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ABSTRACT

Collateral, Default Risk, and Relationship Lending: An Empirical Study on Financial Contracting*

This Paper provides new insights into the nature of relationship lending by analysing the role of collateral and its real effects with respect to workout activities. We use a unique data set based on the credit files of five leading German banks, thus relying on real information used in the process of bank credit decision-making. In particular, risk assessment is derived from bank internal borrower ratings and a new proxy for identifying relationship lending is used. Furthermore, our data set contains information on banks' workout activities relating to borrowers facing financial distress.

We find no significant correlation between borrower quality and the incidence of collateralization, or the degree thereof. Our results indicate that the use of collateral in loan contracts is mainly driven by aspects of relationship lending and renegotiation risk. Relationship lenders do require more collateral from their debtors than normal lenders for two main reasons. First, collateral locks the borrower into the relationship. Second, it strengthens the bank's bargaining power in future renegotiations. This interpretation is strongly supported by our analysis of bank behaviour when borrowers face financial distress. We find that workout activities for distressed borrowers are positively related to both the housebank status and the degree of collateralization.

JEL Classification: G21
Keywords: collateral, housebanks, loan contract design, relationship lending and workouts

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NON-TECHNICAL SUMMARY

To date, there is very little empirical evidence on the evolution of financial relationships and on their role in situations of borrower distress. Lack of data is probably the most serious reason for our limited understanding of the role of housebanks and, more generally, of information-intensive borrower-lender relationships (relationship lending).

The results reported in this Paper strengthen the understanding of the real effects of relationship lending by addressing three questions. First, what is the empirical relationship between the incidence and the degree of collateralization, and expected default risk? Second, what role does collateral play in the context of an information-intensive lending relationship? Third, from an *ex post* point of view, what is the impact of collateral on how lending institutions behave if borrowers face financial distress?

Our analysis proceeds in two steps. We first look at the determinants of collateralization in loan contract design. We then look at the role of collateral and relationship lending if borrowers actually face financial distress. In particular, we analyse the determinants of bank activities supporting firm restructuring and corporate workout.

The analysis is based on first-hand credit-file data collected from five leading universal banks in Germany. The data set is a fairly comprehensive projection of 200 bank credit files into 130 variables, which were collected for the five-year period 1992–6. This data set potentially offers a number of new insights into the real value of financial relationships. The banks' internal borrower ratings were used to evaluate borrower quality, and the banks' own assessment of their housebank status serves to identify information-intensive financial relationships. Hence, we rely on information underlying the actual decision-making of the lender. Furthermore, the five-year panel structure allows a dynamic analysis of the problem. It is, to the best of our knowledge, the first empirical study that directly addresses the role of relationship lending in private workouts.

As to the first step concerning the relationship between collateral, both in terms of incidence and value, and the *ex ante* default risk of the borrower, there are opposing predictions in the literature. Signalling models predict a negative relationship between the value of collateral and default risk, while risk compensation and incentive-oriented models predict a positive correlation between collateral and default risk. Our findings do not lend support to any of these predictions. The incidence of collateral, i.e. the choice between an unsecured and a secured loan, is statistically independent of the borrower's default risk. Similarly, there is no statistically significant difference in the degree of collateralization between prime borrowers and low-quality borrowers (with the highest default expectation).

However, we do find evidence consistent with the idea that collateral serves as a strategic instrument for renegotiation. Housebanks (or relationship lenders) do require collateral more frequently and in larger amounts, relative to the loans outstanding, as compared to normal banks. This finding may be explained as an attempt by housebanks to increase the lock-in of borrowers and to strengthen the bank's future position in contract renegotiation. This argument was developed recently in two theoretical papers by Welch (1997) and Longhofer/Santos (1998). The latter authors suggest that seniority (which is equivalent to inside collateral) increases the probability that a lender invests in costly workouts if borrowers face financial distress. The underlying intuition is simply that it is the most senior claimant who benefits first from improving the quality of the firm. Moreover, in their model, a bank can become a relationship lender (by incurring establishment costs) with an informational privilege. Consequently, the model predicts that it should be the best-informed lender who gets the highest seniority. The latter idea is supported by Welch's analysis of the economic role of seniority. He shows that awarding the potentially strongest creditor *ex post* the highest seniority *ex ante* can be welfare enhancing. The underlying idea is that this minimizes expected coordination cost in renegotiations by establishing the highest degree of deterrence for claimants to enter into (costly) conflicts. As Welch (1997) notes, those potentially strongest creditors *ex post* are presumably banks and pushing forward the argument, both models support the idea that this especially holds true if a bank is relationship lender or housebank. This is due to the fact that a housebank by definition has a long-term perspective in decision-making, an informational advantage and close ties to the borrower in distress.

Using a complementary data set of distressed loans, we analyse the role of collateral and relationship lending for firms in financial distress. Using a logit model, we identify the determinants of workout investments by banks. Our findings indicate that the degree of collateralization positively affects the probability of a workout. In addition, we find housebanks to be significantly more active in company restructuring than 'normal' lenders, i.e. the housebank status significantly increases the probability of a workout. Both results support the theoretical work by Longhofer/Santos (1998) and Welch (1997) on the dynamics of relationship lending. Strong financiers, housebanks, accumulate collateral in 'good' times and get actively involved in company restructuring in 'bad' times. In this sense, collateral serves a strategic function in that it shapes the bank's future position in a renegotiation process. In particular, the accumulation of collateral serves not only as a pledged asset against the outstanding loan, but it also restricts the borrower and other creditors in a desirable way.

1. Introduction

Lack of access to internal data on bank lending decisions has seriously limited empirical research on corporate loan contracting. Drawing on a unique panel data set, this paper contributes to the understanding of bank lending behavior. We address three questions relating to the economic function of collateral in bank lending strategy. First, what is the empirical relationship between the incidence and the degree of collateralization, and expected default risk? Second, what role does collateral play in the context of an information-intensive lending relationship? Third, from an ex-post point of view, what is the impact of collateral on how lending institutions behave if borrowers face financial distress?

The first question refers to the impact of expected default risk on the provision of collateral. Theoretical predictions differ considerably with collateral being positively related to borrower quality in some models, and negatively related in others (e.g. Bester 1985, 1994). The second and third questions build on recent theoretical work concerning the role of relationship lending (Welch 1997, Longhofer/Santos 1998). The issue at hand is whether the decision to become the housebank of a corporate client has an impact on the quality or quantity of collateral demanded. Theoretical predictions in this case depend considerably on the role collateral is believed to play in a possible renegotiation game between the bank and its customer. In our empirical analysis, we focus on the type of activities a bank undertakes once a borrower is in financial distress. These post-distress activities can be related to the structure of the bank-client relationship before the distress occurred, in particular to the amount of collateral and the intensity of the relationship to the bank.

While earlier studies mostly rely on external industry surveys, we are able to base our analysis on first-hand credit-file data collected from five leading universal banks in Germany. The data set is a fairly comprehensive projection of 200 bank credit files into 130 variables which were collected for the five-year period 1992-1996. This data set potentially offers a number of new insights into the real value of financial relationships. The banks' internal borrower ratings were used to evaluate borrower quality, and the banks' own assessment of their housebank status serves to identify information-intensive financial relationships.

Moreover, our test of the role of collateral in financial relationships utilizes information about the specific type of collateral pledged to the bank, about its current value, and about the banks' activities if borrowers face financial distress.

