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Number of Bank Relationships: An Indicator of Competition, Borrower Quality, or just Size?

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Abstract: In this study the firms' choice of the number of bank relationships is analyzed with respect to influential factors like borrower quality, size and the existence of a close housebank relationship. Then, the number of bank relationships is used as a proxy to examine if bank competition is reflected in loan terms. It is shown that the number of bank relationships is foremost determined by borrower size and the existence of a housebank relationship. Loan rate spreads are not effected by the number of bank relationships. However, borrowers with a small number of bank relationships provide more collateral and get more credit. These effects are amplified by a housebank relationship. Housebanks get more collateral and are ready to take a larger stake in the financing of their customers.

Keywords: Relationship banking, Bank loan terms; Internal borrower rating

JEL classification: G21

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1. Introduction

In the empirical literature on relationship banking the number of bank relationships is widely used as a proxy for the strength of bank-customer-relationships or borrowing concentration of a bank customer (see Petersen and Rajan, 1994; Houston and James, 1996; Harhoff and Körting, 1998a, 1998b; Machauer and Weber, 1998; Ongena and Smith, 1999; D'Auria, Foglia and Reedtz, 1999). Such a proxy can be understood as an indicator for the negotiation power of credit granting banks. Negotiation power may help banks to extract excess returns in loan business. However, the number of bank relationships variable does not take other banks into account which are currently not doing business with the borrower but which are additional potential competitors for the relationship banks.

A possible impact of a high number of bank relationships is that firms can play banks off against each other. If they are willing to do so, the maximum possible degree of competition between banks takes place. Otherwise, if customers feel tied to their main bank or housebank, as it is called in this study, competition even if possible can not develop its abilities to the full.

While the link between the number of bank relationships and competition seems to be plausible there are other facts that could be represented by the number of bank relationships. Petersen and Rajan (1994) interpret the number of bank relationships as a hint to the firms' quality. If a firm is unable to get additional funds from one bank, it approaches other banks for credit. The unwillingness of the original bank to increase lending might indicate that the quality of the potential borrower is low.

Finally, the size of firms should have influence on their number of bank relationships. Larger firms require a wide range of bank transactions which may be allotted to a variety of specialized banks (see Ongena and Smith, 1999). This is especially true for companies with an emphasis on international business.

In this paper, we put the above arguments in a broader theoretical context. Then, we use data from six leading German banks and apply a two step analysis. At first, we try to discover possible factors which influence the number of bank relationships chosen by firms. Secondly, we analyze the effect of the number of bank relationships on bank competition operationalized by loan term requirements of banks. The data consists of randomly chosen credit files of two hundred and sixty small and medium-sized firms which had a credit relationship with one of the six banks within the years 1992 to 1996.

A special feature of our analysis is that we could use bank internal credit ratings as a proxy for borrower quality. Additionally our data set contains a so called "housebank"-variable

defined to be “one” if the bank feels to be in a close relationship to its customer and “zero” if this is not the case. With these variables we are able to control for effects of borrower quality and for soft facts which influence the strength of the relationship but which are not honored by using the “number of banks”-variable.

It is shown that company size and the existence of a housebank relationship correlate with the number of bank relationships. Borrower quality, even combined with the existence of a housebank, has no effect on the number of bank relationships. Loan terms like collateralization and credit availability from one bank are influenced by the number of bank relationships whereas interest rates are not. Collateralization and credit availability from a certain bank is negatively correlated to the number of bank relationships. For borrowers with only a few bank relationships, the existence of a close relationship to a housebank leads to more collateralization. Credit availability is improved for all borrowers with a housebank relationship.

2. Recent literature

The theoretical literature on competition in relationship banking circles around the discussion of how many bank relationships might be favorable for borrowers. Sharpe (1990) and Rajan (1992) point out that exclusive relationships to main banks or only a few banks create “information monopolies” or hold-up problems. During such close relationships the problem of asymmetric information gets less severe because banks can assess the firm’s quality and reliability better. However, they do not quote adequate terms of lending. They recognize that lenders who want to change banks face switching costs. Other banks must insist upon stricter loan terms because their assessment quality is weaker. Thus main banks are able to require stricter loan terms with respect to borrower quality than what is just admissible without such monopoly effects.

Petersen and Rajan (1995) propose a strong relationship to main banks over time as a possibility to overcome rationing problems. Their contribution to the literature complements the approaches of Bester (1985), Besanko and Thakor (1987) and Bester and Hellwig (1987) who used loan terms and collateralization as signaling and incentive mechanisms. In their model, Petersen and Rajan show that a close relationship to their borrowers enables banks to require moderate terms of lending (especially lower interest rates) relative to average borrower quality in the early stage of a relationship and stricter terms of lending (especially higher interest rates) in later stages when the average borrower quality has risen because borrowers of bad quality went into bankruptcy. Thus banks smooth the dynamics of terms of

lending over time according to changes in borrower quality. This mechanism leads to gains in efficiency because the necessity of credit rationing given borrower quality can be reduced or avoided.

Under the assumption that hidden information problems are severe Detragiache, Garella and Guiso (1997), in their model, propose that despite high transaction costs a multitude of bank relationships is optimal for borrowers who want to insure themselves against rationing which is to be expected in times of liquidity problems of their main bank. Similar to Petersen and Rajan (1994), they argue that a denial to roll over credit by the main bank will be an unfavorable signal to outside banks who can not assess borrower quality accurately because of a lacking relationship history. These outside banks will suppose bad borrower quality being the reason for the denial.

