

# The Benefits of Relationship Banking: Evidence from Small Business Financing in Finland

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**Abstract** Using unique small business credit-file data from a major Finnish bank, I analyze how relationship characteristics are associated with loan interest rates. Data includes the effective loan rate and variables that describe the duration and scope of relationship, collateralization, firm characteristics, bank's internal risk rating, and loan characteristics. The results show that longer duration tends to lower the cost of credit and that a long-term bank/firm relationship is beneficial especially to high-risk firms. As the relationship matures, the loan premiums for high-risk firms decrease at higher rate than for low-risk firms.

**Keywords** Relationship banking · relationship lending · small business finance · loan pricing · collateral

## 1 Introduction

The innovative resources of small businesses have fundamental value for economic growth. Most small firms receive their financing from external sources, and debt financing plays a major role in their early financing decisions (Berger and Udell 1998). In the U.S., the proportion of debt for firms less than 2 years old is 52% (Berger and Udell 1998). In Finland, it is 54% (Hyytinen and Pajarinen 2002). Because most of the debt financing among small firms is in the form of bank loans, characterizing the bank/firm relationship is essential in analyses of small business financing.

There are many studies that investigate the bank/firm relationship in small business finance. The results of these studies indicate that the relationship has important effects on loan decisions. In an optimal bank/firm relationship, both parties—bank and firm—receive large economic benefits. Numerous studies support this assertion. Recent empirical findings on the strength of the bank/firm relationship show that the length of the relationship is negatively related to the cost of credit. This finding suggests that the value of the relationship increases with the duration of the relationship through lower

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loan premiums (Berger and Udell 1995; Blackwell and Winters 1997; Bodenhorn 2003). Other studies report that the breadth of the relationship, as a measure of strength, is negatively related to the cost of credit (Degryse and van Cayseele 2000; Mörntinen 2000; Elsas 2005). But despite the growing body of studies on relationship banking and its effect on loan pricing, current research does not seem to indicate an understanding of the precise sources of the value of relationship banking (Boot 2000; Berger and Udell 2002).

In this paper I examine the bank/firm relationship by using unique, detailed small business credit-file data from a major Finnish bank for the years 1995–2001. First, my investigation uses the effective interest rate of the loan instead of the nominal interest rate spread (see Degryse and van Cayseele 2000). Thus, the data include the arrangement fees for the bank. For more realistic and efficient testing, if possible, I include these fees when calculating the interest rate of the loan. Restrictions on available data often prevent studies from exploring loan arrangement fees. To my knowledge, this study is the first to analyze the characteristics of the bank/firm relationship by using the effective interest rate of the loan.

Second, I analyze a range of relationship measures. I focus on the variables associated with the duration and scope of the bank/firm relationship. In my study, the relationship scope covers several relationship-specific characteristics such as the number of the bank's financial services used by the firm, the number of loans, and the level of liabilities between the lender and borrower.

Third, my data include the bank's internal risk-rating classes for firms. There are five different rating classes for different risk levels that are based on four factors: firm size, profitability, leverage, and growth. I analyze how borrower risk and relationship characteristics are associated. Elsas and Krahn (2002) also use internal risk ratings in their study.

Fourth, I calculate the level of collateralization by using a continuous measurement (see Elsas and Krahn 1998, and Machauer and Weber 1998). I use a variable that indicates the ratio of a firm's pledged collateral to the firm's total liabilities to the bank at the moment when the credit is granted.

I suggest two main reasons for using continuous rather than dichotomous measurement to determine the level of collateralization. First, if the variable includes more frequent and accurate information on the target of interest, then the efficiency of the expected estimate should increase. Second, if the parameter estimate of the level of (continuous) collateralization is statistically significant, then it suggests that a continuous variable is more valuable than a dichotomous variable. Thus, the implication is that not only is the existence of collateral affecting the loan rate, but also the level of collateralization. By pledging different amounts of collateral, borrowers pay different loan rates for the credit they receive.

I present two main findings. First, that the strength of the bank/firm relationship is negatively related to the cost of credit. My results show that firms that have longer relationships with the lending bank receive loans with lower premiums. This result implies that it is beneficial to firms to establish a close and long-term relationship with the bank. Second, when I analyze how the strength of relationship (measured by the cost of credit) responds to the firm-specific risk levels, I find that the relationship is mature, the price reduction is greater for high-risk firms than for low-risk firms. Thus, a long-term relationship is especially beneficial to high-risk firms. My results are robust to controlling for collateral-, firm- and loan-specific characteristics as well as the aggregate macroeconomic interest-rate level.

The paper is organized as follows. Section 2 briefly reviews the essential recent studies on relationship banking. Section 3 presents my hypotheses. Section 4 describes the major characteristics of Finnish credit markets to provide background for the empirical analysis in

this paper. I give special emphasis to small business financing. Section 5 describes the data, Section 6 documents the empirical results. Section 7 concludes.

## 2 Review of Prior Studies

Relationship banking is a valuable way for small businesses and banks to establish more efficient financial contracts with each other. In particular, a strong bank/firm relationship is able to alleviate problems arising from informational asymmetries, i.e., adverse selection and moral hazard (Boot and Thakor 1994; Thakor 1995). Increased firm-specific information reduces the marginal cost of information, because the bank is able to use the same information again and again to refer to the financial services it offers to the firm.

In the examination of relationship banking and its effect on the cost of credit, many studies show a negative relationship between the strength of the relationship and the cost of credit (Petersen and Rajan 1994; Berger and Udell 1995; Blackwell and Winters 1997; Angelini et al. 1998; D'Auria et al. 1999; Bodenhorn 2003). These studies support the idea that the bank is sharing the mutual benefits of the relationship with the firm. However, other studies show that the strength of the relationship and the cost of credit may be positively related (Caves and Uekusa 1976; Nakatani 1984; Greenbaum et al. 1989; Weinstein and Yafeh 1998). This result typically relates to the hold-up problem, in which the bank uses its monopoly power over the firm. However, Ongena and Smith (2001) find evidence that does not support the theoretical models of the hold-up problem. They find that the firms are more likely to leave the bank as the relationship matures.

Petersen and Rajan (1994) find that concentrated lending with only one bank lowers the cost of credit by 31 basis points compared to multiple lender situations. The length of the relationship does not have statistical significance. Their study uses data from the National Survey of Small Business Finance (NSSBF), which contains information about 1,389 U.S. firms from 1988 and 1989. Large firms, mature firms, and corporations pay lower interest rates than do other firms. The use of financial services from the bank does not affect the cost of credit.

