

Switching from Single to Multiple Bank Lending Relationships: Determinants and Implications¹

Luísa A. Farinha

Research Department, Bank of Portugal, Av. Almirante Reis 71, 1150-012 Lisbon, Portugal
E-mail: lfarinha@bportugal.pt

and

João A. C. Santos

*Research Department, Federal Reserve Bank of New York, 33 Liberty Street,
New York, New York 10045*
E-mail: joao.santos@ny.frb.org

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Our data show that nearly all firms borrow for the first time in their life from a single bank, but soon afterward some of them start borrowing from additional banks. Duration analysis shows that the likelihood of a firm substituting a single relationship with multiple relationships increases with the duration of that relationship. It also shows that this substitution is more likely to occur for firms with more growth opportunities and for firms with poor performance. The analysis of the ex post effects of the initiation of multiple relationships, in turn, shows that firms with higher levels of investment prior to the initiation of multiple relationships increase their investment even further when they start to borrow from multiple banks and that firms with poor prior performance continue to perform poorly afterward. These results suggest that concerns with hold-up costs, together

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with an unwillingness by the incumbent bank to increase its exposure to a firm because of its past poor performance, are the key reasons for these firms to initiate an additional relationship this early in their life. *Journal of Economic Literature* Classification Numbers: G21, G32. © 2002 Elsevier Science (USA)

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1. INTRODUCTION

In recent years, a large number of empirical studies have investigated the benefits to small firms of close relationships with banks. This literature usually proxies the strength of a relationship by its length and the concentration of borrowing. It finds, for example, that long-term relationships generally increase credit availability (Petersen and Rajan, 1994, 1995; Elsas and Krahnen, 1998) and reduce both funding costs (Berger and Udell, 1995) and collateral requirements (Berger and Udell, 1995; Harhoff and Körting, 1998a; Degryse and Van Cayseele, 2000).² This literature also finds that borrowing from a reduced number of banks generally increases credit availability (Petersen and Rajan, 1994, 1995; Cole, 1998) and lowers the cost of funds (Petersen and Rajan, 1994).³

Altogether, this body of research indicates that it is advantageous for small firms to establish long-term relationships and to borrow from a small number of banks. These results, however, raise an important question: Why do these firms start to borrow from more than one bank at some stage of their life?

This question is particularly pertinent in the case of very young firms because their lack of a track record makes it more costly to establish new relationships. Potential lenders face more uncertainty about the competence and trustworthiness of these firms' management, as well as the quality of their investment opportunities. Yet we observe many young firms ending an exclusive relationship and starting to borrow from multiple banks. For example, our data show that when firms borrow for the very first time from the banking sector, nearly all of them (98%) do so from a single bank. In the following years, many of these firms continue to borrow only from that same bank, but others start to borrow from additional banks.

Despite the recent interest in bank-firm relationships and the importance attributed in the literature to the single-multiple lender dichotomy, empirical studies of relationship lending have devoted little attention to the firm's decision to replace

² Cole (1998) and Harhoff and Körting (1998a), however, do not find that long-term relationships improve credit availability. Petersen and Rajan (1994), Elsas and Krahnen (1998), and Harhoff and Körting (1998a) in turn do not find that these relationships reduce funding costs, and Degryse and Van Cayseele (2000) and D'Auria *et al.* (1999) even find that they increase funding costs.

³ Harhoff and Körting (1998a), however, find that borrowing from several banks increases credit availability but has no effect on funding costs, and D'Auria *et al.* (1999) find that it reduces these costs. Houston and James (1996a, 1996b) also find that borrowing from several banks increases credit availability, but they rely on a sample of listed firms.

a single relationship with multiple relationships.⁴ Yet, this is an important issue in understanding, for example, the importance of exclusive relationships and how the value of these relationships evolves with their duration. It is also an important complement to the growing research on the determinants of the number of bank lending relationships chosen by firms.

Our paper attempts to make a contribution to fill this gap. We use duration analysis to study why the length of time that elapses from the beginning of an exclusive relationship until its end differs across firms and to identify the determinants of this difference. We then use conventional regression analysis to study the ex post effects of the firm's initiation of multiple relationships. We rely on a unique data set containing information on individual bank lending relationships and their participating parties (the bank and the firm) since the beginning of the firm's life. This allows us to consider the complete history of the firm's relationships with banks and to study these relationships at the very early stages of the firm's life, arguably when they matter the most.

The remainder of the paper is organized as follows. The next section presents the theoretical literature on the firm's choice of the number of lenders and the testable hypotheses we study. That section also reviews the empirical literature more closely related to our paper. Section 3 presents the method and Section 4 describes our data set. Section 5 discusses the results and Section 6 concludes.

2. BORROWING FROM A SINGLE OR MULTIPLE BANKS?

2.1. *Theoretical Explanations and Testable Hypotheses*

We follow the relationship lending literature and that on the firm's optimal number of creditors to select the testable hypotheses on the duration of the firm's exclusive relationship with a bank. Modern banking literature argues that banks are valuable because firms have information that is not readily available to outsiders. Rather than having investors collect information on the firm's prospects prior to granting credit, investors find it efficient to delegate such a costly task to a bank, through which they all provide funding to the firm.⁵ Within this setup, borrowing from a single bank is advantageous because it saves on monitoring costs (Diamond, 1984).

Once a firm has borrowed from a given bank, it has an incentive to borrow from it again even in the absence of learning. Repeated borrowing gives the bank an opportunity to threaten to cut future lending. This induces truth telling by the borrower and reduces the bank's monitoring costs (Haubrich, 1989). Repeated borrowing also gives the bank an opportunity to efficiently tax and subsidize the firm over time in order to reduce the use of (costly) collateral (Boot and Thakor, 1994).

⁴ Studies such as Petersen and Rajan (1994), Harhoff and Körting (1998b), Detragiache *et al.* (2000) and Ongena and Smith (2000) have examined the number of the firm's bank lending relationships, but they focused on issues different than ours. See Section 2.2 for a review of this literature.

⁵ See Bhattacharya and Thakor (1993) and Freixas and Rochet (1997) for a review of the contemporary banking literature.

Borrowing repeatedly from a bank may also be advantageous for reasons that have to do with learning. The notion that banks arise to consolidate the collection of information leads naturally to the idea of *relationship lending*. Early on in their life, firms have little ability to show their worth and hence find it difficult to access capital markets. Banks fill this void by gathering information about the firm prior to making a funding decision. Upon granting a loan, the bank continues monitoring the firm to ensure it observes the loan covenants. In this process, the bank learns more about the firm, making it easier for the bank to lend again to that firm.

From these perspectives, the longer the relationship the firm has with a bank the more valuable this relationship is and therefore the lower the firm's incentive to initiate an additional relationship. How then do we explain a firm's decision to borrow from another bank after it has had an exclusive relationship for some time?

One possible explanation is that relying on an exclusive relationship can be costly. If the information the bank gathers on the firm cannot credibly be conveyed by the firm to other parties, then the firm will pay a lemon's premium when it approaches another bank. The reason is that this bank will question the firm's decision not to seek funding at its original lender. This gives the incumbent bank an opportunity to extract rents *ex post*.⁶

Competition among banks limits the incumbent bank's ability to extract rents *ex post*, but it does not eliminate it because outside banks are afraid of a "winner's curse" and bid less aggressively than they would under symmetric information (Broecker, 1990). Because of this, it will be in the firm's interest to develop arrangements early on to guarantee that the bank will not extract rents later on. These arrangements can include an equity stake in the firm, long-term borrowing contracts, or initiate a second relationship with another funding provider, such as a trade creditor, another bank, or even the capital markets.