The major results of our study support the view that collateral is used primarily as a tool to control the lenders' strategic position vis-à-vis the borrower (and other lenders) in future games of renegotiation. Thus, the incidence of collateral, as well as the degree of collateralization, are found to be unrelated to ex-ante default risk. Furthermore, collateral is positively related to the intensity of the financial relationship (i.e. the banks' housebank status) and increases the likelihood of workout investments by the lender. These results are consistent with the view of collateral as a contractual instrument that aims at strategically restricting future borrower behavior in a way desired by the lender, as hypothesized by Welch (1997) and Morris/Shin (1999).

The paper is organized as follows. Section 2 reviews the role of collateral in the theoretical and empirical literature on loan contract design and develops the main hypotheses for the empirical part of the paper. Section 3 contains a description of the data set and a number of descriptive statistics. Sections 4 and 5 comprise econometric tests of our main hypotheses, identifying determinants of the collateral decision (Section 4), and analyzing bank behavior in situations of borrower distress (Section 5). Section 6 contains a discussion of the results and concludes.

2 Review of the Literature and Derivation of Hypotheses

2.1 Theoretical concepts and hypotheses

The recent theoretical literature on financial intermediation has stressed the role of information-intensive relationships between borrowers and lenders as a major aspect differentiating bank loans from corporate bonds.[1] In a model with informational asymmetries, relationship lending may restore efficiency by establishing long-term implicit contracts between borrowers and lenders. An established relationship allows the lender to renegotiate contract terms at low cost, thereby creating financial flexibility, and reducing credit rationing. A financial relationship is effectively a long term commitment in which lenders develop an informational privilege vis-à-vis both the market and competing banks. For the lender, such a close financial relationship yields a certain degree of ex post bargaining power (see Greenbaum et al. 1989, Sharpe 1990, Fischer 1990, Rajan 1992, and Petersen/Rajan 1995). The housebank-function of German universal

[1] For a survey on the theory of financial intermediation see Bhattacharya/Thakor (1993) or Thakor (1995).

banks is a good example of such a long-term relationship with a corporate client. The housebank is regarded as the premier lender of a firm. It has access to more intensive and more timely information than a comparable “normal” bank, allowing it to provide insurance-like services like liquidity insurance or better decisions in borrower distress (Fischer 1990, Rajan 1992, Elsas/Krahnen 1998).

Our subsequent analysis is based on the assumption that a housebank, though not necessarily the exclusive financier of a given firm, is the only creditor who sustains an implicit contract with the borrower. This assumption is consistent with empirical evidence indicating that firms typically have a multitude of bank lenders (Ongena/Smith 1998b, Preece/Mullineaux 1996), but nevertheless have at most a single bank relationship with an informational privilege. We thus view the housebank status as a discrete characteristic of a bank-client relationship.

Collateral plays an important role in many models of bank behavior. Bester (1985) and Besanko/Thakor (1987), building on the ex ante screening model by Stiglitz/Weiss (1981), interpret collateral as a signal which allows a bank to solve the adverse selection problem inherent in debt financing under asymmetric information. In a model with two types of projects, high and low risk, a separating equilibrium is shown to exist. Low-risk borrowers generally choose contracts with a high level of collateral. High-risk borrowers, in contrast, prefer to have loans with no collateral. The signaling models thus predict a negative correlation between loan risk and collateral. Note that the signaling model is concerned with the pre-contractual stage. Once the contract has been concluded, however, the informational problem is resolved in principle, and the economic function of collateral in a multi-period, dynamic setting remains to be explored.

A second class of models focuses on the ex post monitoring function of banks. Bester (1994) develops a model of debt renegotiation that predicts a positive correlation between default risk and collateralization. In this model, a creditor cannot distinguish between strategic default (i.e. the borrower is cheating), and default due to a bad state realization of the world. Therefore, the provision of (outside[2]) collateral will reduce the debtor's incentive for strategic default. In a

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2 “Inside collateral“ refers to collateral which reallocates the given adhesive wealth of a firm, while "outside collateral" extends the adhesive wealth. An economically more appealing distinction would be between collateralized assets whose value is (highly) correlated with the earning assets of the firm and those which are not correlated with the cash flow stream derived from the firm’s normal business. In most theoretical models, outside collateral is implicitly modelled as having a lower correlation than inside collateral, and this feature basically drives the results.

model with inside collateral, Rajan/Winton (1995) analyze the case in which the collateralization decision of an inside bank can be observed by less informed outsiders thereby transforming private information on borrower quality into public information. The inside bank will be compensated for the externality by a more senior debt position. Since the lender tends to collateralize loans with high risk borrowers, there is again a positive association between risk and collateral implied. Finally, the prediction of a positive correlation between project risk and collateral corresponds to conventional wisdom in banking, which views collateral as a means to lower the risk exposure of a bank (see e.g. Berger/Udell 1990). Our first hypothesis summarizes the above discussion.

Hypothesis 1: *The incidence of collateral, as well as the extent of collateralization, are an increasing function of borrower default risk.*

We now turn to the role of relationship lending as a determinant of the collateral decision. Boot/Thakor (1994) develop a model of relationship lending as an infinitely repeated moral hazard game. Loan contract terms, notably the interest rate and collateralization, are determined simultaneously. Collateral, which is outside collateral in this model, is a binary ("all or nothing") variable. In the relationship equilibrium, for borrowers without a positive track record, the bank charges high interest rates and requires the provision of collateral. After privately observing the success of the borrower, the bank is willing to lower the interest rate and is no longer requiring collateral. This leads to a *negative* association between relationship intensity and collateral.

A recent paper by Longhofer/Santos (1998), however, reaches the opposite conclusion. In their model, a higher seniority of a bank's claim will increase the likelihood of a relationship emerging. Since seniority of a claim against the assets of the firm is equivalent to the provision of inside collateral, Longhofer/Santos' treatment of collateral differs from Boot/Thakor (1994). Following Longhofer/Santos (1998), additional collateral allows the relationship lender to benefit more from a successful turnaround in bad states of nature, thereby increasing his willingness to be financially supportive and, in particular, to invest in workouts. Furthermore, with assets pledged, the borrower has less room to increase equity value through asset substitution. Hence, the model predicts a *positive* correlation between the extent of collateralization and the intensity of a bank-borrower relationship. This result is similar to the conclusion reached by Welch (1997). This author shows that, ex-ante, it is optimal to give seniority to the lender with maximum ex-post bargaining power. Due to its information privilege, this lender will be the house-

bank (or the main bank) of the firm. The optimal arrangement will minimize coordination costs, and will thus facilitate debt restructuring.

To summarize, theoretical models support a positive as well as a negative association between relationship lending and collateralization. This constitutes our next hypothesis.

Hypothesis 2: *There is a positive (negative) relationship between the intensity of a bank-borrower relationship and the provision of collateral in loan contracts.*

According to the argument of Longhofer/Santos (1998) and Welch (1997), housebanks will be interested in accumulating collateral, thereby improving their bargaining positions in possible future distress situations. On the basis of a strong collateral position, and a privileged access to information about the borrower, the bank is expected to play a more active role in the restructuring of distressed borrowers. This leads to our final hypothesis.

Hypothesis 3: *Given that borrowers are distressed, the willingness of a lender to engage in workout activities is positively related to its housebank status and its degree of collateralization .*

2.2 Related empirical evidence

We will now turn to the empirical evidence. While there are some papers relating to hypotheses 1 and 2, we are unaware of a study addressing the role of collateral as an incentive device in distress situations, which is our third hypothesis.