Berger and Udell (1995) examine the effect of the bank/firm relationship on the cost of credit. They analyze the same data as the Petersen and Rajan (1994) study. Berger and Udell concentrate on lines of credit (L/C) types of loans. In L/C loans, the lender promises credit to the borrower with certain terms in the future. Berger and Udell argue that examining only L/C loans, rather than all types of loans, is a better way to observe relationship banking characteristics. Their data cover 863 L/C contracts. Their results show that the length of the relationship is negatively related to the cost of credit, especially for larger firms. Also, collateral requirements are lower in longer-term relationships.

Degryse and van Cayseele (2000) examine a very large data set with almost 18,000 Belgian small business bank loans. They test whether banks can engage in intertemporal interest rate-shifting. Their results show two main effects of the bank/firm relationship. First, that there is a positive correlation between relationship duration and the interest rate on loans. Second, that the scope of the relationship is negatively related to the interest rate. Moreover, they find that in terms of the cost of credit, the relationship scope seems to be an important determinant of relationship strength (when scope and duration variables are combined, the coefficient of the interaction term becomes negative.)

My paper extends the ideas presented in the Petersen and Rajan (1994), Berger and Udell (1995), and Degryse and van Cayseele (2000) in relation to the cost of credit and bank/firm relationship characteristics. My investigation adds two facets to these studies by using the effective loan rate and by examining the correlation between the

strength of the relationship and the cost of credit with an additional risk-duration interaction term. I also present new factors associated with the relationship scope and the level of liabilities.

### 3 Hypotheses

I empirically test the following hypotheses:

Hypothesis 1. Duration effect: The duration of the bank/firm relationship is negatively or positively related to the cost of credit.

I also test whether and how the interaction between borrower risk and relationship duration is associated with the cost of credit. I assume that the effect of the duration of the relationship on the loan rate differs between high-risk and low-risk firms.

Hypothesis 2. Scope effect: The scope of the bank/firm relationship is negatively related to the cost of credit.

I use several proxies for relationship scope, as discussed above.

Understanding the mechanisms of the strength of the bank/firm relationship is extremely important for finding out more about the precise sources of value of the relationship. As noted above, prior studies' main findings support the idea that stronger relationships may overcome, or at least decrease, the problems caused by informational asymmetries, such as adverse selection and moral hazard. In short, stronger relationships can increase the efficiency of small-business financing in the banking sector.

### 4 Financial Markets and the Role of Banks in Finland

Financial market liberalization in Finland began gradually in the 1980s, but picked up speed in the 1990s. Considering the positive aspects of the consequences of financial market liberalization, authorities realized that closer screening and monitoring of borrowers by banks was necessary.

Also, the deep recession and bank crisis in the period between 1990 and 1995 increased the need for more careful lending activities in Finland, especially within the banking sector.

Today, banks focus a great deal of attention on the methods they use to measure investment- and firm-specific risks in bank/firm relationships. Risk management has become vital for both banks and financial intermediaries. Information processing is the key element of risk management for lending between banks and firms, particularly in the more opaque area of small-business finance. The more public, and especially the more private, firm-specific information the bank receives from the borrower, the more accurately can the bank determine the risk level of the firm and its investment projects. This circumstance is related to the better terms and access to credit available under relationship banking.

Banks constitute the primary source of external finance for over 60% of Finnish small firms (defined as those with fewer than 250 employees). Trade credit companies are the primary source for about 20% of service firms and 10% of industrial firms. The major financial intermediary Finnvera plc, a government institution, has a 10% share. Finnvera is the primary source of external finance for small firms. Three major commercial banks account for most of the activity in the Finnish banking sector, with a combined market share of 84% in 2001 (Bank of Finland 2002).

## 5 Data

My original data covers all corporate loans originating from a local corporate division of a major Finnish bank from 1995 to 2001.<sup>1</sup> I obtain my sample from a full long-term credit decision period from a large bank. Thus, the data represents the banking environment in Finland, I collect data from 1995–1999 in 2000, and data for 2000–2001 in 2002. Each credit file includes detailed information on the credit contract between the borrower firm and the bank, covering relationship-, collateral-, firm-, and loan-specific characteristics.

The sample comprises 1,436 loan decisions for 936 small firms. I include only limited liability companies or partnerships in the analysis and exclude 112 non-profit organizations with 125 loans. I exclude 108 loans that provide no information on the interest rate. These loans include 55 with fixed rates and 53 with no loan rate information. Fourteen loans have no information for effective loan rate calculations. Thus, my final sample consists of 1,189 loans for 768 firms.

The number of observations in my regression models drops dramatically, mainly because of the lack of firm-specific information from financial statements. Thus, the reduced sample size is due to missing data. Regressions (1)–(4) include 279 observations in Table 4. Regression (5) is a reduced model for reliability check, including 625 observations. Altogether, I analyze variables from 1,436 credit files covering the corporate loans granted between 1995 and 2001.

I divide the explanatory variables into four categories. The endogenous variable is the effective interest rate of the loan, i.e., the interest rate spread that includes the total amount of the bank's loan arrangement fees. The effective loan rate is the actual, true price of the loan that the lender and the borrower negotiate in the contracting process.

I optimize the effective rate ( $i$ ) according to Eq. 1 so that the amount of the loan  $K$  after the fees have been charged equals the payment  $K'$  discounted by the calculated effective rate on yearly basis:

$$A_K = \sum_{K'=1}^m \frac{A'_{K'}}{(1+i)^{t_{K'}}} \quad (1)$$

where  $A_K$  is amount of the loan  $K$  (after fees charged),  $A'_{K'}$  is the amount of the payment  $K'$ ,  $m$  is the number of the last payment,  $t_{K'}$  is the time period between the payment no 1 and payments no 2  $\rightarrow m$ , and  $i$  is the effective interest rate.

Since is the bank has no legal obligation to disclose the effective interest rate of the loan for firms in the loan contract, I calculate the effective interest rate from the data. I apply the effective rate equation (1) from the European Union directive 87/102/EEC.

As noted, my primary interest lies with relationship variables that should capture effects related to the strength of the bank-loan relationship. Although the duration of this relationship is one of the basic measures of relationship strength in studies on relationship banking, unfortunately, duration does not disclose enough about the intensity of the relationship. Therefore, I include various measures for relationship scope, such as the number of financial services, loans, and firms by same owner in the bank, and a liability factor. In my analysis I use collateral-, firm- and loan-specific factors as control variables. I also include an aggregate economy variable, term spread, in my analysis.

I assume that, according to the discussions and the credit process in this particular bank, the bank determines the loan rate after other variables values are set. Thus, the bank negotiates with its clients about the size of the loan and the level and quality of collateral

<sup>1</sup> As a condition of being given access to the loan files of this bank, I have promised confidentiality to the bank and the customers regarding identity and location.

before making a decision on the loan rate. I am aware of the possible endogeneity of non-rate terms if there is simultaneous determination in the models I use in my econometric specifications. Generally, this problem may exist in collateralization and loan size. Therefore, the robustness (endogeneity tests) of the models have been tested in the end of the empirical analysis (regressions are reported in Appendix II; Table 6). I use the following explanatory variables and define them as follows.