Agency problems often limit the feasibility of long-term contracts and asymmetry of information makes young firms' access to the capital markets infeasible. Trade credit is an important funding source, but its usefulness to restrict banks from extracting rents is limited because trade creditors usually extend credit only as an ancillary activity to their business and not to fund investment. Therefore, initiating a relationship with a second bank can be the optimal solution to the potential hold-up problem.⁷ As in the Williamsonian dual-sourcing theory, *ex ante* duplication costs may be more than offset by the protection competition offers to the firm.⁸ As von Thadden (1992) shows, if incentive compatibility precludes an

⁶ Studies of the implications of the incumbent bank's information advantage include Greenbaum *et al.* (1989), Sharpe (1990), Rajan (1992), and von Thadden (1992, 1995, 1998).

⁷ Researchers have identified other reasons for firms to borrow from multiple banks. Bhattacharya and Chiesa (1995), Yosha (1995), and von Rheinbaben and Ruckes (1998) consider the costs of confidential information leakage and Bolton and Scharfstein (1996) consider the costs of renegotiation.

⁸ The hold-up problem that arises in an exclusive lending relationship is similar to that which arises when customers are deterred from buying specific products from a monopolist supplier because they are afraid of being expropriated later on. A response to this problem has been "dual-sourcing"—monopolists giving away the technology to a competitor (Shepard, 1987; Farrell and Gallini, 1988).

exclusive monitor from passing future monopoly profits on to the firm, banks will optimally give up exclusivity and offer contracts with duplicated monitoring.

From this perspective, if the lemon's premium the firm pays when it approaches the second bank increases with the length of its relationship with the incumbent bank, then the longer the exclusive relationship the more likely it is that it pays for the firm to incur the costs of initiating a second relationship. A possible reason for the lemon's premium to increase with the age of the exclusive relationship is that as this relationship grows in duration, so does the amount of proprietary information that is passed on to the bank, and therefore the more the outside bank will question the firm's decision not to seek funding from the incumbent bank.

Within the setting discussed above, we would also expect that, *ceteris paribus*, firms with more growth opportunities and more opaque assets would tend to substitute the single relationship with multiple relationships at an earlier stage.

In our investigation into the duration of exclusive relationships that end when the firm starts to borrow from multiple banks, we also consider the hypothesis often discussed in the literature that the number of borrowing relationships is a proxy for the firm's credit quality.⁹ Risk-diversification objectives give banks an incentive to share the risks of lower credit quality firms with other banks. Banks may choose to attain these objectives by limiting their exposure to poor credit quality firms. These firms unable to borrow more money from the incumbent bank will then approach another bank for additional credit.

From this perspective, the longer the firm is in financial difficulties or the lower its credit quality, the more likely it is for its bank to deny it additional credit, thus forcing the firm to approach another bank and bring their exclusive relationship to an end.

2.2. *Prior Empirical Evidence on Firms' Choice of Lenders*

The empirical literature on the number of bank lending relationships chosen by firms is still in its infancy. For this reason, the literature on the determinants of these relationships is still scant. Some studies, such as Detragiache *et al.* (2000) and Ongena and Smith (2000), provide evidence on the number of bank lending relationships in various countries, but their focus was to identify structural differences across countries capable of explaining the differences in the number of relationships that they unveiled.

Studies such as Petersen and Rajan (1994) and Harhoff and Körting (1998b) have focused more closely on the determinants of the number of the firm's bank lending relationships. Petersen and Rajan (1994), for example, investigate whether American firms with fewer relationships pay lower borrowing costs because fewer relationships lead to lower overall monitoring costs and improve the lender's control or because the number of relationships is a proxy for the firm's quality. They find that firms which borrow from multiple banks are of lower quality than those

⁹ See Hellwig (1991), Petersen and Rajan (1994), Harhoff and Körting (1998b), and Foglia *et al.* (1998).

that borrow from a single bank, but this alone does not explain the entire difference in borrowing costs between these firms.

Harhoff and Körting (1998b) consider a broader set of determinants in their attempt to explain the number of bank lending relationships chosen by German firms. They find that the number of relationships increases with the firm's age, size, and leverage and that innovative firms have more relationships. They also find that firms which have experienced financial distress have more relationships, and there is a causal relationship running from the firm's financial health to its number of creditors.¹⁰

3. METHOD

Since the Petersen and Rajan (1994) evidence of the benefits of a long-term relationship with a bank, there have been several studies on the importance of the duration of these relationships.¹¹ This literature, however, relies on firms surveyed at a given point in time. Consequently, it does not take into account the history of the relationship and it misses the information on the relationships that have already ended.¹²

Ongena and Smith (2001) take into account some of these issues by using duration analysis with a data panel of Norwegian firms. Duration analysis is often used to study problems that involve the passage of time before a certain event occurs. Ongena and Smith use it to study the length of a relationship, that is the passage of time before the relationship ends. They find that long-standing relationships are more likely to end, a result they argue is contrary to the intuition that firms gain from longer relationships or that they become locked into a bank. They also find that firms with multiple relationships tend to end a relationship sooner.

Our paper is close to Ongena and Smith's in that we also use duration analysis. There are, however, important differences between the two studies. First, unlike them, we are not interested in the duration of a given relationship. Instead, we are interested in the duration of exclusive relationships that end because firms start to borrow from more than one bank.

Second, because they rely on firms for which they do not have information prior to their sample period, they are unable to consider the complete history of

¹⁰ Foglia *et al.* (1998) also find an inverse relationship between Italian firms' financial health and their number of relationships, but they argue that the causality runs in the opposite direction. Their measure of fragility is whether the firm fails in the following years while Harhoff and Körting (1998b) measure whether the firm has experienced a situation of financial distress in the recent past.

¹¹ See Berger and Udell (1995), Blackwell and Winters (1997), Cole (1998), Elsas and Krahnen (1998), Harhoff and Körting (1998a), Angelini *et al.* (1998), Degryse and Van Cayseele (2000), and D'Auria *et al.* (1999).

¹² D'Auria *et al.* (1999) avoid these problems by considering a panel of firms. However, their estimates of duration are left-censored because their information on relationships goes back only to the beginning of their sample period.

these firms' relationships, thus leading to left-censored estimates of duration. This problem is heightened by their use of a sample of mature firms (with an average age of 45 years). We avoid this problem by considering only firms for which we have their complete history of relationships with banks. This biases our sample toward young and small firms, but it also makes our results related to those firms for which there is the least information available, the universe where the informational theories of banks are most applicable.

Finally, we complement our duration analysis with a conventional regression analysis to identify some ex post effects of firms' substitution of their exclusive relationships with multiple relationships. In the rest of this section, we briefly review the duration analysis and the regression analysis we use to test our hypotheses.

3.1. Duration Analysis

The term *spell* in duration analysis is used as a catch-all for the different duration variables that may be measured. The length of a spell can be represented by a continuous random variable, T , with a density function $f(t)$ where t is a realization of T . The hazard function, $\lambda(t)$, gives us the rate at which spells are completed after duration t , given that they lasted at least until t . It can be defined in terms of the distribution and probability density functions of t , $F(t)$, and $f(t)$, respectively,¹³

$$\lambda(t) = \frac{f(t)}{1 - F(t)} = \frac{f(t)}{S(t)},$$

where $S(t)$ is the survivor function. It gives us the probability that the spell duration lasts until t . The hazard function does not add any information to $f(t)$, but it is useful because it provides a straightforward interpretation of the distribution. When a hazard function has a positive slope (negative slope), it is said to have positive (negative) duration dependence; that is, the likelihood that the spell ends at time t , conditional upon duration until t , increases (decreases) in t .

3.1.1. Explanatory variables and the hazard function. Parametric models of duration, which are akin to the conventional regression models, embody specific assumptions about the distribution of duration. In parametric analysis the choice among the various models is made on the basis of the specification chosen for the distribution, the Weibull being one of the most frequently used in the literature. For that reason we also consider a Weibull distribution. Its hazard function is¹⁴

$$\lambda(t) = \lambda p (\lambda t)^{p-1}.$$

When $p > 1$ ($p < 1$), the Weibull hazard function has positive (negative) duration dependence. The effect of explanatory variables on the hazard function can be

¹³ See Lancaster (1990).