The argument of favoring fewer bank relationships is supported by the fact that transaction costs, the costs of opening and coordinating bank accounts, play a role in the decision of how many bank relationships are suitable. We hypothesize a tendency of the number of bank relationships growing with firm size because large firms require a wide range of bank transactions which may be allotted to a variety of specialized banks. Additionally, large firms have their specialized financial department that does not bother handling business with a wide variety of banks.

Using descriptive statistics Ongena and Smith (1999) find weak evidence for a relation between the number of bank relationships and firm size. They refer to data of large European firms. The results of Harhoff and Körting (1998b) confirm this view for large German firms which tend to have many institutional creditors. Both studies are not able to make accurate statements about the correlation of the number of bank relationships and borrower quality. While Ongena and Smith in their regression analysis do not introduce any variable serving as a proxy for borrower quality, Harhoff and Körting only use a dummy variable for distressed firms. They show that such firms have more creditor relationships.

Other studies only use the number of bank relationships as an exogenous variable in regressions of bank loan terms like interest rates, collateralization and availability of credit. Interpreting the number of bank relationships as a proxy for competition, the effect of competition on loan terms can be measured by these analyses.

Petersen and Rajan (1994) find a significantly positive relationship between the level of interest rates and the number of bank relationships. This finding is contrary to our view that the number of bank relationships represents competition which should lead to lower interest rates. However, Petersen and Rajan interpret a small number of bank relationships as a signal

for high borrowing concentration that leads to lower interest rates because certain banks have larger loan sizes which they honor with a discount. An opposing view is that larger loan sizes are linked with an extension of bank exposure to borrower risk. Thus, the expected loss is higher and therefore interest rates should be higher. However, empirical studies in this field like Ewert and Schenk (1998) and Machauer and Weber (1998) do not support this view.

3. Data

3.1. General description

Our data on bank-borrower-relationships was drawn from a set of credit files coming from six major German banks: Bayerische Vereinsbank, Deutsche Bank, Commerzbank, DG Bank, Dresdner Bank, and WestLB. These banks represent six of the nine biggest banks in Germany at the end of the year 1996. The data covers the period from January 1992 to December 1996. Since the analysis focuses on small and medium-sized firms the set of feasible relationships is generally limited to firms with an annual turnover between EUR 25 and 250 million. Furthermore the minimum loan size should not be under EUR 1.5 million.[1] No relationships with firms of the eastern part of Germany, the former German Democratic Republic, were involved because the nature of such relationships is dominated by industrial restructuring with a specific risk structure in credit portfolios that is expected to differ substantially from that of customers in the western part of Germany. For a detailed description of the data set see Elsas, Henke, Machauer, Rott and Schenk (1998). See Elsas and Krahnen (1998, 1999), Ewert and Schenk (1998) and Machauer and Weber (1998) for first results gained from the analyses of this data set.

The data set consists of sample A and sample P. For sample A 125 customer relationships were taken randomly from the population of “all” the borrowers described above. Usually, the whole credit history of these relationships is available for the period of 1992 to 1996. However, some credit relationships with borrowers of very good quality were not evaluated every year. Sample P consists of 135 customer relationships. It was drawn from a subset of the population of all borrowers described above with the special characteristic that they are “problematic” or "potentially distressed". The characteristic “problematic” or “potentially distressed” was defined as a borrower being of category 5 or 6 on a calibrated credit rating scale of 1 to 6 (described below) once between 1992 and 1996. Sample P was drawn to

[1] The exchange rate of the Euro in US-Dollars at the end of 1996 was: .7940 US$/EUR.

strengthen the number of customers with poor credit ratings which otherwise would be too small to generate statistically significant results.

For several credit relationships the data does not cover the full range of the period from 1992 to 1996. The reason for this is that data for some variables was just not available or that some relationships started in the years after 1992.

The rating scale from 1 to 6 was created by Elsas, Henke, Machauer, Rott and Schenk (1998) to make the internal ratings of the six banks in this study comparable. In order to achieve this calibration the rating subcategories on certain borrower characteristics were matched to get the new six rating classes with 1 being very good, 2 being good or above average, 3 being average, 4 being below average, 5 being problematic and 6 being very much in danger of default.

3.2. Definition of the variables

The variables used for the following analysis are shown in Table 1. We begin by explaining variables of the debt *contract*. The loan rate spread (SPREAD) is defined as the difference between the loan interest rate for withdrawals on current accounts and the capital market interest rate for the same duration of lending. We used the 3-month Frankfurt Interbank Offered Rate (FIBOR3M) as our reference. Bankers consider this rate as the appropriate *market* rate to refinance this kind of lending because borrowers usually do not repay their loans on a day-to-day basis, even if they can.

To define the collateralized percentage of the lines of credit (COLLAT), we used the internal evaluation of the liquidation value of collateralized assets on which banks base their decision making. Total lines of credit (TLC) include all forms of credit a bank grants to its customers, i.e. lines of credit for cash loans, discounted bills, guarantees and margins of derivatives. Banks refer to these overall lines in decision making on an increase or decrease of their loan business with the customer.

