKDOWN BY SIZE OF TOTAL LOAN GRANTED
(end of 1994 data)

Size classes (billions)	Number of borrowers	Amount granted (billions)	Average amount of the loan granted (billions)	Amount drawn (billions)	Drawn/ granted x 100	Average value of Herfindahl index
Up to 1	194,471	63,542	0.3	40,245	63.3	0.80
1-4	55,298	105,627	1.9	66,163	62.6	0.47
4-10	13,979	84,643	6.0	50,854	60.1	0.36
10-30	5,873	95,713	16.3	55,345	57.8	0.29
30-50	1,069	40,560	37.9	22,153	54.6	0.24
50-100	640	44,385	69.3	22,152	49.9	0.23
100-200	265	35,913	135.5	18,664	52.0	0.20
200-500	107	31,691	296.2	15,257	48.1	0.17
500 and more	61	83,070	1,361.8	37,277	44.9	0.13
Total	271,763	585,144	2.1	328,110	56.0	--

Herfindahl concentration index.[5] The 194,000 and more firms inclu-
ded in the class of loans up to one billion -- about 72% of the total --
are characterized by very high concentration (0.8), similar to those
they would have if dealing with only one bank. Moreover, the 55,000
firms included in the class 1-4 billion -- 20% of the total -- show a
concentration of 0.47, almost equivalent to the level that would result
if they had relations with two banks.[6] The values of the index are
continuously decreasing to a minimum of 0.13 for the class of the
largest loans.

The non-financial firms registered in the Central Credit Register
may therefore be divided into two sub-groups. The first is composed
of firms whose main features, as of the end of 1994, are a total loan
size smaller than 4 billion lire and a high concentration of their loan

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[5] Once more, the Herfindahl index seems to be appropriate because of its capacity
to take into account, at the same time, both the number of banks with which the firm has
a relation and the differences in the relative importance of loans granted by each bank
(Conigliani and Lanciotti 1978, pp. 428-33).

[6] It should be observed that the fact that the value of the Herfindahl index is close
to 0.5 does not necessarily mean that the two banks have the same share in the
breakdown of the loans of the firm. The survey carried out by Banca d'Italia (1995)
shows that, generally, the leading bank is in a position of clear pre-eminence.

distribution; the second includes firms characterized by a loan size
greater than that threshold, by frequent recourse to multiple borrow-
ing and a low concentration of their loan distribution. The hypothesis
that the two sub-groups of firms are in a sharply different position
vis-à-vis the lending banks seems to be confirmed, indirectly, by the
trend of the percentage ratio between the credit actually drawn and
the credit granted, shown in the fifth column of Table 1: it is about
63% for the two lower classes and decreases progressively when the
loan size increases, down to 45% for the class of 500 billion and more.
We may therefore argue that such differences could perhaps deter-
mine different behaviours, on the side of the banks, in transmitting
the impulses of monetary policy.

2. Bank-firm relationships as a determinant of the level and of the change in interest rates

Can the bank-firm relationship determine the size of the adjust-
ment of interest rates charged by banks when the stance of monetary
policy changes? This Section is devoted to trying to answer this
question.

Before presenting the empirical results, a brief review of the
literature on banking contracts can help focus the issue better. Com-
parison of the relative efficiency of obtaining external finance in the
form of bank credit or in the form of bonds is made by Gorton and
Kahn (1993): they note that the design of loan contracts -- collateral,
options to call the loan in advance of its expiry date and seniority --
allow to control borrowers' risk-taking activity via renegotiation of
the loan. Bank contracts are utilised more when problems of asym-
metric information between borrower and lender are more severe.
Focusing on bank debt it is possible to devise contracts permitting a
different degree of monitoring by the bank and inducing a different
strength in the bank-firm relationship. In this Section we examine
some variables which proxy for the strength of the bank-firm relation-
ship and test whether they can account for differences in terms of the
interest rate paid by the firm and/or in terms of the speed with which
this interest rate reacts to changes in the stance of monetary policy. In
detail, we examine the role of:

a) the length of the bank-firm relationship, which, as argued by Berger and Udell (1995, p. 10), is an important dimension of the bank-firm relationship and should capture "the ability of the bank to learn more about the nature of the borrowing firm through its lending relationship";[7] on this same issue Petersen and Rajan (1994, p. 4) note:

> "An important dimension of the relationship is its duration. The longer a borrower has been servicing its loans, the more likely the business is viable and its owner trustworthy";

b) an index of credit concentration at the firm level should capture the trade-off existing between the strength of the bank-firm relationship – since in the case of higher concentration the informational advantages for the bank are enhanced – and the possibility that the firm be captured by the bank – since when concentration is higher, and when the firm has no other source of financing available, the likelihood of the bank behaving as a pure monopolist is also higher;[8]

c) the number of banks granting credit to the firm is meant to capture the intensity of multiple-banking relationship. This issue is of particular importance in the case of Italy and has been attributed to various reasons. For the bank, it can be a way to diversify risk across firms (Cesarini 1977). For the firm it can also ensure a diversification of lenders and a negotiation device. Detragiache, Garella and Guiso (1997) contrast these and other explanations[9] of multiple-banking relations with two structural factors: the inefficiency of the bankruptcy procedures and the fragility of the banking system.[10] Although

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[7] It is important to note that if the length of the relationship matters in reducing the asymmetries between the bank and the firm, these asymmetries are probably reduced at the beginning of the relation. It follows that a small difference in the stability index can be very important for a firm that has just started its relationship with the bank, whereas these effects should be weaker as the relationship continues.

[8] The paper focuses on the effects of credit concentration for firms. It has to be recalled that the effects of an increase in concentration are important for banks too; if the bank grants credit to few firms this can have consequences in terms of excessive risk-taking.

[9] Other reasons over the one cited are: legal restrictions, the greater specialization of Italian banks, differences in the financial structure.