¹⁴ The exponential distribution can be derived from the Weibull distribution by assuming $p = 1$.

considered by assuming

$$\lambda_i = e^{-\beta' x_i}.$$

This is equivalent to a change in the units of measurement on the time axis. The coefficients for the explanatory variables can be estimated by maximizing the likelihood function, which when it incorporates the relevant probabilities for right-censored observations can be written as

$$\ln L = \sum_i [\delta_i \ln f(w_i) + (1 - \delta_i) \ln S(w_i)],$$

where δ_i takes the value 1 if the spell is completed and 0 if it is censored, and w_i results from a convenient change of variable:

$$w_i = p \ln(\lambda_i t_i) = p(\ln t_i - \beta' x_i).$$

With the Weibull distribution, the sign of the coefficients suggests the direction of the effect of the explanatory variable on the hazard function. In this case, we can also get a regression-like interpretation of the magnitudes of the coefficients because we have:

$$E[t | x_i] = \exp(p\beta' x_i).$$

Thus, β_k is a multiple of the derivative of this conditional mean.

3.2. Regression Analysis

To analyze the ex post effects of a firm's substitution of its exclusive relationship with multiple relationships, we follow these firms in our sample after the substitution. The analysis is structured as follows. Let Y_{it} be the variable of interest of firm i in period t . The general model was then

$$Y_{it} = \alpha_1 \text{Multiple Banks}_{it} + \text{BX}_{it} + \theta_i + \lambda_t + \varepsilon_{it},$$

where *Multiple Banks*_{it} is a dummy variable which takes the value 1 in the year t (with $t = 1 \dots 4$) after the firm starts to borrow from more than one bank and 0 otherwise. To estimate the impact of these dummies, we control for other firm characteristics expected to be correlated with the dependent variables. This is done in two ways. First we include a set of observed firm variables, X_{it} . Second, we take advantage of the panel format of our data set and estimate a fixed-effects model in order to account for unobserved firm-specific time-constant factors. The coefficients θ_i in the model capture this heterogeneity. The effect of time-varying economy-wide conditions was taken into account by including a set of time dummy variables, λ_t . Finally, ε_{it} is the error term of the regression.

With our data, the random-effects estimator was clearly rejected in favor of the fixed-effects model. The random-effects model assumes that the individual effects are uncorrelated with the other regressors. Under the alternative hypothesis, this estimator is not consistent. The procedure suggested by Hausman (1978) can be used to test for orthogonality of the random effects and the regressors. Large values of the Hausman statistic argue in favor of the fixed over the random-effects estimator. F -statistics were also computed in order to test for the overall significance of both firm and time dummies in the fixed-effects model.

4. DATA

4.1. Bank Lending Relationships in Portugal

Our data source on lending relationships is the monthly reports on credit filed by banks operating in Portugal with the central bank during the period 1980–1996. This data set covers virtually all banks operating in the country. Credit reports detail all bank credit claims vis-à-vis each firm at the end of the month.¹⁵ Each claim specifies, among other things, the debtor's identity, the amount it owes the bank in the short and long term, and the amount that is past due.¹⁶ It does not, however, specify the amount and terms of the loan (or loans) extended by the bank to the firm that led to the bank's credit claim on that firm. For this reason, we cannot use information on such matters as the interest rate charged and the collateral required over the life of the firm's relationship with the bank.

Before we characterize our sample, it is worth comparing Portuguese firms' choices of the number of bank-lending relationships with similar choices by firms in other countries. Two common patterns that researchers have found in this regard are that the average number of bank-lending relationships increases with firm age and size.¹⁷ Table I shows that these patterns also apply to Portuguese firms.

Researchers have also found that in some countries the majority of firms have single bank lending relationships. Petersen and Rajan (1994) and Harhoff and Körting (1998a), for example, report that single relationships dominate among small U.S. and German firms. In contrast, Detragiache *et al.* (2000) find that single relationships are uncommon even among small Italian firms. Table I shows that single relationships also dominate among small Portuguese firms. That table, however, also shows that single relationships become less prevalent as firms get larger and older.

Table II presents stronger evidence of the negative correlation between single relationships and firm age. As firms get older the median firm continues to have only one relationship and the median number of relationships becomes 2 only

¹⁵ We do not consider claims on individuals because we want to study only bank–firm relationships.

¹⁶ Throughout the paper, short-term claims are defined as those with maturity shorter than one year and long-term claims as claims with a maturity of at least one year.

¹⁷ See Petersen and Rajan (1994), Harhoff and Körting (1998b), and Detragiache *et al.* (2000).

TABLE I
Number of Bank Lending Relationships at the End of 1995 (Relative Frequencies)^a

Number of relationships	Total sample	Relationships by firm size		Relationships by firm age	
		<10 employees	<100 employees	<5 years	<10 years
1	57.30	69.60	58.80	69.60	64.10
2	22.70	20.50	22.90	20.50	22.10
3	9.70	6.50	9.60	6.30	8.00
4	4.60	1.90	4.30	2.10	3.00
5	2.50	0.80	2.20	0.80	1.40
6	1.30	0.40	1.10	0.30	0.60
7	0.80	0.10	0.60	0.20	0.30
8	0.50	0.00	0.30	0.10	0.10
9	0.30	0.00	0.20	0.10	0.10
10	0.20	0.00	0.10	0.10	0.10
>10	0.30	0.00	0.10	0.00	0.10
Mean	1.87	1.46	1.78	1.47	1.61
Median	1	1	1	1	1
Mode	1	1	1	1	1
Number of firms	54,182	31,926	52,203	13,436	29,109

^a The statistics presented in the table relate to a sample of 54,182 firms. These are the firms in the credit reports for which we have information on their age and size as measured by the number of employees. Data on the number of employees are from Quadros de Pessoa, a Ministry of Employment publication.

TABLE II
Number of Bank Lending Relationships Given the Age of the Firm^a

Age of the firm	Number of firms	Number of relationships			Coefficient of variation	% of firms with a single relationship
		Mean	Median	Mode		
0	18,046	1.15	1	1	0.40	87.93
2	59,676	1.40	1	1	0.58	72.82
4	57,916	1.58	1	1	0.66	65.11
6	50,805	1.69	1	1	0.69	61.04
8	41,852	1.79	1	1	0.72	58.20
10	33,636	1.87	1	1	0.74	55.93
12	28,067	1.93	1	1	0.76	54.86
14	24,543	1.99	1	1	0.77	53.80
16	19,648	2.04	1	1	0.78	52.51
18	15,681	2.12	1	1	0.80	51.71
20	11,928	2.18	1	1	0.82	51.00
22	9,787	2.22	1	1	0.83	50.99
24	8,244	2.23	1	1	0.84	51.16
25	7,529	2.25	1	1	0.84	50.72
>25	100,469	2.49	2	1	0.86	47.20

^a The statistics presented in the table relate to a panel covering the years 1980–1996 and a set of 127,743 firms. These are the firms in the credit files file by banks with the Bank of Portugal for which we have information on their age.

for firms with ages above 25 years. Note, though, that the reduction in the portion of firms that borrow from a single bank is more pronounced in the early years of the firm's life. This suggests that most of the firms that initiate multiple relationships do so in the early stages of their life.

An important piece of information missing from Table II is the length of time that elapses from the beginning of an exclusive relationship until its end, that is, until the firm starts to borrow from multiple banks. This is the subject of our duration analysis. Before we present the results of this analysis we first characterize our sample of firms.

4.2. *Sample Description*

In building our sample, we started by selecting only firms created after 1980, the first year of our sample period. Then, out of these firms we chose only those that borrowed for the first time from a single bank. This condition does not appear to be important because only 2% of all the firms created in the 1980–1996 period borrowed for the first time from more than one bank.

