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An Empirical Study on Financial Contracting**

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Collateral, Relationship Lending and Financial Distress: An Empirical Study on Financial Contracting

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Abstract:

This paper analyses the role of collateral in loan contracting when companies are financed by multiple bank lenders and relationship lending can be present. We conjecture and empirically validate that relationship lenders, who enjoy an informational advantage over arm's-length banks, are more senior to strengthen their bargaining power in future renegotiation if borrower's face financial distress. This deters costly conflicts between lenders and fosters workout decisions by the best informed party.

Consistent with our conjecture, we find that relationship lender in general have a higher probability to be collateralized, and a higher degree of collateralization (i.e. seniority). Furthermore, we show that seniority and the status of relationship lending increases the likelihood that a bank invests in a risky workout of distressed borrowers. Both findings support the view that collateral is a strategic instrument intended to influence the bargaining position of banks. Our result further suggest that seniority and relationship lending are complementary to each other.

JEL Classification: G21

Keywords: relationship lending, collateral, multiple lending, loan contract design, workouts

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1. Introduction

Multiple banking and relationship lending are two important characteristics describing a typical bank based financial system. The former, multiple banking, implies that different, non-syndicated banks lend money to a particular firm at any given moment. The latter, relationship lending, implies that there is a long term, information intensive contractual relationship between a single bank and a particular borrower. Yet, there is an inherent conflict between these two features. It becomes apparent when a borrower enters in a state of financial distress. Then, financiers have to decide on debt restructuring, fresh money to allow workout activities, or simply liquidation.

With multiple source lending, the primary problem of resolving financial distress is to achieve coordination of lenders. Since claimants mutually have to decide on liquidation or continuation of the borrower's operations, coordination failures can lead to (socially) inefficient distress decisions, for example by triggering a run on the borrower's assets, or by increasing deadweight costs of renegotiation. In this context, Welch (1997) shows that ex ante fixed seniority of lenders can serve as an instrument to strategically allocate bargaining power between lenders, thereby deterring costly conflicts ex post.

In this paper we conjecture that i) collateral in corporate bank debt financing primarily serves to set seniority between multiple bank lenders, ii) the bank presumably best suited to decide on continuation or liquidation of distressed borrowers has the highest degree of collateralization (or seniority), and iii) that both issues systematically affect the decision of bank lenders to engage in risky workouts of distressed borrowers. The objective of the paper is to provide empirical evidence on all of these conjectures.

Hence, we adopt Welch's (1997) explanation of the role of collateral in loan contracting and argue that relationship lending and loan collateralization are complementary institutions potentially designed (and ex ante agreed on) to minimize ex ante costs of coordination failure (henceforth: *complement hypothesis*). The special emphasis on relationship lending is due to the alleged role of relationship lenders to make different decisions in renegotiations and borrower distress due to their implicit long-term horizon and their information privilege, as emphasized e.g. by Rajan (1992), Allen/Gale (1995), and Boot (2000).

Our empirical study thus addresses two prominent features of bank debt in corporate finance: on the one hand seniority or collateralization of bank loans and on the other close ties between a firm and one bank that is special in the sense of relationship lending. The analysis proceeds in two major steps. First, we examine the determinants of loan collateralization and thus the allocation of collateral between lenders in normal times of borrower's business operations. Second, we analyze whether the existence of a relationship lender and seniority of lenders affects bank's decisions to invest in risky workouts if borrower's actually face financial distress.

The empirical analysis relies on a unique data set that was collected from credit-files of five major universal banks in Germany, the prime example for a bank-based financial sys. Consistent with our conjectures, we find that the allocation of collateral is strongly correlated with the intensity of bank-firm relationships, and with a bank's willingness to engage in the workout of a distressed borrower. We interpret these findings as evidence in favor of the complement hypothesis.

The paper is organized as follows. Section 2 develops the idea of collateral as a complement to relationship lending in more detail, relating it to the literature. In Section 3 we analyze empirically the role of collateral in lending contracts. We first examine the determinants of collateralization

zation with the focus on the type of collateral, the incidence of relationship lending, and multiple bank lending. Then, we measure involvement of banks in workout activities if borrower's actually face financial distress. Taken together, the analysis relates collateral to relationship lending, and to workout activities in distress, establishing a direct test of the complement hypothesis. Section 4 discusses the results in the light of financial systems architecture and concludes.

2. Collateral and Relationship Lending

What influence does collateral have on the behavior of the borrower and (multiple) creditors in corporate bank lending? The answer to this question depends on the type of collateral under consideration (see Bester 1994). Either collateral is based on particular assets coming from outside the firm (outside collateral, like a portfolio of securities, or a personal guarantee by a third party), or collateral is based on particular assets from inside the firm (inside collateral, like machinery, equipment, buildings). In the case of outside assets, collateral increases payments to the bank in borrower default, may resolve problems of adverse selection, affects incentives for strategic default by the borrower, and can substitute for information about project quality (see Besanko/Thakor 1987, Bester 1994 and Bolton/Scharfstein 1996, and Manove/Padilla/Pagano 2001, respectively). In the case of inside assets, however, collateral serves different functions, in particular defining priority over future cash flows of the firm among lenders, but also providing incentives and/or valuable information for monitoring (see Rajan/Winton 1995).

In this paper, we will ignore the role of collateral as a signaling device because signaling solves problems of adverse selection before contracts are written. Our sample of bank-borrower relationships has a fairly long duration of already established relationships, however. In this context,

signaling models have no clear implication. For the purpose of our analysis, the role of collateral determining seniority between multiple lenders (i.e. inside collateral) is essential.

The seniority of a bank due to collateral rights affects its bargaining position in the presence of multiple lending. If corporate assets are already pledged to existing lenders, the borrower will find it hard to attract additional debt from third sources, because he can offer nothing but junior debt to investors. Furthermore, the right of a senior lender to seize “his” company assets is a serious threat to all other stakeholders, in particular to other, secondary banks. The reason is that the seizure of real assets is likely to affect both the liquidation and going concern value of the remaining assets of the firm. Since collateral decisions of one lender has wealth effects for other lenders, seniority can be seen as an instrument by which bargaining power is allocated between lenders. This is the interpretation for the role of collateral in loan contract design that is at the heart of this paper and in particular underlying our complement hypothesis between relationship lending and collateral.

Indeed, much of the theoretical literature on relationship lending emphasizes that the need for monitoring intense financing of certain types of firms makes collateral an essential characteristic of loan contracts and requires “the proximity between bank and borrower that comes with relationship [lending]” (Boot 2000, p. 15). Relationship lending is defined as a long-term implicit contract between a bank and its debtor.¹ Due to information acquisition and repeated interaction with the borrower over time, the relationship bank accumulates private information. This information privilege commits both parties to each other, often interpreted as close ties between the bank and the borrower (see e.g. Sharpe 1990, Rajan 1992). From the perspective of the borrower, one economic rationale for allowing a lender to have an information privilege is the expectation

that this relationship lender will make superior investment decisions than other, less informed lenders, if the firm faces financial distress (Rajan 1992, and Boot 2000).

In the context of multiple source lending, it remains unclear how such a “pivotal” bank can impose her workout policy given the coordination problems between the relationship lender and secondary lenders. Longhofer/Santos (2000) highlight the fact that it is the most senior lender who benefits first from revenues of a risky investment in a workout of a distressed borrower. Therefore, *ceteris paribus*, it is the most senior lender who is most willing to invest in workouts.² In turn, providing a relationship lender with the highest seniority renders informed lending more attractive to the borrower, thereby making the initiation of relationship lending more likely. Overall, it can be efficient to give seniority to the lender with the best information about the borrower. These results point to the fact that relationship lending, seniority, and workout decision of banks are related to each other.

The complementary nature of relationship lending and seniority is further supported by the analysis of Welch (1997), who shows that it can be optimal to give seniority *ex ante* to the lender who, in future (re-)negotiations, is likely to have the highest bargaining power. This arrangement minimizes coordination costs by deterring conflicts between lenders, thereby facilitating (efficient) debt restructuring. Due to its information privilege and the resulting borrower lock-in, the relationship lender is the prime candidate to be made senior *ex ante*. Although Welch (1997) in his interpretation distinguishes between banks and other types of lenders (trade creditors, bond holders), his theory can be interpreted as well as representing one relationship lender and several other (secondary) banks. The special role of banks in Welch’s interpretation is related to better organization and reorganization skills. This can as well hold for the distinction between relationship lenders and arm’s-length banks, but relying on the information privilege and the induced

commitment between the borrower and the relationship lender is an even stronger argument in this context.