[10] "Specifically, for a given range of parameter values characterizing the stability of the banking system and the efficiency of the enforcement mechanism we find that a single banking relation is the optimal outcome, whereas once certain threshold values are crossed multiple banking becomes desirable" (p. 3). Multiple-banking relations are more likely to characterise financial systems in which the banking system is stable and bankruptcy procedures are less efficient.

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the debate on the causes of these peculiarities of the Italian case is still open, there is more consensus on the effects of multiple-banking relations. They reduce the incentive for banks to a thorough monitoring of the firm: the relation between the bank and the firm becomes loose and the ability to control the amount of credit granted to the firm is also diminished.[11] Most important for our analysis, a firm related to many banks can find itself in a weak position when a shock in interest rates occurs: the fact that the relation is loose reduces the expected value for the bank of a continuation of the relationship and lowers the incentives to smooth the effect of the shock in monetary policy.

2.1. *Customer relationship and the level of interest rates*

A number of empirical analyses of the Italian case making use of data at the firm level have been put forth recently (Angelini and Guiso 1994, D'Auria and Foglia 1997). We found nonetheless useful to carry out the analysis of the determinants of the level of interest rate again for two reasons. First, the evidence on the level of the bank lending rate is the starting point to understand the role the same variables play in determining the size of the increase (decrease) in this same rate when monetary conditions suddenly change; secondly, our empirical analysis utilizes a larger sample of firms than those employed in previous studies: we examine 33,808 non-financial firms present in the data-base of the Central Credit Register, thereby reducing the risk of distorting the results by considering only larger-sized firms.[12] More in detail, we selected our sample in four steps:

1) starting from 253,452 non-financial firms included in the Central Credit Register in June 1992, we reduced the sample to 153,437 by excluding those firms for which no information on lending rates was available;[13]

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[11] Ciocca (1991) and Padoa-Schioppa (1994).

[12] For this sample we calculated the weighted average loan interest rate at firm level.

[13] Whereas information pertaining to loans outstanding is sent to the Central Credit Register from all banks operating in Italy, data on interest rates are sent by a sample of more than 70 banks: it follows that for many firms no information on interest rates is available, because these firms do not borrow from banks included in the interest rate survey.

2) by limiting analysis to the firms continuously present in the records of the Central Credit Register in the period March 1984-June 1992, the number of firms is reduced to 59,155;

3) we did not consider those firms not recorded between June 1992 and December 1993 and those for which information on interest rates was not available for every quarter: the sample is reduced to 34,484;

4) finally we dropped 676 firms for which some of the information was considered as an outlier.[14]

With respect to the previous literature, our sample has the advantage of considering also smaller-sized firms. By selecting the firms as described above, we introduced nonetheless some distortions. The most significant are: step 1) introduces an over-representation of larger-sized firms in the sample, because of the larger size of the banks reporting information on interest rates and the correlation between firm and bank size, particularly in the case of medium-large sized loans. Step 2), by excluding those firms which are not continuously present in the data-base, introduces a survivorship bias: we exclude firms constituted after March 1984; on the other hand we do not consider firms which exited from the data-base due to a crisis. Step 3) introduces both a dimensional and a survivorship bias. As a consequence, the main features of the median firm are significantly changed with respect to those of the whole sample. Considering June 1992, the median firm of our final sample of 33,808 firms had a total of bank loans of 1 billion lire and borrowed from 5 banks, as opposed to 0,2 billion and 1 bank for the median borrower of the largest sample.

Cross-section regression for the lending rate level was run for June 1993, by adopting the following specification:[15]

$$\text{loart}_j = \beta_0 + \beta_1 \ S_j + \beta_2 \ h_j + \beta_3 \ \text{numb}_j + \beta_4 \ cd_j + \beta_5 \ \text{dummy south} + e_j$$

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[14] The number of firms included in the regression for the period of loan rate reduction (1st semester of 1993) is equal to 33,637.

[15] The specification we adopted is extremely simple; no variables which synthesise the economic and financial conditions of firms or of banks were employed as is the case for other empirical analyses (e.g. D'Auria and Foglia 1997). On the one hand disregarding these variables maintains a high number of observations; in fact considering variables at firm level would have reduced the sample insofar as the data set available of Company Accounts Data Service, containing this information, is referred to medium-large sized firms. On the other hand the exclusion of these variables probably introduces a missing variable problem in the regression.

For each firm S is an index representing the stability of the relation between the bank and the firm in the course of time, obtained as the ratio between the length of the contract and the maximum number of quarters identified with the observation period; the average value for each firm is obtained by weighting each bank-firm index for the value of the credit lines granted by each bank to the firm.[16] S varies between 0 and 1, with 1 indicating maximum stability. The index gives an incomplete representation of the stability of bank-firm relations because it is obtained for a pre-specified time span.

h is the credit concentration index, obtained as the sum of the squares of the incidence of the loans granted by each bank to the firm on the total indebtness of the same firm.

There is no consensus in the literature about the expected sign either of the stability index or of the concentration index. As for the former index, Berger and Udell (1995, p. 352) note:

> "Recently, a theoretical literature on relationship lending has appeared which provides predictions about how loan interest rates evolve over the course of a bank-borrower relationship. The models of Boot and Thakor (1995) and Petersen and Rajan (1993) predict that rates should decline as a relationship matures, while the models of Greenbaum, Kanatas and Venezia (1989), Sharpe (1990) and Wilson (1989) predict increases in rates over time".

Petersen and Rajan (1994, pp. 5-6) indicate the length of the relationship between the bank and the firm as an approximation of the intensity of the relation; they suggest that, the longer the relation, the lower should the cost of borrowing for the firm be:

> "Conditional on its past experience with the borrower, the lender now expects loans to be less risky. This should reduce its expected cost of lending and increase its willingness to provide funds".