In a seminal study, Berger/Udell (1990) empirically analyze the risk-collateral relationship. They use data from the 1988 "US Survey of Bank Lending Terms" and consistently find a positive relationship between credit risk and collateral. The authors use two different proxies for credit risk. The first proxy is an ex post measure of aggregate bank risk. It defined as the fraction of borrowers with non-performing loans among all borrowers of a given bank. The second risk proxy captures credit risk on the level of the individual borrower. It is defined as the credit spread, i.e. the difference between the contractual rate of the loans and a risk-free reference interest rate. This is an indirect and potentially biased measure of ex ante risk since the spread is determined by several factors of which a borrower's default risk is only one (see Harhoff/Körting (1998) and Elsas/Krahnen (1998) for empirical details).

Berger/Udell (1995) extend this analysis to aspects of relationship lending and the financing of small firms by using data from the 1988 "National Survey of Small Business Finance". They use balance sheet ratios (e.g. leverage, profit margin) as risk proxies and duration as a proxy for relationship intensity. The authors claim that their findings support a positive risk-collateral correlation, though leverage is the only significant explanatory variable out of eight risk measures. Duration, as an explanatory variable for the incidence of collateral , has a significant negative coefficient, thereby implying decreasing collateral requirements for more intensive bank-borrower relationships. Harhoff/Körting (1998) replicate this study with German data and reach identical conclusions.

These empirical findings with respect to relationship lending are based on the interpretation of duration as an adequate measure for relationship lending. This assumes that duration is to some extent associated with information intensity. This might be problematic if the data set under considerations does not consist of firms observed at the beginning of a bank-borrower relationship, which is typically not the case. Additionally, recent empirical evidence raises further doubts on duration as a proxy for relationship intensity. Ongena/Smith (1998a) find a significantly positive impact of contract duration on the likelihood of relationship termination for the Norwegian market. However, those firms presumably most in need of relationship finance (i.e. small or young or growth firms) maintain the shortest relationships. Furthermore, Elsas/Krahnen (1998) find no significant difference in the mean contract duration between their sub-samples of housebank and non-housebank relationships. Additionally, duration is not significant in either of the authors' regressions, though Elsas/Krahnen find evidence for distinct behavior by relationship lenders identified as housebanks.

The most closely related studies to ours with respect to the data set are Degryse/van Cayseele (1998) and Machauer/Weber (1998). Like us, both studies use credit file data, and their indicator for relationship lending is a self-evaluation of the bank, i.e. whether it views itself as the primary bank. The implication of changing the relationship variable is fundamental. The authors find that the probability of pledging collateral increases rather than decreases if the bank is the borrower's main bank. However, the study of Degryse/von Cayseleen (1998) study relies only on noisy risk proxies like company size and loan type. The analysis by Machauer/Weber (1998) is based on the same data set as this study but differs fundamentally in terms of methodology and focus of the study.

In summary, only little empirical evidence on the link between relationship lending, risk and collateral exists. The existing studies use noisy proxies for borrower quality and usually only a crude proxy for relationship lending. In the remainder of this paper we address the hypotheses, outlined above, on the role of collateral in relationship lending. We use banks' internal borrower ratings as a more direct measure of borrower quality and the banks own assessment of their relationship status to identify information-intensive bank-borrower relationships.

3. DATA SET AND DESCRIPTIVE STATISTICS

3.1 General data description

The data set underlying our analysis includes corporate debtors of five major German banks: Bayerische Vereinsbank (now HypoVereinsbank), Deutsche Bank, Deutsche Genossenschaftsbank (DG Bank), Dresdner Bank, and Westdeutsche Landesbank (WestLB).[3] The data set contains general company characteristics (e.g. legal form, branches), a complete overview on loan contracts and their specific terms (e.g. collateral, maturity, credit volume), balance sheet data and the bank's own risk assessment (internal rating). This information was collected directly from the banks' credit files.

Our data is a random sample drawn from a population of all corporate customers with some active business at some time between January 1992 and January 1997 who also meet a number of selection criteria.[4] First, companies had to be medium sized, i.e. with an annual turnover between DM 50m and DM 500m (US$ 25m -US$ 250m). Due to the absence of surveillance by rating agencies and the lack of rigorous disclosure requirements,[5] we expect this company size segment to be subject to a significant degree of asymmetric information between lenders and borrowers, thus constituting a prime population for the analysis of issues related to relationship lending and loan contract design. Second, to ensure a minimum level of information in the bank credit files, a minimum total loan size of DM 3m (US$ 1.5m) was imposed. All loans surpassing DM 3m are

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3 These institutions comprise the three largest German private banks, the (national) apex cooperative bank, and the largest (regional) apex savings banks. In the list of the largest banking firms of the country at year end 1995, they comprise the ranks 1, 2, 3, 5, 8.

4 For a detailed presentation of the data set, see Elsas et al. (1998).

5 Note that no company in our sample is listed on a stock exchange, and only 12 out of 200 are public limited companies (AG) under German law.

subject to the regulatory notification requirement of Article 14 of the KWG (German Banking Act), and have to be communicated to a national credit bureau.[6] Third, clients with registered seats in the former GDR (East Germany) were excluded, and, fourth, inclusion in the population required that the respective client had at least one longer-term investment loan with a fixed interest and repayment schedule.

The sample used for the subsequent analyses of Section 3 and 4 consists of 25 customers from each of the five banks, resulting in a total of 125 individual debtors (representative sample).[7] For each of these credit relationships, the full set of variables was recorded from the credit files whenever a credit decision (e.g. loan renewal, change in credit volume) was documented, or the firm was re-rated. The observation period comprises five complete years (1992 to 1996). Thus, for example, for a credit relationship with three credit decisions and one additional re-rating, there are four observations per variable. The advantage of such a procedure is that for all structural variables such as credit volume, collateralization or rating, we know the value of each variable (after an initial observation) during the complete observation period. In order to avoid a potential bias due to non-synchronous data-collection, we stratified our panel by simulating data collection at the end of each year between 1992 and 1996. If for a given firm and a given year no contract change occured, i.e. no data collection was triggered, we generated an artificial observation.[8] These artificial observations are based on the respective preceding real observation whose value equals by construction the actual one.

This leads to a synchronous panel data set with a theoretical number of 625 observations (5 years x 125 individuals).[9] The actual number of observations is smaller, since there are initial observations occurring later than 1992, the beginning of our observation period, or due to missing values.

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6 §14 of the KWG (German Banking Act) requires each bank to report the name and loan terms of each debtor with a consolidated debit balance of DM 3m or above. The Bundesbank, on behalf of the Federal Banking Supervisory Authority (BAKred), collects all notifications and produces a quarterly consolidated statement per customer. These are in turn accessible by all reporting banks.

7 See Elsas et al. (1998) for a detailed description of the data and the sampling procedure.

8 Note that this procedure is not suitable for variables that did not trigger a new observation, but are time-variant having a higher variability than the structural variables, such as the interest rate. However, we do not use such variables in the present paper.

9 If an individual has more than one observation in one specific year, only the last one was used.

The analysis in Section 5 is based on a the sample of potentially distressed borrowers. These borrowers meet all of the selection criteria mentioned above, i.e. they belong to the same population. Additionally, all these borrowers faced a poor rating at least once during the observation period. Poor ratings indicate that banks expect these borrowers to be problematic, i.e. potentially distressed. In the standardized rating system that we use, with six different classes of borrower quality (see below), a negative rating is either a rating of 5 or 6. For each bank, 15 cases were drawn from this stratified subset of the population, yielding a sub-total of 75 borrowers. We label this sample PD (potentially distressed).