The number of bank *relationships* with a loan engagement of the bank is represented by NUMBANK which is an integer variable ranging from one to forty in our data set. It is used as dependent variable in the regression of the next chapter. In the regressions which identify the effect of the number of bank relationships or, finally, the effect of competition on loan terms a set of dummy variables is used to enable us distinguishing the effects of different numbers of bank relationships. NUMB1_3 has a value of one if the number of bank relationships a borrower has is one to three, else it has a value of zero. NUMB4_7 is defined similarly. NUMB8_ equals one if the number of bank relationships is eight or greater than eight, else it equals zero.

To consider effects of the closeness of relationship banking we control for the fact that a so called housebank relationship between the borrower and the bank exists. The HOUSEBANK-variable is equal to one if there is evidence for such a relationship in the credit files of the banks. Sometimes there was a direct indication like: "We are the housebank", sometimes the activities of the bank commented in the credit file gave hints to housebank relationships. We thus use a direct variable of a housebank indication while other studies like Blackwell and Winters (1997), Berger and Udell (1995), Petersen and Rajan (1994, 1995) and Boot and Thakor (1994) used indirect variables like the age of the firm and the duration of the bank-customer relationship (DURATION). The latter variable is also used in our study. The variable NON-HOUSEBANK is complementary to the HOUSEBANK variable.

Variables on *risk* characterize default risk of borrowers without taking collateral into account. Dummy variable R12 equals one if a borrower is of rating category 1 or 2 and zero otherwise. R3 is one if a borrower is of rating category 3 and so on. We combined rating categories 1 and 2 into one variable because only a few borrowers in our sample were of rating category 1.

Table 1. Variable description

Variable	Description
Contract	
SPREAD	spread between loan rate and FIBOR3M
COLLAT	collateralized percentage of borrower total credit line
TLC	Borrower total credit line (thousands of Euros)
Market	
FIBOR3M	3-month Frankfurt Interbank Offered Rate (%)
Relationship	
NUMBANK	Number of bank relationships
NUMB1_3	= 1 if the number of bank relationships is 1, 2 or 3; = 0 else
NUMB4_7	= 1 if the number of bank relationships is 4, 5, 6 or 7
NUMB8_	= 1 if the number of bank relationships is 8 or greater than 8
NON-HOUSEBANK (NB)	= 1 if bank does not feel as housebank of the borrower
HOUSEBANK (HB)	= 1 if bank feels as housebank of the borrower
DURATION	Duration of the bank-customer relationship in years
Risk	
R12	= 1 if borrower is of rating category 1 or 2
R3, R4, R5, R6	= 1 if borrower is of rating category 3, 4, 5 or 6 respectively
Governance	
CORP	= 1 if borrower is a corporation (AG, KGaA, GmbH)
PARTNER	= 1 if borrower is a partnership
PROP	= 1 if borrower is a sole proprietorship
Size	
TA	total assets
TO	turnover
Banks	
B1, B2, B3, B4, B5, B6	= 1 if bank 1, 2, 3, 4, 5 or 6 is the lender

Variables on *governance* characterize the legal form of the firms. The dummy variable CORP indicates whether the firm is a corporation, i.e. Aktiengesellschaft, Kommandit-gesellschaft auf Aktien or a Gesellschaft mit beschränkter Haftung in Germany. PARTNER indicates whether the firm is a partnership like Offene Handelsgesellschaft or Kommanditgesellschaft and PROP indicates whether there is a sole proprietor of the firm who usually manages its business like an Einzelunternehmung in Germany. In partnerships and in proprietorships the owners are liable for the firm's debt with their whole private property whereas in corporations the liability of the owners is limited to their contribution to capital.

Total assets (TA) of the borrowers represent company size. As seen in many studies, size has an effect on loan terms. It should also be a factor for the decision on the number of bank relationships as previously explained. In the regression of total credit lines relative to total assets we use the turnover (TO) of the firm to avoid interdependencies between the dependent and the independent variables.

The dummy variables on *banks* help to control for bank specific effects. B1 to B6 are equal to one if the credit file which was analyzed comes from the related bank. We use B1 to B6 instead of the banks' names in order to maintain confidentiality.

4. Number of bank relationships

4.1. Descriptive statistics

In order to give an impression of the distribution of the number of bank relationships borrowers maintain table 2 shows some descriptive statistics for the years of 1992 to 1996, respectively. It seems that borrowers' bank relationships remain stable over time because the statistics do not indicate significant changes. The number of valid observations for the different years is smaller than the number of borrowers in the data set which is 260. The fact that we could not get reliable data for every data field and every year is responsible for this.

As the frequencies for the certain numbers of bank relationships illustrate, about one third of the companies generally have three or less than three relationships. Another third has four to seven bank relationships and the rest has eight or more than eight relationships. The median for the number of bank relationships throughout all years from 1992 to 1996 is five. For the years between 1993 to 1996 the average number of bank relationships is below six. In 1992 it is slightly above six.