In our estimates the sign of the stability index coefficient proves negative (Table 2), confirming the hypothesis that as the length of the

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[16] This index is obtained with the following formula:

$$S_j = \sum_{i=1}^{m} q_{ij} \ ST_{ij}$$

where: $j = 1, .., n$ firms; $i = 1, .., m$ banks; $q_{ij} = CL_i/CL_j$ and $ST_{ij} = t_{ij}/T$ with $t_{ij} =$ number of quarters in which the firm borrowed by the bank and $T =$ maximum number of quarters, equal to 32 in our sample.

Obviously our index is different from that employed in Petersen and Rajan (1995) and in Berger and Udell (1995), who consider only the first bank in terms of credit granted.

TABLE 2

CROSS SECTION REGRESSION DEPENDENT VARIABLE:
LOAN INTEREST RATE LEVEL
(June 1993)

Variable	Coefficient	t statistic	prob t
Constant	17.29	190.3	0.000
S	–1.13	–17.4	0.000
h	0.32	4.9	0.000
cd	–0.24	–20.5	0.000
numb	–0.02	–5.6	0.000
dummy south	1.90	54.4	0.000

Number of observations = 33,808
$R^2 = 0.12$

relation increases, the informational problems between the bank and the firm are reduced and, therefore, the risk premium required by the bank to the borrower lowers. This evidence is also consistent with that reported in Berger and Udell (1995).

In interpreting our results one should take account of the likely distortions due to the sample selection methodology discussed above. Moreover, as the stability index is a weighted average for each firm, it takes account of the relative importance of each single bank for the firm. Greenbaum, Kanatas and Venezia (1989) have shown that, on theoretical grounds, there exists a positive relation between the length of the bank-firm relationship and the interest rate paid. This contradicts our empirical evidence only apparently: in our case the issue pertains to the number of banks operating with the firm; in the case made by Greenbaum, Kanatas and Venezia (1989) there exists only one incumbent bank: in this framework, when the length of the relation increases, the monopoly power of the bank also increases; furthermore, the probability that the contractual relation will continue decreases. These conclusions do not necessarily fit in an environment in which multiple-banking relations are widespread: in our case the stability index refers to the length of the contractual relations with a pool of banks and presents, not surprisingly, a low correlation with *h*, the concentration index.

The index for credit concentration (*h*) has a positive sign: this result, together with the negative sign of the variable that represents the number of banks lending to the firm (*numb*), shows that an incentive to multiple banking relations derives from the lower level of the interest rate paid by firms with a low concentration of credit. To check for differences linked to the size of the borrower the regression contains also the total credit used by the firm (in logarithms; *cd*):[17] the negative sign of this variable shows that larger-sized borrowers pay a lower interest rate, probably because the debtor is in a better position to negotiate. Other empirical tests on the Italian case (D'Auria and Foglia 1997), conducted on a sample of 2,300 non-financial firms with total indebtedness not less than 20 billion lire, point out that the benefit in terms of interest paid exists only up to a certain threshold in terms of credit concentration; above this threshold, the growth of the concentration of credit gives rise to an increase in the interest rate paid by the firm, thereby showing that highly concentrated firms can be captured by the bank (hold-up). Finally, we check for geographical differences between firms by introducing a dummy variable equal to 1 for firms operating in Southern Italy and in the Islands: the positive sign of the dummy confirms that the interest rates applied by banks are significantly higher in those regions.

From these results the following conclusions on the Italian case emerge:

1) firms with highly concentrated lines of credit pay higher interest rates;

2) high concentration is not the only variable which captures the nature of the relationship between the bank and the firm; the stability index presented in this paper helps to discriminate the effects exerted by the concentration variable: for the same level of concentration, firms characterized by long-lasting relations with a pool of banks pay lower interest rates on average. These results are in line with the theoretical indications contained in Boot and Thakor (1994, p. 914). In their model, firms with long-lasting relations are the successful ones:

"[...] It takes a finite number of periods on average to achieve the first project success. Until then the borrower must accept a secured loan with

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[17] The size of firms' indebtedness with banks is only a proxy for the size of the firm. Giannini, Papi and Prati (1991) pointed out to the pitfalls in using such a variable in the case of multiple-banking relationships. However, Angeloni *et al.* (1995) find a significant positive correlation between firm size-proxied by the proceeds of sales and credit drawn.

higher total cost of borrowing than it will have after its first project success. Thus we explain why banks make secured loans to borrowers without "track records", reserving the privilege of unsecured debt for established borrowers. Moreover, we can rationalise [...] why the costs of borrowing in the later stages of the bank-borrower relationship are lower than in the earlier stages".

It is possible to quantify the effects of a change in the variables found to influence the cost of credit for the firm, other things being equal. The interest rate paid by the firm grows by 32 basis points when the firms' concentration grows from 0 to 1. One more bank in the pool of lenders causes a reduction of 2 basis points in the interest rate. The effect of an increase in the length of the relationship is somewhat larger: a firm characterised by a stability index equal to 1 – i.e., a firm which has not changed the pool of banks between 1984 and June 1992, the period on which S is calculated – pays an interest rate 100 basis points lower than another firm which has continuously changed its borrowers.

The evidence that, when credit concentration increases, firms pay higher interest rates is consistent with the hypothesis of the hold-up mechanism, by which a bank that grants the bulk of credit to the firm gains a rent in terms of higher spreads over a risk-free (market) interest rate. As Petersen and Rajan (1994, p. 6) clearly state:

> "[...] if the information generated in the relationship is private to the lender and not transferable by the borrower to others, the relationship reduces the interest rate by less than the true decline in cost".

In the light of our results, however, we cannot reject the alternative explanation that firms paying higher interest rates to some extent do so in exchange for a reduced risk of variability in interest rates during the different phases of monetary policy. The next paragraph is devoted to this issue.