*Relationship Variables* I use the length of the relationship in years to analyze relationship duration (Duration). The other relationship variables deal with relationship scope. These factors represent different aspects of the breadth of the relationship. I use the following variables: number of financial services used (Financial Services), number of performing loans (Loans), one or several firms under the same ownership (Multiple), and level of liabilities (Liabilities). All of these variables indicate the nature of the relationship between the borrowing firm and the lender bank.

The Financial Services variable includes the total number of the subject bank's financial services that the firm is currently using. The Multiple variable indicates whether the firm belongs to a so-called firm group, i.e., if there is more than one ongoing relationship (either firm or family member) under the same ownership with this bank. For instance, when one person owns two firms, both of which have relationships with the bank. Another example would be a married couple that governs two or more firms, either mutually or individually.

The Liabilities variable is the ratio that denotes a firm's total liabilities (to the subject bank) per total assets of the firm, including the current loan. The more debt the bank has issued to the firm, the bigger the share of the firm's total assets that the bank holds. The firm's liabilities include all performing loans as well as bank guarantees to the firm. A higher Liabilities variable indicates closer ties between the bank and the firm and a stronger relationship.

*Collateral Variables* Two main control variables serve as proxies for Collateral effects. These are the value of a firm's total collateral over total liabilities to the bank (Collateralization) and the use of a personal guarantee (Personal Guarantee). Collateralization is a continuous variable that shows the level of the firm's liabilities to the bank after the current loan is covered by the pledged level of total collateral. Data comprise 55 observations (4.6%) of Collateralization values that exceed the value of two. I consider that all values that exceed the value of one are secured loans. I assume that the bank is indifferent to the extent of overcollateralization when it is greater than two (outliers), since the loan is secured within this regime.

The Personal Guarantee variable indicates whether or not the loan is personally guaranteed. Typically, in my data, the person who gives a personal guarantee is the firm owner. However, I note that I do not have detailed loan-specific information.

I also control for whether the loan is guaranteed by the major non-bank financial institution (Non-bank Guarantee) or not. This particular non-bank is owned by the Finnish government and often works closely with banks by giving external guarantees to loans. Typically, banks require this type of guarantee for loans that are requested by start-ups or high-risk firms.

*Firm-specific Variables* I use five firm-specific control variables that are associated with the following sectors of firm performance: the leverage of the firm (Leverage), the age of the firm (Firm Age), the size of the firm (Firm Size), the legal form of the firm (Legal Form) and the internal risk rating of the firm (R1–R5). The five risk classes are internally determined by the bank. I use dummy variables to analyze the effect of each risk class on the effective loan rate. R1 denotes the lowest, and R5 denotes the highest, risk level for a firm. The risk classes do not sum up to one, since all risk classes equal to zero for missing observations.

*Loan-specific Variables* I use maturity of the loan (Maturity), year dummies (Year-dummies) and term spread (Term Spread) as loan-specific control variables. For each year, I use a dummy variable indicating the year when the loan was granted. I use Term Spread to control for variation in the aggregate economy interest rate. This variable represents the difference between interest rates on a 5-year bond and a 3-month Treasury bill. The Loan Size variable indicates the size of the loan.

I further describe the sample by emphasizing relationship characteristics, i.e., duration and scope. Table 1 contains complete variable definitions and information on the construction of the variables.

The summary statistics in Table 2 indicate that average relationship duration is approximately 9 years and the average number of the bank's financial services used by firms is about 11. Compared to other studies, the data have similar length of duration than in the United States where average duration of bank relationship is between 7 and 11 years (Blackwell and Winters 1997; Cole 1998; Petersen and Rajan 1995). Longer duration is reported in Italy—average of 14 years (Angelini et al. 1998), in Germany—average of 22 years among large firms (Elsas and Krahen 1998), in Sweden over 20 years (Sjögren 1994) and in Japan nearly 30 years (Horiuchi et al. 1988). The mean of the Loans variable is 1.143, which means that a

**Table 1** Definition of variables

Variable	Definition
Effective rate	Negotiated marginal interest rate, which is adjusted to include the total loan arrangement fees and provisions for the lender by calculating the effective interest rate of the loan.
Duration	Length of the relationship between the subject bank and firm (measured in years).
Financial services	Number of the subject bank's financial services used by the firm.
Loans	Number of currently performing loans from the subject bank.
Multiple	Dummy variable indicating whether the firm owner has multiple client–bank relationships with the subject bank (= 1) or not (= 0). Client–bank relationships can include either firms or individuals.
Liabilities	Ratio of firm's total liabilities to the subject bank per total assets of the firm (= total liabilities/total assets). The liabilities of the firm to the subject bank equal the sum of all performing loans and bank guarantees.
Collateralization	Coverage of pledged total collateral over the total liabilities of the firm to the subject bank after the current loan (measured in percent). [= (total collateral/liabilities)*100].
Personal guarantee	Dummy variable indicating whether the loan is personally guaranteed (= 1) or not (= 0).
Non-bank guarantee	Dummy variable indicating whether the loan is guaranteed by a Finnish non-bank financial institution (= 1) or not (= 0).
Leverage	Debt per assets of the firm. (= debt/assets)
Firm age	Age of the firm (measured in years).
Total assets	Total assets of the firm.
Legal form	A dummy variable indicating whether the legal form of the firm is partnership/proprietorship (= 1) or a limited liability (= 0).
R1–R5	Bank's internal risk-rating classification (lowest risk = R1).
Industry-dummies	Ten industry-dummies.
Maturity	Maturity of the loan (measured in years).
Loan size	Amount of the loan (in thousand FIM).
Year-dummies	A dummy variable for each year in the data. The base year is 1995.
Term spread	The difference between the yield on a 5-year government bond and a 3 month Finnish Treasury bill.