Finally, Bris/Welch (2002) show that concentrated creditors (again, relationship lenders) are at a relative advantage in financial distress because they face lower coordination and free-riding costs making it easier to enforce their contractual obligations.

In combination, the preceding arguments support our conjecture that making the relationship lender's claim senior over all other claims can help to resolve the coordination problem between informed and uninformed lenders. Seniority in this context refers to the priority given to a collateralized lender with respect to future cash flow of the firm, either from liquidation of assets, or from the income stream. Thus, in the following, we equate collateral with the earning assets of the company, tangible and non-tangible, i.e. inside collateral.³

The existing evidence on loan contract design, the number of creditors, and relationship lending supports some of the essential features addressed in the outlined theories. Berger/Udell (1990, 1995), Petersen/Rajan (1994, 1995), Carey (1995), and Degryse/van Cayseele (2000) provide evidence that loan contracts are typically collateralized.

Regarding empirical predictions on multiple lending and the existence of relationship lending, most available evidence indicates that multiple bank lending is the rule rather than the exception in corporate finance for mid-cap and large-cap companies (see e.g. Ongena/Smith 2001, Detragiache/Garella/Guiso 2000). Furthermore, empirical studies analysing relationship lending in the context of multiple bank lending (e.g. Petersen/Rajan 1995, Elsas/Krahn 1998, and Degryse/van Cayseele 2000) observe behavioral bank patterns consistent with relationship lending, like increased credit availability in general and the provision of liquidity insurance if borrower quality deteriorates. Thus, firms typically maintain more than one bank relationship, and one of

them can be an informationally intense relationship.⁴ For example, in the sample used by Elsas/Krahen 1998, firms where one bank *explicitly* claimed to be the relationship lender have 4 bank relationships on average.⁵

Using the insights from the preceding analysis of the literature, we can restate and sharpen the empirical predictions (or conjectures) outlined in the introduction: First, firms typically have more than one (bank) lender. Second, collateral rights typically serve the purpose to fix seniority among multiple lenders. Third, we observe relationship lending and multiple banking jointly, though not necessarily in all cases. Fourth, the relationship lender has a higher seniority than arm's-length banks. Fifth, the relationship lender should be the bank most willing to get actively involved in workout investments.

This paper will present new evidence on each of these predictions. It is tested whether the observed allocation of collateral is consistent with the idea of collateral being an instrument which strategically influences (expected) renegotiations between a company and its multiple bank lenders. The complementary nature of collateral and relationship lending, which is our main hypothesis, is in particular reflected in predictions 4 and 5 and will be analysed empirically in the subsequent section. This is the main contribution of our study to the literature.

3. Data Set and Descriptive Statistics

3.1 The Credit File Data

The data underlying our analysis has been collected from the credit files of five major German banks, including Deutsche Bank, Dresdner Bank, Bayerische Vereinsbank (now HypoVereinsbank), Deutsche Genossenschaftsbank (now DZ Bank), and Westdeutsche Landesbank (WestLB).⁶ All of these banks are universal banks with credit business in the small, medium and

large firm size segment; three banks are private, one is a mutual (DZ), one is a savings bank (Landesbank).

The data set is a 5 years-panel, containing general company characteristics (e.g. age, industry, legal form), specific loan contract characteristics (e.g. collateral, maturity, exposure, credit lines, contractual interest rate), balance sheet data, and the bank's assessment of borrower default probability (internal ratings). The firms were sampled randomly from a population of all corporate customers who had active business with one of the banks at some time between January 1992 and December 1996, and who matched further selection criteria.⁷ There were four such criteria: firm size, loan size, location of the headquarters, and type of loans.

First, companies had to be medium sized, defined by annual turnover between DM 50m and DM 500m (US\$ 25m -US\$ 250m). Since firms in this size bracket typically do not issue public debt, they are not covered by rating agencies either. Absent rigorous disclosure requirements (as in Germany),⁸ we expect asymmetric information between lenders and borrowers to play an important role. It therefore constitutes a perfect population to study the relationship lending and loan contract design.

Second, to ensure a minimum level of information on all banks of the borrowers, a minimum total loan size of DM 3m (US\$ 1.5m) was imposed.⁹ All loans surpassing DM 3m are 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.¹⁰ Third, borrowers with headquarters in the former GDR (East Germany) were excluded, just as, fourth, borrowers without at least one longer-term investment loan, to enable observing loans with fixed maturity and repayment schedule.¹¹

These four criteria were applied to generate what we label the “representative sample”, to be used for the analysis of the determinants of loan collateralization under normal times of business operations of borrowers in Section 3.2. It consists of 25 borrowers from each of the five banks, resulting in a total of 125 credit relationships. For each of these borrowers, the full set of variables was recorded from the credit files whenever a credit decision (e.g. loan renewal, or change in loan amount) was documented, or a re-rating occurred. 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 loan amount, collateralization, or borrower rating, we have the complete time series over the observation period. In order to avoid a potential bias due to non-synchronous data collection, we stratified our panel by yielding one annual observation at the end of each year between 1992 and 1996, using always the last available - and by design of the data collection *appropriate* - observation.

This leads to a synchronous panel data set with a theoretical number of 625 observations per variable.¹² The actual number of observations is smaller, since there are some relationships that started either later than 1992, or ended earlier than 1996, and there were also missing observations.

The analysis of bank behavior if borrowers actually face financial distress in Section 3.3 will be based on the so-called “distress sample”, taken from the same population of borrowers. The sample selection meets the four criteria of the representative sample, augmented by a fifth criterion: Borrower must have received a poor (negative) 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 6-notches rating system that we use to calibrate the risk assess-

ments of different banks, the notches 5 or 6 are reserved for negative ratings (notches 1-4 being investment grade). The distressed sample consists of 5 x 15 borrowers.

Thus, the overall number of firms in our sample is 200, out of which 125 were sampled from the full population, and 75 were sampled from the distress subset of this population. Though theoretically possible, there was no overlap between the two samples. Note that the data set consists of the information taken from the credit files of only one of the company's bankers the company may have (henceforth "our bank"), and typically has additional banks, whose credit files we do not observe.

Characteristics of the Sample

The data source and the sampling procedure lead to specific characteristics of the sample. First, and most important, the sample consists of firms that typically do not rely on public debt markets, and which are believed to be subject to high degree of (potential) informational asymmetries. Not astonishingly, we find that none of the sample firms is exchange listed, and none of the sample firms has issued public debt in the past. Therefore, bank financing turns out to be the single most important source of outside financing.¹³ This evidently makes a relatively simple debt structure, and a low number of creditor classes which have to be taken into account in our subsequent empirical analysis.¹⁴

Furthermore, to examine the monitoring role of banks it is important to incorporate all instruments that can be used to exert influence on management decisions. In the context of our analysis, it is remarkable that there is no firm where equity holdings by a bank are reported (in line with our expectation about the ownership structure of medium-sized companies in Germany,

which are mainly family-owned). Thus, the credit relationship is the only means by which banks can possibly exert monitoring and management control.¹⁵

More technically, the sampling design guarantees our data to be a comprehensive and complete projection of all relevant information documented in the bank's credit files. The data collection was conceptually and organizationally supported by the banks joining the research project. Therefore, we had unrestricted access to all sources of information and documents about the borrowers available to the banks themselves.¹⁶ This suggests a high quality of data, in particular in comparison to survey-based data.

The access to credit files allowed a detailed record of the different internal rating systems used by these banks. All institutions produce two internal ratings, one with and one without considering the value of pledged collateral.¹⁷ In what follows we rely solely on the latter notion, i.e., internal ratings are a measure of expected default risk for an uncollateralized exposure.

All banks used rating systems that were comparable in terms of methodology and data input, allowing the transformation of the different scales into one "master scale". This standardized scale ranges from 1 (highest quality, lowest default risk) to 6 (worst quality, highest default risk). According to the internal guidelines, these ratings are intended to capture the unconditional default probability over a one-year horizon. The rating notch attributed to a certain borrower, therefore, corresponds to a particular risk class.¹⁸ The re-calibration was based on the qualitative information provided by the bank internal rating guidelines. Although we believe that this re-calibration of ratings does not affect their information value,¹⁹ we will provide robustness checks of all our respective results by using standard risk proxies as substitutes for internal ratings (notably firm profitability and standard deviation of profits).

