Through which channels does relationship banking affect firms' credit financing?

Manuel Wiegand [*]   Christa Hainz [†‡]

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Relationship banking is considered to mitigate problems of asymmetric information in credit markets. As the latter became more severe during the financial crisis, credit financing became more problematic. How and through which channels did relationship banking unfold its advantages for private firms during the financial crisis? For our empirical analysis we use survey data for 1,139 firms in the German manufacturing sector. We link the number of main bank relationships to firms' perceptions of impaired credit financing. We find that firms with one close and exclusive main bank relationship are indeed less likely to report impairments of credit financing. In particular, we find that they face a lower risk of higher information requirements and impairments of non-price contract terms (i.e. collateral and maturity). Having one main bank also has an impact through the channel of interest rates, but this impact is also found for having two main banks. Our results also show that relationship banking has no effect on credit availability.

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1 Introduction

The recent financial crisis has highlighted the importance of access to finance for firms and ultimately for the whole economy.[1] To ensure the availability of funding, central banks have injected huge amounts of liquidity into financial markets. Moreover, governments supported banks and often also firms, for instance by granting guarantees, to stabilize the supply of credit (OECD 2011). Even in ordinary times, relationships between banks and firms are characterised by asymmetric information. Therefore, banks face significant problems of adverse selection and moral hazard when they credit finance firms. Relationship banking is considered to mitigate such problems of asymmetric information between banks and its debtors by providing soft and proprietary information to the relationship bank. The popularity of credit risk models involving mainly hard information, however, has rendered soft information, and thereby inherently the impact of relationship banking, less important.

Due to the economic crisis accompanying the financial crisis, firms operate under higher uncertainty, which increases asymmetric information between banks and firms substantially. Hard information, which is mostly backward looking, might thereby lose informational relevance relative to soft information and relationship banking might regain importance. Therefore, we would like to know: Do firms with a close and exclusive bank relationship face fewer impairments of credit financing during the financial crisis? What are the channels through which relationship banking affects firms' credit financing?

To investigate these questions, we use data from the Ifo survey "Financing of the German Economy", which encompasses 1,139 firms from the German manufacturing sector. In the survey firms report whether they have experienced impaired credit financing during the financial crisis between 2007 and 2009 in a perception-based manner. The data set also contains information on the kinds of impairment experienced, thereby enabling us to capture all components of credit contracts (availability, price terms and non-price terms and information requirements) within one analysis. This allows us to investigate through which channels relationship banking has affected firms' credit financing during the financial crisis.

Our analysis yields four main results. First, we show that firms following the concept of relationship banking most strictly by having one main bank are less likely to experience impaired credit financing during the financial crisis compared to firms with three or more main banks. This result suggests that the concept of relationship banking is important for the resolution of asymmetric information during the financial crisis. This view is supported by our second finding. Firms with one main bank relationship face higher information requirements by a bank less often. Third, our results clearly indicate that

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[1] For empirical studies on the effects on growth, see Rajan and Zingales (1998) and Beck, Levine, and Loayza (2000)

firms benefit from having one main bank relationship through better non-price terms of bank credit. They are less likely to be offered shorter maturities and face a lower risk of experiencing higher collateral requirements. However, we also find that having one main bank relationship does not affect the probability of experiencing impairments of the availability of credit. Finally, analysing the price component of bank credit, we observe that firms with one main bank relationship report increases in lending rates less often than firms with three or more main banks. This effect, however, is even stronger for firms with two main banks, which indicates that firms with only one main bank face stronger hold-up problems.

The impact of relationship banking on credit financing has been analysed in several empirical studies. The results are mixed because different studies use different definitions of relationship banking and different measures for its impact on credit financing. Also the use of different data sets explains contrasting results, e.g. relationship banking appears to have a positive impact in the US, but hold-up problems appear to be more prevalent in European countries.