3.2 The identification of housebanks

With respect to the housebank status, we rely primarily on an *internal* attribution, namely on the assessment by the credit manager in charge of that particular customer. The credit manager was given a questionnaire asking for a housebank-attribution ("Do you feel that your bank is the housebank for that particular client?"). The respondents had to check "yes" or "no", and were further asked to give a brief explanation in writing. The resulting dummy variable is labeled “HB_inter”. Then a second variable, with information taken from the credit files, was used to double check the reliability of the credit officer’s attribution. Whenever, in the credit files, a particular decision taken by the bank in question was explained using arguments explicitly relating to its housebank-status (e.g. "we are the housebank", "we are the main bank", "we have a special responsibility", etc.), the variable "HB_exter" was assigned the value of one, and zero otherwise. Since this external attribution was recorded separately for every credit event, a time series of "HB_exter"-attributions resulted. These dummies represent an *external* attribution of the housebank characteristics.

From these two proxies for housebank relations, we construct a third, modified indicator variable (“HBM”, modified housebank attribution) which is used for our subsequent regression analyses. HBM attributes in a first step the value 1 and 0 to all relationships that were consistently grouped as either "housebank" or "non-housebank" in both attributions, “HB_inter” and "HB_exter". Inconsistent attributions were recorded in 24 cases. They are due to changing attributions in the time series of "HB_exter" observations. These inconsistencies were resolved by use of the additional information contained in the written explanation given in the questionnaire.

The resulting housebank attribution thus differs substantially from other measures of relationship intensity used in the literature, such as duration or the number of bank lenders. We believe our attribution to be a more reliable indicator since it is directly based on the judgement of one of the parties to the implicit contract.

3.3 Descriptive statistics

This section provides some basic descriptive statistics of the sample of representative borrowers (R-sample).[10]

We use three different variables to describe the degree of collateralization, each based on a different scale of measurement. The most commonly used variable in the literature is a simple dichotomous variable assigned a value of one if a loan contract is collateralized and zero if it is not. We label this variable COLYN. A second variable differentiates according to the type of collateral. The variable COLTYPE is assigned a value of zero if a credit relationship is not collateralized, one if the loan[11] is collateralized only by real securities (land charges, mortgages, assignments of accounts receivable), two if the loan is secured only by personal securities (guarantees), and three if the latter two types are combined. Thus, COLTYPE is analogous to COLYN with respect to all debtors, but it contains more information about the type of collateral provided. A third variable, labeled COLDEGREE, measures the degree of collateralization in terms of value. It is defined as the ratio of collateral value (as assessed by the bank) to total credit volume supplied by the bank. This variable takes on values in the closed interval from zero to one, multiplied by a scaling factor of 100. Therefore, if the variable COLDEGREE has the value “100”, the credit provided by the bank is fully secured. The bank, according to its own assessment, has zero exposure in the sense of capital at risk. However, if COLDEGREE is assigned a value “0”, this does not necessarily imply the absence of priority rights to firm assets. Though in such a case the bank estimates collateral value to be negligible, it may nevertheless have property rights on specific firm assets. This conceptual difference between COLYN and a COLDEGREE of 0 is important,

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10 Some descriptive statistics for the PD sample are provided in section 5. A more detailed description is contained in Brunner/Krahnen (2000).

11 The term "loan" is imprecise because any data on collateral we used relates to a borrower’s total credit volume with a particular bank, not to a single loan.

because even zero-valued collateral may change the incentive of a company or manager to behave in an opportunistic way, which of course is not true if no collateral is pledged at all.

Table I below shows the frequency distribution of observations for COLYN and COLTYPE differentiated first by the dummy-variable LIMLIAB, which takes on a value of "1" if the company is incorporated and "0" else. The second differentiation of the frequency distribution is with respect to the variable BANK, which depicts the bank from which the observation originates; its values range from 1 to 5.

Table I
Collateral according to incidence, type, and limited liability (Year 1996, All years)

		COLYN						LIMLIAB				
		1996			1992 – 1996			1992-1996				
		1	0	Sum	1	0	Sum			0	1	sum
	1	21	2	23	100	14	114		0	25	148	173
	2	15	11	26	72	54	126		1	79	250	329
BANK	3	11	14	25	59	66	125	COLTYPE	2	0	2	2
	4	20	5	25	100	18	118		3	3	85	88
	5	21	3	24	88	21	109		sum	107	485	592
	sum	88	35	123	419	173	592					

Table I shows considerable variation between the banks in our sample, in particular with respect to the percentage of collateralized loans. For example, in the overall period, only 14% of Bank 1 observations are not collateralized, in contrast to 53% of the loans at Bank 3. Thus, it seems to be important to control for effects due to bank heterogeneity in subsequent regression analyses. Furthermore, since the absolute number of observations of noncollateralized loans for any given year is small for some banks, pooling of time-series and cross-sectional observations is necessary to carry out econometric tests.

The frequency distribution of noncollateralized observations differentiated by companies with and without limited liability (COLTYPE versus LIMLIAB) implies that the fraction of noncollateralized observations is smaller for companies with unlimited liability (25 out of 107 versus 148

out of 485). There are only two observations in the total sample period with only personal securities, and these companies have limited liability. Thus, the variable COLTYPE is informative for descriptive purposes only. Finally, 85 out of 88 observations with both real and personal securities are companies with a limited liability structure, i.e. are incorporated. This pattern is consistent with the idea that personal securities are used as collateral to overcome the limited liability status of a corporation.

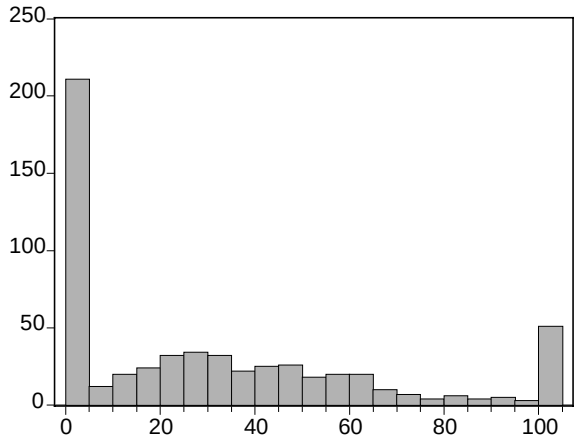

Figure 1: Frequency Distribution of COLDEGREE (degree of collateralization)

Figure 1 shows the frequency distribution of COLDEGREE on its range of possible values from 0 to 100 for the total sample period and all individuals. Note that there are two significant peaks at values of 0 and 100, respectively. This pattern highlights the fact that the ratio of collateral value to credit volume is a censored variable. COLDEGREE is left censored because all unsecured loans are assigned a value of “0”. By a similar argument, a value above 100 is not observed, since a collateralization in excess of "fully secured" is not differentiated. Nevertheless, there may be debtors with more assets pledged to the bank than required for attaining “fully secured” (right censoring).[12] Thus, an analysis using the variable COLDEGREE has to control for the censored nature of this variable by employing a Tobit-procedure.

[12] Usually, the banks did not evaluate collateral to be in excess of the total credit volume.

Table II shows the different types of collateral (COLTYPE) differentiated by housebank status (HBM) for 1996.[13] In addition, it shows the mean rating (RATING) and the mean company size (SIZE), the latter proxied by total annual sales of a firm, for all possible combinations of HBM and COLTYPE. The variable RATING is an ordinal measure of borrower quality, representing the expected default probability as estimated by the lender (internal rating). The rating scheme used in our analysis has been calibrated among all banks. It has six categories where a rating of 1 is the best quality, and a rating of 6 is worst. Note that these bank internal borrower ratings are prior to the assessment of collateral; therefore they reflect creditworthiness or borrower quality rather than net exposure.

[13] Only one observation per individual is included if the analysis is restricted to one specific year; if the analysis is for the entire sample period, individuals are repeatedly included.