Identification of Relationship Lending

With respect to the identification of relationship lending, we rely primarily on the German notion of a “housebank”, a well defined term in the context of German banking. It refers to a company’s primary financier, who is said to have access to more relevant, and more timely information than arm’s-length lenders. Furthermore, housebanks allegedly take special responsibility if their borrowers are in financial distress (see for example Fischer 1990, and Elsas/Krahnert 1998 for corroborating evidence). For the purpose of this analysis, we treat the notions of the housebank and relationship lending synonymously. Banks may be either a housebank for their client, or they are not. In the latter case we speak of an “arm’s-length bank” (see Rajan 1992).

In order to assess the housebank status for a given bank-borrower relationship, we rely primarily on the self-assessment of the relevant credit officer at our bank (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. 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 related to a housebank status (e.g. “we are the housebank”, “we are the main bank”, “we have a special responsibility”), this was coded into the data set. Since this attribution was recorded separately for every credit event, a time series of attributions results. From these two housebank proxies we construct an indicator variable, HB, which is used in the subsequent analyses. HB takes the value 1 for all relationships that are consistently grouped as “housebank” in both attributions, the self-assessment of the bank and the analysis of credit-file statements, and at all times. HB equals zero, in contrast, if both attributions classify the credit-relationship consistently as “non-housebank”, or if they are incon-

sistent, or change over time. Thus our HB variable minimizes the Type-I-error, i.e., it minimizes the probability of assigning the housebank status when, in fact, this is false. Note, however, that our empirical results are robust in the sense of being qualitatively unaffected if instead the raw, unmodified self-assessment of the banks is used.²⁰

Remarkably, our housebank attribution differs substantially from measures of relationship intensity commonly used in the literature, such as duration or the number of bank lenders. To provide some insights into these alternative measures, Table I documents descriptive statistics (see Elsas (2002) for further details).

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Insert Table I

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From column 2 of Table I it is apparent that the length of the bank-borrower relationship (duration) does not differ significantly between housebanks and arm's-length banks. On the other hand, the "number of bank relationships" as well as the "debt share financed by our bank" both differ significantly between housebanks and arm's-length banks. If a housebank is involved in firm's debt structure, the number of banks is smaller and the financing share of the housebank is larger, on average. These stylized observations are compatible with predictions based on the theory of relationship lending, see e.g. Boot (2000). It is also suggested by Table I, that duration is a poor proxy for capturing relationship lending - at least for our sample of bank borrower relationships with a very fairly average duration - while the financing share is a better substitute for housebanking, though also far from perfect.

The indicator variable HB is a new proxy of relationship lending. It is as close as one can get to capture the distinction between relationship lending and arm's-length bank-borrower relationships, since it is based on the self-assessment of one of the parties to the implicit contract of relationship lending.

Collateral

Table II provides information on borrower characteristics in the representative sample. On average, bank debt accounts for 55% of total liabilities. The share of our banks in total debt of the borrowers amounts to 38%, on average. Firms are highly indebted, with equity accounting for only 20 percent of all funds. This number is close to the average equity stake in all German corporations, see Bundesbank (2002) for a recent update. Most borrowers are incorporated (81%), as expected for firms in this size class. Those that are not are foremost the smallest firms with turnover below 100m DM.

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Insert Table II

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To gain some insights on the type and frequency of collateral we use three variables. The incidence and qualitative characteristics of collateral are captured by COLYN and COLTYPE. COLYN is binary, taking a value of one if the loan is collateralized, and zero otherwise. COLTYPE is a categorical variable, assigning the value zero if a credit relationship is not collateralized, the value one if at least one of the loans of the sample firm provided by one of our banks is secured by company assets (like e.g. land charges, mortgages, assignments of accounts

receivable) alone, the value two if the loan is secured by non-company assets (e.g. personal guarantees) only, and the value three if company and non-company assets are combined. Thus, COLTYPE breaks down the observation COLYN equal to one according to the type of security. COLTYPE allows to distinguish between inside and outside collateral, i.e. collateral based on a company's earning assets, or inside wealth, and collateral based on extra-company, or outside, wealth.

A third variable, labeled COLDEGREE, is a quantitative measures of the degree to which outstanding loans are collateralized. It is defined as the ratio of collateral value (as assessed by the bank) to total debt supplied by our bank. The variable is bounded from below by zero, as collateral cannot be negative. It is not bounded from above, as the current value of collateral may exceed outstanding debt. It is multiplied by a scaling factor of 100. A value of COLDEGREE of "100" or more refers to a bank that is fully secured. The bank, according to its own assessment, has zero expected loss. As explained above, collateral may be valuable to lenders not only for its market value, but also for its threat value. Therefore, COLDEGREE equal to zero does not imply the absence of priority rights on firm assets. In particular, the bank may estimate the market value of the collateral to be zero, but it may still retain the right to withdraw the physical asset. This, in turn, will influence the decisions of the borrower or other lenders.

Table III below shows the frequency distribution of observations for COLYN differentiated by the variable BANK, which depicts our bank, i.e. the bank from which the credit file data observation originates; it's values range from 1 to 5.

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Insert Table III

Table III shows considerable variation between the banks in our sample, in particular with respect to the percentage of collateralized loans. For example, in the period 1992-1996, 14% of Bank 1 observations are not collateralized, while this number amounts to 66% in case of Bank 3. Clearly, we will have to control for bank heterogeneity in the regression analysis.

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Insert Figure 1

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Figure 1 shows the frequency distribution of COLDEGREE on the range of values from 0 to 100 for the total sample period and all individuals.²¹ Note the significant peak at value zero. This pattern highlights the fact that the ratio of collateral value to credit volume is a left censored variable because all unsecured loans are assigned a value of “0”, and some collateral rights may have value of zero. Thus, an analysis using the variable COLDEGREE has to employ a Tobit-procedure.

Finally, Table IV provides some statistics on loan collateralization according to type of collateral (COLTYPE) housebank status (HB) for one sample year, 1996. In addition, it shows the mean rating (RATING) and the degree of collateralization COLDEGREE for all possible combinations of HB and COLTYPE. Recall that these internal bank ratings estimate the probability of default gross of collateral (borrower ratings).

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Insert Table IV

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Table IV 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 relationships rely exclusively on inside collateral (like guarantees).

With respect to the housebank status, Table IV reveals that arm's-length 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 non-collateralized 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, the univariate analysis in Table IV reveals no significant differences regarding type of collateral and degree of collateralization.

The breakdown according to type of collateral reveals that, given that assets are pledged as collateral, all cases involve company assets, a few cases add non-company assets on top, and not a single case involves non-company assets alone. This is an indication that, at least in our sample of mid-cap German firms, collateral primarily serves to determine the seniority structure among bank lenders.²²

In summary, three characteristics of our data will influence the empirical design of the study. First, bank heterogeneity. This may to some extent reflect differing credit management policies between banks, but will also be due to heterogeneity between firms. Second, personal securities (outside collateral extending the pledgeable wealth of firms beyond the value of their assets) are

never the only type of collateral being pledged, and collateral on company assets (inside collateral) is the predominant type of collateral, thus determining seniority. This pattern is consistent with our empirical predictions concerning the complementary role of relationship lending (the housebank status) and collateral. Third, the degree of collateralization in terms of value is a censored variable, which will bear on the econometric method used.

3.2 Determinants and Allocation of Collateral in Lending Relationships

Design of the Empirical Model

In this section, we examine the main determinants of collateral in loan contracting, as they appear in the representative data set, i.e. under normal business conditions. We start by discussing the design of the empirical model.

Under the complement hypothesis advanced earlier, it is expected that relationship lending and the provision of collateral are complementary to one another. This implies that the incidence of the housebank status increases the priors of finding the loan collateralized. Furthermore, the degree of collateralization should also be higher for housebanks than for arm's-length banks. The reason is that the housebank holds an informational advantage over arm's-length banks and is therefore best prepared to bargain with a borrower, in case of financial distress. This is true even if the market value of collateral turns out to be low in an actual distress situation, as long as a physical withdrawal of the asset poses a threat to the smooth operation of the company. We will analyze both variants of the collateral hypothesis in this section, with COLYN and with COLDEGREE as dependent variables.