The selection criterion we adopted has some important advantages. It avoids the problems often present in duration analysis resulting from left-censoring. The reason is that it assures us that when firms in our sample substitute a single relationship with multiple relationships, it is the first time they do so. That criterion, in addition, gives us the opportunity to study the cases where firms initiate multiple relationships by borrowing from a second bank with which they have not had any prior relationship. This is important because it assures us that such a bank does not have any privileged information about the firm which could happen if the bank had a previous relationship with the firm.

Of the selected firms, we have balance sheet data for every year from the time they first borrowed from a bank until they initiated multiple relationships, or until the end of the sample period, for 1,577 firms.¹⁸ Of these, 870 borrowed from a single bank throughout the entire sample period and 707 started to borrow from multiple banks at some point in time during our sample period. The latter firms had single relationships that lasted on average two years. The median duration of these single relationships was also two years. Note, though, that this duration is right-censored because it does not take into account the 870 firms in the sample that still had a single relationship at the end of the sample period. Once duration is adjusted for right-censoring the median duration of single relationships increases to five years.

Of the 707 firms that substitute single relationships with multiple relationships, 195 had already switched banks by the time they started to borrow from multiple banks. In contrast, the remaining 512 always borrowed only from their very first bank until they initiated multiple relationships. With respect to the 870 firms that

¹⁸ Our source for firms' balance sheet data is the balance sheet survey conducted by the Bank of Portugal on a yearly basis since 1986. Our sources for bank balance sheet data and the regional number of bank branches are publications from the Portuguese Bankers Association.

borrow from only one bank throughout the entire sample period, 575 of them always borrowed from the same bank and the remaining 295 switched banks at some point in time but continued to borrow from only one bank.

Following von Thadden (1998), who argues that firms may react to a bank's attempt to extract rents by switching banks as opposed to initiating multiple relationships, we compare in Table III firms which initiate multiple relationships with those that switch banks.¹⁹ The results of this comparison show that these are two quite different groups of firms. Despite being younger, firms that initiate multiple relationships are larger and they are growing faster than those firms that switch banks. Moreover, the former firms hold less liquidity and more bank debt as well as long-term bank loans than the firms that switch banks.²⁰ These results seem to suggest that the causes that lead firms to end a single relationship by switching banks are different from those that encourage banks to end a single relationship by initiating multiple relationships.

To control for this difference in our duration analysis, we include in our duration models an explanatory variable measuring the number of times firms switch banks before they initiate multiple relationships or the sample period ends.

5. RESULTS

We begin by estimating several models of duration to study the firms' likelihood of starting to borrow from multiple banks as their single-bank relationships mature and to identify the determinants of this likelihood. We then complement this analysis with a study of the ex post effects resulting from that change in the number of relationships.

5.1. Duration Analysis

5.1.1. Firms' likelihood of initiating multiple relationships. The dependent variable in our duration analysis is the duration of single relationships measured as the length of time from its beginning until the firm initiates multiple relationships or the end of the sample period (right censoring). Recall that, as we consider only firms for which we have information on their bank lending relationships since the beginning of their existence, we avoid the problem of left-censored observations. We are still left with the problem of right-censored observations, which we take into account through the estimation.

Table IV presents the results of our duration analysis obtained using a fully parameterized specification for the baseline hazard (Weibull distribution) and time-varying explanatory variables. That is, we considered in the estimations the values

¹⁹ The former are measured just before they initiate multiple relationships and the latter are measured just before they first switch banks.

²⁰ We define firm liquidity as the sum of cash plus bank deposits plus all other tradable securities. Long-term loans are defined as bank loans with maturity over one year.

TABLE III
Firms That Borrow for the First Time from a Single Bank but Later Either Switch Banks
or Initiate Multiple Relationships

Variables	Firms that switch banks but retain a single relationship (295 firms) ^a		Firms that substitute a single relationship with multiple relationships (707 firms) ^b		<i>t</i> -test for difference of means ^c
	Mean	CV ^d	Mean	CV ^d	
Firm					
Age (years)	4.68	0.62	4.07	0.68	−3.15***
Conglomerate dummy ^e	0.02	6.43	0.03	5.59	0.64
Size (sales in billion escudos, 1986 prices)	0.09	4.25	0.52	9.36	1.51
Size (employees)	27.34	3.37	54.13	4.54	1.82*
Sales growth (%)	30.31	3.08	45.73	2.57	2.01**
Liquidity/assets ^f	0.13	1.27	0.10	1.32	−2.66***
Intangibles/assets	0.003	5.39	0.01	4.13	1.80*
Tangibles/total debt	0.54	1.07	0.54	1.45	−0.11
Investment/(intangibles + tangibles) ^g	0.34	1.00	0.32	1.06	−0.73
Cash flow/assets ^h	0.12	0.91	0.10	1.08	−2.10***
Bank loans/assets	0.06	1.83	0.11	1.34	4.58***
Trade credit/assets	0.26	0.80	0.32	0.75	1.34
Insider loans/assets ⁱ	0.19	1.20	0.18	1.22	−0.89
Bank					
Size (sales in billion escudos, 1986 prices)	586.85	0.87	577.72	0.77	−0.28
Growth of assets (%)	18.57	2.24	16.31	2.38	−0.82
Total lending/assets	0.57	0.22	0.54	0.23	−4.13***
Liquidity/assets ^j	0.13	0.96	0.16	0.84	2.67***
Profits/assets	0.01	1.31	0.01	0.93	1.14
Bank-firm relationship					
Number of relationships ^k	1.00	—	1.31	0.42	—
Single relationship duration (months)	24.76	0.65	24.06	0.69	−0.61
Bank long-term loans/bank debt	0.05	4.19	0.10	2.76	2.88***
Past due loans dummy ^l	0.06	3.93	0.06	3.84	0.16
Risk exposure ⁿ	0.0001	3.82	0.001	7.53	1.98**
Banking market					
Bank location dummy ⁿ	0.83	0.45	0.85	0.43	0.65
Banks in the market (number)	12.57	0.63	11.71	0.62	−1.62

^a Statistics computed at the time before the firm switches banks for the first time. ^b Statistics computed at the time before the firm initiates multiple relationships. ^c The null hypothesis of equal means is rejected at: ***1%, **5%, *10%. ^d Coefficient of variation. ^e Dummy equals 1 if the firm belongs to a conglomerate and 0 otherwise. ^f Firm liquidity equals the sum of cash, bank deposits, and all other tradable securities. ^g Investment represents investments made by the firm including asset acquisitions and expenditures on projects the firm undertakes for itself. ^h Cash flow is defined as the sum of profits before tax plus provisions and depreciation allowances. ⁱ Insider loans equal the sum of loans extended by the firm's shareholders and associated firms. ^j Bank liquidity equals cash plus deposits at the central bank and interbank deposits. ^k Number of single relationships that the firm had before it replaced a single relationship with multiple relationships. ^l Dummy equals 1 if the firm had past due loans with its bank before it switches banks for the first time and 0 otherwise. ^m Ratio of bank loans to a single firm over bank's equity. ⁿ Dummy equals 1 if the firm's single bank has a branch in the region where the firm is located.