Table 2. Descriptive statistics on the number of bank relationships

statistic	1992	1993	1994	1995	1996
valid observations	169	174	197	187	190
mean	6.21	5.84	5.68	5.66	5.70
standard deviation	4.01	4.53	4.26	4.48	4.60
median	5	5	5	5	5
minimum	1	1	1	1	1
1^{st} tercile	4	4	3	3	3
2^{nd} tercile	7	6	7	6	7
maximum	25	40	40	40	40
frequencies [%]					
NUMBANK = 1	4.14	5.75	5.08	6.42	6.29
NUMBANK = 2	10.65	12.64	12.69	12.30	12.05
NUMBANK = 3	13.61	13.79	16.75	17.11	15.21
NUMBANK = 4	12.43	12.64	11.17	10.16	16.32
NUMBANK = 5	9.47	13.22	12.18	11.76	11.11
NUMBANK = 6	10.65	12.07	9.14	10.70	10.53
NUMBANK = 7	10.65	5.17	10.66	12.30	10.08
NUMBANK = 8	4.73	6.90	8.12	5.88	4.21
NUMBANK = 9	8.28	5.75	2.54	1.07	3.16
NUMBANK ≥ 10	15.39	12.07	11.67	12.30	11.04

The numbers here are comparable with the findings of Ongena and Smith (1999) who analyze bank relationships of companies of different countries in Europe. Their German subsample of medium-sized and large firms also show a median of five bank relationships while the mean is 8.1. 39.7 percent of their German companies have between three to seven bank relationships while in our data set the proportion is about 33 percent. For their sample of small companies Harhoff and Körting (1998b) found the average number of bank relationships being around two.

Considering the terciles calculated for the certain years we can divide the data set in three equally sized groups with the number of bank relationships ranging from one to three (NUMB1_3), four to seven (NUMB4_7) and eight or more than eight (NUMB8_). We use this kind of partitioning in the following chapters for the analysis of loan terms.

4.2. Regressions analysis

In a regression analysis with the number of bank relationships as the dependent variable we try to identify possible determinants of this variable. The number of bank relationships in the data set is an integer variable ranging from a minimum value of one to a maximum value of 40. The distribution of this variable can be approximated by a Poisson pattern. Therefore, we use a random effects Poisson regression model (see Hausman, Hall and Griliches, 1984 for details). The random effects panel model eliminates borrower- and time-specific effects with

the inclusion of separate random error terms for borrower specialties and time specialties (see Baltagi, 1996).

The estimated coefficients of the independent variables are listed in table 3. The first two columns refer to a regression (1) with the HOUSEBANK-variable and the rating variables R12 to R 6 being separated. The second regression (2) uses interaction variables for the combined belonging to a certain rating category and to the housebank or non-housebank group. All other variables are used similarly to regression (1).

It can be seen that like in Ongena and Smith (1999) and Harhoff and Körting (1998b) firm size represented by the logarithm of total assets of the firms (lnTA) has a statistically significant effect on the number of bank relationships. Larger firms use a greater number of banks for their financial business supporting the hypotheses that such firms need a variety of specialized banks for their business and that they dispose of more personnel to handle bank transaction.

The DURATION of the bank relationship which is a proxy for the duration of bank relationships of the customer in general is also statistically but not economically significant. In another regression we also used the logarithm of the DURATION-variable and found similar results. With this in mind, we do not try to interpret the effect of the DURATION-variable any further.

In comparison, the coefficient of the HOUSEBANK-variable indicates significant influence on the number of bank relationships. It shows that customers with whom the banks feel to have a closer relationship dispose of a smaller number of alternative bank relationships (.236 less on average). Thus, competition should play a minor role in their relations. We address this hypothesis in the next chapter directly.

Borrower quality, which is denoted by the dummy variables R12, R3, R4, R5 and R6 here, does not have substantial influence on the choice of the number of bank relationships. Regression (2) with interaction variables RH12 to RH6 and RN12 to RN6 combines the belonging to a certain category of borrower quality (R12 to R6) with the existence of a housebank relationship or a non-housebank relationship (HOUSEBANK, NON-HOUSEBANK). In table 4 the differences between firms with and without housebank relationships within the rating categories are presented. The results are gained by variations of regression (2) with the non-housebank groups being the reference variables. These results support the housebank effect found above throughout all rating categories.

Table 3. Regression of the number of bank relationships NUMBANK (coefficients of the independent variables, standard errors in parentheses)

Independent variables	(1)		(2)	
lnTA	.165***	(.020)	.161***	(.020)
DURATION	.006***	(.001)	.006***	(.001)
NON-HOUSEBANK	reference			
HOUSEBANK	-.236***	(.037)		
R12	reference			
R3	-.005	(.035)		
R4	.018	(.039)		
R5	-.035	(.042)		
R6	-.011	(.060)		
RN12			reference	
RN3			-.088**	(.040)
RN4			-.098**	(.043)
RN5			-.167***	(.049)
RN6			-.144**	(.073)
RH12			-.342***	(.059)
RH3			-.319***	(.056)
RH4			-.305***	(.053)
RH5			-.286***	(.060)
RH6			-.263***	(.095)
CORP	reference		reference	
PARTNER	.182***	(.070)	.188***	(.070)
PROP	-.412***	(.118)	-.411***	(.119)
B1	reference		reference	
B2	-.111	(.080)	-.127	(.080)
B3	.057	(.092)	.081	(.092)
B4	-.357***	(.095)	-.343***	(.095)
B5	-.121	(.090)	-.092	(.090)
B6	-.307***	(.124)	-.334***	(.124)
constant	-.002	(.243)	.123	(.243)
	χ^2 (14) = 217.42***		χ^2 (18) = 223.12***	
	no. obs. = 723		no. obs. = 723	

*** Statistically significant at or better than the 1% level, two-tailed
** Statistically significant at or better than the 5% level, two-tailed
* Statistically significant at or better than the 10% level, two-tailed

In the variations of regression (2) the coefficients of the interaction variables RH12 to RH6 and RN12 to RN6 also suggest that there are no economically significant deviations between different rating categories within the housebank and non-housebank groups. Thus, we come to the conclusion that the number of bank relationships chosen by the firms are not driven by their credit rating. Rather, the closeness of the relationship which is analyzed here shows distinct correlation to the number of bank relationships in total. The problem to say which

variable, the number of bank relationships or the housebank property, is the driving factor, is comparable with the question who was there first, the duck or the egg.