**Table 2** Effect of relationship characteristics on the cost of the credit

Variables	Whole sample 1995–2001				Subsample 1995–2001			
	Unit	Obs.	Mean	Std	Unit	Obs.	Mean	Std
Effective rate	%	1,189	3.660	4.184	%	279	3.078	2.136
Duration	Years	1,059	9.080	8.740	Years	279	8.663	6.748
Financial services	Quantity	918	9.922	9.238	Quantity	279	10.168	9.001
Loans	Quantity	954	1.143	1.324	Quantity	279	1.280	1.422
Multiple	0,1	701	0.585	0.493	0,1	279	0.642	0.480
Log (commitment)	Log ratio	501	-2.881	5.092	Log ratio	279	-2.240	4.323
Collateralization	%	1,143	103.479	36.300	%	279	100.736	30.621
Personal guarantee	0,1	1,186	0.290	0.454	0,1	279	0.297	0.458
Non-bank guarantee	0,1	1,160	0.077	0.266	0,1	279	0.125	0.332
Leverage	Ratio	535	0.972	1.423	Ratio	279	0.929	0.678
Firm age	Years	825	9.045	8.673	Years	279	11.082	8.991
Log (total assets)	Log ratio	540	6.969	1.756	Log ratio	279	7.031	1.498
Legal form	0,1	1,189	0.461	0.499	0,1	279	0.240	0.428
R1	0,1	1,189	0.045	0.206	0,1	279	0.090	0.286
R2	0,1	1,189	0.063	0.243	0,1	279	0.090	0.286
R3	0,1	1,189	0.093	0.291	0,1	279	0.208	0.407
R4	0,1	1,189	0.051	0.221	0,1	279	0.104	0.306
R5	0,1	1,189	0.026	0.159	0,1	279	0.054	0.226
Maturity	Years	1,189	4.663	3.748	Years	279	4.569	3.422
Log (loan size)	Log ratio	1,189	5.217	1.307	Log ratio	279	5.495	1.184
Term spread	%	761	0.851	0.725	%	279	1.026	0.807
Industry:								
Agriculture	0,1	1,189	0.112	0.108	0,1	279	0.012	0.103
Industrial	0,1	1,189	0.071	0.256	0,1	279	0.125	0.332
Electronics	0,1	1,189	0.006	0.077	0,1	279	0.007	0.085
Construction	0,1	1,189	0.169	0.375	0,1	279	0.208	0.407
Wholesale, retail	0,1	1,189	0.155	0.362	0,1	279	0.229	0.421
Hotel and restaurants	0,1	1,189	0.056	0.231	0,1	279	0.047	0.211
Transportation	0,1	1,189	0.044	0.205	0,1	279	0.086	0.281
Financing	0,1	1,189	0.015	0.122	0,1	279	0.011	0.103
Real estate	0,1	1,189	0.170	0.376	0,1	279	0.211	0.409
Other services	0,1	1,189	0.073	0.261	0,1	279	0.061	0.240

Whole sample, period 1995–2001 and subsample, period 1995–2001

normal quantity of loans is between one and two. Over 50% of firms or firm owners have multiple client relationships with the bank, i.e., the Multiple variable has the value of 0.585. The Personal Guarantee variable indicates that such guarantees are used in 29% of the loans, and that the non-bank guarantees 7.7% of the loans. The level of the Collateralization variable is about 103%, which means that on average, loans are fully covered. Still, 29% of loans are only partially secured. In Machauer and Weber (1998) the average collateralization is 68.6%, with 8.8% being fully collateralized and 33.8% having no collateralization. The debt-to-assets ratio is over 97%, indicating that firms are relatively highly leveraged. The average age of the firm is 9 years. Forty-six percent of firms are limited liability companies and the rest are either partnerships or proprietorships.

The correlation table of explanatory variables is reported in Appendix IV (Table 8). The highest correlations are found between Duration and Firm Age (0.636), Duration and Financial Services (0.499), Maturity and Loan Size (0.425) and Firm Age and Financial Services (0.402).



I also present summary statistics for the subsample of 279 firms in Table 2. The number of observations in my regression models drops dramatically because of the lack of firm-specific information from financial statements.

To point out a few differences, the Effective Rate variable is smaller in the subsample than in the whole sample. Also, the number of available observations indicating the existence of the risk classes (R1–R5) is higher in the subsample than in the entire data sample. I note the increased frequency of observations of the lowest risk class in the subsample compared to the data as a whole.

## 6 Results

Table 4 presents the estimation results for the relationship characteristics. I test five different pooled cross-sectional regressions in which I treat every loan independently, using OLS assumptions. (I note that I also analyze loans by using fixed and random intercept panel models for the individual firm-specific effects. However, because the majority of the firms in my sample have only one loan, these models are not usable.)

In Table 4, the first four regressions are subsample examinations of the 279 observations available for the reported variables. The fifth regression is the robustness check, which tests the reduced model by using only variables necessary for the analysis. I drop most of the firm-specific variables that cause the large number of missing observations in the first four regressions.

My main emphasis in characterizing the strength of the bank/firm relationship relies on six variables: relationship duration (Duration), the number of the bank’s financial services used by a firm (Financial Services), the number of loans (Loans), existence of multiple client relationships (Multiple), and the level of liabilities (Liabilities). Again, using the six variables that characterize the strength of the bank/firm relationship, I control for and report collateral, firm and loan

**Table 3** Effect of relationship characteristics on the cost of the credit

Authors	Data	Parameter value, $\sigma_{cost}/\sigma_{duration}$	Comparable value, basis points
Petersen and Rajan (1994)	NSSBF, 3,404 US firms, year 1987.	0.002	0.5
Berger and Udell (1995)	Data: NSSBF 3, 400 US firms, 1988–1989.	-0.20**	-48
Blackwell and Winters (1997)	Data: Bank records, 174 active lines of credit (L/C), year 1988.	-0.07	-17
Harhoff and Körting (1998)	Data: German bank, 1,399 small firms, lines of credit (L/C), year 1997.	0.071	17
Angelini et al. (1998)	Data: Italian banks, 1,858 small firms, lines of credit (L/C).	-0.18***	-43
Degryse and van Cayseele (2000)	Data: A large Belgian bank, 18,000 firms, year 1997.	0.128***	31
Peltoniemi (this study)	Data: Finnish bank, 1,436 firms, 1995–2001.	-0.12***	-29

Comparable values measured by 11-year versus a 1-year;  $(\ln 11 - \ln 1)$  multiplied by the parameter value