TABLE IV
Duration of Single Relationships^a

Variables	Model 1 (1,471 firms)	Model 2 (1,577 firms)	Model 3 (1,577 firms)
Constant	4.830 5.462***	4.816 6.501***	5.987 18.387***
Firm			
Age (years)	-0.003 -0.228	-0.004 -0.283	-0.005 -0.377
Conglomerate dummy ^b	-0.262 -1.340	-0.346 -1.769*	-0.338 -1.697*
Log of sales (thousand escudos, 1986 prices)	-0.214 -8.063***	-0.200 -8.145***	-0.211 -9.166***
Sales growth (%)	-0.001 -4.355***	-0.001 -4.839***	-0.001 -4.924***
Liquidity/assets ^c	0.760 3.018***	0.676 2.745***	0.674 2.727***
Intangibles/assets	-0.921 -0.758	-0.881 -0.727	-0.852 -0.703
Tangibles/total debt	0.045 0.997	0.034 0.772	0.038 0.844
Investments/(intangibles + tangibles) ^d	-0.147 -1.950*	-0.157 -2.045**	-0.156 -2.033**
Cash flow/assets ^e	0.678 2.477**	0.587 2.052**	0.570 2.009**
Bank loans/assets	-1.520 -5.998***	-1.612 -6.538***	-1.704 -6.948***
Trade credit/assets	-0.119 -0.604	-0.150 -0.802	-0.152 -0.811
Insider debt/assets ^f	-0.113 -0.599	-0.078 -0.439	-0.093 -0.524
Bank			
Log of assets (million escudos, 1986 prices)	0.055 1.139	0.049 1.094	—
Age dummy ^g	-0.011 -0.101	0.009 0.089	—
Assets growth (%)	0.001 0.624	0.001 0.789	—
Liquidity/assets ^h	1.395 1.308	1.184 1.608	—
Profits/assets	1.037 0.148	0.962 0.148	—
Bank-Firm relationship			
Number of switches ⁱ	-0.175 -2.729***	-0.146 -2.349**	-0.143 -2.331**
Bank long-term loans/ Bank debt	0.132 1.134	0.113 0.997	0.128 1.117
Past due loans dummy ^j	-0.678 -3.582***	-0.790 -4.169***	-0.850 -4.375***
Risk exposure ^k	-0.010 -1.185	-0.009 -1.006	—

TABLE IV—*Continued*

Variables	Model 1 (1,471 firms)	Model 2 (1,577 firms)	Model 3 (1,577 firms)
Banking market			
Bank location dummy ^l	−0.043 −0.407	—	—
Banks in the market (number)	0.005 0.859	—	—
<i>P</i>	1.37	1.345	1.336
$H_0 : p \leq 1$	6.897***	6.872***	6.830***
Median of the duration (months)	57.007	54.615	54.777
LR ^m (degrees of freedom)	0.884 (2)	8.944 (6)	—

^a Parametric models (Weibull distribution) estimated with time-varying explanatory variables and time dummies. The null hypothesis is rejected at: ***1%, **5%, *10%. ^b Dummy equals 1 if the firm belongs to a conglomerate and 0 otherwise. ^c Firm liquidity equals the sum of cash, bank deposits and all other tradable securities. ^d Investment represents investments made by the firm including asset acquisitions and expenditures on projects the firm undertakes for itself. ^e Cash flow is defined as the sum of profits before tax plus provisions and depreciation allowances. ^f Insider loans equal the sum of loans extended by the firm's shareholders and associated firms. ^g Dummy equals 1 if the bank is old (existed prior to the beginning of the sample period) and 0 otherwise. ^h Bank liquidity equals cash plus deposits at the central bank and interbank deposits. ⁱ Number of times firms switch banks. ^j Dummy equals 1 if the firm had past due loans with its bank before it switches banks for the first time and 0 otherwise. ^k Ratio of bank loans to a single firm over bank's equity. ^l Dummy equals 1 if the firm's single bank has a branch in the region where the firm is located. ^m Model 1 versus model 2, and model 2 versus model 3, respectively.

of these variables for each year between the beginning of the relationship and the terminal observation. Firm age, however, was fixed at its value measured at the beginning of the sample period because firm age varies exactly in the same way as duration, our dependent variable. Therefore, if it were included like the other explanatory variables it would introduce problems of endogeneity. The Appendix discusses some of the robustness tests we performed on our models.

The first important result of the models in Table IV is that our estimated hazard functions have positive duration dependence. This indicates that the likelihood of a firm substituting a single relationship with multiple relationships increases with the duration of the single relationship. A unilateral test to the null hypothesis $p \leq 1$ is rejected for the conventional significance levels in all three models. The estimated median duration of single relationships that end when firms initiate multiple relationships is about five years.

5.1.2. The hold-up hypothesis. The positive duration dependence of our hazard functions result runs counter to the idea that the value of an exclusive relationship increases with its duration. In contrast, this result lends some support to the hypothesis that firms initiate multiple relationships as a way to protect themselves against future hold-up costs. As we noted above, the relationship lending literature suggests that the longer a firm's relationship with a bank, the more information it

will pass on to the bank, and therefore the larger the lemon's premium the firm will pay if it approaches another bank for a loan. Thus, the longer the exclusive relationship the more likely it is that it pays for the firm to incur the costs of initiating an additional relationship.

If concerns with future hold-up costs were the driving reason behind the firm's decision to substitute a single with multiple relationships, then we should also observe, as hypothesized by the hold-up literature, firms with more growth opportunities and opaque assets initiate multiple relationships earlier because they would incur higher costs in case they were to become locked-in. To test these hypotheses we investigate how the slope of our hazard function varies with proxies for firms' growth opportunities and opacity of their assets. In doing that, we control for a set of factors that may also influence the firm's decision to substitute a single relationship with multiple relationships (more on this below).

The results of our tests are in Table IV. They do support the hypothesis that the likelihood of a firm substituting a single relationship with multiple relationships is, *ceteris paribus*, larger for firms with more growth opportunities, as proxied by the firm's size, growth, and investments.²¹ However, we do not find the conditional likelihood of initiating multiple relationships to be larger for firms with more intangible assets, our proxy for asset opacity. This variable is not statistically significantly different from zero in our models, thus casting some doubt on the hypothesis that what leads firms at the very early stages of their life to substitute a single relationship with multiple relationships are concerns with future hold-up rents. Of course, an alternative possibility is that our proxy of asset opacity is a poor measure of this feature of the firms' assets. Even though intangibles are often used in the literature as a measure of assets' opacity, its value as such is still a highly debated issue.²²

5.1.3. The bank diversification hypothesis. The lack of statistical significance of this variable together with the potential problems of our proxy for asset opacity does not appear sufficient to disprove the hold-up hypothesis for firms to initiate multiple relationships, particularly in light of the robustness of the results previously presented. There is, however, a second set of results in our duration models that suggest an alternative explanation for the positive duration dependence property of our hazard functions. It has to do with the fact that poor performing firms and those of lower credit quality tend to substitute a single relationship with multiple relationships earlier.

²¹ We present the results for the case where the firm's size and growth are measured by its sales. We obtained similar results when we measured these variables by the firm's number of employees. Investments represent investments made by the firm including asset acquisitions and expenditures on projects the firm undertakes for itself. Our data source for investments was a survey the Bank of Portugal conducts on a yearly basis where firms provide, in addition to their accounting data, information on their investments.

²² The other proxy of opacity often used, R&D expenses, is included in our intangibles' variable.

Specifically, our results in Table IV show that, *ceteris paribus*, multiple relationships are more likely to be initiated by less profitable firms and firms that have had past-due loans with the bank with which they had a single relationship.²³ These results support the hypothesis that risk-diversification objectives lead banks to refuse to increase their exposure to lower-credit-quality clients and thus force them to approach another bank for additional credit.

5.1.4. Robustness of the duration analysis' results. Before we discuss the relative importance of the two hypotheses we have suggested to explain the firm's decision to substitute a single relationship with multiple relationships, we discuss next some of the robustness checks to the results of our duration analysis. In estimating our duration models, we considered in addition to economic activity dummies and time dummies, a set of control variables related to the firm, the banking market where the firm is located, the single relationship the firm had before it initiated multiple relationships and the bank with which it had this relationship.²⁴ Somewhat surprisingly, firm age does not play a role in the firm's decision to substitute a single relationship with multiple relationships. A possible explanation for this result is that the factors which would be captured by firm age, most notably firm size, were accounted for in the models.