Table 4. Differences between the housebank and non-housebank subgroups of the various rating categories gained by variations of the regression of the number of bank relationships with changing referential variables (coefficients of the housebank interaction variables, standard errors in parentheses)

Rating category	non-housebank	housebank	
R12	reference	-.342***	(.059)
R3	reference	-.276***	(.052)
R4	reference	-.264***	(.048)
R5	reference	-.196***	(.054)
R6	reference	-.263***	(.097)

In the regressions (1) and (2) we also analyzed if the juridical form of the firm is responsible for the number of bank relationships. The reason therefore could be that banks may prefer firms with unlimited liability like partnerships (PARTNER) or sole proprietorships (PROP). For partnerships this hypothesis seems well founded. However, for sole proprietorships the opposite is true. Thus, it is difficult in this respect to come to a final conclusion.

The coefficients of the dummy variables indicating a relationship to one of the banks which delivered data for our analysis (B1 to B6) point to significant differences in the number of bank relationships throughout the customers of different banks. However, this effect is not systematic with respect to bank size.

5. Competition represented by loan terms

In the previous chapter we have seen that the number of bank relationships depends on the size of the firm and the existence of a housebank relationship. Firm quality has no effect. We now turn to the question, whether the number of bank relationships has any impact on bank competition about customers. Therefore, bank loan terms like loan rate spreads and collateralization and credit availability from the bank that delivered data are analyzed with respect to the influence of the number of bank relationships.

5.1. Loan rate spreads

As the number of bank relationships of a customer increases it should be expected that the negotiation power of banks declines and so do loan rate spreads banks earn. We use a normal random effects panel regression model to separate this effect from other effects caused by borrower quality and the development of the general interest rate level over time. The panel

structure of the data requires the application of a random effects panel model which eliminates borrower- and time-specific effects with the inclusion of separate random error terms for borrower specialties and time specialties.

Table 5 shows the estimation results for the coefficients of independent variables. The number of bank relationships variable was introduced by a dummy variable set distinguishing three groups, one group disposing of one to three banks for their financial business (NUMB1_3), another group having four to seven bank relationships (NUMB4_7) and a third group with eight or more than eight bank relationships (NUMB8_). Besides the classification into these groups other classifications were tried. However, more detailed classifications lead to high standard error terms in the estimation procedure which counteract getting significant results. Therefore, we used this kind of classification leading to equally weighted populations corresponding to the terciles gained in the descriptive analysis above. In a variation of this regression, denoted by (2) in the table 5, these groups are divided in two sub-groups, respectively, which are generated by the property of borrowers being in a housebank relationship or not.

Before we come to the results concerning the number of bank relationships the effects caused by other variables should be discussed. The coefficient of the FIBOR3M-variable which represents the level of short-term interbank lending indicates that loan rate spreads are relatively small in times of high general interest rate levels and vice versa. This is a well known phenomenon in banking business. The works of Berger and Udell (1992) and Machauer and Weber (1998) provide empirical evidence for this kind of interest rate smoothing concerning bank loans.

Borrower quality represented by bank internal credit ratings has significant influence on loan rate spreads. The estimation results presented in table 5 show that loan rate spreads increase successively with worsening borrower quality. The worst rating categories R5 and R6 pay around .6 % higher loan rates than the best ones, namely R12. The results go in line with the empirical literature on bond markets (see Fons, 1987 and Altman, 1989) and on bank lending (see Blackwell and Winters, 1997 and Machauer and Weber, 1998)

Missing borrower quality can partially be compensated by offering collateral eventually leading to better loan rates. In the regression of loan rate spreads here a variable for collateralization is omitted because it shows multicolinearities with the variable of the number of bank relationships and thus disturbs the quality of estimation results. Nevertheless, collateralization has a positive influence on loan rate spreads. The more collateralization the cheaper is the loan. We will provide a separate regression with collateralization as the

dependent variable and the number of bank relationships as an independent variable in the following sub-chapter.