\*, \*\*, \*\*\* Significance at the 10, 5, and 1% levels, respectively

**Table 4** Relationship characteristics, OLS-regressions

Explanatory variables	(1)	(t)	(2)	(t)	(3)	(t)	(4)	(t)	(5)	(t)
Intercept	2.779***	(11.70)	2.646***	(10.15)	2.773***	(11.79)	2.705***	(11.47)	2.700***	(18.74)
Relationship characteristics										
Log (duration)	-0.120***	(-2.99)	-0.118***	(-2.93)	-0.126***	(-3.15)	-0.094**	(-2.22)	-0.055**	(-2.06)
Log (financial services)	0.033	(0.81)	0.031	(0.76)	0.039	(0.95)	0.031	(0.76)		
Loans	0.039**	(2.12)	0.039**	(2.15)	0.037**	(2.06)	0.045**	(2.46)	0.043***	(3.03)
Multiple	0.023	(0.46)	0.016	(0.32)	0.027	(0.53)	0.034	(0.69)		
Liabilities	-0.001	(-0.24)	-0.0007	(-0.12)	-0.002	(-0.39)	-0.002	(-0.29)		
Collateral characteristics										
Collateralization	-0.001*	(-1.71)	-0.001*	(-1.67)	-0.001*	(-1.73)	-0.001	(-1.59)	-0.001*	(-1.91)
Personal guarantee	0.174***	(3.07)	0.175***	(3.08)	0.175***	(3.09)	0.181***	(3.21)	0.235***	(5.54)
Non-bank guarantee	-0.048	(-0.68)	-0.043	(-0.61)	-0.047	(-0.67)	-0.040	(-0.57)		
Firm characteristics										
Log (leverage)	-0.013	(-0.41)	-0.011	(-0.35)	-0.011	(-0.34)	-0.018	(-0.55)		
Log (firm age)	0.051	(1.16)	0.052	(1.18)	0.050	(1.14)	0.057	(1.30)	0.018	(0.64)
Log (total assets)	-0.013	(-0.53)	-0.012	(-0.47)	-0.011	(-0.43)	-0.017	(-0.68)		
Legal form	0.000	(0.00)	-0.004	(-0.07)	0.0007	(0.01)	0.011	(0.19)	0.009	(0.19)
R2	-0.027	(-0.32)	-0.048	(-0.57)						
R3	0.035	(0.59)	0.035	(0.59)						
R4	0.116	(1.50)	0.114	(1.48)						
R5	0.203**	(1.97)	0.201*	(1.96)						
R3-5					0.085*	(1.69)	0.333***	(2.62)	0.226**	(-2.19)
R3-5 * Log (duration)							-0.124**	(-2.12)	-0.089*	(-1.79)
Loan characteristics										
Maturity	-0.038***	(-4.48)	-0.039***	(-4.58)	-0.038***	(-4.47)	-0.040***	(-4.68)	-0.055***	(-9.47)
Log (loan size)	-0.204***	(-6.73)	-0.205***	(-6.75)	-0.208***	(-7.00)	-0.201***	(-6.78)	-0.179***	(-10.46)
Term spread			0.060	(1.23)						
Obs.	279		279		279		279		625	
Adj. R2	0.522		0.523		0.522		0.529		0.499	

Dependent variable: Log (effective rate). I control for year-dummies and industries in the estimations, I do not report parameter values. Data: bank loans, 1995–2001

\*, \*\*, \*\*\* Significance at the 10, 5, and 1% levels, respectively

characteristics. I also control for, but do not report, parameter values for year dummies and industries.

Table 4 shows that Duration is negatively and significantly related to the loan premium. In the first regression the parameter value of Log (Duration) is  $-0.12$ . This result indicates that for every one percent increase in (the logarithm of) the length of the relationship, the effective loan rate decreases by 12 basis points. Whether the magnitude of Log (Duration) is economically significant or not, I calculate that its coefficient of  $-0.12$  suggests that a firm with an additional 10 years in a relationship with the bank benefits by an expected 29 basis point decrease in the effective rate on its bank loan. I calculate the expected decrease in the effective loan rate as  $-0.120 * (\ln 11 - \ln 1)$ . I consider the case of an 11-year compared to a 1-year relationship with the bank and its effect on loan pricing. The results of other similar empirical results are presented in the Table 3. In the last column I have calculated the comparable parameter value from the reported parameter value of the cost of the credit. My result for the relationship between the relationship characteristics and the cost of the credit supports the comparable values of Berger and Udell (1995), Blackwell and Winters (1997) and Angelini et al. (1998), but contrasts with Petersen and Rajan (1994) and Degryse and van Cayseele (2000) in Table 3.

The results for characteristics of the scope of the relationship show that only the Loans variable is associated with the cost of credit in Table 4. The parameter value for the Loans variable, 0.039 (significant at the 5% level), implies that the more performing loans a firm currently has from the bank, the higher the interest rate of the loan. I interpret this result to mean that firms with several simultaneous loans are riskier than firms with fewer loans. I confirm this interpretation by a probit-model estimation (not reported), which shows that riskier firms are more likely to be related to higher number of performing loans (Loans).

For relationship characteristics as a whole, I show that Duration is the single most important factor of relationship strength in explaining variations in the effective interest rate. I measure the value of the relationship by analyzing how different relationship characteristics are related to the cost of credit. However, Table 4 shows that Financial Services, Multiple and Liabilities are not associated with the cost of credit. As I report in Table 4, the Liabilities variable is negatively but nonsignificantly related with the cost of credit. Because of the counter-intuitive (positive) parameter sign of Loans, I test the potential bias by robustness models. The positive sign of the Loans may be related with the repetitive observations of the loans of same firms.

I test the parameter sign of Loans with the models that are reported in Appendix I (Table 5). I add a variable, Loan Repetition, which reports the explanatory power of all repetitive loans. The sign of the Loans in all equations (1)–(4) in Appendix I (Table 5) is consistently positive in relation to earlier results in Table 4. I also test the sample which contains only the first loan of the firm (non-first loans are excluded) in equation (4). I conclude that the pricing decisions are indifferent for the Loans-variable between the first loan and the consecutive loans according to the results. Our tests also show that Loans and R3–5 (high risk group) are positively correlated and according to the probit model (not reported) it is likely that the level of Loans increases when the loan is equal to R3–5. The implication of this result is that the number of performing loans is one of the risk factors with internal risk ratings. High-risk firms have more performing loans than low-risk firms. In addition, when the regression 4 in Table 4 is regressed without Loans-variable, the magnitude for the parameter value for R3–5 is higher than in the regression where Loans is included.

In Table 4, I simultaneously control for collateral, firm, and loan characteristics and the effects of relationship characteristics. Again, for collateral characteristics, I use the level of collateralization (Collateralization) and the use of personal guarantees (Personal Guarantees). As before, my measure of Collateralization indicates the coverage of a firm's total

pledged collateral to a firm's total liabilities to the bank. The parameter value for Collateralization indicates that a higher level of pledged collateral reduces the loan rate. Thus, my results show that not only is the incidence of collateral important in loan pricing, but also the level of collateralization.

Also as before, the Personal Guarantee variable indicates whether the loan includes a personal guarantee or not. I find that Personal Guarantee has statistically significant parameter values between 0.174 and 0.235. The implication is that loans with personal guarantees carry higher interest rates. My interpretation of this finding is that the use of personal guarantees is related to higher borrower-specific risk. This interpretation is supported by an additional probit regression in which I find that high-risk firms are more likely to be required to give a personal guarantee than are low-risk firms. (I do not report the regression here.)