The only two control variables related to firms that appear to play a role on the firm's decision are the conglomerate dummy (independent firms are less likely to substitute a single with multiple relationships) and its own liquidity (firms with less liquidity are more likely to initiate multiple relationships). We do not rely on this result to distinguish the two hypotheses because both firms with financial problems and those that are growing faster tend to hold less liquidity. A similar issue also led us to not rely on another control variable we used—the firm's ability to pledge collateral.²⁵ The availability of collateral makes the information specific to the firm less valuable, as the firm can use it to raise funding. For that reason, we would expect firms with higher ability to pledge collateral to have less incentive to initiate multiple relationships in order to protect themselves against future hold-up rents. But the availability of collateral also reduces the risk of lending to such firms and therefore makes it less likely that these firms have to approach another bank for additional funding because they were denied it by their incumbent bank.

Regarding the control variables for the banking market, we do not find that bank competition in the region where the firm is located plays a role in its decision to switch from single to multiple relationships.²⁶ A possible explanation for this

²³ We proxy firms' profitability by the ratio of cash flow to assets. Cash flow is defined as the sum of profits before tax plus provisions and depreciation allowances. The past-due dummy takes the value 1 whenever the firm has loans extended by the bank with which it has the exclusive relationship that are past due.

²⁴ The results presented in Table IV were estimated without the economic sector dummies. We did not detect any significant changes, however, when we included these dummies.

²⁵ We use the ratio of tangible assets to debt as a measure of the firm's ability to pledge collateral.

²⁶ We proxy competition by the number of banks in that market and use a dummy variable to control whether the firm's single relationship is with a local bank.

result is that because the vast majority of the banks in Portugal operate nationwide, there is reduced variation in the competition across regions.²⁷

With respect to the single relationship the firm has before it initiates multiple relationships, we do not find that the firm's access to long-term financing plays a role in its decision to initiate multiple relationships. We find, however, that firms which switch banks more often are more likely to substitute a single relationship with multiple relationships. This result seems to suggest, as we have already noted when we characterized our sample, that switching banks is not a substitute for the firm's decision to initiate multiple relationships (see Appendix for further discussion on the distinction between switches and initiations of multiple relationships).

The last set of control variables we consider is related to the bank with which the firm had its single relationship. We included variables to control for the risk exposure regulation, the bank's lending capacity, and whether this bank is old or new, that is a bank that started operations after the beginning of the sample period.²⁸ We control for the bank age because old banks may have different ways of doing business with their clients. We also evaluated the possibility that the arrival of new banks influenced the firm's decision to initiate multiple relationships (see Appendix for further discussion of the impact of the arrival of new banks). As the results in Table IV show, none of these variables play a role in the firm's decision to substitute a single relationship with multiple relationships. This was somewhat expected given the small size of the firms in our sample.

5.1.5. Separating the two hypotheses. The results of our duration analysis seem to provide some support for the two hypotheses we suggested as explanations for the firm's substitution of a single relationship with multiple relationships. The hold-up hypothesis is very pertinent for our sample because it is made of very young firms that are growing fast and for which there is little information available because they have not established a track record. The bank diversification hypothesis is also very pertinent to our sample of firms because failure rates are usually higher among firms in the early stages of their life. In an attempt to ascertain further the plausibility of the two hypotheses on the firm's decision to substitute a single relationship with multiple relationships, we decided to investigate what happens to these firms after they initiate multiple relationships.

For example, if a firm initiates multiple relationships because it has many growth opportunities and is therefore concerned with the future costs of becoming locked

²⁷ It is also worth noting that researchers have identified conflicting effects of competition on relationship lending. For example, Petersen and Rajan (1995) show that competition is detrimental to relationship lending because it makes it more difficult for the bank to carry out intertemporal subsidization. In contrast, Boot and Thakor (2000) show that competition encourages banks to customize services and leads to an increase in relationship lending, but as competition keeps increasing this response is no longer profitable and relationship lending decreases.

²⁸ This regulation requires banks to limit their exposure to any single borrower to 25% of their own funds. We did not expect it to be binding for these firms because they are all small firms. We do not control for banks' equity stakes in firms because this occurs with only two of the firms in our sample.

TABLE V

Importance of the Relationship with the Incumbent Bank after the Firm Changes from a Single Relationship to Multiple Relationships^a

Months after firms start multiple relationships	Number of firms	Number of banks that the firm borrows from			% of the firm's bank debt borrowed from the incumbent bank		
		Mean	Median	CV ^b	Mean	Median	CV ^b
0–12	707	2.0	2	0.35	62.6	66.8	0.51
12–24	560	2.2	2	0.51	60.0	62.5	0.57
24–36	407	2.4	2	0.61	56.4	56.3	0.62
>36	322	2.8	2	0.59	50.4	44.5	0.68

^a Computations based on monthly observations.

^b Coefficient of variation.

in, then we would expect it to borrow a significant amount from the new bank in order to promote competition with the incumbent bank, and to implement some of its growth opportunities, leading, for instance, to an increase in its investment afterward. In contrast, if the firm initiates multiple relationships because the incumbent bank refuses to increase its exposure to the firm due to its poor performance, then we should not observe this firm increase its indebtedness to the incumbent bank afterward. In addition, we should not observe an improvement in this firm's performance as this would mean that incumbent banks systematically misevaluated the firms with which they had exclusive relationships.

5.2. *Ex post Effects*

We start by studying the number of relationships that firms choose to maintain in the four years after they start to borrow from multiple banks. The results are reported in Table V. They show that during that period of time the vast majority of these firms borrow from only two banks. We then evaluate the importance of the new relationship by studying the share of bank debt provided by the incumbent bank in each of these four years. As the results in Table V show, the share of bank debt provided by the incumbent bank decreases to 63% in the year the firm starts to borrow from a second bank and to 50% 3 years latter. These results confirm that the second relationship is an important one from its very beginning and that the bank with which firms had an exclusive relationship loses importance over time.

We then use regression analysis to identify some effects of the firm's substitution of a single relationship with multiple relationships on investment, indebtedness, and profitability.²⁹ In addition, we use a probit model to study the impact of the

²⁹ The reported *F*-statistics show a statistically significant improvement in the model fit when the regression includes firm-specific effects. The Hausman statistic on the hypothesis of orthogonality between the individual effects and the regressors is rejected, thus suggesting the use of the fixed-effects estimator.

change in the number of relationships on the firm's likelihood of having past-due loans afterward, our proxy for the firm's credit quality. The results are reported in Table VI. They seem to be more aligned with the hypothesis that it is the incumbent bank's potential reluctance to increase its exposure to the firm because of its poor past performance that leads the firm to start borrowing from another bank than with the hypothesis that firms initiate multiple relationships because they are planning to implement many growth opportunities and therefore want to protect themselves against the hold-up costs inherent in a single relationship.

The reason is that we do not find an increase in the firm's investments in the years after it starts to borrow from multiple banks. In contrast, and consistent with the former hypothesis, we do find that after initiating multiple relationships firms perform less well (have a lower return on assets) and are more likely to have past-due loans, that is to miss their debt payments to banks. Still, it is conceivable that some of the firms that initiated multiple relationships, say those with more investment opportunities, did so because they wanted to protect themselves from future hold-up costs while the poor-credit-quality firms did it because they were refused additional credit by their incumbent bank. To study the plausibility of this scenario, we investigated how each of these two groups of firms performed afterward.