Table II
Sample statistics 1996: Rating, size, and degree of collateralization according to type of collateral and housebank status

COLTYPE	HBM	Observations	RATING	SIZE	COLDEGREE
0	non-housebank	20	3.1	193.4	0
	housebank	10	2.6	132.5	0
	Total	30	2.9	173.1	0
1	non-housebank	32	3.2	236.7	40.0
	housebank	21	2.7	164.6	41.6
	Total	53	3.0	208.1	40.2
2	Total	0	--	--	--
3	non-housebank	12	3.3	177.4	55.4
	housebank	3	4.0	301.8	59.7
	Total	15	3.4	202.3	56.7
Total	non-housebank	64	3.2	212.0	32.1
	housebank	34	2.8	167.3	30.3
	total	98	3.0	196.5	31.5

COLTYPE is a qualitative variable indicating the type of pledged collateral; HBM is a dummy variable indicating whether a relationship is a housebank or a non-housebank relationship; RATING is the mean borrower rating; SIZE is the mean annual turnover in DM million; and COLDEGREE is the ratio of collateral value to total credit volume, i.e. the fraction of secured debt in terms of value.

Table II uses 98 valid observations on collateralization for the year 1996, of which 35 % can be attributed to housebank relationships. 30 out of 98 observations have no collateral. None of the remaining 68 observations with collateral being pledged rely exclusively on personal securities.

With respect to the housebank status, Table II reveals that company size is not significantly different among the sub-samples, housebanks and normal banks (annual sales: DM 167m versus DM 212m). Furthermore, normal banks tend to contract more frequently for a simultaneous inclusion of personal and real securities (12/64 versus 3/34 for housebanks). The ratio of noncollateralized cases to total cases is about equal for both types of relationships (10/34 versus 20/64). The mean rating across all types of collateral is significantly lower for housebank relationships (2.8 versus 3.2), indicating that housebank borrowers, on average, are expected to have lower default probability. Furthermore, in the univariate analysis Table II reveals no significant differences between the types of collateral and the company size, the rating and the housebank status.

In summary, three main findings emerge that bear on the empirical design of this study. First, the sample is characterized by bank heterogeneity. The small sample size indicates that pooled time series and cross sectional data should be used in subsequent regression analyses. Second, personal securities are virtually never the only type of collateral being pledged. Therefore, an in-depth analysis of inside versus outside collateral is infeasible based on our data and we dispense with the variable COLTYPE. Third, the degree of collateralization in terms of value is left and right censored.

4. Determinants of Collateralization

4.1 Methodology

In this section, we will empirically identify the main determinants of collateral in loan contracting, controlling for default risk, and relationship lending. This test is carried out in two steps. First, the incidence of collateral in a loan contract, i.e. whether or not a loan is collateralized is explained. In a second step, the determinants of collateral intensity are identified, i.e. the degree of collateralization.

For an analysis of the incidence of loan collateralization, the binary variable COLYN is used as the dependent variable. This test will be the starting point for our analysis, as it provides comparability with previous studies. The second step uses each bank's own assessment of collateral value, where COLDEGREE is the ratio of collateral value to total credit volume. COLDEGREE not only contains information on collateral incidence, but also on bank net exposure vis-à-vis the client.

Both models are tested using a panel model with a one factor random effects specification, allowing us to use the full sample, while controlling for unobserved heterogeneity among individuals.[14] Since COLYN is a dichotomous variable, we use a probit specification for our step-1 regression. Furthermore, since COLDEGREE is a censored variable we use a Tobit-formulation for our step-2 regression.[15]

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14 See Greene (1997), Chapter 14 and Hsiao (1986) for details relating to this specification.

15 See Baltagi (1995), pp. 183-184 for details.

The explanatory variables can be grouped as firm variables, risk variables, and relationship variables. Firm variables comprise an industry classification, where ENGINEER, CONSTR and TRADE are dummies representing engineering, construction, and trade, respectively. A second set of dummies controls for the identity of the lender (BANK2 - BANK5). POTCOLLAT is a proxy for a company's ability to provide inside collateral. This variable is defined as the ratio of fixed assets to balance sheet total. A large value of POTCOLLAT indicates the presence of more valuable assets potentially available as collateral. It is expected to influence COLDEGREE rather than the dichotomous variable COLYN. LOGSIZE measures the natural logarithm of a company's sales per year, serving as a proxy for company size. Since company size potentially reflects the bargaining power of the borrower, we expect to find a negative correlation between company size and collateral. LIMLIAB is another dummy variable, indicating the corporate charter of the borrower.

Based on existing evidence we include the logarithm of the size of the loan in the probit specification, LOGVOLUME. This variable was found to have a positive influence on the incidence of collateralization by Harhoff/Körting (1998), among others. For the second regression, with the degree of collateralization as dependent variable, LOGVOLUME is substituted by FINSHARE, which is the ratio of credit volume (loan size) supplied by the bank and total debt financing as reported in the balance sheet.

Expected default risk is proxied by the bank's internal borrower ratings. Since RATING is an ordinal variable with six possible values, a dummy variable was assigned to each rating class. Three dummies are included in the regressions: RATING3 to RATING5. Therefore, the prime borrowers (RATING 1 and 2) with the lowest default probabilities serve as the reference group. There were no observations with a distress rating of 6, rendering the inclusion of the respective dummy obsolete. According to Hypothesis 1, there should be a positive relation between credit risk and collateral.

Finally, to control for the effect of a bank-client relationship, we include our relational variable, HBM, referring to the housebank status of the lender in a given relationship. According to Hypotheses 2, and given that collateral in our data set is largely identical with inside collateral, we expect to find a positive coefficient for the relationship variable. HBVOLUME and HBFIN are the interaction terms of the housebank status with loan volume and with financing share, respectively.

Table III summarizes our regression variables and specifies predicted signs of regression coefficients.

Table III
Definition of explanatory variables

	Variable	Definition	Expected sign of coefficient
control variables	BANK2 – BANK5	Set of dummies, 1 if debtor belongs to bank x (x=2 to 5)	No prediction
	ENGINEER, CONSTR, TRADE	Dummies, indicating whether a company is active in either engineering, construction or trade industry	No prediction
	LOGSIZE	Natural logarithm of a company's annual sales (proxy for size)	Negative
	LOGVOLUME	Natural logarithm of credit volume	Positive
	LIMLIAB	Dummy, indicating private limited companies	No prediction
	POTCOLLAT	Ratio of borrower fixed assets to borrower total assets (potential ability to pledge collateral)	Positive
	FINSHARE	Relative importance of bank financing	Negative
risk variables	RATING3 – RATING5	Dummy variables, representing bank internal ratings (1 is best, 6 is worst)	Positive
relationship	HBM	Dummy, 1 if housebank	Positive / Negative
	HBVOLUME	Interaction term between housebank status and credit volume	No predicition
	HBFIN	Interaction term between housebank status and FINSHARE	No predicition

4.2 Results

The results of the panel analysis are presented in Table IV.