We are estimating panel regressions, assuming a one factor random effects specification. This allows to use the full sample while controlling for unobserved heterogeneity among individuals.²³ Since COLYN is a dichotomous variable, we use a probit specification for our first regression. Furthermore, since COLDEGREE is a censored variable we use a Tobit-formulation for our second regression.²⁴ We are going to test variants of equation (1).

$$\text{Collateral} = f(\text{controls}, \text{risk}, \text{relationship}) \quad (1)$$

The explanatory variables can be grouped as control variables, risk variables, and relationship variables, respectively. The group of general controls comprises a proxy for firm size, LOGSIZE, measured as the natural logarithm of a company's annual sales. LIMLIAB is a dummy variable, indicating limited liability of the borrower. A set of dummies for the individual bank from which the credit file observation originates is included to control for inter-bank heterogeneity (BANK2 - BANK5), Bank 1 serving as a benchmark. Finally, to control for the company asset structure (which may affect the potential of the firm to provide collateral in the first place), we include an index of research and development expenses (R&D) measured on an industry level.²⁵ All other general and time-invariant characteristics (like industry affiliation etc.) are controlled for by the random effects.

Expected default risk is likely to influence the demand for collateral in loan contracts. It is proxied by bank internal borrower ratings. Since RATING is an ordinal variable, dummy variables are used to differentiate between borrowers according to quality. RATING3 and RATING4,5 are used in the regression, while the prime risk classes (RATING 1 and 2) with the lowest default probabilities serve as the reference group.²⁶ Firm profitability (PROFIT) and its volatility (VOLA) are also supposed to capture company quality. They are used as a robustness test for bank internal ratings. PROFIT is measured as return on assets, based on profits before taxes and extraordi-

nary items. VOLA is calculated as it's respective standard deviation over all time series observations per individual and thus time-invariant.

The key variable in this regression measures the effect of relationship lending. It is represented by the variable HB, referring to the housebank status of the lender in a given relationship. Given that collateral in our data set is dominated by company assets (inside collateral), the complement hypothesis suggests a positive coefficient of the relationship variables.

Finally, we construct the variable #BANKS that accounts for the total number of banks with active business with the company. Since the number of banks and the housebank status are related to each other, we further include the interaction term of the two variables, HB x #BANKS.²⁷

Table V summarizes the definitions of all variables.

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Insert Table V

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Regression Results

The results of the panel analysis are presented in Table VI. We estimate the determinants of the allocation of collateral using three specifications of equation (1). Model I reports a Probit-analysis, estimating the determinants of the binary collateral variable COLYN. Model II presents the results of a Tobit-analysis, using the degree of collateralization as dependent variable (COLDEGREE). The right hand side of both regressions are identical. With Model III we vary some of the explanatory variables used in Model II, in particular the measures of borrower risk or quality.

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Insert Table VI

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The results are as follows. Control variable estimates are stable across all models. As expected, there is heterogeneity among banks with respect to their collateral decisions. Three out of four bank-dummy coefficients are significantly different from the reference, Bank 1.²⁸ Company size (LOGSIZE) has no significant influence on the incidence of collateralization (Model I), but affects the degree thereof, conditional on a loan being collateralized. Firms with limited liability (LIMLIAB) are less frequently collateralized; and also to a lower degree. Finally, firms from industries with higher average research and development expenses (R&D) have a lower probability for the incidence and a lower degree of collateralization. This may reflect different asset structures between industries and therefore the potential of firms to provide banks with a claim on physical assets.

We next turn to the risk variables. It is interesting to observe that in neither regression the coefficients of the rating dummies are significant.²⁹ As indicated by the estimates of Model III in Table VI, the insignificance of borrower quality or risk remains valid if one uses the alternative (and more standard) proxies PROFIT and VOLA. The former is insignificant, while the latter is statistically significant but negligible in terms of economic impact throughout. All other estimates in Model III remain qualitatively unchanged, however.

Hence, in our sample of mid-sized German companies, collateral in loan agreements does not respond to different levels of default risk of the lender. To put it differently, the role of collateral in these contracts cannot solely be to trade off repayment risk, else it were responsive to the level

of these risks. Since under the complement hypothesis collateral serves a different purpose, the result is compatible with a role of collateral as an strategic instrument for renegotiations, though not conclusive.

We now turn to the key variable, relationship lending. Under the complement hypothesis one should expect relationship lenders to be collateralized more frequently and to a higher extent. Consistent with this hypothesis, the coefficient of HB is positive and significantly different from zero in all regressions. This result also holds when using different risk proxies (see Model III).

A higher number of creditors significantly reduces the degree of collateralization, but not the probability of a bank to become secured. Since we include in the first and the second regression the number of bank relationships and the housebank dummy simultaneously, this implies that relationship lending is a determinant of loan contract design that goes beyond the impact of obtaining credit just by a smaller number of banks.

As further (unreported) robustness tests to these results we ran several regressions with varying specifications, each taking one of following issues into account:

- *Time effects and Industry Affiliation:* We included a full set of year dummies and/or industry dummies as explanatory variables. These were insignificant.
- *Capital Structure:* We augmented the explanatory variables by the variable LEVERAGE as another proxy for the capital structure of the borrowers. The respective coefficient was insignificant.
- *Relationship Lending:* We included additional measures for relationship lending, DURATION and FINSHARE, as explanatory variables. DURATION was insignificant, while FINSHARE had a weak negative impact on collateralization.

Neither of these robustness exercises affected the overall qualitative results, in particular the positive and significant coefficient of the housebank variable. This indicates that the finding of relationship lenders being more senior than arm's-length banks is a very robust result.

This result is consistent with the complement hypothesis, which is primarily based on the argument by Welch (1997) that seniority or inside collateral should be allocated ex ante to the ex post strongest bank in future renegotiations to deter costly conflicts of lenders. While our evidence so far is consistent with this explanation, it is *not* the only one that is able to explain the pattern in our data. For example, the existence of a simple cost advantage on the side of housebanks in assessing the value of collateral would imply similar coefficients.

Hence, 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, we need to know whether, once the borrower is in distress, seniority of the housebank affects its lending decisions. We are effectively testing whether relationship lending (our variable HB) provides a link between pre-distress collateral allocation and in-distress workout investment. To extend our test to the role of housebanks in distress, we can rely on the complementary data set of actually distressed firms.

3.3. Collateral and Relationship Lending in Borrower Distress

The Main Hypothesis and Descriptive Statistics

The preceding section established that relationship lenders have a higher seniority (possess more collateral) than arm's-length lenders. According to the complement hypothesis, we interpret this finding as an indication of a role of collateral to determine ex ante the bargaining power of bank

lenders in borrower distress. With sufficient collateral at hand, in particular the housebank will be able to play a formative role in bargaining situations that are caused by borrower distress. If there are multiple lenders, and bargaining costs are thus high, collateral is instrumental in deterring costly conflicts between lenders and enforcing the decision of the bank best suited to decide on firm continuation or liquidation – the relationship lender. According to the results of the previous section, collateral is primarily based on company assets, and non-company assets are a minor part of the wealth pledged to lenders (see Table III). Therefore, the allocation of collateral is in fact the allocation of seniority. Since the most senior lender benefits first from a successful reorganization of the borrower, we should expect that the housebank status, and the degree of collateralization are positively related to the likelihood of a workout involvement of a bank. This constitutes the major test of the complement hypothesis.

To derive a suitable design of the corresponding empirical model, one has to model a bank decision on continuation or liquidation of a distressed borrower. Since this is basically an investment decision under uncertainty, the empirical model needs to capture the corresponding determinants, augmented by variables necessary to conduct the test of the complement hypothesis. For the latter, in particular variables reflecting multiple lending, relationship lending, and collateral are essential.

Let us start by considering the investment decision under uncertainty and the role of relationship lending therein. If a borrower faces financial distress, it may be efficient either to liquidate the firm right away, or to restructure it. An additional investment, which is needed to carry out a workout, is worth its while if it is a positive net present value project. Otherwise, for a negative present value, the bank will not be willing to extend additional loans, or to take any other supportive action.³⁰ The lender will rather pull back and, perhaps, trigger the liquidation of the company.

Given a troubled loan, a supportive action by a particular lender is more likely, *ceteris paribus*, (i) the more senior his claim is over the claims of other creditors, (ii) the lower are expected bargaining costs, and (iii) the lower is his uncertainty about the true quality of the borrower's assets.