Table 5. Regression of loan rate spreads SPREAD (coefficients of the independent variables, standard errors in parentheses)

Independent variables	(1)		(2)	
FIBOR3M	-.321***	(.016)	-.322***	(.016)
lnTA	-.247***	(.057)	-.245***	(.058)
R12	reference		reference	
R3	.196*	(.113)	.190*	(.113)
R4	.388***	(.125)	.369***	(.126)
R5	.600***	(.137)	.582***	(.137)
R6	.672***	(.211)	.645***	(.212)
NUMB1_3	-.048	(.111)		
NUMB4_7	reference			
NUMB8_	.116	(.123)		
NON-HOUSEBANK	reference			
HOUSEBANK	.013	(.103)		
NUMB1_3NB			reference	
NUMB1_3HB			.126	(.156)
NUMB4_7NB			.169	(.152)
NUMB4_7HB			.044	(.173)
NUMB8_NB			.207	(.188)
NUMB8_HB			.305	(.231)
B1	reference		reference	
B2	.525***	(.170)	.522***	(.171)
B3	-.190	(.203)	-.206	(.205)
B4	.144	(.197)	.111	(.201)
B5	.005	(.201)	-.023	(.204)
B6	.367*	(.217)	.345	(.220)
constant	7.775***	(.692)	7.667***	(.673)
	Adj. R^2 = .5334		Adj. R^2 = .5381	
	χ^2 (14) = 584.36		χ^2 (16) = 586,85	
	no. obs. = 561		no. obs. = 561	

*** Statistically significant at or better than the 1% level, two-tailed
** Statistically significant at or better than the 5% level, two-tailed
* Statistically significant at or better than the 10% level, two-tailed

The size of the borrower represented by the logarithm of total assets (lnTA) leads to lower interest rate spreads. This result corresponds with findings in the literature on relationship banking (see Petersen and Rajan, 1994 and 1995, Blackwell and Winters, 1997 and Harhoff and Körting, 1998a). Only Berger and Udell (1995) could not identify this effect.

The influence of the number of bank relationships on interest rate spreads of loans was first examined by Petersen and Rajan (1994). They found a significantly positive effect which

means that the interest rate spread on loans is high when the number of bank relationships is high. Thus, they give support for the hypothesis of Sharpe (1990) and Rajan (1992) that relationships to only one or a few banks generate information monopolies which lead to higher loan terms. Other banks, the borrowers could switch to, face more severe asymmetric information problems because they do not know the borrower's history. As a consequence, to compensate this kind of uncertainty they must require higher loan rate spreads than banks who know the history. Using the number of banks as an independent variable like Petersen and Rajan (1994) Machauer and Weber (1998) found no significant effect of the number of bank relationships on interest rate premiums.

The variable used by Petersen and Rajan (1994) and by Machauer and Weber (1998) corresponds to the dependent variable NUMBANK of the first regression in this paper. In Regression (1) an in-depth approach is tried by using a dummy variable technique to possibly identify structural effects between certain groups of borrowers with differing numbers of bank relationships. However, no significant differences between the groups NUMB1_3, NUMB4_7, NUMB8_ was found. The estimation result concerning the housebank variable which represents the closeness of the bank-customer-relationship support this finding. It shows no significant effect on interest rate spreads.

In regression (2) the three groups NUMB1_3, NUMB4_7 and NUMB8_ are divided into two subgroups respectively. Thereby the suffix HB denotes the fact that borrowers belong to the subgroup with a housebank relationship and the suffix NB denotes the fact that they belong to the subgroup with no housebank relationship. Introducing these interaction variables we tried to identify any effect that would be covered by using the variables on the number of bank relationships and on the existence of a housebank relationship separately as in regression (1). In table 6 the differences are illustrated by coefficients gained from variations of regression analysis (2) with changing referential variables. It can be seen that there is no significant difference between the interest rate spreads of the housebank and nonhousebank subgroups of NUMB1_3, NUMB4_7 and NUMB8_.

Referring to the assumption that bank competition should have an effect on interest rate spreads when it is assured that the analysis controls for other influential variables like general interest rate levels, borrower size and borrower quality we conclude that the number of bank relationships does not represent bank competition, here. However, the question that remains is, if the number of bank relationships has any impact on loan collateralization which is another pricing component. In the next sub-chapter, we discuss influential factors on

collateralization, especially the number of bank relationships, in a separate regression analysis.

Table 6. Differences between the housebank and non-housebank subgroups of borrower groups with different numbers of bank relationships. Results gained by three variations with changing referential variables of the regression of loan rate spreads SPREAD (coefficients of the housebank subgroup variables, standard errors in parentheses)

variable	non-housebank (NB)	housebank (HB)	
NUMB1_3	reference	.122	(.156)
NUMB4_7	reference	-.112	(.142)
NUMB8_	reference	.119	(.214)

5.2. Collateralization

Collateral requirements help to reduce bank exposure to borrower risk. Aside from loan rates collateralization is a pricing factor which is influenced by bank competition. In the following regression analysis we use the percentage of the total credit line which is collateralized as the dependent variable. This variable is censored in so far as it ranges from 0 to 100 in its values. The maximum is 100 percent even if the borrower provides collateral that has more value than the total credit line granted by the bank. The range of values below 0 is not defined. To consider censoring in isolating the effect of competition represented by the number of bank relationships of firms we use a random effects Tobit panel regression model (see Tobin, 1958).

In table 7 the estimated coefficients of independent variables including the number of bank relationships are presented. It can be seen that the number of bank relationships has a significant impact on collateralization. Borrowers of the group with one to three bank relationships (NUMB1_3) collateralize 8.698 % more of their total credit line with the bank than borrowers of the reference group with four to seven bank relationships (NUMB4_7). This difference is significant at the five percent level. Borrowers of the group with eight or more bank relationships (NUMB8_) have to collateralize 6.532 % less of their total credit line than the ones of the reference group. However, this indication is not significant even at the ten percent level.