The first empirical studies about the effects of relationship banking on credit availability use indirect measures to approximate credit constraints. Late payment of trade credit (Petersen and Rajan (1994) using US data) and fast payment discounts not taken (Harhoff and Koerting (1998) using data from Germany) are used as proxies. Trade credit is argued to be the most expensive source of finance, which will only be used if no other source (i.e. bank credit) is accessible. The studies show that credit availability decreases with the number of bank relationships maintained by a firm. Additionally, Petersen and Rajan (1994) show that credit availability improves when the length of the longest relationship is high and when a firm borrows from banks from which it receives other financial services.

In contrast to these studies, Cole (1998) measures credit availability more directly by looking at credit denials by banks in the US. He finds that a higher number of bank relationships increases the risk of a credit denial. A pre-existing relationship to the bank lowers the likelihood of a credit denial, but the length of the relationship does not matter. In contrast, Jimenez, Ongena, Peydro, and Saurina (2012) show a positive effect of relationship length on the probability that credit is granted. In a similar approach, Cole, Goldberg, and White (2004) find that multiple bank relationships decrease the likelihood of a loan approval significantly. Also using a dummy variable for credit approval based on data from a survey among German banks, Lehmann and Neuberger (2001) find that banks that consider themselves as main banks for a firm play a significant role in supplying loans when the firm is in distress.

Concerning the impact of relationship banking on the interest rates of bank credit, Petersen and Rajan (1994) find that firms with a higher number of bank relationships have to pay a higher interest rate. The result is not confirmed for Germany by Harhoff and Koerting (1998) who do not find any significant effect. Lehmann and Neuberger (2001)

test whether a bank asks for lower interest rates if it is a firm's main bank. They do not find evidence for this hypothesis either. Using US data, Berger and Udell (1995) show that the interest rates decrease when firms maintain a longer relationship with the current lender. Bharath, Dahiya, Saunders, and Srinivasan (2011) find that a pre-existing relationship to the bank decreases interest rates. The duration of the relationship, however, does not affect the interest rate. Other studies also find no effect of the duration of the bank relationship in interest rates (Petersen and Rajan (1994), Harhoff and Koerting (1998) Lehmann and Neuberger (2001)). In contrast, Degryse and van Cayseele (2000) report a loan rate increase over the course of a bank relationship based on data from Belgium, but find that the scope of the relationship decreases the interest rate.

Another question of the empirical studies is how relationship banking affects non-price components of credit contracts, in particular collateral. Berger and Udell (1995) report that a longer bank relationship with the current lender reduces the probability of pledging collateral. Degryse and van Cayseele (2000) confirm this finding, but also show that the likelihood of collateral increases with the scope of the relationship. Bharath, Dahiya, Saunders, and Srinivasan (2011) confirm that a pre-existing relationship decreases the likelihood of collateral. These findings are supported by Harhoff and Koerting (1998) who show that the probability of collateral requirement decreases with the length of the relationship and increases with a higher number of banks. Lehmann and Neuberger (2001) present evidence that main banks receive more collateral than non-main banks.

All approaches that use terms and conditions of loans consider only situations in which a loan contract is completed, but they neglect decision making processes leading to a credit rejection by the bank or withdrawal of the application by the firm. Even studies using dummy variables for credit approval by the bank still require that a firm must apply for credit. This approach does not account for discouraged borrowers that do not apply for credit in the first place (e.g. because they expect a rejection by the bank). In contrast, more recent empirical studies use firms' perceptions to measure credit constraints following Kaplan and Zingales (1997). Beck, Demirgüc-Kunt, Laeven, and Maksimovic (2006) use data from the World Business Environment Survey (WBES) in which firms are asked to what extent financing was problematic for the firm's operation and its growth on a scale from 1 to 4. They use this variable to study which firm and country characteristics explain financing obstacles. Beck, Demirgüc-Kunt, Laeven, and Maksimovic (2006) are, however, not able to link the information about financing obstacles to the firm's bank relationships. We add to the literature by linking different sorts of credit financing impairments perceived by firms to data on the number of main bank relationships they maintain. The perception-based approach allows us to analyse different channels through which relationship banking may affect credit financing within one study.