I find that the Leverage variable for firm characteristics is negatively, Firm Age positively, Total Assets negatively, and Legal Form slightly positively, related to the cost of credit. However, none of the parameter values for these variables is statistically significant. Due to a possible correlation with the internal bank risk variables, these proxies for the traditional firm risk may be nonsignificant. Therefore, I examine the model without the internal risk rating factors. However, the results do not indicate statistically significant parameter values.

I find that high-risk firms tend to have a higher cost of credit than do low-risk firms (see Table 4). In particular, R5 has a positive and slightly statistically significant parameter value of 0.203 in the first regression and 0.201 in the second regression. Firms in the highest risk class pay an average of over 20 basis points more in interest rates than do firms in the lowest risk class.

Finally, loan characteristics in the first regression show that Maturity and Loan Size are negatively and significantly related to the effective rate, with parameter values of  $-0.038$  and  $-0.204$ , respectively. Thus, longer maturity and larger loans are related to lower interest rates. This result is particularly interesting, since earlier studies are not unanimous in their views on the relationship between maturity and loan rate. For example, my result contrasts with traditional knowledge of positive relationship (Crabbe 1991), but supports the recent findings in Degryse and Ongena (2005). The intuitive explanation for longer maturity and lower interest rates may be found in the following characteristics; low risk–low debt firms in their early stages with the bank seem to be receiving long maturity loans.<sup>2</sup> Banks may have an incentive to establish long-term relationship with these types of firms by granting them long-term loans. Also, larger loans seem to be related to lower interest rates because these firms already have a broad set of financial services established with the bank and the owners of these firms may have more than one business entity related to the same bank (which indicates strong relationship), these firms are more experienced (older age) and they have more assets (see Appendix IV; Table 8).

To control for the robustness of the model, I conduct a separate estimation in the second regression in Table 4. This regression includes the variable Term Spread, which indicates the change in interest rates in the aggregate economy. I measure this change by the difference between the yield on 5-year government bonds and 3-month Treasury bills. Instead of using corporate bonds, I use government bonds (the availability of corporate bonds is very limited because of the thin markets in Finland).

<sup>2</sup> See the correlation matrix in Appendix IV. Requirement of personal guarantee (Pergua) has negative and statistically significant correlation with the maturity of the loan (Maturity). According to the additional probit-regression (not reported), it is likely that the firm has higher internal risk rating when personal guarantee is required.

The results reported in the first regression are robust after controlling for Term Spread in the second regression.

I also test for homoskedasticity (White-corrected p-values) and normality (Kolmogorov–Smirnov, QQ-plot) for the error term, but find no serious problems.

I analyze relationship characteristics, borrower risk, and cost effects in the regression in column (3) of Table 4. I test whether the high-risk firms (R3–5) are related to more variation in interest rates than are low-risk firms (R1–2). I assume that the difference between the first- and second-lowest risk classes is smaller than the difference between the second- and third-lowest risk classes. The results show that high-risk firms consistently pay higher interest rates than do low-risk firms.

In addition, in the fourth (4) regression in of Table 4, I test whether the essential relationship characteristic, Log (Duration), is associated with borrower risk. I add an interaction term, R3–5 \* Log (Duration), to the fourth regression and find that as the relationship matures, the loan rate for high-risk firms decreases. This result indicates that a longer relationship is especially beneficial for high-risk firms in terms of the cost of credit. Moreover, the parameter value is statistically significant at the 5% level. For low-risk firms, the effective interest rate also decreases as the relationship matures, but the effect is smaller than for high-risk firms.

I construct an additional test to examine whether the youngest high-risk firms (less than 2 years of age) benefit from establishing long-term relationships with the bank. My findings also support this approach, which has a consistent (negative) parameter sign, although without a statistical significance.

I also conduct a similar estimation for the interaction term R3–5\* Log (Financial Services). The sign is consistent (negative) to the interaction of firm risk and duration of relationship, but has no statistical significance.

My results indicate the importance of the riskiness of the borrower when the bank/firm relationship matures. It seems that when a firm and a bank establish a long-term relationship, they develop a mutual trust, which is indicated by the significantly decreasing slope of Log (Duration) for both borrower types. This decreasing slope is even more pronounced for high-risk firms. The implication is that a long-term relationship with the bank is desirable for small businesses. Although high-risk firms have to pay higher interest rates than do low-risk firms in the beginning of the relationship, as the relationship matures the loan rate decreases more for high-risk firms than for low-risk firms.

To confirm that the regression results (1)–(4) are not the result of sample selection bias, in regression (5) of Table 4 I examine a reduced regression model with 625 observations. As two firm-specific variables, Log (Leverage) and Log (Total Assets), are the main reason for the lack of observations in the first four regressions, I drop those variables in order to increase the number of observations in the fifth regression. Also, I leave out Non-bank Guarantee, since it has had no significance in previous regressions. In addition, none of the (dropped) firm-specific variables is significant in the subsample regressions, which increases the reliability of my robustness check. I do not find that my results are affected by sample selection bias.

I test the robustness of the previous regressions by running a model with exactly the same data matrix used in the first four regressions in Table 4, but with a reduced variable set. The results remain consistent (not reported). Since the reduced regression (5) includes the interaction term, I check the robustness by running an additional regression without the interactive term and with the original five risk classifications (not reported). The results remain consistent.

It is possible that interest rates and collateral coverage of the loan are simultaneously determined (Brick et al. 2003). Therefore, I test potential endogeneity problems among

independent variables, especially in the assumption of the exogeneity of Collateral, in my analysis. To conduct this type of test, I use two-stage regressions by setting total asset of the firm (log Total Assets) as an instrument variable for Collateral in the regression analysis. The main results remain consistent with previously reported results. The sign and magnitude of log Duration is consistent. Also, the earlier observation of the interaction term  $R3-5 * \text{Log (Duration)}$  remains consistent with both in sign and in magnitude (Appendix II; Table 6).

I also test the potential endogeneity problems with the number of financial services (log Financial Services) and the size of the loan (log Loan size). I use total assets (log Total Assets) as an instrument variable for financial services (log Financial Services) and for the size of the loan (log Loan size). The results are consistent with the tests of the endogeneity of Collateral (endogeneity rejected).

In comparison between the effective loan rate and the conventional non-effective loan rate (arrangement fees excluded), the results of non-effective loan rate are reported in Appendix III (Table 7). I note that adjusted explanatory power is much less compared to regressions with effective loan rate (Table 4). Significance levels and magnitudes are also smaller in the non-effective loan rate regressions than in the effective loan rate regressions. The results confirm that regressions which include the effective loan rate, outperform the non-effective loan rate, as an explanatory variable.