We started by separating the firms that initiate multiple relationships in two groups according to their levels of investment in the period before they initiate multiple relationships, with the separating line being the median of that variable. We then compare the investment of each group of firms after they initiate multiple relationships with their investment at the time they had a single relationship and compare the change in the investment between the two groups. We find that those firms which had higher levels of investment in the period before they initiate multiple relationships do increase their investment afterward while the other firms decrease it and that these variations are statistically significant. Moreover, the difference in the variation of investment between the two groups of firms is statistically significant.³⁰

We next performed a similar analysis but this time we grouped the firms that initiate multiple relationships according to their credit quality at the time they had a single relationship. In one case we proxied credit quality by the return on assets in the years prior to the initiation of multiple relationships. In another case we proxied it by the absence of past-due loans during those years. Regardless of the criteria adopted, we generally did *not* find any evidence that the poor-credit-quality firms that initiated multiple relationships improved their performance or increased their investment afterward.³¹

³⁰ We obtained these results controlling for the set of other factors that we also considered in the analysis presented in Table VI. To save on space we do not report the econometric results here, but they are available from the authors on request.

³¹ Here too we obtained these results controlling for the set of other factors that we also considered in the analysis presented in Table VI. The econometric results are available from the authors on request.

TABLE VI
Ex Post Effects of the Firm's Substitution of a Single Relationship with Multiple Relationships^a

Variables	Investment/ (Intangibles + Tangibles) ^b		Total debt/Assets		Bank debt/Assets		Cash flow/Assets ^c		Probit ^d Past-due loans
	Model 1 ^e	Model 2 ^f	Model 1 ^e	Model 2 ^f	Model 1 ^e	Model 2 ^f	Model 1 ^e	Model 2 ^f	
Multiple banks dummy 0 ^g	10.981	—	1.874	—	3.478	—	-3.428	—	-0.234
	1.552		0.973		2.146**		-2.267**		-1.623
Multiple banks dummy 1 ^h	—	13.433	—	-2.336	—	-5.406	—	-3.447	0.636
		1.268		-0.496		-1.452		-1.105	4.963***
Multiple banks dummy 2 ⁱ	—	—	—	—	—	—	—	—	0.746
									4.962***
Multiple banks dummy 3 ^j	—	—	—	—	—	—	—	—	0.389
									2.100**
Switch banks dummy ^k	-0.289	-0.940	-0.654	0.282	2.792	-6.444	-0.375	2.878	0.0015
	-0.035	-0.063	-0.293	0.043	1.486	-1.230	-0.214	0.646	0.013
Log of firm age (years)	-25.182	-33.928	-5.049	-2.113	-2.152	10.113	10.755	3.019	-0.092
	-0.834	-1.377	-0.617	-0.196	-0.312	1.189	1.670*	0.416	-0.682
Log of sales ^l	-12.340	-16.662	2.839	-1.178	0.383	-1.154	-5.035	-1.329	-0.020
	-1.868*	-1.921*	1.572	-0.304	0.252	-0.378	-3.701***	-0.532	-0.613
Liquidity/assets ^m	0.327	0.286	-0.001	-0.101	-0.004	0.008	—	—	—
	2.060**	1.094	-0.031	-0.884	-0.109	0.085			
Tangibles/total debt	-0.036	-0.138	0.014	-0.029	0.004	-0.026	—	—	—
	-1.216	-2.305**	1.840*	-1.192	0.713	-1.349			
Investment/(intangibles + tangibles) ^b	—	—	-0.023	0.028	-0.006	0.042	0.008	-0.015	-0.003
Cash flow/assets ^c	0.394	0.297	-1.792*	0.756	-0.523	1.411	0.794	-0.582	-1.578
	1.790*	0.915	0.021	-0.320	0.025	0.063	—	—	—
			0.378	-2.374**	0.533	0.590			

Total debt/assets	0.016	-0.297	—	—	—	0.176	0.091	0.020
	0.079	-1.076	—	—	—	4.747***	1.284	6.103***
Adjusted <i>R</i> -squared	0.908	0.397	0.853	0.728	0.658	0.649	0.512	Correctly predicted outcomes (%)
<i>F</i> ($H_0 : \theta_i = \theta, \forall i$)	15.605	1.617	6.146	2.646	3.748	2.288	2.110	94.8
(<i>p</i> -value)	(0.000)	(0.0005)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	
Hausman test	12.529	13.492	309.34	11.30	21.513	29.000	12.817	
(<i>p</i> -value)	(0.639)	(0.488)	(0.000)	(0.662)	(0.121)	(0.011)	(0.3825)	

^a Models estimated with time dummies and fixed effects with the exception of the probit model which was estimated with random effects. The null hypothesis is rejected at: *** 1%, ** 5%, * 10%. ^b Investment represents investments made by the firm including asset acquisitions and expenditures on projects the firm undertakes for itself. ^c Cash flow is defined as the sum of profits before tax plus provisions and depreciation allowances. ^d Due to the lower frequency of the past-due loan variable, this model was estimated taking into account all the observations before and after the firm substitutes a single relationship with multiple relationships. ^e Model 1 compares the firm at the period prior to the change from single to multiple relationships with the period where that change occurs. ^f Model 2 compares the firm at the period prior to the change from single to multiple relationships with 1 period after that change had occurred. ^g Dummy equals 1 the year the firm changes to multiple bank relationship. ^h Dummy equals 1 one year after the change to multiple bank relationship. ⁱ Dummy equals 1 two years after the change to multiple bank relationship. ^j Dummy equals 1 three years after the change to multiple bank relationship. ^k Number of times firms switch banks. ^l Value in thousand escudos, 1986 prices. ^m Firm liquidity equals the sum of cash, bank deposits and all other tradable securities.

These two sets of evidence lend additional support to the hypotheses we suggested above to explain the firm's substitution of a single relationship with multiple bank-lending relationships. Consistent with the hypothesis that firms initiate multiple relationships in order to protect themselves from the future hold-up costs associated with exclusive relationships, we do find that, among the firms that initiate multiple relationships, those that have higher prior investments increase their investments even further once they start borrowing from more than one bank. Consistent with the hypothesis that a bank's refusal to increase its exposure to poor-performing firms forces them to approach another bank for additional funding, we do find that, among the firms that initiate multiple relationships, those that had poor prior performance do not increase their investment and continue to have a poor performance afterward. Finally, note that it is possible for these hypotheses to hold simultaneously because, as our evidence shows, they apply to different subsets of the firms that initiate multiple relationships.³²

6. FINAL REMARKS

We addressed in this study a unique question using a unique data set. In contrast with the empirical literature on the determinants of the number of bank-lending relationships, we focused on the single versus multiple relationships dichotomy and in particular on the firm's decision to end a single relationship and start borrowing from more than one bank. Moreover, because we relied on a data set of very young firms, our study relates to a period of time of a firm's life that, to our knowledge, has not been investigated. The literature on bank-lending relationships has focused on firms that are on average significantly older than those in our sample.

Though not an objective of this research, our study also complements the literature on the value of a firm's relationship with a bank. As other studies have shown, our results also suggest that there is value in such a relationship. Our result, that exclusive bank relationships with good firms generally last longer than exclusive relationships with poorly performing firms, suggests that a relationship is more valuable to the former firms than to the latter ones. But even the latter firms appear to value their relationships with the incumbent bank, because the majority of them continue to borrow from it after they initiate multiple relationships. We find, for example, that one year after they have initiated multiple relationships, 75% of them still borrow from the bank with which they had an exclusive relationship, and two years later 54% of them still borrow from that bank.

³² An important distinction between the two hypotheses not evidenced in our results is that while in the case of firms' concerns with the future hold-up costs of exclusive relationships the initiation of multiple relationships is a choice of the firm, in the case of the bank-risk diversification objective that initiation is imposed on the firm as a result of the incumbent bank's decision.

APPENDIX

A.1. Additional Robustness Checks

A.1.1. The exogeneity assumption of the variable “number of switches.” As we discussed above, a possible reason for firms initiating multiple relationships is to avert ex post hold-up rents. Alternatively, the firm may choose to maintain a single relationship and switch banks in response to the incumbent bank’s attempt to extract rents. If this were the case, then there would be some substitutability between bank switches and initiations of multiple relationships. Consequently, the assumption of exogeneity of the explanatory variable “number of switches” would not hold and the quality of our estimations would be influenced.