Conditions (i) and (ii) refer to the coordination problem that emerges in borrower distress with multiple lenders. Relationship lending and the accumulation of collateral are seen as complementary to resolve this free-riding problem, as explained above. The third condition is especially true for those lenders with private information. Hence, all three conditions are met by relationship lenders (and therefore housebanks), supporting our assertion that these do engage more frequently in workouts than arm's-length lenders.

In summary, we should observe a positive correlation between the occurrence of workout activities, the degree of collateralization, and the existence of a relationship lender. Note, however, that neither the complement hypothesis nor our subsequent empirical analysis are concerned with the *success* of workout activities, we are solely concerned with the *occurrence*.

We rely on the sample of distressed firms as already introduced in Section 3.1. Recall that it comprises credit-file data of 75 medium-sized German companies over the five-year period 1992-1996, who had received a distress rating at least once during this period. The distress sample contains the same information as available for the representative sample, i.e. contract terms, balance sheet information, relationship and internal rating data. In addition, it comprises detailed information on distress-related activities by the bank. This information is mainly of qualitative nature, for example indicating whether additional collateral has been pledged, or whether the amount of outstanding debt has changed (including debt forgiveness, loan redemption, or the provision of new loans). The data also include information on the termination of a bank-borrower relationship, and commencement of bankruptcy proceedings.

The structure of the distress sample differs from the representative sample in so far, as observations are more frequent. This is due to the emergency situation which requires more frequent monitoring (or actions) by the bank. In some cases there are up to six contract modifications per year, as compared to the average number of one in the representative sample. Furthermore, in line with the nature of troubled firms, the survivorship rate is lower in the distress sample than in the representative sample. Given this structure, a panel analysis is inadequate and we focus on a cross-sectional analysis.

Table VII provides some descriptive statistics on the distressed firms, differentiated by the housebank status.

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Insert Table VII

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According to Table VII, the general pattern of borrower and loan contract characteristics is similar to the representative sample. Housebanks do have a higher share in debt financing, and borrowers within a housebank relationship maintain fewer bank relationships. Most importantly, however, housebanks have significantly more collateral. Hence, the necessary condition for the idea of collateral and relationship lending being complementary does hold for the distress sample even univariately, i.e. relationship lenders are more senior.

In order to identify a banks involvement in a private workout we define a corresponding measure labeled WORKOUT. This variable takes the value one if i) bank *activities* relating to workout investments are documented in the credit files, and/or ii) *financial support* is explicitly docu-

mented. In particular, workout activities comprise the initiation or leadership of a lender syndicate explicitly intended for restructuring, the provision of consultancy services provided or initiated by the bank itself, an active search for a potential merger candidate, or any other activity indicating a serious involvement of the bank in restructuring.³¹

Due to the fixed observation period of our data collection (1992-1996), some workout activities will have started before the beginning, or they might have happened only after the end of the observation period. To avoid related problems of censoring, we require each company without observed workout activities to have at least one year of observation after the onset of financial distress. In addition, firms with contract termination during the initial two years of our sample period are excluded from the analysis. This leaves us with 62 firms for an analysis of the determinants of bank's workout decisions.

$$\textit{Workout} = f(\textit{controls}, \textit{collateral}, \textit{relationship}) \quad (2)$$

The analysis will be structured according to equation (2). Thus, we assume that workout activities depend on three sets of variables: controls for general firm heterogeneity, a measure for collateralization, and finally one set capturing relationship lending and multiple bank lending. Control variables are firm size (LOGSIZE), limited liability (LIMLIAB), and leverage (LEVERAGE). In addition, we include return on assets to control for borrower quality (PROFIT).³²

For testing the complement hypothesis based on equation (2) we employ a logit regression, where the binary dependent variable (WORKOUT) is regressed on the housebank attribution (HB), the degree of collateralization, (COLDEGREE), as well as the interaction term of these two variables (HB x COLDEGREE), to control for the coordination-related function of collateral in relationship lending.

As is well known in the literature and of particular importance regarding the complement hypothesis, the decision to engage in a risky workout will depend on the severity of the coordination problem of lenders (see e.g. Bolton/Scharfstein 1996, Welch 1997). To control for this issue, we use either the variable FINSHARE or the number of banks (#BANKS).

As before, FINSHARE is a proxy for the relative importance of our bank among all creditors of a firm, and measured by the bank's share in total debt financing of the firm. Note that it is closely related to the Herfindahl-index of concentration of debt if one assumes that all other creditors have a financing share of $1/(N-1)$ of the remaining debt.³³ We will use interaction terms (HB x FINSHARE, FINSHARE x COLDEGREE) to sort out the joint effect of the financing share with relationship lending or collateralization, respectively.

As a robustness test, we use the (natural logarithm) of a firm's number of bank relationships, #BANKS, to control for the debt financing structure of the borrower, i.e. multiple lending.³⁴

In general we expect the likelihood of a workout investment of bank to be increasing in its relative importance. Hence, the coefficient of #BANKS should be negative in general, but there is a countervailing force with the incidence of relationship lending. The reason is that under the complement hypothesis, coordination of lenders is facilitated if a housebank with collateralized debt serves to deter costly conflicts among lenders. This could lead to an insignificant coefficient of #BANKS (though not a positive coefficient).

For all variables, we use the most recent observation before the distress event. Table VIII gives cross-tabulations of housebank status, WORKOUT, and the individual banks. The variability of observations is sufficiently large to conduct a logit analysis. Since there are two banks with no workout involvement at all (4th line in Table VIII), we will not include bank dummies in the model to avoid problems of estimation.

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Insert Table VIII

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Regression Results

Table IX shows the results of two logit models estimating the determinants of the workout incidence. The main difference between the two specifications concerns the variables used to control for the severity of the coordination problem, i.e. the share of our bank in total debt financing of the borrower or the number of banks, respectively. The two models represent distinct attempts to capture the debt structure of the borrower with respect to multiple lending and heterogeneity in the relative importance of lenders. Clearly, if a creditor is offering management advice or attempts to replace management, or is taking some other action that directly or indirectly affects the welfare of other lenders, he must be one of the large financiers of the institution, else his involvement will neither be accepted by the other creditors, nor does it payoff to him in the first place. In Model I we use the share of our bank in overall debt of the firm as the indicator of his relative importance. This measure is appropriate if financing shares of banks (or other lenders like trade creditors) are heterogeneous (i.e. not close to $1/N$), as to be expected in the presence of relationship lending.

In Model II of Table IX we measure the debt structure of the borrower simply with the number of banks, thereby implicitly assuming that the importance of each institution is proportional to $1/N$, and that all important financiers are to be found among these banks.

Since the debt financing share of our bank is 38 percent on average (and even 48% for housebanks), it is apparent that heterogeneity is an important characteristic of the debt structure of the sample firms. Thus, a priori, the specification of Model I is more convincing. Model II serves as a robustness test.

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Insert Table IX

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The estimation results are as follows. Considering the structural variables first, there is firm heterogeneity in both specifications. The coefficients for LOGSIZE and LIMLIAB are negative and significant (LOGSIZE only in Model I). The coefficient of LEVERAGE, as a general measure for the relative importance of debt as a funding source, is negative and significantly different from zero. It indicates that, ceteris paribus, more debt in the capital structure tends to reduce the workout probability, having controlled for multiple lending, relationship lending and seniority.

At the core of our analysis are the variables COLDEGREE and HB. In Model I, the coefficient of the housebank dummy is positive and significant, indicating that relationship lenders do engage more often in workouts. The coefficient of COLDEGREE is of the same sign and significant as well. This supports the hypothesis that seniority affects the likelihood of bank to engage in costly workouts. The hypothesis that relationship lending and collateral are complementary is strongly supported by both findings and the fact that the coefficient of the interaction term between HB and COLDEGREE is not significantly different from zero. In our interpretation, collateral serves to align interests of lenders by deterring costly conflicts. Relationship lending and collateral are therefore no substitutes (which would imply a significant, negative interaction term).

Another interesting insight can be inferred from the coefficient of the interaction between FINSHARE and COLDEGREE, which is negative and significant. Both the financing share as well as collateralization directly affect the bargaining power of a bank vis-à-vis other lenders. Given this interpretation, a bank's financing share is - at least to some extent - a substitute for the degree of collateralization. To clarify, assume a bank were the exclusive debt financier of a firm (FINSHARE equal to 100%). In this case, additional collateral will have no impact on workout decisions since expected coordination conflicts with other lenders are zero anyway, and incremental cash flows caused by workout activities will benefit the bank alone. Even if the bank were one financier among others, an increased financing share will still be a substitute for more collateral, inducing a negative coefficient on the interaction term, and positive coefficients on both direct effects.