Our paper is organised as follows. In Section 2 we derive four theoretical predictions about how relationship banking could affect a firm's credit financing. Section 3 provides

information about the data set and the dependent variables. Section 4 contains descriptive statistics. In Section 5 we discuss the representativity of our sample. We show estimation results and robustness checks in Section 6. Finally, we present our conclusions in Section 7.

2 Hypotheses

Based on theories about relationship banking, we expect that close ties to a bank have a positive impact on a firm's credit financing situation (see Boot (2000)). This should be even more important during the financial crisis because asymmetric information increases in times of uncertainty. For the design of policy measures, however, it is important to figure out what sort of credit financing problems firms could be facing and whether relationship banking could alleviate them. Four channels of impairments credit financing stand in the focus of our analysis: Information requirements by the bank, availability of bank credit, price terms of bank credit and non-price terms of bank credit.

A firm's obligation to provide information about its current situation is an important part of every credit contract. It facilitates interim monitoring by the bank, but also causes costs for the firm. For example, the provision of quarterly statements to the bank is burdensome for borrowing firms. Theoretical literature argues that a flow of information about the firm is adjunct to loan contracts (Fama (1985), Sharpe (1990)) and more generally to all kinds of interactions. If this is the case and if these information help the bank to monitor the firm, we expect that firms have to provide less hard information to the bank.

- Hypothesis 1: Firms that maintain a close and exclusive bank relationship are on average less likely to report that they had to provide more information about themselves to the bank during the financial crisis.

Asymmetric information causes credit rationing (Stiglitz and Weiss 1981), and therefore we expect that the provision of information through relationship banking improves a firm's availability of funding from banks. Thakor (1996), however, shows that the effect of the number of banks on the availability of credit can be ambiguous. Firms with more banks are less likely to receive a credit denial caused by a negative screening result. But knowing the firms' optimal application strategy, the banks are more likely to ration credit. Given that the main banks possess proprietary information, which is particularly important in the uncertain environment of a crisis, we expect another effect to be prevalent: Banks with constrained lending capacities first lend to firms to which they have a close and exclusive relationship because they are best informed about these.

- Hypothesis 2: Firms that maintain a close and exclusive bank relationship are on

average less likely to report that the availability of credit from banks was impaired by the financial crisis.

Over the duration of a bank-firm relationship, loan contracts do not necessarily break even in every period because both parties agree on (implicit) long-term contracts. Thereby, banks tax borrowers in some periods and subsidise them in others (Boot 2000). With respect to interest rates, some papers argue that banks grant lower rates to young firms and extract the informational rent due to the proprietary information the bank obtains later in the course of the relationship (Sharpe (1990), Petersen and Rajan (1995)). The firms thus face a hold-up problem and an interest rate increase over the time of the relationship. Other papers find that interest rates decrease over time as banks learn the quality of the firm and banks can commit to grant lower rates in the later periods (Boot and Thakor 1994). The empirical results in this context are mixed.

- Hypothesis 3: Firms that maintain a close and exclusive bank relationship are on average less likely to report that the price terms of the credit contracts with banks are impaired by the financial crisis.

Besides the interest rate payments, a credit contract contains non-price terms. These differ in nature from the interest rate. The interest rate induces a pecuniary transfer from the borrower to the bank (which has implications for the borrower's risk taking incentives). In contrast, the loan's maturity, for example, does not have direct pecuniary effects for the bank but influences the risk sharing between the contract parties. In this respect, the fact that a bank gains proprietary information from a close and exclusive relationship should render the non-price terms less stringent for the firm. Inderst and Mueller (2007) obtain this result in a model in which a local relationship lender has an informational advantage against transaction lenders. They show that this advantage lowers the collateral requirements. Another aspect of collateral is that it can only fulfill its role of mitigating moral hazard and adverse selection problems if the value of the collateral can be observed by the bank (Rajan and Winton 1995). Relationship banking causes proximity between a bank and the firm and thereby helps to improve the bank's ability to assess the value of the collateral (Boot 2000). This makes it less likely that the bank requires a high level collateral.

- Hypothesis 4: Firms that maintain a close and exclusive bank relationship are on average less likely to report that the non-price terms of the credit contracts with banks are impaired by the financial crisis.