Table IV
Determinants of collateralization - panel analysis

Variables	Probit (dependent is COLYN)	Tobit (dependent is COLDEGREE)
Constant	-0.89 (0.92)	187.59 (0.000)***
BANK2	-4.69 (0.02)**	-52.92 (0.00)***
BANK3	-8.75 (0.002)***	-29.62 (0.00)***
BANK4	-1.50 (0.43)	13.17 (0.02)**
BANK5	-0.19 (0.92)	8.08 (0.17)
ENGINEER	-3.69 (0.02)**	-29.24(0.00)***
CONSTR	6.07 (0.01)**	48.28 (0.00)***
TRADE	1.97 (0.21)	-7.47 (0.14)
LIMLIAB	-2.98 (0.01)**	-13.58 (0.005)***
POTCOLLAT	-0.89 (0.97)	-0.02 (0.83)
LOGSIZE	-0.88 (0.17)	-11.72 (0.000)***
LOGVOLUME	2.17 (0.001)***	---
FINSHARE	---	-8.50 (0.20)
RATING3	-0.80 (0.46)	-7.99 (0.03)**
RATING4	-0.59 (0.59)	-2.59 (0.46)
RATING5	2.64 (0.93)	1.07 (0.94)
HBM	17.64 (0.04)**	17.97 (0.002)***
HBVOLUME	-1.94 (0.04)**	---
HBFIN	---	-3.84 (0.70)
N	472	472
X^2 (Explanatory variables)	110,7 (0.00)***	174,24 (0,00)***
X^2 (Random Effects)	236.46 (0.00)***	291.13 (0.00)***
Pseudo-R^2	0.61	---

COLYN is a dummy variable, indicating whether or not collateral has been pledged, COLDEGREE is the ratio of collateral value to total credit volume (x 100). For definitions of explanatory variables see Table III. The Tobit-procedure adjusts for censoring at values of zero.[16] p-values in parentheses. *,**,***: Significance at the 10%, 5% and 1% level, respectively.

Column 2 of Table IV displays the Probit-results, where the incidence of collateral in the loan contract, COLYN, was regressed on the set of explanatory variables. As expected, there is con-

16 Robustness tests showed that the qualitative results remain unchanged if one controls for censoring at COLDEGREE equal to 100 as well as if one ignores censoring at all. The scale factor for marginal effects of the regressors is estimated as 0.87.

siderable heterogeneity among banks with respect to their collateral decisions. Three out of four bank-dummy coefficients are significantly different from zero. Similarly, two out of three industry dummies are significantly different form zero. Company size (LOGSIZE) has no significant influence on collateral requirements. Furthermore, the magnitude of potential inside collateral, as proxied by POTCOLLAT, does not influence the incidence of collateral per se. However, loan size significantly increases the probability of collateralization, in line with the findings of Harhoff/Körting (1998).

We next turn to the rating coefficients, relating to Hypothesis 1, where expected default risk is proxied for by RATING3 - RATING5. The hypothesis predicts a positive slope coefficient. However, the results are not in line with this prediction: the coefficients of the rating dummies have different signs and are statistically insignificant. Hence, borrower quality does not influence the decision to collateralize.[17] The coefficient of HBM is positive and significantly different from zero, revealing a systematic effect of relationship intensity on the incidence of collateral. Thus, consistent with our second hypothesis, relationship lenders do behave differently as compared to "normal" bank lenders. The housebank status leads to a higher probability of collateralization. We will give an interpretation of this finding below.

We next turn to column 3 of Table IV. As mentioned above, the analysis of the dichotomous collateralization variable COLYN uses only little information on collateral being pledged. Column 3 of Table IV reports the results of an extended analysis by using information on the value of collateral as assessed by the banks themselves. Since COLDEGREE is a censored variable, a Tobit-estimation is employed.

With respect to most of the structural variables, the implications of the Tobit regression are similar (in terms of sign and significance) to those discussed above. Hence, we will not provide a separate discussion of bank heterogeneity (BANK2-5), industry rooting (ENGINEER, CONSTR, TRADE) and the role of the corporate charter (LIMLIAB). POTCOLLAT, the company's share of fixed assets in total assets, carries again an insignificant and negative coefficient. The same holds for FINSHARE our measure for the relative importance of the bank in debt financing. However,

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17 This result is similar to Machauer/Weber (1998), and to some extent to Berger/Udell (1995), who find only one out of eight risk measures to be a significant explanatory variable.

as opposed to the probit regression, the degree of collateralization is negatively affected by firm size, thus indicating some relevance of bargaining power on the side of the debtor.

We now turn to the role of expected default risk, as expressed by internal bank ratings, in explaining collateral value. In the Tobit model, the rating coefficients have again different signs and are - with one exception - insignificant. The one exception is RATING3. Since the prime rating classes 1 and 2 serve as the benchmark and the low classes 4 and 5 are insignificant with opposing signs, we interpret this result as evidence against both our hypothesis 1 and the traditional signaling hypothesis. According to the former, collateral in debt contracts serves the purpose of neutralizing the exposure of the lender or to set proper behavioral incentives for the borrower, and is thus increasing in expected default risk. According to the latter hypothesis, collateral is predicted to be a negative function of risk, as low risk borrowers signal their quality by offering large amounts of collateral. Our findings are inconsistent with both hypotheses because, in our sample, the value of collateral appears to be unrelated to default risk. This is supported by a test of the null-hypothesis of all coefficients of the rating variables being simultaneously equal to zero. The Wald-test statistic could not reject the null with a p-value of 95% in both models, the Probit- as well as the Tobit-estimation.[18]

In the theoretical literature, collateral is modeled either as a risk compensation device or an incentive device. In both types of models, collateral is seen as outside collateral. We thus checked the robustness of our results by including interaction terms between rating classes and the relative magnitude of outside collateral in the Tobit regression. The qualitative results remained unaffected, however.

If collateral does neither compensate for default risk, nor does it signal borrower quality, what is a valid explanation of its role in debt contract design? A clue to answering this question is provided by the coefficients of the relationship variables, both in the Probit-specification and in the Tobit-specification. Confirming the result of the Probit-analysis, the coefficient of HBM is positive and highly significant in the Tobit-analysis. Thus, in comparison to a normal bank, the housebank is more likely to require collateral and will do so for higher amounts. Therefore, the evidence supports hypothesis 2 with a positive association. As pointed out by Longhofer/Santos

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[18] It is again emphasized that the banks‘ internal ratings are not influenced by any collateralization. For further details on the internal rating systems see Brunner/Krahnen/Weber (2000).

(1998) and Welch (1997), collateral seems to be a strategic instrument for strengthening a bank's bargaining position in renegotiations.

The strategic role of collateral for future bargaining situations is a plausible explanations of our findings in Table IV. It is, however, not the only possible explanation compatible with the evidence. An alternative explanation that leads to the same set of predictions would simply rely on a cost advantage of housebanks in assessing the market value of collateral. In order to differentiate between the renegotiation argument on the one side and other explanations as for example the cost advantage hypothesis on the other side, one has to gather information about bank behavior subsequent to the onset of a borrower's financial distress. We extend our analysis to cases of borrower distress in the next section.

Incidentally, since we have two variables describing the housebank status, we are able to compare the explanatory power of two variables that attempt to proxy for relationship intensity, i.e. the housebank variable HBM, and the relationship duration variable DURATION. The inclusion of DURATION in our regressions does not materially change regression results. In particular, the coefficient of DURATION is not significantly different from zero, while the HBM coefficient remains relatively stable, and significant in both formulations. Since DURATION is also insignificant if it is used as a substitute for HBM, one may conclude that duration of a bank-borrower relationship is not an appropriate measure that captures the essence of relationship lending.

5. Collateral Accumulation, Relationship Lending and Workout Activities

5.1 Methodology

The preceding section established that relationship lenders tend to accumulate more collateral than normal lenders, after controlling for credit risk. We interpret this finding as an indication of housebank preparedness for borrower distress. With sufficient collateral at hand, the housebank will be able to play a formative role in future bargaining situations that are caused by borrower distress. In particular, if there are multiple lenders, and bargaining costs may thus be high, collateral is instrumental in preparing for active involvement in the restructuring of distressed companies. In this section we make an initial attempt to understand the role of lenders vis-à-vis distressed borrowers. While in the last section our focus was on risk, and thus dealing with the expectation of default, the focus in this section is on actual distress according to the bank's own

judgment. In concentrating on the role played by housebanks, we will undertake a direct test of our third hypothesis (the renegotiation hypothesis), developed in Section 2 above.