2.2. Customer relationship and the response in lending rates

Following the implicit contract theory literature, firms character-ised by a close relationship with few banks may be willing to pay a premium in terms of a higher cost of credit, in exchange for a lower variability of the interest rate charged by banks when monetary conditions become more stringent. When money market interest rates increase, interest rates paid by these firms increase less than for the

other firms in the market. A higher degree of risk-aversion would characterise the more concentrated firms and hence determine the closeness of the bank-firm relationship (Fried and Howitt 1980).[18]

The analysis of the structural factors determining a different degree of stickiness in banks' interest rates at a micro level is of particular importance for the Italian case in the light of the evidence reported at the macro level that the degree of stickiness is high if compared to other countries' experience (Borio and Fritz 1995). Moreover, previous empirical analyses of the Italian case have shown that the response of interest rates varies across groups of banks (Cottarelli, Ferri and Generale 1995; Angeloni et al. 1995).

Referring to two periods in which changes in money-market interest rates have been particularly sharp, we attempted to quantify the importance of the factors illustrated above in determining the intensity of banks' interest rates variations. We examined – at the firm level – the increases in banks' interest rates which took place in the latter half of 1992, after the significant increase in money market interest rates in the period of the exchange rate crisis; and the reductions in the subsequent period (December 1992-June 1993). Probit estimates (Table 3) for the first period indicate that the probability of a percentage increase higher than that which occurred to 75% of firms is significantly lower for firms characterised by a high degree of concentration of lines of credit (h); the sign of S, the stability variable, has the same sign of h, but is not significant. The results confirm the predictions of the implicit contract theory as far as concentration is concerned. Firms characterised by a high number of banking relations and larger-sized firms experienced higher increases in interest rates. Multiple banking relations are efficient in ensuring a lower level of interest rates, but do not shield the firm in episodes of sharp increase. We checked for geographical differentiations using the dummy variable south: the sign of the dummy confirms the higher degree of stickiness in the South of Italy (Banca d'Italia 1995).

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[18] Berger and Udell (1992, p. 1049) review the different interpretations of interest rate stickiness: "While sticky loan pricing is consistent with the rationing hypothesis, it is not by itself sufficient evidence of it. One alternative explanation is that banks may offer implicit interest rate insurance to risk-averse repeat borrowers in the form of below-market rates during periods of high market rates, for which the banks are later compensated when market rates are low. Another possibility is that stickiness may be the result of loan recontracting between banks and companies experiencing financial distress when market interest rates are high. To avoid bankruptcy costs, banks may be willing to renegotiate and grant new loans at concessionary rates to such companies at these times".

TABLE 3

PROBIT FOR THE EPISODE OF INCREASE IN INTEREST RATES *
JUNE-DECEMBER 1992
(descriptive statistics as at June 1992)

Variable	Obs	Mean	Std. Dev.	Min.	Max.
difp	33808	0.234	0.084	0.0005	1.507
S	33808	0.745	0.185	0.0294	1
h	33808	0.344	0.233	0.0319	1
numb	33808	5.741	4.300	1	40
cd	33808	7.052	1.318	2.3025	14.276
south	33808	0.137	0.344	0	1

Probability of an increase greater than 28% (75° percentile)

Variable	Coef.	Std. Err.	z	P> |z|	[95% Conf. Interval]	
S	−0.065	0.042	−1.544	0.123	−0.147	0.017
h*	−0.228	0.045	−4.986	0.000	−0.318	−0.138
numb	0.019	0.002	7.218	0.000	0.013	0.024
cd	0.049	0.007	6.535	0.000	0.034	0.064
south	−0.098	0.022	−4.404	0.000	−0.141	−0.054
constant	−1.003	0.057	−17.340	0.000	−1.116	−0.889

* At June 1992.

PROBIT FOR THE EPISODE OF DECREASE IN INTEREST RATES *
DECEMBER 1992-JUNE 1993
(descriptive statistics as at December 1992)

Variable	Obs	Mean	Std. Dev.	Min.	Max.
difp	33637	0.177	0.063	0.0004	0.542
S	33637	0.746	0.185	0.0294	1
h	33637	0.349	0.234	0.0320	1
numb	33637	5.741	4.300	1	40
cd	33637	7.048	1.320	2.3025	13.567
south	33637	0.136	0.343	0	1

Probability of a decrease less than 14% (25° percentile)

Variable	Coef.	Std. Err.	z	P> |z|	[95% Conf. Interval]	
S	−0.317	0.040	−7.758	0.000	−0.397	−0.237
h*	0.160	0.043	3.733	0.000	0.076	0.244
numb	−0.008	0.002	−2.898	0.004	−0.013	−0.002
cd	−0.048	0.007	−6.467	0.000	−0.063	−0.033
south	0.399	0.020	19.370	0.000	0.358	0.439
constant	−0.176	0.057	−3.063	0.002	−0.289	−0.063

* At December 1992.