At first sight, one could argue intuitively that when the number of bank relationships is high the amount of collateral granted to one of these banks is tendentiously low and therefore is not necessarily an indication of competition. However, in our study a relative number, namely the collateralized percentage of the borrowers' total credit line, is regressed on the

independent variables like the number of bank relationships and borrower size. Such a variable which is related to the actual size of loan business with a bank is suitable to make statements about the indications of competition because a credit granting bank would like to make its value as large as possible given the other variables of loan business. Thus, the coefficients referring to the groups of borrowers with different numbers of bank relationships show that a larger number of bank relationships leads to a lower intensity of collateralization signaling that, in this case, competition between banks is strong and negotiation power is weak.

Table 7. Regression of collateralized percentage of the borrower total credit line COLLAT (coefficients of the independent variables, standard errors in parentheses)

Independent variables	(1)		(2)	
lnTA	-2.997	(2.612)	-2.120	(2.383)
R12	reference		reference	
R3	3.147	(5.046)	3.822	(5.116)
R4	4.982	(5.367)	6.204	(5.463)
R5	12.810**	(5.742)	13.045**	(5.703)
R6	14.792*	(8.532)	15.124*	(8.502)
NUMB1_3	8.698**	(4.499)		
NUMB4_7	reference			
NUMB8_	-6.532	(5.034)		
NUMB1_3NB			reference	
NUMB1_3HB			13.769**	(5.870)
NUMB4_7NB			-5.388	(5.830)
NUMB4_7HB			5.110	(7.316)
NUMB8_NB			-13.549**	(7.048)
NUMB8_HB			-.529	(8.479)
B1	reference		reference	
B2	-17.299*	(9.620)	-19.618**	(9.328)
B3	-20.211**	(10.208)	-18.250*	(9.868)
B4	4.108	(9.533)	4.103	(9.505)
B5	4.305	(8.320)	4.770	(8.577)
B6	-6.709	(11.270)	-9.846	(11.005)
constant	63.413**	(30.513)	55.009**	(27.750)
	Wald χ^2 (12) = 35.26		Wald χ^2 (15) = 49.16	
	no. obs. = 757		no. obs. = 757	

*** Statistically significant at or better than the 1% level, two-tailed
** Statistically significant at or better than the 5% level, two-tailed
* Statistically significant at or better than the 10% level, two-tailed

In a variation of the above regression, denoted by (2) in table 7, interaction variables are included which divide the borrower groups with one to three, four to seven and eight or more

than eight bank relationships into two subgroups with and without a housebank relationship, respectively. The results suggest slight evidence that the two subgroups with and without a housebank relationship of the group with one to three bank relationships (NUMB1_3NB, NUMB1_3HB) differ from each other by the fact that borrowers with a housebank relationship grant more collateral in relation to their total credit line. Variations of this regression with changing referential variables, namely NUMB4_7NB and NUMB8_NB, presented in table 8, do not indicate significant differences between the corresponding subgroups of borrowers with four to seven (NUMB4_7NB, NUMB4_7HB) and eight or more than eight relationships (NUMB8_NB, NUMB4_8HB).

The results on the relation of collateralization and the number of bank relationships combined with the indications of the housebank variable provide support for the hypothesis of Sharpe (1990) and Rajan (1992) that banks with close relationships to their customers are in an information monopoly which they can use to improve their position in loan term negotiation.

Table 8. Differences between the housebank and non-housebank subgroup coefficients for borrower groups with different numbers of bank relationships. Results gained by three variations with changing referential variables of the regression of the collateralized percentage of the borrower total credit line COLLAT (coefficients of the housebank subgroup variables, standard errors in parentheses)

variable	non-housebank (NB)	housebank (HB)	
NUMB1_3	reference	13.769**	(5.870)
NUMB4_7	reference	9.651	(6.693)
NUMB8_	reference	9.936	(8.031)

Other independent variables were included into the regression to control for borrower properties like size and quality and for lender specialties. We controlled for borrower size by the logarithm of total assets (lnTA). The coefficient does not indicate an effect on the collateralized percentage of the total credit line

Borrower quality has an expected influence on collateralization. The relation of the collateralized percentage of the borrowers' total credit line to their internal bank rating shows that borrowers with sound or acceptable ratings (R12, R3, R4) collateralize their total lines of credit at a significantly lower level than borrowers of the worst rating categories (R5, R6). The reason why the worst borrowers are granting more collateral than the ones of better quality is obvious. By requiring more collateral banks try to reduce their exposure to borrower–risk while borrowers in a bad situation indicated by their quality do not have the

negotiation power to deny it.

As the belonging of a customer to a certain bank is concerned, no systematic effect on collateralization can be identified with respect to certain bank characteristics.

5.3. Credit availability

Besides loan rates and collateralization, credit availability for borrowers might be influenced by bank competition approximated by the number of banks a borrower deals with. In a regression with the percentage of the borrowers' total credit line at a certain bank relative to their total assets as the dependent variable we tried to identify its effect. The methodology chosen is similar to the one in the previous sub-chapter. The dependent variable is censored as its values may reach the 100 percent level and are not defined below 0.