## 7 Conclusion

In this study I analyze two dimensions of relationship banking, the duration and scope of the relationship. In my empirical study, I analyze unique, small business credit-file data that I obtain from one of the major Finnish banks. The data cover the 7-year period from 1995 to 2001.

I find that longer relationships seem to be associated with stronger bank/firm relationships through lower loan rates. These findings imply that in my data, the benefits of relationship banking are strongly related to the duration of the relationship. When I add the bank's internal risk ratings to the bank/firm relationship analysis, I find that in terms of loan pricing, high-risk firms, in particular, benefit from establishing long-term relationships with the bank. Although on average, high-risk firms seem to pay higher interest rates than do low-risk firms, as the bank/firm relationship matures, the interest rates for high-risk firms decrease more than for low-risk firms. The implication of this result basically supports the view that to receive economic benefits, high-risk firms should establish a close, long-term relationship with the bank.

I also analyze the effective interest rate of the loan. To my knowledge, this is the first study that analyzes bank/firm relationship effects by taking the effective interest rate of the loan into account.

My data include detailed information on loan-specific loan arrangement fees for the bank. I find that in general, and if it is possible, I should always calculate the arrangement fees as part of the nominal interest rate spread. By doing so, I am able to obtain more realistic and useful research results.

I control the bank/firm relationship measures for collateral, firm, and loan characteristics. I find that the requirement of a personal guarantee is related to a higher interest rate and that riskier firms are more likely to give personal guarantees. My firm-specific control variables include a range of risk measures such as the degree of leverage, firm size and the bank's internally determined risk-rating class. For loan-specific controls, loans with longer maturity and larger size seem to be related to significantly lower interest rates.

My study examines some specific factors associated with relationship duration, scope, and borrower quality. The overall implication of my results is that a long bank/firm relationship is valuable and desirable to small businesses.

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## Appendix I

### Multiple Loans Control

**Table 5** Relationship characteristics are controlled by firm-specific repetitive loan decisions (Loan Repetition) in equations (1)–(3), and non-first loans are excluded in equation (4)

Explanatory variables	(1)	(t)	(2)	(t)	(3)	(t)	(4)	(t)
Intercept	2.785***	(11.77)	2.707***	(11.54)	2.700***	(18.72)	2.864***	(14.31)
Relationship characteristics								
Log (Duration)	-0.130***	(-3.20)	-0.103**	(-2.41)	-0.055**	(-2.05)	-0.054*	(-1.70)
Log (Financial Services)	0.039	(0.93)	0.036	(0.90)			0.002	(0.05)
Loans	0.048**	(2.52)	0.056***	(2.94)	0.043***	(2.87)	0.031	(1.31)
Multiple	0.013	(0.26)	0.024	(0.47)				
Liabilities	0.0003	(0.05)	0.0003	(0.05)				
Collateral characteristics								
Collateralization	-0.001*	(-1.73)	-0.001	(-1.61)	-0.001*	(-1.91)	-0.002**	(-2.10)
Personal guarantee	0.175***	(3.09)	0.183***	(3.25)	0.235***	(5.52)	0.182***	(3.13)
Non-bank guarantee	-0.048	(-0.68)	-0.039	(-0.57)				
Firm characteristics								
Log (leverage)	-0.014	(-0.45)	-0.020	(-0.62)				
Log (firm age)	0.056	(1.28)	0.063	(1.45)	0.017	(0.63)		
Log (total assets)	-0.008	(-0.32)	-0.011	(-0.46)			-0.0002	(-0.01)
Legal form	-0.0008	(-0.01)	0.011	(0.18)	0.008	(0.19)		
R2	-0.027	(-0.33)					0.047	(0.49)
R3	0.037	(0.61)					0.051	(0.74)
R4	0.114	(1.47)					0.081	(0.86)
R5	0.200*	(1.95)					0.110	(0.95)
R3–5			0.351***	(2.76)	0.226**	(2.18)		
R3–5 * log (duration)			-0.132**	(-2.28)	-0.088*	(-1.77)		
Loan characteristics								
Maturity	-0.039***	(-4.62)	-0.041***	(-4.86)	-0.055***	(-9.32)	-0.034***	(-3.86)
Log (loan size)	-0.206***	(-6.81)	-0.203***	(-6.86)	-0.179***	(-10.44)	-0.227***	(-7.55)
Loan repetition	-0.080	(-1.62)	-0.092*	(-1.86)	0.005	(0.14)		
Obs.	279		279		625		223	
Adj. R2	0.526		0.534		0.499		0.620	

Loan Repetition indicates “0” if the loan is the first issued loan at the data period, otherwise “1” for consecutive loans. OLS-regressions. Dependent variable: Log (effective rate). I control for year-dummies and industries in the estimations, I do not report parameter values. Data: bank loans, 1995–2001

\*, \*\*, \*\*\* Significance at the 10, 5, and 1% levels, respectively

## Appendix II

### Endogeneity Tests

**Table 6** Dependent variable is the effective loan rate (effective rate)

Explanatory variables	Endogeneity test for collateralization				Endogeneity test for loan size			
	First stage		Second stage		First stage		Second stage	
	(1)	(t)	(2)	(t)	(3)	(t)	(4)	(t)
Intercept	2.705***	(11.47)	1.835*	(1.78)	2.705***	(11.47)	2.583***	(10.04)
Log (duration)	-0.094**	(-2.22)	-0.106**	(-2.19)	-0.094**	(-2.22)	-0.100**	(-2.30)
Log (financial services)	0.031	(0.76)	0.038	(0.83)	0.031	(0.76)	0.031	(0.78)
Loans	0.045**	(2.46)	0.041**	(2.18)	0.045**	(2.46)	0.042**	(2.32)
Multiple	0.034	(0.69)	0.059	(0.99)	0.034	(0.69)	0.051	(0.97)
Liabilities	-0.002	(-0.29)	-0.004	(-0.58)	-0.002	(-0.29)	-0.002	(-0.38)
Collateralization	-0.001	(-1.59)	0.003	(0.46)	-0.001	(-1.59)	-0.001	(-1.62)
Personal guarantee	0.181***	(3.21)	0.285*	(1.69)	0.181***	(3.21)	0.178***	(3.08)
Non-bank guarantee	-0.040	(-0.57)	-0.004	(-0.05)	-0.040	(-0.57)	-0.024	(-0.35)
Log (leverage)	-0.018	(-0.55)	-0.014	(-0.41)	-0.018	(-0.55)	-0.011	(-0.36)
Log (total assets)	0.057	(1.30)			0.057	(1.30)		
Log (firm age)	-0.017	(-0.68)	0.039	(0.85)	-0.017	(-0.68)	0.049	(1.13)
Legal form	0.011	(0.19)	0.042	(0.65)	0.011	(0.19)	0.020	(0.33)
R3-5	0.333***	(2.62)	0.376**	(2.10)	0.333***	(2.62)	0.296**	(2.35)
R3-5 * log (duration)	-0.124**	(-2.12)	-0.141*	(-1.88)	-0.124**	(-2.12)	-0.111*	(-1.91)
Maturity	-0.040***	(-4.68)	-0.042***	(-3.69)	-0.040***	(-4.68)	-0.033***	(-3.34)
Log (loan size)	-0.201***	(-6.78)	-0.189***	(-4.00)	-0.201***	(-6.78)	-0.237***	(-5.72)
Obs.	279		279		279		279	
Adj. R2	0.529		0.470		0.529		0.525	