Analysis of the episode of interest rates reduction[19] affords further insights into the different nature of the various characteristics of the bank-firm relation; the probability that a firm will experience an interest rate decrease smaller than that of the first 25% of firms ranked by the intensity of the reduction is higher for firms characterised by higher credit concentration, confirming the hypothesis of an implicit insurance granted to those firms. The stability index has a negative sign: firms characterised by long-lasting relationships enjoy larger interest rate reductions. The signs of the other variables are in line with those which emerged from analysis of the period of interest rates increase.[20]
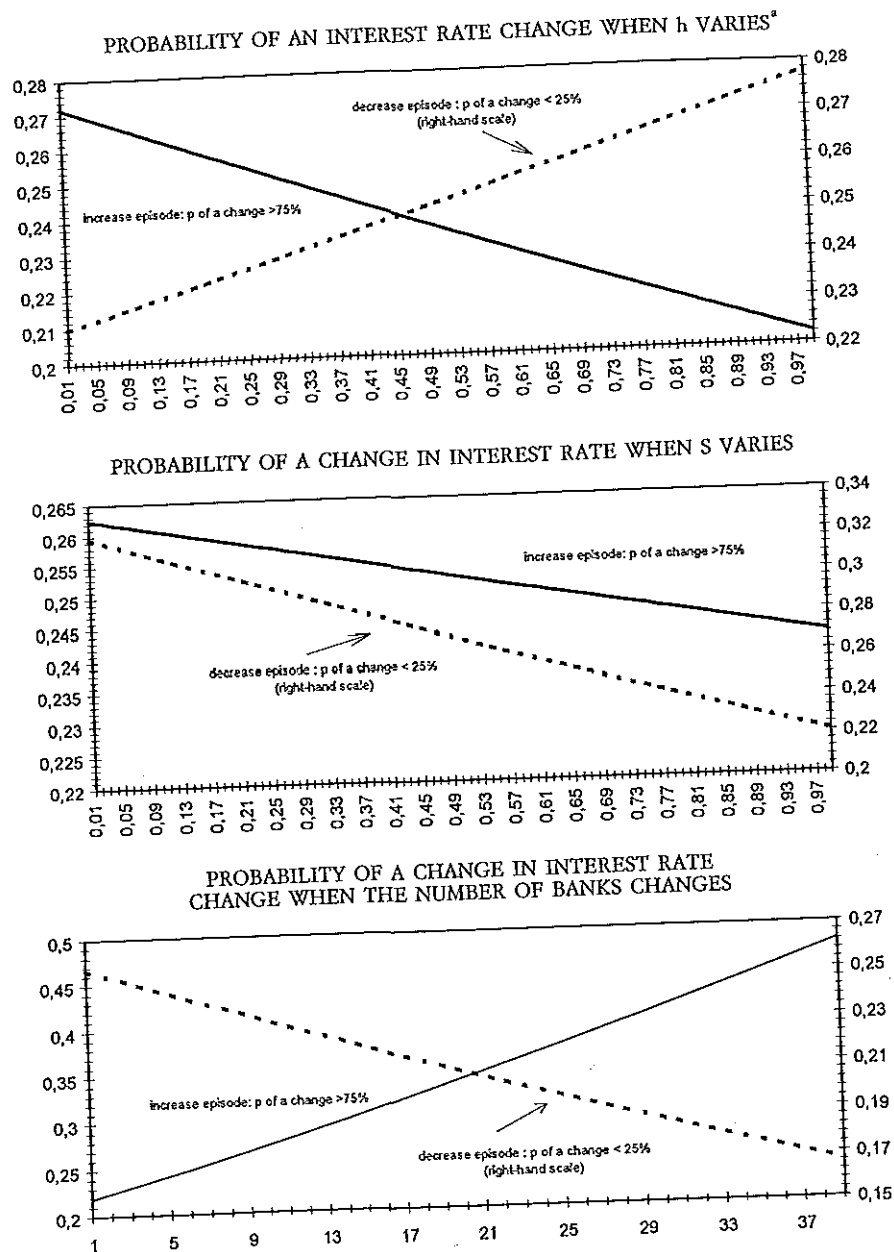
To quantify the importance of the characteristics of the bank-firm relation, we estimated the probability distribution of the change in interest rates when these characteristics vary. The probability of an interest rate increase beyond the 75th percentile for firms characterised by maximum values of the concentration index is lower by about 30% with respect to firms with minimum concentration (Figure 1); in the episode of interest rate decrease the probability of a reduction significantly lower than the 25th percentile is higher for firms with high levels of the concentration index, thereby confirming the symmetric effect of this variable and the relevance of the insurance mechanism hidden in the degree of concentration of credit. The variation in the stability index does not cause significant changes in the probability of an interest rate increase in the episode of money market interest rates growth; on the other hand, the probability of being penalised in the episode of money market interest rates decrease is lower for those firms marked by high values of the stability index.

An increase in the number of banks granting credit to the firm proves the most significant variable in determining the increase in probability of being penalised in the episode of interest rates increase; the increase in this probability is less pronounced in the episode of interest rates reduction.

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[19] Interest rate percentage changes in the episode of decreasing money market interest rates are expressed in absolute values; this should ease the interpretation of results and comparison with the episode of increase in money market interest rates. In the first period we dropped negative changes; in the second episode, positive changes were dropped.

[20] In interpreting the results of the episode of decreasing rates we recall that since we analyse a reduction smaller than that experienced by a certain percentile, if the variables analysed exert symmetric effects in the two episodes, these variables will have opposite signs in the two periods.

FIGURE 1

PROBABILITY OF AN INTEREST RATE CHANGE WHEN h VARIES[a]

PROBABILITY OF A CHANGE IN INTEREST RATE WHEN S VARIES

PROBABILITY OF A CHANGE IN INTEREST RATE CHANGE WHEN THE NUMBER OF BANKS CHANGES

[a] Percentage values refer to firms ordered according to the size of the variation in interest rates.

In the light of the empirical evidence we can qualify the results gained by the analysis on the determinants of the level of interest rates:

– it is confirmed that the two relation variables chosen to describe customer relationships – concentration and stability – have different significance: an increase in concentration reinforces the insurance mechanism; the concentration index permits us to single out the characteristics of loans granted to relatively small firms.[21] High values of the stability index locate those contracts in which screening by the banks has been successful in picking up good firms: indirectly this is confirmed by the fact that there is no clear-cut relation between this index and the size of the firm;

– multiple banking relationships have an important role in reducing the cost of credit for the firm, thereby reducing the hold-up problem; on the other hand, operating with a high number of banks does not shield the firm in the episodes of unusual increases in interest rates, such as those occurring in the aftermath of the exchange rate crisis in 1992;

– analysis of these variables for groups of banks indicates that – if the groups are formed following the size of the bank – the infra-group variability of the concentration index and of the multiple-banking variable is higher than that of the stability index. We obtained H, which at the bank level is the aggregation of the firm-specific h indexes of concentration: this index is three times larger for the smallest banks as compared to the largest;[22] the multiple-banking relation index[23] is 17 for the largest and large banks; it is below 10 for the smallest banks (Table 4);

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[21] As Ferri and Pittaluga (1996, p. 476) note: "[...] the loan contract to small firms can have the characteristic of being – even if in an implicit way – an insurance contract. By means of this contract it is the bank that bears the risk due to sudden variations in money market interest rates. The firm pays a lower interest rate than it should in periods characterized by raising interest rates, whereas it pays more when monetary policy is expansionary; we have a risk-sharing contract. In this setting, it follows that the impact of some monetary impulses is weaker than expected for risk-averse firms".