Our results do not seem to support the substitutability hypothesis, as we find that firms that switch banks are more likely to initiate multiple relationships. As a further check on the robustness of our results, we re-estimated our models, excluding from the sample all the firms that switched banks before they initiated multiple relationships.³³ The results are reported in Table VII. They confirm the results presented in Table IV, which were obtained with all the firms in the sample. The only important difference relates to trade credit, which is now statistically significantly different from zero.

A.1.2. Distinguishing switches from initiations of multiple relationships. As we mentioned above, our data source contains only the amount a firm owes each bank at the end of each month. Based on this information alone, in some cases it is difficult to distinguish a switch from an initiation of multiple relationships. For example, when a firm owes money for the first time to two banks, one of which is its old lender, it does not necessarily mean that it has started multiple relationships. It could be that the firm has switched banks but still owes money to its original lender. When this occurs closer to the end of the sample period it becomes even more difficult to distinguish between the two possibilities.

Because of these cases, we decided to evaluate the sensitivity of our results to the procedure we used to distinguish switches from initiations of multiple relationships. We did that by considering several variants to the criteria we used to distinguish switches from initiations of multiple relationships.³⁴ In all cases we obtained results similar to those presented in Table IV. We found some minor differences on the significance of certain bank-control variables.

³³ In yet another test, we estimated the models excluding from the sample the firms that switched banks but continued to have only one relationship. We do not present these results because they are similar to those presented in Table IV, but they are available from the authors upon request.

³⁴ After identifying the first time a firm owes money to more than one bank, say t_0 , we used the following criteria to decide whether the firm switched banks or started multiple relationships. If at t_0 the firm starts to owe money to three or more banks we considered it as having started multiple relationships. If it starts to owe money to two banks and in the twelve subsequent months it increases the amount it owed the incumbent bank at t_0 by more than 25% then we consider that the firm started multiple relationships. Otherwise we defined what happened at t_0 was a switch rather than the initiation of multiple relationships.

TABLE VII
Duration of Single Relationships for Firms That Do Not Switch Banks before
They Start Multiple Relationships^a

Variables	Model 1 (1,134 firms)	Model 2 (1,218 firms)	Model 3 (1,218 firms)
Constant	4.709 4.253***	4.957 5.399***	6.373 16.946***
Firm			
Age (years)	-0.012 -0.717	-0.009 -0.573	-0.011 -0.696
Conglomerate dummy ^b	-0.270 -1.129	-0.257 -1.081	-0.266 -1.104
Log of sales (thousand escudos, 1986 prices)	-0.238 -7.222***	-0.247 -8.050***	-0.257 -9.233***
Sales growth (%)	-0.001 -3.221***	-0.001 -3.524***	-0.001 -3.881***
Liquidity/assets ^c	1.235 3.752***	1.016 3.247***	1.011 3.237***
Intangibles/assets	-0.131 -0.085	-0.040 -0.026	-0.324 -0.212
Tangibles/total debt	0.025 0.472	0.012 0.239	0.020 0.381
Investments/(intangibles + tangibles) ^d	-0.181 -2.073**	-0.186 -2.198**	-0.176 -1.981**
Cash flow/assets ^e	0.642 1.792*	0.543 1.505	0.548 1.526
Bank loans/assets	-2.025 -5.615***	-1.941 -5.864***	-2.072 -6.340***
Trade credit/assets	-0.459 -1.881*	-0.483 -2.163**	-0.507 -2.281**
Insider debt/assets ^f	-0.293 -1.253	-0.330 -1.497	-0.332 -1.508
Bank			
Log of assets (million escudos, 1986 prices)	0.085 1.238	0.068 1.137	—
Age dummy ^g	-0.152 -1.021	-0.194 -1.326	—
Assets growth (%)	0.001 0.683	0.001 0.793	—
Liquidity/assets ^h	1.675 1.394	1.220 1.538	—
Profits/assets	-1.174 -0.128	-1.199 -0.152	—
Bank-firm relationship			
Bank long-term loans/ Bank debt	0.167 1.157	0.163 1.194	0.183 1.341
Past due loans dummy ⁱ	-0.976 -3.379***	-1.090 -3.998***	-1.134 -3.814***
Risk exposure ^j	-0.007 -0.709	-0.005 -0.570	—

TABLE VII—*Continued*

Variables	Model 1 (1,134 firms)	Model 2 (1,218 firms)	Model 3 (1,218 firms)
Banking market			
Bank location dummy ^k	−0.008 −0.061	—	—
Banks in the market (number)	0.001 0.112	—	—
<i>P</i>	1.289	1.284	1.276
$H_0 : p \leq 1$	4.693***	4.988***	4.959***
Median of the duration (months)	62.349	58.171	58.698
LR ^l (degrees of freedom)	0.016 (2)	8.64 (6)	—

^a Parametric models (Weibull distribution) estimated with time-varying explanatory variables and time dummies. The null hypothesis is rejected at: ***1%, **5%, *10%. ^b Dummy equals 1 if the firm belongs to a conglomerate and 0 otherwise. ^c Firm liquidity equals the sum of cash, bank deposits and all other tradable securities. ^d Investment represents investments made by the firm including asset acquisitions and expenditures on projects the firm undertakes for itself. ^e Cash flow is defined as the sum of profits before tax plus provisions and depreciation allowances. ^f Insider loans equal the sum of loans extended by the firm's shareholders and associated firms. ^g Dummy equals 1 if the bank is old (existed prior to the beginning of the sample period) and 0 otherwise. ^h Bank liquidity equals cash plus deposits at the central bank and interbank deposits. ⁱ Dummy equals 1 if the firm had past due loans with its bank before it switches banks for the first time and 0 otherwise. ^j Ratio of bank loans to a single firm over bank's equity. ^k Dummy equals 1 if the firm's single bank has a branch in the region where the firm is located. ^l Model 1 versus model 2, and model 2 versus model 3, respectively.

A.1.3. The impact of the arrival of new banks. Finally, we considered the potential impact on our results of the arrival of new banks. We have included in our models a dummy variable to control whether the firm's incumbent bank was an old or a new bank, that is a bank that started operations after the beginning of the sample period. This dummy controls for a possible difference between the way old banks and new banks do business and the associated impact on their clients' decision to start borrowing from another bank. It does not control, however, for such things as the impact of the new banks' arrival on the firm's decision to borrow from them.

This is a potentially important issue because the number of banks in our sample increased during the sample period (1980–1996) from 16 to 33. It is worth noting, though, that despite this arrival of a large number of new banks, old banks continued to dominate the industry until the mid-1990s. By 1990 they still held 85% of the industry's assets and represented 9 out of the 10 largest banks in the country. By 1996 these numbers were down to 68 and 7, respectively. Of the 707 firms in our sample that initiated a second relationship, 541 of them did so with an old bank, implying that the remaining 166 firms initiated their second relationship with a new bank.

To ascertain whether the arrival of the new banks influenced the firm's decisions to initiate multiple relationships, we performed two tests. First, we re-estimated

our models with a dummy variable to control for those firms that initiate their second relationship with a new bank. Second, we re-estimated our models, this time excluding the firms that chose one of the new banks to initiate the second relationship. The results of the former test show the new dummy variable to be significant, indicating that firms which initiate the second relationship with a new bank are more likely to do it sooner than those that do so with an old bank.

While this result is consistent with the idea that the arrival of new banks led some firms to initiate multiple relationships, the remaining results of the two robustness tests mentioned above are qualitatively similar to our original results concerning both the conditional likelihood of firms with single relationships starting multiple relationships and the determinants of this likelihood.³⁵

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³⁵ For this reason, and in the interest of saving space, we chose not to include these results here, but they are available from the authors upon request.

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