Two nonlinear 2SLS tests is regressed separately for potential endogenous variables collateralization and log (loan size). The instrumental variable is log (total assets) in both independent regressions

\*, \*\*, \*\*\* Significance at the 10, 5, and 1% levels, respectively



### Appendix III

#### Conventional Rate

**Table 7** Explanatory variable is the conventional non-effective rate (arrangement fees excluded)

Explanatory variables	(1)	(t)	(2)	(t)	(3)	(t)	(4)	(t)	(5)	(t)
Intercept	8.175***	(6.56)	7.895***	(5.75)	8.140***	(6.61)	7.801***	(6.31)	10.360***	(7.39)
Relationship characteristics										
Log (duration)	-0.423**	(-2.00)	-0.418**	(-1.97)	-0.447**	(-2.13)	-0.291	(-1.30)	-0.392	(-1.51)
Log (financial services)	0.053	(0.25)	0.049	(0.23)	0.086	(0.040)	0.047	(0.22)		
Loans	0.063	(0.66)	0.064	(0.67)	0.058	(0.62)	0.097	(1.02)	0.096	(0.69)
Multiple	0.257	(0.97)	0.242	(0.91)	0.276	(1.04)	0.314	(1.19)		
Liabilities	-0.007	(-0.24)	-0.006	(-0.20)	-0.011	(-0.38)	-0.008	(-0.28)		
Collateral characteristics										
Collateralization	-0.005	(-1.25)	-0.005	(-1.23)	-0.005	(-1.29)	-0.005	(-1.15)	-0.005	(-0.93)
Personal guarantee	0.675**	(2.27)	0.676**	(2.27)	0.680**	(2.29)	0.711**	(2.40)	1.262***	(3.06)
Non-bank guarantee	-0.474	(-1.28)	-0.464	(-1.25)	-0.470	(-1.27)	-0.433	(-1.18)		
Firm characteristics										
Log (leverage)	0.004	(0.02)	0.008	(0.05)	0.016	(0.10)	-0.017	(-0.10)		
Log (firm age)	0.071	(0.31)	0.073	(0.32)	0.061	(0.27)	0.094	(0.41)	0.124	(0.47)
Log (total assets)	0.131	(1.00)	0.134	(1.03)	0.135	(1.05)	0.104	(0.81)		
Legal form	-0.113	(-0.36)	-0.122	(-0.39)	-0.120	(-0.38)	-0.069	(-0.22)	-0.245	(-0.56)
R2	-0.126	(-0.29)	-0.172	(-0.39)						
R3	0.020	(0.06)	0.021	(0.07)						
R4	0.217	(0.53)	0.213	(0.52)						
R5	0.831	(1.54)	0.827	(1.53)						
R3-5					0.200	(0.76)	1.426**	(2.14)	0.284	(0.28)
R3-5 * log (duration)							-0.610**	(-2.00)	-0.173	(-0.36)
Loan characteristics										
Maturity	-0.133***	(-2.97)	-0.135***	(-3.00)	-0.131***	(-2.95)	-0.140***	(-3.15)	-0.276***	(-4.85)
Log (loan size)	-0.700***	(-4.40)	-0.701***	(-4.39)	-0.706***	(-4.54)	-0.673***	(-4.32)	-0.764***	(-4.59)
Term			0.126	(0.49)						
Repetitive										
Obs.	279		279		279		279		625	
Adj. R2	0.250		0.248		0.252		0.261		0.147	

OLS-regressions. Dependent variable: Log (non-effective rate). I control for year-dummies and industries in the estimations, I do not report parameter values. Data: bank loans, 1995–2001

\*, \*\*, \*\*\* Significance at the 10, 5, and 1% levels, respectively

**Appendix IV**

**Correlation Matrix**

**Table 8** Correlation matrix of explanatory variables

	Ldurati	Lfinser	Loans	Multi	Liabil	Collat	Pergua	Non-B	Leverage	Lfrage	Ltotass	Legtype	R3-5	R3-5 * Ldurati	Maturity
Ldurati	1														
Lfinser	0.499	1													
Loans	0.313	0.354	1												
Multi	0.163	0.228	0.154	1											
Liabil	0.213	0.308	0.258	0.270	1										
Collat	0.090	-0.053	-0.015	0.010	0.050	1									
Pergua	-0.249	-0.150	-0.099	-0.178	-0.042	-0.316	1								
Non-B	-0.050	-0.0007	0.061	-0.031	0.030	-0.127	0.081	1							
Leverage	0.049	0.076	0.091	-0.067	-0.004	0.003	0.044	0.019	1						
Lfrage	0.636	0.402	0.244	0.180	0.006	0.052	-0.261	-0.041	-0.035	1					
Lrassets	0.244	0.352	0.294	0.193	0.028	-0.188	-0.195	0.158	-0.197	0.365	1				
Legtype	0.267	0.048	-0.008	-0.047	0.047	0.135	-0.162	-0.162	0.178	-0.048	-0.364	1			
R3-5	-0.004	0.130	0.161	0.090	0.086	-0.127	0.050	0.137	0.146	0.115	0.167	-0.204	1		
R3-5*Ldurati	0.184	0.190	0.251	0.123	0.138	-0.089	0.0008	0.128	0.104	0.212	0.203	-0.163	0.868	1	
Maturity	-0.103	-0.040	0.009	-0.030	-0.071	0.019	-0.177	0.044	-0.167	-0.042	0.021	0.035	-0.055	-0.088	1
Loansize	-0.016	0.172	0.100	0.180	-0.033	-0.146	-0.195	0.207	-0.140	0.189	0.625	-0.349	0.156	0.151	0.425

Italicized values indicate significance at the 5% level

Abbreviations: *Ldurati*=Log (duration), *Lfinser*=Log (financial services), *Multi*=Multiple, *Liabil*=Liabilities, *Collat*=Collateralization, *Pergua*=Personal Guarantee, *Non-B*=Non Bank Guarantee, *Lfrage*=Log (firm age), *Ltotass*=Log (total assets), *Legtype*=Legal Form. Data: bank loans, 1995–2001

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