[22] Having hi i=1, ..., n equal to the values of index h for n firms borrowing from bank j, H_j is given by the following formula:

$$H_j = \sum_{i=1}^{n} q_i h_i$$

where $q_i = CL_i / \sum_{i=1}^{n} CL_i$ and CL_i is the amount of credit lines granted from the bank to firm i.

[23] Having bi i = 1, ..., n be the number of banks which lend to the n firms of bank j, the index for multiple-banking relationships is given by the following formula:

TABLE 4

CUSTOMER RELATIONSHIP PROXIES RANKED FOLLOWING
THE CLASS-SIZE OF THE BANKS

Banks	Stability	H	Multiple-banking proxy
Larger	0.79	0.07	17.0
Big	0.78	0.10	17.5
Medium	0.77	0.20	14.1
Small	0.76	0.16	12.4
Minimal	0.75	0.23	9.5

– our analysis refers to episodes of unusual increase and decrease in interest rates; therefore the results must be interpreted with caution. Nonetheless the empirical evidence shows that the relationship characteristics have a significant effect on the monetary transmission mechanism. We did not find evidence of a cross section lending channel effect as described in the literature with reference to the United States: following this literature smaller-sized firms – for which financial constraints should be more binding than for larger ones – should be more exposed to the risk of being hit by an increase in interest rates, thereby reinforcing the monetary transmission mechanism.

3. Bank-firm relations and the availability of credit after the monetary squeeze

Above we have examined the evidence that customer relationships exert an impact on the response of lending rates to the 1992 monetary policy restriction. However, the cost of borrowing is not the only determinant of credit constraints for firms. Indeed, borrowers may in the first place be denied additional credit or they may see their credit lines curtailed by banks undergoing a liquidity drain. In this Section, we analyse whether customer relationships bear

$$B_j = \sum_{i=1}^{n} q_i b_i$$

where $q_i = CD_i / \sum_{i=1}^{n} CD_i$ and CD_i is the amount of credit draws from firm i.

an impact on the dynamics of credit lines available to individual firms.

Thus our study on the determinants of lending rates has to be matched by analysis of the determinants of credit availability during the very special time span we examine. So far, the evidence available on the Italian case in this respect draws on the results of direct interviews with firms studied by Angelini and Guiso (1994). Their results suggest that firms with a high Herfindahl index would have a lower probability of meeting liquidity constraints. However, we adopt a different approach here in order to bring new light on this issue.

As Bernanke and Gertler (1995) warn us, observing a slowdown in the expansion of loans after the monetary squeeze is not enough to identify a shift in the supply of loans; it could as well be that worsening business prospects lead firms to refrain from venturing into new investment and, therefore, from demanding more credit. Fortunately for our exercise, the lending practices of the Italian banks help us in such identification. This is the case because credit lines are offered by banks at no charge, if they are not actually drawn. As it happens, borrowers pay the contractual loan rate only on the share of the credit line they actually draw, whereas the remaining portion of the credit line bears no cost: one can in fact think of the undrawn part of the line as an option with zero price for the borrower. Given the fact that demanding larger credit lines bears no pecuniary cost per se, it goes without saying that firms will have an incentive to demand credit lines well beyond their expected borrowing so as to cushion unanticipated liquidity needs. Therefore, it is solely the bank that determines the credit limit, thereby rationing the amount that would be demanded by each borrower. Of course banks know that most customers will not borrow up to their limits, but in principle they should be ready to meet such maximum demand which might materialise with some positive probability.

Accordingly, if we analyse the ratio of credit actually drawn to credit limits (utilisation ratio) we have for each borrower a good proxy of his/her credit availability. However, what is even more important for our research question is how this ratio varies with the monetary squeeze: if it increases, either banks have curtailed credit limits or banks have not let credit limits grow by as much as credit drawn was growing. Between June 1992 (before the monetary restriction) and December 1992 (after the restriction slackened) the average utilisation ratio for the non-financial firms increased of over 3 per-

centage points, while the dynamics of credit drawn was actually declining on a yearly basis. This is not yet enough to claim that there was a shift in the loan supply, because aggregation effects might bias this result. However, individual data from our sample of firms confirm such result. The utilisation ratio for the median firm increases from 64 to 66.5%, and that for the 90th percentile goes from 0.98 to 1%, exposing these firms to growing credit constraints.

All in all, we thought it reasonable to define as (probably) credit constrained those firms having a utilisation ratio beyond 95%. Between June and December 1992 the share of firms in our sample that were credit constrained according to this definition increases from 12.4 to 15%. It is therefore likely that, with the monetary squeeze, credit constraints ensued for a certain number of firms that did not previously suffer from such constraints. Our aim now is to assess whether customer relationships are a factor in the probability that firms previously unconstrained become constrained.

We estimate a probit equation in which the dependent variable (rat) takes value 1 for firms with a utilisation ratio beyond 95% in December 1992 and 0 for the other firms. The explanatory variables include: a dummy which is set at 1 for firms that were credit constrained in June 1992 and 0 for the remaining firms (rat_{-1}); our proxy for stability of borrowing relationships of the firm (S); the Herfindahl concentration index computed among banks lending to the firm (h); the number of banks lending to the firm ($numb$); a variable interacting credit drawn with h (cdh; i.e. the product of cd and h); the log of the overall credit limit for the firm (cl); a dummy variable taking value 1 for firms incorporated in the less developed area of the country ($south$).