If a borrower faces financial distress, it may be efficient either to liquidate the firm right away, or to restructure it. It depends on the circumstances, whether an additional investment, as is required in the case of a restructuring or a workout, is a positive net present value project. What will the bank do? In many cases, restructuring will not be possible unless there are additional financial resources forthcoming. Each bank among the company's creditors will therefore have to evaluate the present value of an extended financial commitment vis-a-vis the company. If this present value is positive, the required workout can be undertaken. Otherwise, for a negative present value, the bank will not be willing to extend additional loans, or to take any other supportive action[19]. She will rather pull back and, perhaps, trigger the liquidation of the company.

Ceteris paribus, supportive actions by a particular lender in situations of borrower distress are more likely (i) if his claims have priority over the claims of other creditors, (ii) if his bargaining costs are expected to be low relative to other creditors, and (iii) if his uncertainty in the assessment of the real economic value of a debtor's assets is low. The first two conditions refer to the free-riding problem that emerges in a borrower distress with multiple lenders. Relationship lending and the accumulation of collateral are seen as complementary in view of solving this free-riding problem. The third condition is especially true for those lenders with private information. Hence, all three conditions are met by relationship lenders, and one should therefore expect that these do engage more frequently in workouts than normal lenders.

Additionally, according to the renegotiation argument, collateral distributes bargaining power among lenders. Combining the bargaining power argument with the implicit insurance function of relationship lending, the relevant prediction, Hypothesis 3, claims a positive correlation between all three variables: the occurrence of workout activities, the accumulation of collateral, and the existence of a lending relationship.

For a formal test, we rely on our sub-sample of potentially distressed companies, as described above. It includes credit-file data of 75 potentially distressed medium-sized German companies over a five-year period (1/1992 -12/1996). Whenever there was a change of contract terms, or a

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19 Supportive actions are those activities that increase the probability of a restructuring being successful. Examples comprise the provision of consulting services, or the extension of additional loans, see below.

re-rating, during this period, the complete set of variables was collected. The data set includes the contract terms, current balance sheet data, risk assessment in terms of internal ratings, and information on distress-related activities by the bank. The latter information typically is of a qualitative nature, indicating the pledging of additional collateral, any change of credit outstanding (including debt forgiveness, credit rationing, redemption of loans or the granting of additional loans). The data set also includes information on the termination of a bank-borrower relationship, like for example the commencement of bankruptcy proceedings.

The structure of the data used in this section of the paper, the PD-sample, is different in some respect to the representative sample (R-sample) used in Section 4. First, observations of a given individual are in single years (typically the year where the distress event occurred) significantly more frequent than in the R-sample, e.g. some companies then have up to six contract modifications. Second, as was to be expected, the survivorship rate is lower in the PD-sample, due to liquidation decisions and relationship terminations. Given this structure, we do not conduct a panel analysis but focus on cross-sectional analysis.

In order to identify the banks involvement in a private workout, we define a proxy variable that is positively related to workout activities by the bank. This variable is labeled WORKOUT and is assigned a value of one if either bank activities relating to workout investments are documented in the credit files, and/or financial support is explicitly documented. In particular, such workout activities comprise the setup of a lender syndicate, the provision of consultancy services delivered or initiated by the bank itself, an active search for a potential merger candidate, or any other activity that indicates the heavy involvement of the bank in a restructuring.[20]

Our data may be affected by a type of observational bias which is common for panel studies. Though we document all workout activities that occur during the period of observation (1992-1996), some such activities will have started before the beginning of our sample period, or they happen only after the end of our sample period. As a consequence, we require for each individual in the sample to have at least one year of observation after the onset of financial distress. Additionally, companies with contract termination during the initial two years of our sample period were also excluded from the analysis.

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[20] Some illustrative example cases are documented in the Appendix.

This leaves us with 62 firms for an analysis of bank workout activities. Our main focus is on determinants of the workout decision, with a special focus on the key factors of this paper, collateral and relationship lending. We employ a logit estimation, where the binary dependent variable (WORKOUT) is regressed on housebank attribution (HBM), the degree of collateralization, (COLDEGREE), as well as the interaction term of these two variables (HBCOLLAT), to control for the coordination-related function of collateral in relationship lending.

In addition, we control for company heterogeneity by using LOGSIZE, LIMLIAB and ENGINEERING as structural variables.[21] As before, FINSHARE measures the relative importance of a particular bank among all creditors of a firm. HBFIN and FINCOLLAT are the respective interaction terms used to sort out the joint effect of financing share and relationship lending or collateralization, respectively. Finally, we include a measure of the importance of debt for total financing of a given borrower, labeled LEVERAGE. It is defined as the ratio of total debt financing to balance sheet total in percentage points.

For all variables, the observation at the distress event or, in case of missing observations, immediately before this date are used.

Table V shows the frequency distribution of WORKOUT over housebank status and banks, indicating a sufficient degree of variability for carrying out a logit analysis. Additionally, Table V shows that there are two banks for which no observation with a workout exist. Therefore, we dispense with the bank dummies to avoid estimation problems.

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21 We dropped the other industry variables since about 80% of the sample firms belong to the manufacturing industry.

Table V
Frequency Distribution of WORKOUT

		BANK						HBM		
		1	2	3	4	5	∑	0	1	∑
HBM	0	9	3	10	10	10	42			
	1	1	8	4	5	2	20			
	∑	10	11	14	15	12	62			
WORKOUT	0	10	7	7	10	12	46	34	12	46
	1	0	4	7	5	0	16	8	8	16
	∑	10	11	14	15	12	62	42	20	62

WORKOUT is a binary variable, indicating whether workout activities occurred or not; HBM is housebank attribution dummy, BANK indicates the bank form which an observation originates.

5.2 Results

Table VI contains the results of two logit models estimating the determinants of the workout incidence. Model I includes only one interaction term, HBCOLLAT, the role of collateral under relationship lending. Model II considers the two additional interaction effects, namely the financing share in relationship lending, and its interaction with the provision of collateral, HBFIN and FINCOLLAT.

Table VI
Logit regression of workout incidence on a set of explanatory variables

Regressors	Model I	Model II
Constant	16.46 (0.03)** *(0.03)*	35.96 (0.008)*** *(0.01)*
ENGINEER	-2.47 (0.03)** *(0.03)*	-5.26 (0.007)*** *(0.008)*
LOGSIZE	- 0.81 (0.08)* *(0.09)*	-2.37 (0.011)** *(0.013)*
LIMLIAB	-2.77 (0.02)** *(0.02)*	-5.10 (0.008)*** *(0.009)*
LEVERAGE	-0.08 (0.012)** *(0.01)*	-0.14 (0.004)*** *(0.004)*
FINSHARE	- 10.12 (0.01)** *(0.01)*	9.47 (0.14) *(0.14)*
COLDEGREE	0.03 (0.14) *(0.15)*	0.12 (0.007)*** *(0.007)*
HBM	6.64 (0.007)*** *(0.009)*	9.37 (0.02)** *(0.02)*
HBCOLLAT	- 0.05 (0.08)* *(0.09)*	0.04 (0.40) *(0.41)*
HBFIN	---	- 0.15 (0.03)** *(0.04)*
FINCOLLAT	---	- 0.43 (0.013)** *(0.01)*
N	62	62
LR-statistic	20.27 (0.005)***	35.49 (0.0001)***
Pseudo-R^2	0.29	0.50
Predictive improvement	31.25%	50.00%
Hosmer-Lemeshow-Statistic	6.7 (0.35)	3.52 (0.74)

The dependent variable is WORKOUT which is assigned a value of one if workout activities occurred, and zero otherwise; ENGINEER is binary: 1 if a firm is rooted in the engineering industry; LOGSIZE is the natural logarithm of a company's annual sales; LIMLIAB is binary: 1 if incorporated; HBM is binary: 1 if housebank; LEVERAGE is the ratio of total debt financing to balance sheet total; COLDEGREE is the ratio of collateral value to total credit volume in percentage points, HBCOLLAT the corresponding interaction term with HBM; FINSHARE is the ratio of total credit volume supplied by the respective bank to total debt financing of a borrower, HBFIN and FINCOLLAT the corresponding interaction term with HBM and COLDEGREE, respectively.