A similar argument does not hold for the housebank status and the financing share, however. The housebank status affects renegotiations by a different mechanism than FINSHARE because it relies primarily on the information privilege. Correspondingly, the coefficient of the interaction term is insignificant (though at the 11 percent level).

Turning now to Model II, FINSHARE is replaced by #BANKS to test the robustness of results when varying the proxy for the debt financing structure and multiple bank lending. We find the major explanatory variables having the same signs as in our base model, while the overall model appears to be severely misspecified. The HB coefficient remains to be positive and significant, and the coefficient of the degree of collateral is also still positive, but it is insignificant. However, the coefficient of #BANKS is insignificant as well. A Likelihood-Ratio test against a model just specifying a constant term is insignificant, indicating that the group of regressors does not significantly add to the explanatory power of the model. This is also supported by the low McFadden- R^2 . Since there are no apparent signs of misspecification for Model I, we attribute the

low quality of Model II to the variable #BANKS, which seems to be a poor proxy for the coordination problem inherent in multiple banking relationships. Hence, Model I is our preferred specification. The estimation results constitute suggestive evidence that collateral (or seniority) and relationship lending are complementary, The results are also consistent with the idea that collateral is a strategic instrument to determine bargaining power between multiple bank lenders in renegotiations.

Finally, to interpret the economic significance of these results, Table X shows marginal effects and elasticities for the (significant) key variables, calculated at the means of the regressors.³⁵

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Insert Table X

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Note that the elasticities documented in Table X can directly be used to compare the absolute and relative impact of the regressors. Evaluated at their respective means, all three variables have a strong economic impact on the probability of a workout investment. For example, a 1% increase in the degree of collateralization leads to a 2.46% increase in the workout probability. These numbers confirm that both collateralization and the housebank status have an economically significant impact on workout decisions of banks.

4. Discussion

A firm in financial distress typically needs additional funds and expertise to solve its problems. This may well turn into “a matter of life and death”³⁶ for the troubled company. The critical question is: Should the business operations be continued and if so, which investor is willing to help working out a troubled company, putting up additional funds, giving advice, or rescheduling a loan? Almost invariably, troubled firms have no access to capital markets, and have to rely on existing lending relationships with banks. It seems to be common practice in some countries, Germany and Japan in particular, that the housebank, or the main bank, becomes the lender of last resort in those situations, sometimes even taking the lead in a reorganization process. As a consequence, such a special role of housebanks, if it exists, should be reflected in the structure of the loan contract.

This paper has shown that the provision of collateral is one such important contractual element that helps to ensure lender involvement in distress. Our findings suggest that collateral is used to define seniority between multiple (bank) lenders and, by implication, is a *complement* to superior information about borrower quality, rather than a substitute.

This has to be contrasted with the more common view that interprets collateral in loan contracts as a cushion against shocks to borrower liquidity, or as a signaling device to solve problems of adverse selection, or even as a substitute for monitoring of the borrower. These latter interpretations hinge, however, on collateral having high liquidation value despite corporate earning assets having little or no value, a condition which is met only for external assets, like a personal guarantee, or a portfolio of securities.

In a data set gathered from major universal banks in Germany, we find concentration of collateral to reflect the informational intensity of the bank-client relationship. Using a random sample of mid-cap bank-client relationships, we find that housebanks tend to hold more collateral than arm’s-length banks, having controlled for other factors, like firm size, default risk etc. Using a

complementary firm sample data set comprising distressed borrowers, drawn from the same population of firms, we identify differential behavior of housebanks. We find that workout activities are more likely when the bank is a housebank, and when the bank is more senior (more collateralized).

These two results are the main contribution of our paper. They support the predictions developed by Welch (1997). In his model, the ex post strongest lender receives highest seniority, thereby minimizing ex-ante costs of renegotiations, either from deterring costly conflicts between lenders, or by minimizing costs of claim enforcement, see also Bris/Welch (2002).

The crucial interpretation of seniority as an instrument to determine bargaining power of lenders is of course related to the institutional design of the particular financial system. Our analysis is based on German data, and it is well known that the German insolvency regime strictly protects creditor rights. This holds for the old insolvency code which was in effect until December 1998 (covering our observation period), and it holds for the new legislation enacted in 1999. The latter code introduces an automatic stay, hitherto unknown in Germany (see Franks/Nyborg/Torous 1996 and Bartlett 1999). Note that before bankruptcy proceedings have started, any collateral - even on assets belonging to the physical equipment necessary for the operation of the firm - can be seized by the bank, if a company does not meet contractual repayments. Moreover, even if a formal bankruptcy procedure is eventually initiated, secured claims of banks (collateral) are protected by the legal concepts of preferential satisfaction from the asset (“Absonderung”). Hence, German banks can use collateral not only to compensate losses from borrower default but also as an strategic device to influence (or even extort) other lenders. This institutional framework clearly supports our interpretation of collateral being of strategic use in bargaining situations, and therefore is one explanation for our empirical results.

It will be an interesting avenue for future research to figure out the exact interdependency between the economic role of collateral and the financial system architecture. In this sense, a comparison of our results with a similar study for firms under a more debtor-friendly insolvency regime, in the US, for example, would be interesting.

Our empirical results regarding ex ante loan contract design and ex post bank behavior in borrower distress support the conjecture of seniority and relationship lending being complementary to each other. Strong financiers, i.e. housebanks, are made more senior ex ante (in "good" times), and become pivotal in company restructuring (in "bad" times). It is important to note two caveats when interpreting our results and their implications, however. First, it remains unclear whether the higher probability of workout investments by housebanks reflects economically "better", that is *more efficient*, decisions. Second, our analysis does not incorporate an analysis of the *success* of workout activities. Both issues are essential for a welfare evaluation of relationship lending, and therefore promising objectives for future research.

Appendix

Illustrative Cases with WORKOUT Investments

No	General Descriptives			Workout Activity				Distress Consequence			Additional Notes
	Distress Event	Industry	Number bank relationships	Consultant	Takeover	Reorganization Plan	Debt Restructuring	Bankruptcy Proceedings	Debt Write-Offs	Termination	
1	05.11.91	Chemicals	12	0	0	X	X	0	X	0	---
2	26.03.93	Electricity	3	0	0	X	0	0	X	0	Additional credit supply
3	19.09.96	Construction	3	X	0	0	X	0	X	0	---
4	28.01.94	Automotive supplier	18	0	X	0	X	0	X	0	---
5	27.10.94	Wood	6	0	0	X	0	0	X	X	Banks become shareholder.

Distress Event = date of initial distress event; *Consultant* = bank initiated or hired consultant; *Takeover* = bank actively engaged in search for merger /takeover candidate; *Reorganization Plan* = bank is actively engaged in development of restructuring concept, leads reorganization pool, etc.; *Debt restructuring* comprises loan volume reductions, additional collateral requirements, change in maturity structure or interest payments, etc.; *Bankruptcy Proceedings* = Distress ends with formal insolvency procedure; *Debt Write-Offs* = borrower loans are fully or in major parts written-off; *Termination* = banks cancels all loans and seizes collateral.

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Table I
Association between Housebank Status and Alternative Relationship Measures

HB	Duration (DURAT)	Number of bank relationships	Bank share in total debt financing (FINSHARE)
0 (non-housebank)	20.2 (18.1)	6.1 (5.4)	29.2 (21.7)
1 (housebank)	22.5 (20.7)	4.4 (2.9)	47.9 (30.7)
Significance [p-value]	0.52	0.047**	0.0004***
Correlation	0.06	-0.17	0.33

Note. All values are based on the representative *R*-sample and are cross-sectional means, calculated from the average time-series values per individual over the observation period 1992-1996. Numbers in parentheses are standard deviations. *Significance* indicates the p-value of a t-test of differences in means between the cases with and without housebank status. Using a nonparametric Mann-Whitney-test for differences in medians leads to the same results. *Correlation* is a correlation measure controlling for the nominal scale of the housebank variable. DURAT is the number of years of the bank-borrower relationship, FINSHARE is the ratio of credit provided by the bank (from which the observation originates) to total debt (as documented in the balance sheet), multiplied by 100.