We include rat_{-1} in order to check for firms that were already constrained because constraints for them might have little to do with the inception of the monetary restriction. We expect rat_{-1} to have a strong positive impact if credit constraints tend to be persistent. The three customer relationship variables s, h and $numb$ are the same as above, as is the case with $south$. We anticipate $numb$ and $south$ to have a positive impact on the probability of liquidity being constrained because, for the former, firms borrowing from more banks are releasing less information to lenders, while, for the latter, credit rationing is reportedly more acute in the Southern part of Italy. To the contrary, s and h should exert a negative impact, since more lengthy relationships help the accrual of information to lenders and a

higher degree of concentration (given the number of banks) in the supply of credit also makes the released information more readily interpretable to the major lender(s). However, we instead replaced cd (the log of the overall credit drawn) with cl since this 'supply based' variable appears more suited to the present analysis: for quite obvious reasons, we expect cl to be negatively related to the probability of suffering liquidity constraints. The inclusion of the interaction variable cdh is designed to capture a possibly significant difference: namely that between small borrowers and large borrowers. For small borrowers, usually borrowing from just a few banks, a high credit concentration could normally serve as a credible signal of the lending bank(s) that it (they) will likely be the most important lender(s) for those borrowers also in the future, whereas it could be unwarranted to entertain the same expectation for large borrowers, usually gathering loans from many banks, who might easily redirect their borrowing to other banks. If this conjecture is right, we should observe that h has per se a negative impact on the probability of meeting liquidity constraints but cdh has a positive impact.

TABLE 5

PROBABILITY OF BEING RATIONED
(probit estimates)

rat	Coef.	Std. Err.	z	P> |z|	[95% Confidence Interval]	
rat_{-1}	1.298	0.0253502	51.205	0.000	1.248382	1.347752
S	−0.2584849	0.0532185	−4.857	0.000	−0.3627913	−0.1541785
h	−3.649408	0.2561675	−14.246	0.000	−4.151488	−3.147329
numb	0.0482606	0.0044767	10.780	0.000	0.0394864	0.0570348
cl	−0.3422285	0.0209587	−16.329	0.000	−0.3833068	−0.3011501
south	0.1167813	0.0264387	4.417	0.000	0.0649624	0.1686001
cdh	0.6992876	0.0386685	18.084	0.000	0.6234987	0.7750765
cons	0.7977969	0.1418497	5.624	0.000	0.5197766	1.075817

Pseudo R^2 = 0.2189.
Number of observations = 32,422; χ^2 (7) = 5172.57; Probability > χ^2 = 0.0000.

The results are reported in Table 5. The most important determinant of the probability of being rationed in December 1992 is having been constrained already in June 1992: the impact of this variable is obviously positive. The signs of the other regressors

confirm our expectations, showing that a close bank-firm relationship reduces the probability of being rationed. Naturally, these results must be interpreted cautiously, inasmuch as they refer to a particular episode; thorough analysis of the impact of these variables on the amount of credit granted to firms is left for future research.

4. Multiple borrowing in France, Germany and Italy

In Section 2 we showed that the chance of a sharp increase in interest rates charged by banks, as a consequence of a monetary shock, increases as the intensity of the bank-firm relationship decreases. We thought it interesting to compare the situation in Italy with that in France and Germany, two of the main countries for which information concerning multiple borrowing is available.[24] The most simple and direct proxy of multiple borrowing by firms is the ratio between the number of reports received and the number of borrowers registered in the Central Credit Register. Owing to its very high variability, in relation to particular sub-groups of borrowers, or to the loan size, this ratio often provides ambiguous indications.[25] We therefore preferred to analyze the incidence of the first n banks, in decreasing order of importance, on the total bank loans granted to the borrower.[26]

Table 6 provides information on the weighted average incidence of the leading bank for the three countries considered. The data show that the practice of multiple borrowing by firms is particularly notable in Italy but is not unknown in the other two countries either. Two facets appear of interest. First, multiple borrowing does not exist, or is in all cases negligible, in the class of loans smaller than 500,000 ecu: the weighted average incidence of the leading bank is 100% or close to this value. The minimum value, in any case corresponding to 84%, is that of Italy.

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[24] The data we refer to are the result of the first comparative exercise carried out in this field; they will be refined and integrated in the future and should therefore be considered with the necessary caution.

[25] At the end of 1994, as an example, the ratio in consideration was 1.6 for all borrowers registered in the Central Credit Register and 2.5 for all non-financial firms (Banca d'Italia 1995).

[26] Padoa-Schioppa (1994).

TABLE 6

BANK, FIRM AND MULTIPLE BORROWING:
AVERAGE INCIDENCE OF THE LEADING BANK[a]
(as at the end of 1994)[b]

Size classes of the loan (in ecu)	Country		
	France	Germany	Italy
Up to 500,000	97	99	84
500,000-5 million	77	95	61
5-25 million	60	78	49
25-100 million	57	64	43
100-250 million	58	52	33
more than 250 million	63	50	27

[a] Weighted with the frequency of classes.
[b] With reference to Germany, the reference date is 31 March 1995.

Secondly, the incidence of the leading bank decreases significantly, in the three countries, when the loan size increases. The decrease is particularly rapid and evident in the case of Italy, but it concerns also the other two countries, even though for these latter the weighted average incidence of the leading bank is never lower than 50%.

Assuming such an incidence as a threshold of significance, we notice that the practice of multiple borrowing in Italy is actually limited to the firms whose bank indebtedness is greater than 5 million ecu. They represent little more than 2% of the non-financial firms registered by the Central Credit Register, although they bulk up to some 54% of the loans utilized by the whole sector of non-financial firms.

We should not be surprised to find evidence of multiple borrowing by firms even in countries where the institutional framework is based on the universal bank and on the *Hausbank*. Recent researches show that, e.g., in Germany, for medium and large firms, an exclusive bank-firm relationship is the exception rather than the rule; firms borrow from more than one bank, deliberately setting them in competition. In Japan, the largest firms try to increase recourse to direct placement of securities on the market in order to become less dependent on banks. Other studies come to the conclusion that the bank-

firm relationship in which the bank has a potentially exclusive relevance seems to be less stable than one would expect, both because of the tendency of firms to free themselves from too close a relationship with banks (Hellwig 1991), and of the strong competition existing between banks in order to assume a pre-eminent position in the financing of firms (Edwards and Fisher 1994).