In table 9 the estimation results are presented. The ones for regression (1) suggest that members of the borrower group with one to three bank relationships (NUMB1_3) have a significantly higher proportion of financing by one specific bank than members of the borrower group with four to seven bank relationships (NUMB4_7). The coefficient has a value of 10.865 percent with a significance level below .001. Having in mind that the mean percentage of the total credit line with respect to the value of total assets for borrowers with four to seven bank relationships is 19.35 percent, 10.865 more in percentage points are about 50 percent more relative to these 19.35 percentage points. Thus, this difference between the borrower group with one to three bank relationships and the borrower group with four to seven bank relationships is also significant in the economic point of view. Members of the borrower group with eight or more than eight bank relationships (NUMB8_) do not differ significantly from the ones with four to seven bank relationships with respect to their proportion of total assets financed by loans of one specific bank.

Table 9. Regression of the borrowers' total credit line TLC relative to the borrowers' total assets (TA) (coefficients of the independent variables, standard errors in parentheses)

Independent variables	(1)		(2)	
R12	reference		reference	
R3	11.255***	(3.464)	12.368***	(3.431)
R4	13.265***	(3.670)	14.676***	(3.625)
R5	17.029***	(3.936)	18.039***	(3.891)
R6	31.090***	(5.535)	32.315***	(5.472)
NUMB1_3	10.865***	(3.023)		
NUMB4_7	reference			
NUMB8_	-.504	(3.290)		
NUMB1_3NB			reference	
NUMB1_3HB			14.768***	(4.128)
NUMB4_7NB			2.785	(4.656)
NUMB4_7HB			-3.942	(3.788)
NUMB8_NB			8.289	(5.550)
NUMB8_HB			-6.774	(4.460)
B1	reference		reference	
B2	-41.873***	(5.026)	-41.410***	(4.808)
B3	-41.503***	(5.855)	-40.181***	(5.638)
B4	-39.601***	(5.665)	-38.382***	(5.467)
B5	-54.926***	(5.537)	-54.056***	(5.267)
B6	-46.062***	(6.726)	-47.646***	(6.459)
constant	57.473***	(4.507)	57.527***	(5.295)
	Wald χ^2 (11) = 143.69		Wald χ^2 (14) = 175.62	
	no. obs. = 878		no. obs. = 878	

*** Statistically significant at or better than the 1% level, two-tailed

** Statistically significant at or better than the 5% level, two-tailed

* Statistically significant at or better than the 10% level, two-tailed

In a variation of regression (1), denoted by (2) in table 9, interaction variables are included which divide the borrower groups with one to three, four to seven and eight or more than eight bank relationships into two subgroups with and without a housebank relationship, respectively. In table 10, it can be seen that with respect to their total credit line relative to total assets members of the borrower groups with one to three and eight or more than eight bank relationships that have a housebank relationship (NUMB1_3HB, NUMB8_HB) differ significantly from their counterparts without a housebank relationship (NUMB1_3NB, NUMB8_NB). The coefficients representing the differences between the corresponding subgroups with values of 14.768 percentage points and 10.951 percentage points are remarkably high. Referred to the mean percentages of the total credit line related to total assets of the non-housebank borrower groups with values of 19.30 and 14.98 percentage points, respectively, the relative differences of housebank borrowers to non-housebank

borrowers are 76.5 percent and 73.10 percent. Thus, despite the fact that housebank borrowers within the group NUMB4_7 do not differ significantly from non-housebank borrowers with respect to the financing proportion of the bank, the results give a distinct hint to the hypothesis that housebanks take a greater stake in financing their customers than other banks in a non-housebank relationship. These findings support the proposition of Petersen and Rajan (1995) that, in expectation of future compensation because of information monopolies, banks with a close relationship are ready to provide more credit to their customers given borrower quality.

Table 10. Differences between the housebank and non-housebank subgroup coefficients for borrower groups with different numbers of bank relationships. Results gained by three variations with changing referential variables of the regression of the collateralized percentage of the borrower total credit line COLLAT (coefficients of the housebank subgroup variables, standard errors in parentheses)

variable	non-housebank (NB)	housebank (HB)	
NUMB1_3	reference	14.768***	(4.128)
NUMB4_7	reference	3.199	(3.535)
NUMB8_	reference	10.951**	(5.474)

In regressions (1) and (2) dummy variables controlling for the belonging to bank B1 to B6 are included. However, the coefficients do not indicate any systematic differences with respect to bank size.

6. Conclusion

This paper provides evidence that the number of bank relationships is predominantly influenced by firm size. Firm quality does not have any effect. A housebank relationship goes in line with a small number of bank relationships.

The number of bank relationships itself indicates bank competition for customers. While interest rate spreads are not influenced by the number of bank relationships collateral requirements are stricter for borrower groups with only a few bank relationships compared to borrowers with many relationships. The division of borrowers into subgroups with and without a special housebank relationship underlines the findings concerning the relation between the number of bank relationships and collateralization. In the group of borrowers with a few bank relationships, borrowers with a housebank relationship provide more collateral than borrowers with no housebank relationship.

As it should be expected, loan interest rates and collateralization are influenced by borrower quality represented by bank internal credit ratings. Loan rates are high when

borrower quality is low. Borrowers of the worst qualities provide more collateral than the better ones. Thus, banks try to reduce their exposure to borrower risk by collateral requirement and borrowers of bad quality do not have the negotiation power to deny it.

The findings on credit availability suggest that firms with a close relationship to a housebank receive a higher proportion of financing from this bank compared to banks without such a close relationship. This result provides support for Petersen and Rajan (1995) who conclude that close bank relationships are suitable to attenuate credit rationing problems. Thus, sometimes less competition is useful.

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