** ,***: Significance at the 5% and 1% level, respectively.

Table II
Descriptive Statistics of Borrowers in the Representative Sample

	Size [thousand DM]	Leverage [%]	Profitability [%]	Rating	Limited Liability	Bank Debt [%]	Debt share fi- nanced by our bank [%]
Mean	171,798	80.02	10.53	2.93	0.81	54.89	37.97
Median	112,623	81.30	5.40	3.00	1.00	43.49	29.94
Std.dev.	211,633	14.82	20.30	0.82	0.39	41.57	28.69

Note. Characteristics of the representative firm sample. Number of observations is $N=125$. All calculations are based on averages of time series observations per individual from 1992 to 1996. *Size* is based on annual turnover. *Leverage* is debt divided by total assets (including reserves). *Profit* is return on assets based on earnings before taxes and extraordinary items. *Rating* is based on standardized bank internal ratings (1 is best quality, 6 is worst). *Limited Liability* is a dummy, taking value one if a firm is incorporated. *Bank Debt* is total debt provided by all banks of one particular borrower. The debt share financed by our bank is termed FINSHARE later on.

Table III
Incidence of Collateral by Banks(Year 1996, All years)

		COLYN					
		1996			1992 – 1996		
		1	0	Sum	1	0	Sum
BANK	1	21	2	23	100	14	114
	2	15	11	26	72	54	126
	3	11	14	25	59	66	125
	4	20	5	25	100	18	118
	5	21	3	24	88	21	109
	Sum	88	35	123	419	173	592

Note. COLYN is binary variable indicating that loans of a borrower are collateralized (COLYN=1) or not.

Table IV
Sample Statistics 1996: Rating and Degree of Collateralization according to Type of Collateral and Housebank status

COLTYPE	HB	Observations	COLDEGREE	RATING
0	non-housebank	20	0	3.1
	housebank	10	0	2.6
	Total	30	0	2.9
1	non-housebank	32	40.0	3.2
	housebank	21	41.6	2.7
	Total	53	40.2	3.0
2	Total	0	--	--
3	non-housebank	12	55.4	3.3
	housebank	3	59.7	4.0
	Total	15	56.7	3.4
Total	non-housebank	64	32.1	3.2
	housebank	34	30.3	2.8
	total	98	31.5	3.0

Note. COLTYPE is a qualitative variable indicating the type of pledged collateral (0= no collateral, 1= only real securities, 2= only personal securities, 3= both real and personal securities); HB is a dummy variable indicating whether a relationship is a housebank or an arm's-length relationship; RATING is the mean borrower rating; and COLDEGREE is the ratio of collateral value to total credit volume, i.e. the fraction of secured debt in terms of value.

Table V
Definition of Variables

	Variable	Definition
Dependent variables	COLYN	Dummy, one if loans of a borrower are collateralized.
	COLDEGREE	Degree of loan collateralization, calculated as value of pledged collateral according to bank's own assessment divided by debt provided by bank.
	WORKOUT	Dummy, one if i) workout activity by our bank undertaken, or ii) additional funds provided (distress firm sample)
control variables	BANK2 – BANK5	Set of dummies, 1 if debtor belongs to bank x (x=2 to 5)
	LOGSIZE	Natural logarithm of a company's annual sales (proxy for size)
	LIMLIAB	Dummy, indicating private limited companies
	LEVERAGE	Ratio of debt to total assets according to annual reports of firms.
	R&D	Research and development expenses, based on average industry expenses per unit of turnover in 1996.
	FINSHARE	Relative importance of our bank in borrower debt financing, calculated as the ratio of debt provided by our bank to total debt financing according to the annual report of the borrower.
risk variables	RATING3, RATING4,5	Dummy variables, representing categories of bank internal ratings (1 is best, 6 is worst)
	PROFIT	Return on assets based on earnings before taxes and extraordinary items.
	VOLA	Standard deviation of PROFIT over entire observation period (1992-1996)
relationship	HB	Dummy, 1 if housebank according to modified self-assessment of the banks.
	#BANKS	Natural logarithm of number of bank relationships of a borrower.

Table VI
Determinants of Collateralization - Panel Analysis

Regressor	Model I: Probit (dependant is COLYN)	Model II: Tobit (dependant is COLDEGREE)	Model III: Tobit (dependant is COLDEGREE)
Constant	15.40 (0.002)***	243.30 (0.000)***	198.25 (0.000)***
BANK2	-4.25 (0.004)***	-48.85 (0.000)***	-33.25 (0.000)***
BANK3	-0.99 (0.265)	-19.68 (0.001)**	-35.15 (0.028)**
BANK4	-0.69 (0.482)	-2.43 (0.694)	1.98 (0.687)
BANK5	-1.13 (0.204)	15.32 (0.001)***	17.71 (0.001)***
LIMLIAB	-2.98 (0.000)***	-18.20 (0.000)***	-22.19 (0.000)***
LOGSIZE	-0.39 (0.205)	-13.99 (0.000)***	-9.78 (0.000)***
R&D	-0.67 (0.000)***	-6.57 (0.000)***	-3.52 (0.000)***
RATING3	-0.11 (0.078)*	-2.80 (0.496)	---
RATING4,5	0.83 (0.257)	2.52 (0.604)	---
PROFIT	---	---	-0.16 (0.136)
VOLA	---	---	-0.66 (0.029)**
HB	4.39 (0.060)*	26.65 (0.000)***	20.02 (0.000)***
#BANKS	-0.99 (0.231)	-13.37 (0.000)***	-14.97 (0.000)***
HB x #BANKS	-1.81 (0.117)	-6.15 (0.238)	-6.60 (0.256)
N	404	404	413
X ² (Explanatory variables)	43.70 (0.000)***	329.62 (0.000)***	228.77 (0.000)***
X ² (Random Effects)	165.99 (0.000)***	252.25 (0.000)***	257.77 (0.000)***

Note. 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 V. The Tobit-procedure adjusts for censoring at values of zero. p-values in parentheses. *, **, ***: Significance at the 10%-, 5%-, and 1%-level, respectively.

Table VII
Descriptive Statistics of Borrowers in the Distress Sample

	Housebank		Non-Housebank		t-test (p-value)
	N	Mean (Std.dev.)	N	Mean (Std.dev.)	
LOGSIZE	20	11.55 (0.99)	42	10.775 (1.27)	0.01***
LIMLIAB	20	0.70 (0.47)	42	0.81 (0.40)	0.34
PROFIT	20	-0.08 (6.18)	42	-3.03 (8.16)	0.12
COLDEGREE	20	55.27 (33.60)	42	39.49 (26.04)	0.047 **
FINSHARE	20	55.20 (30.70)	42	34.32 (39.30)	0.041 **
Number of banks	20	4.9 (2.85)	41	6.5 (4.68)	0.09*

Note. All calculations are based on the distressed firm sample with N=62 observations (*Number of banks*=61 obs.). For definition of variables see Table V. *, **, ***: Significance at the 10%-, 5%-, and 1%-level, respectively.

Table VIII
Frequency Distribution of WORKOUT

		BANK						HB		
		1	2	3	4	5	Sum	0	1	Sum
HB	0	9	3	10	10	10	42			
	1	1	8	4	5	2	20			
	Sum	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
	Sum	10	11	14	15	12	62	42	20	62

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

Table IX
Logit Regression of Workout Incidence on a Set of Explanatory Variables

Regressors	Model I	Model II
Constant	15.48 (0.03) **	3.70 (0.41)
LOGSIZE	-0.96 (0.05) *	-0.38 (0.25)
LIMLIAB	-3.05 (0.03) **	-2.16 (0.06) *
PROFIT	0.05 (0.53)	0.03 (0.66)
LEVERAGE	-0.7 (0.02) **	-0.04 (0.06) *
FINSHARE	1.70 (0.46)	---
#BANKS	---	1.54 (0.16)
COLDEGREE	0.06 (0.04) **	0.02 (0.50)
HB	6.02 (0.04)***	3.53 (0.06) *
HB x COLDEGREE	-0.04 (0.71)	-0.03 (0.27)
HB x FINSHARE	- 6.95 (0.11)	---
#BANKS x COLDEGREE	---	-0.002 (0.88)
FINSHARE x COLDEGREE	- 0.15 (0.06) *	---
N	62	61
LR-statistic	22.49 (0.01)***	11.64 (0.23)
Pseudo-R ²	0.32	0.17
Hosmer-Lemeshow-Statistic	9.95 (0.27)	7.99 (0.44)

Note. The dependent variable is WORKOUT which is assigned a value of one if workout activities occurred, and zero otherwise; LOGSIZE is the natural logarithm of a company's annual sales; LIMLIAB is binary: 1 if incorporated; PROFIT is return on assets based on earnings before taxes and extraordinary items; LEVERAGE is the ratio of total debt financing total assets; COLDEGREE is the ratio of collateral value to total credit volume of our bank in percentage points, HB is binary: 1 if housebank; HB x COLDEGREE the corresponding interaction term; FINSHARE is the ratio of total credit volume supplied by our bank to total debt financing of the borrower, HBFIN and FINCOLLAT the corresponding interaction terms with HB and COLDEGREE, respectively.