In this context, the circumstance that the practice of multiple borrowing by firms is more widespread in Italy than elsewhere could also be explained, among other factors, by the inadequate development of the Italian capital market. Another factor could be the relatively small dimension of Italian banks in comparison with firms:[27] Thornton (1991) observes that in 1989 the ratio between the total assets of the largest national bank and the turnover of the largest national firm was 2.9 for Italy against 4.1 for United Kingdom, 5 for Germany, 6.8 for Japan and 8.8 for France.

5. Multiple borrowing: recent evolution in Italy

The evidence that the practice of multiple borrowing is more widespread in Italy than in other countries must be integrated with analysis of the evolution in time of the phenomenon. There are two particularly relevant factors which might exert a considerable influence on such evolution: i) the abolition, with the new Banking Law of 1993, of the operative and time specialization of banking activity and intermediaries, which has been considered one of the main causes of the "extreme multiple borrowing" tendency (Capra et al. 1994); and ii) the increase in the concentration of the distribution of bank loans granted to non-financial firms.

Table 7 shows, for the past decade, and for a sample of more than 270,000 non-financial firms registered in the Central Credit Register, the values of the index of Herfindahl over time, with reference to the same classes of loan size reported in Table 1. It confirms the great variability of the phenomenon already verified for 1994: ranges of the same width can be observed for the whole decade. It is interesting to note that for all size classes there is a clear

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[27] For the low concentration in the Italian banking market, see Conigliani (1990).

TABLE 7

CONCENTRATION OF LOANS PER BORROWER
(Average of Herfindhal index for loans granted to the single borrower, according to the size of total loan granted)

Size classes (billions)	Year									
	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994
Up to 1	0.77	0.78	0.78	0.78	0.79	0.79	0.79	0.79	0.80	0.80
1-4	0.36	0.37	0.37	0.39	0.40	0.43	0.44	0.46	0.46	0.47
4-10	0.26	0.27	0.27	0.27	0.30	0.32	0.33	0.34	0.35	0.36
10-30	0.20	0.20	0.20	0.21	0.23	0.25	0.26	0.27	0.28	0.29
30-50	0.16	0.17	0.16	0.17	0.19	0.20	0.21	0.21	0.23	0.24
50-100	0.13	0.13	0.16	0.15	0.16	0.18	0.20	0.22	0.21	0.23
100-200	0.12	0.13	0.13	0.11	0.13	0.15	0.16	0.19	0.20	0.20
200-500	0.08	0.08	0.07	0.09	0.11	0.11	0.14	0.13	0.16	0.17
500 and more	0.06	0.10	0.07	0.07	0.07	0.08	0.10	0.11	0.11	0.13

tendency for the index to increase in the second part of the decade, doubling in the greater-size classes. Multiple borrowing seems therefore to be progressively diminishing in importance in Italy.[28]

6. Conclusions

With reference to the most intense monetary restriction of the past decades, that of 1992, and on the basis of the widest possible sample of non-financial firms registered in the Central Credit Register, we have analyzed two dimensions of the relationship between bank and firm: the stability in time and the concentration of the distribution of loans granted to the firm by the lending banks, in accordance with the assumption that the length and the exclusiveness of the customer relationship are extremely important factors in over-

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[28] Banca d'Italia (1995, Table 4, p. 26).

coming problems of informational asymmetries and that they provide incentives for the debtors, contributing to the outcome of more efficient financial allocation.

The analysis confirms that the size of the total indebtedness of the firm is of the utmost importance in order to assess the bank-customer relationship. As a matter of fact, analysis according to the loan size of non-financial firms allowed us to pinpoint sharp differences between smaller and larger borrowing sub-groups of non-financial firms: they differ, in fact, in terms of the kind of relationship they have with the lending banks; the level of interest rates they pay on loans and the risk of coming up against increases in rates owing to a monetary restriction.

We found that when monetary conditions become sharper, close customer relationships generate a significant decrease in the probability of the firms running into particularly heavy increases in rates and being rationed. The results of the empirical analysis show that the probability of running into substantial increases in the interest rates charged on bank loans, becomes significantly higher: *i*) when the indebtedness position of the enterprise grows (under the same gearing ratio, it is a proxy of the productive scale); *ii*) when the concentration of the loan distribution decreases; and *iii*) when the number of the lending banks increases.

Given that, *ceteris paribus*, small firms are characterized, as compared with larger ones, by a smaller loan size, a very limited number of lending banks and a higher concentration of credit, there is a lower probability of their running into particularly sharp increases in the interest rates charged by banks. Needless to say, that does not mean that small firms are immune from the effects of a monetary restriction: as an example, they could suffer from reductions in the availability of credit more than big firms; moreover if they have a less capitalized structure, they would even suffer financial tensions with limited increases in interest rates. The evidence we reported on the probability of rationing during the 1992 episode shows, nonetheless, that firms with close relations with the banks are also less exposed to credit rationing.

In other words, we did not find the effects described in the literature as being associated with the existence of a cross section lending channel effect. According to this line of research, small firms, which do not have access to capital markets, should turn out to be

penalized in periods of rates increases, because of the behaviour of the lending banks which magnifies the effects of monetary policy. The analysis did not show any evidence of such effects.

Our study shows that the intensity of the relationships between the bank and the firm plays a significant role in the transmission of the effects of monetary policy impulses. Comparative analysis of the cases of France, Germany and Italy shows that, generally speaking, the customer relationship proves significantly different in these countries, at least as far as can be assessed according to the practice of multiple borrowing. National boundaries, having become almost evanescent through the process of integration in the European Union, seem to maintain their discriminating role in terms of the practice and the customs which characterize the customer relationship between banks and firms. As a consequence, an integrated monetary policy carried out in the European Union could produce uncertain and perhaps unpredictable results in different member countries. This will raise a new problem to the attention of the future European central bank, responsible for the monetary policy of the whole Union, which seems to merit further studies.

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