All observations of the explanatory variables were taken at or immediately before the distress event. p-values in parentheses. Values in italics are p-values based on robust estimation using a generalized linear model (GLM). The predictive improvement measures the increase in correct classifications of the estimated model compared to a naive model with constant probability. The Hosmer-Lemeshow test is a Goodness-of-Fit test with the null hypothesis of no misspecification. *, **, ***: Significance at the 10%, 5%, and 1% level, respectively.

Considering the structural variables first, there is clear indication of firm heterogeneity in both specifications. The coefficients for ENGENEERING, LOGSIZE and LIMLIAB have a negative and significant coefficient. Therefore, e.g., the probability of workout activities occurring is higher for smaller companies. The coefficient of LEVERAGE, the measure for the relative importance of debt as a funding source, is negative and significantly different from zero. It indicates that more debt in the capital structure tends to reduce the workout probability, abstracting from relationship lending.

At the core of our analysis are the variables COLDEGREE and HBM. The coefficient of HBM is positive and significantly different from zero, indicating a higher probability of an active workout involvement of housebanks as compared to normal banks. This is consistent with hypothesis 3, while, in Model I, the coefficients of both COLDEGREE and FINSHARE are not compatible. The former is positive but insignificant, whereas the latter is significantly different from zero and negative. However, Model I does not account for a potential substitutability of a bank's financing share and the degree of collateralization. For example, suppose a bank is almost the exclusive financier of a firm. In this case, the additional provision of collateral will not have much impact on workout decisions since expected coordination conflicts are low, and incremental cash flow caused by workout activities will flow to the exclusive financier anyway. The same argument may hold for the housebank status and the financing share. Model II explicitly accounts for such substitutional effects between the financing share, collateralization and the housebank status by including the respective interaction terms.

As a result, the explanatory power of the model increases considerably, as is evidenced by the increase in R^2 and the predictive improvement (over a naive prediction) of 50%, compared to 31.25% in Model I. The coefficients of the interaction terms FINCOLLAT and HBFIN are significantly different from zero. Their coefficients are negative, confirming the substitutional relationship between these determinants.

Finally, and most importantly, the direct effects of both collateralization and relationship lending are significantly positive, thereby providing strong evidence for our renegotiation hypothesis 3. An increase in collateral value as well as the existence of a relationship thus strengthens workout efforts by banks.

6. Conclusions

To date, there is very little empirical evidence on the evolution of financial relationships and on their role in situations of borrower distress. Lack of data is probably the most serious reason for our limited understanding of the role of housebanks, and more generally, of information-intensive borrower-lender relationships. This paper draws on a unique set of credit-file data that includes observations on borrower-related bank decisions, on contract design, on the bank's own assessment of individual borrower risk and, most importantly, on bank decision-making after the occurrence of financial distress. The five-year panel structure allows a dynamic analysis of the problem. It is to the best of our knowledge the first empirical study that directly addresses the role of relationship lending in times of borrower distress. The results reported in this paper strengthen the understanding of the real effects of relationship lending.

Our analysis proceeds in two steps. We first look at collateral in loan contracts prior to the onset of a distress. We then looked at the role of collateral and relationship lending after distress has occurred. In particular, we analyze the determinants of activities supporting firm restructuring and corporate workout.

As to the first step concerning the relation of collateral, both in terms of incidence and in terms of value, to the ex ante default risk of the borrower, there are opposing predictions in the literature. Signaling models predict a negative relation between the value of collateral and default risk, while risk compensation and incentive-oriented models predict a positive correlation between collateral and default risk. Our findings do not lend support to any of these predictions. The incidence of collateral, i.e. the choice between an unsecured and a secured loan, is statistically independent of the borrower's default risk. Similarly, there is no statistically significant difference in the degree of collateralization between prime borrowers and low-quality borrowers (with the highest default expectation).

We find evidence consistent with the idea of housebanks accumulating collateral over time. Housebanks do require collateral more frequently and in larger amounts, relative to the loans outstanding, as compared to normal banks. This finding may be explained as an attempt by housebanks to increase the lock-in of borrowers and to strengthen the bank's future position in contract renegotiation.

Using a complementary data set of distressed loans, we were able to further pursue the analysis of workout activities. Using a logit model, we identified the determinants of workout investments by banks. Our findings indicate that the degree of collateralization is positively correlated with the level of future workout activities. In addition, we find the housebank to be significantly more active in company restructuring than a "normal" lender. Both results support the Longhofer/Santos (1998) model on the dynamics of relationship lending. Strong financiers, housebanks, accumulate collateral in "good" times, and get actively involved in company restructuring in "bad" times. In this sense, collateral serves a strategic function in that it shapes the bank's future position in a renegotiation process. In particular, the accumulation of collateral serves not only as a pledged asset against the loan outstanding, but it also restricts the borrower and other creditors in a desirable way.

The findings reported in this paper give rise to an important follow-up question addressing the shareholder value implications of their involvement, which by some is seen to be typical for bank-oriented financial systems. As has been shown, relationship lenders are the most important claim holders and the prime providers of workout support in situations of borrower distress. Do their activities add value in terms of workout success? Does relationship lending enhance an efficient choice between workout involvement and timely liquidation? Clearly, these questions have to be answered before one may attempt to evaluate the overall vices and virtues of housebanking as a financial institution.

Appendix *Cases with WORKOUT investments (examples)*

No	General descriptives			Workout activity			Distress consequence				Additional Notes
	Distress-Event	Industry	Number bank relationships	Consultant	Takeover	Restructuring	Formal insolvency	Loan value adjustment	Termination	Liquidation	
1	05.11.91	Chemistry	12	0	0	0	0	X	0	0	Debt restructuring, development of reorganization plan
2	26.03.93	Electricity	3	0	0	0	0	X	0	0	Additional credit supply, development of reorganization plan
3	19.09.96	Construction	3	X	0	0	0	X	0	0	Debt restructuring
4	28.01.94	Automotive supplier	18	0	X	X	0	X	0	0	Debt restructuring
5	27.10.94	Wood	6	0	0	0	0	X	X	X	Banks become shareholder.
Group	WORKOUT = 1	---	∅6,5	Σ5	Σ5	Σ7	Σ1	Σ13	Σ2	Σ1	Total cases: 16
Group	WORKOUT = 0	---	∅5,7	Σ0	Σ0	Σ4	Σ4	Σ15	Σ4	Σ3	Total cases: 46

Distress Event= date of initial distress event, *Consultant*= bank initiated and hired consultant, *Takeover*= bank actively engaged in search for merger /takeover candidate, *Restructuring*= Bank leads restructuring pool or is actively engaged in development of restructuring concept, *Formal insolvency*= Distress ends with formal insolvency procedure. *Group*= summary statistics with WORKOUT equal to zero and one, respectively. *Debt restructuring* comprises loan volume reductions, additional collateral requirements, change in maturity structure or interest payments etc.

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