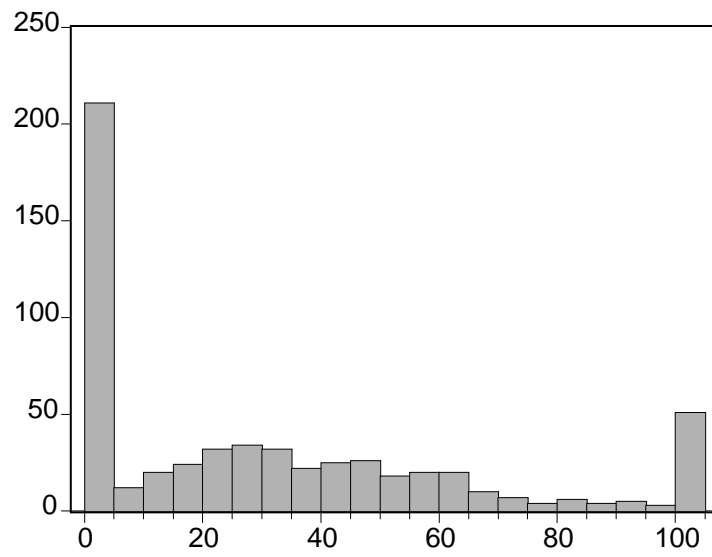
All observations of the explanatory variables are taken at or immediately before the distress event. p-values in parentheses. The Hosmer-Lemeshow test is a Goodness-of-Fit test with the null hypothesis of no misspecification. *, **, ***: Significance at the 10%, 5%, and 1%-level, respectively.

Table X
Economic Significance of Logit Coefficients

Variable	Coefficient	Marginal effect	Elasticity
COLDEGREE	0.06	0.006	2.46
HB	6.02	0.56	1.74
FINSHARE x COLLDEGREE	-0.15	-0.14	-2.55

Note. The dependent variable is the workout probability. *Coefficient* are the corresponding values from Model II in Table IX. *Marginal effects* and *Elasticity* are calculated at the means of the regressors.

Figure 1: Frequency Distribution of COLDEGREE (Degree of Collateralization)



Endnotes

- ¹ For recent surveys on the theoretical concept of relationship lending and respective international evidence, see Ongena/Smith (2000) and Boot (2000).
- ² Since a senior claim on an otherwise troubled firm gives the lender a first claim on future earnings of the company (be they from operation, or from liquidation), the holder of a senior debt claim faces no debt overhang problem (Myers 1977) - he takes full benefit of a successful turnaround.
- ³ In part of the literature collateral is designed as extra-company assets, like private property or guarantees as e.g., in Bester 1985, or Manove/Padilla/Pagano 2001. We believe that our interpretation of collateral as a strategic device to set bargaining power between multiple lenders goes through as long as at least part of the pledged collateral reflects the company's earning assets, i.e. as long as not all collateral refers to extra-company wealth.
- ⁴ Petersen/Rajan (1995) report an average number of bank relationship for their sample of very small US firms to be 1.4. Elsas/Krahn (1998) report for their sample of medium sized German firms an average of 6 simultaneous bank relationships. According to Degraiche/Garella/Guiso (2000), the average Italian firm in their sample even maintains 16 bank relationships.
- ⁵ Note that our analysis relies on the same data as used by Elsas/Krahn 1998.

⁶ These banks comprise the three largest German private banks, the apex cooperative bank, and the largest (regional) apex savings bank. In the list of the largest banks of the country at year end 1995, they comprise the ranks 1, 2, 3, 5, 8.

⁷ For a more detailed presentation of the data set and sampling design, see Elsas et al. (1998).

⁸ Only 12 out of 200 are public limited companies (AG).

⁹ Loan size refers to total amount of debt given by the one bank (sum over all outstanding loans owed by the this firm vis-a-vis this bank).

¹⁰ §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.

¹¹ Note that the loan type criterion was in general not a binding restriction.

¹² If an individual has more than one observation in a given year, only the last one was used.

¹³ See Table II for descriptive statistics.

¹⁴ The other important group of outside claimants, trade creditors, are typically not pivotal in renegotiations in financial distress in Germany.

¹⁵ In the subsample of potentially distressed firms, there is only one exception where a bank took an equity stake *after* the onset of financial distress. This is taken into account in the analysis of Section 3.3, below.

¹⁶ As an example, the assessment of the housebank status was based on an additional questionnaire. The involvement of the banks in the project explains the high response rate of 98%.

¹⁷ See Brunner/Krahn/Weber (2000) for details on the internal rating systems.

¹⁸ While the concept of rating notches as representing discrete default intervals is similar to the concept used by rating agencies, the rating itself is not quite the same. Agencies target loss severity rather than default probabilities, and they rate through the cycle, i.e. construct longer-term averages, rather than specifying an exact prediction period (which is one year in case of our banks), see Löffler 2002.

¹⁹ A detailed description and a systematic comparison of the banks internal rating systems of our sample is provided by Brunner/Krahn/Weber (2000).

²⁰ Elsas (2002) provides an in-depth analysis of the characteristics associated with the housebank status and a comparison of the raw self-assessment and our modified attribution HB. His results indicate that the modified attribution is superior in terms of reliability.

²¹ Note that for our data, banks do not have an incentive to report collateral values strategically. For external reporting purposes, banks may have an incentive to provide excessive estimates of security values only for land charges and mortgages, in order to reduce risk-weights for the determination of equity standards under Basel I. However, our data are taken from the banks' internal files, which are instrumental for pricing decisions. Upwardly biased collateral value estimates would run counter to the bank's profit motive, without any effect on regulators. We have found no indication that has led us to believe these estimates to be biased.

²² Looking at the association between debt guarantees and the status of limited liability of firms indicates that personal guarantees occur more often if firms are incorporated. This supports conventional wisdom of bankers, who claim that guarantees by managers of small corporations are used to elude limited liability and to „align“ incentives of managers.

²³ See Greene (1997), Chapter 14 for details relating to this specification.

²⁴ See Baltagi (1995), pp. 183-184 for details.

²⁵ Note that there is no disclosure rule for R&D expenses for German firms. The respective industry data was provided by the *Stifterverband für die Deutsche Wissenschaft*.

²⁶ There were no observations for the worst rating class, 6, rendering the inclusion of a respective dummy obsolete.

²⁷ We have also used Duration as a proxy for the intensity of relationship lending, but this variable was always insignificant. This can be explained by the fact that most of our firms report long relationship duration, with an average value of more than 20 years.

²⁸ It is likely that this reflects differences in collateral valuation procedures between the banks with respect to certain types of collateral like chattel mortgages. Since there is no reason expect different valuation procedures to be in place for housebank and arm's-length customers, we strongly believe that the respective dummies fully control for this effect and that our main results regarding relationship lending do not depend on this issue.

²⁹ This result is similar to Machauer and Weber (1998); and to some extent to Berger and Udell (1995), who find only one out of eight risk measures to be a significant explanatory variable.

³⁰ 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.

³¹ Some illustrative example cases are documented in the Appendix.

³² We do not specify other industry variables or R&D expenses since about 80% of the sample firms belong to the manufacturing industry.

³³ We neither do have information on the exact structure of non-bank debt financing of firms, nor on the financing shares of other banks than our bank.

34 There may be trade creditors, or other individual non-bank lenders in addition, but these are expected to be small in term of relative individual importance.

35 See Greene (1997), pp. 876-880 for the details of the calculations.

36 The title of a report on Enron's struggle for survival, published in the Economist, Nov 1st, 2001.