3 The data set

To analyse the impact of relationship banking on credit financing impairments, we use data from the Ifo survey "Financing of the German Economy". The extensive questionnaire

contains questions about each firm's credit financing situation, its bank relationships as well as its last negotiations about a bank loan and/or a line of credit. The questionnaire was sent to German manufacturing firms in September 2011. All firms are part of the address database for the Ifo Investment Survey. Thereby, the representativity of the sample of addressees is ensured. In total, 1,139 firms participated in the survey. The response rate was close to 25 per cent leading to a sample in which small firms (less than 50 employees), medium firms (50-249 employees) and large firms (more than 249 employees) are evenly represented. Firms established more than 25 years ago build almost three quarters of our sample while young firms are less represented with only around 5 per cent of the firms being established less than ten years ago.

3.1 Dependent variables

To assess a firm's credit financing, different approaches were applied in the empirical literature (see Section 1 for a review). We rely on a firm's perception by asking directly whether its credit financing was impaired by the financial crisis between 2007 and 2009. Table 1 presents the dummy variable indicating that a firm reports the impairment of its credit financing, which will be the dependent variable in the first part or our empirical analysis. Of the 1,062 firms answering this question 22.13 per cent report impaired credit financing.

Table 1: Firms reporting their credit financing being impaired by the crisis

	N	Yes	No
Credit financing impaired	1062	0.2213	0.7787

[a] The variable "Credit financing impaired" equals one if the firm answers the following question with yes: Was the credit financing of your firm impaired by the financial crisis between 2007 and 2009?

Asking a firm about the impairment of its credit financing in such an open way has two main advantages compared to other approaches. First, we do not rely on the completion of a new loan or line of credit contract in the years between 2007 and 2009 as we would do if we used loan data. Therefore, the question also covers the impairment of credit relationships that were established before the financial crisis. Second, the perception-based measure covers all sorts of impairments. In contrast, loan data can only serve the analysis of terms and conditions of credit contracts and data about credit approvals and rejections allows to assess difficulties concerning the availability of bank funding only. Neither of the two approaches, however, enables to analyse both aspects simultaneously.

We use the perception-based approach to analyse through which channels a firm's credit financing was impaired by the financial crisis and how relationship banking alleviated the different kinds of impairment. For this purpose, firms that report impaired credit financing are asked in what way they saw their credit financing being impaired by the financial crisis. The possible answers are listed in Table 2. More than 14 per cent of the firms in our sample report that banks required more information about the firm as a borrower. The fact that higher information requirements constitute the impairment reported most often underlines that, due to uncertainty, interim monitoring was difficult for banks during the financial crisis. We will use a dummy variable indicating higher information requirement to test whether a provision of proprietary information through a close and exclusive bank relationship alleviates this kind of credit financing impairment (Hypothesis 1).

In line with Hypothesis 2, we will test how a close and exclusive relationship affects the availability of funds. The reduction of existing lines of credit by the bank (reported by 7 per cent of the firms) and the constrained availability of new loans or lines of credit (almost 11 per cent) are indicating an impairment through the channel of constrained availability of bank credit.

To cover potential effects of a close and exclusive bank relationship on the price component of bank credit (Hypothesis 3), firms could report an increase of the interest rate for an existing loan or line of credit during the financial crisis. Almost 11 per cent of the firms do so.

In order to test Hypothesis 4 about the effects of a close and exclusive bank relationship on non-price terms of a loan or a line of credit contract, we allow firms to report that banks offered credit only for shorter maturities (only less than 3 per cent of the firms reported this impairment) and banks' request of more collateral, which was relevant for almost 10 per cent of the firms.

Table 2: Channels of impairment

	N	Yes	No
More information required by the bank	1046	0.1463	0.8537
Existing lines of credit reduced	1046	0.0717	0.9283
Constrained availability of new loans/lines of credit	1046	0.1090	0.8910
Interest rate increase for existing loans/lines of credit	1046	0.1071	0.8929
Shorter maturities offered	1046	0.0258	0.9742
More collateral required	1046	0.0985	0.9015
Others	1046	0.0478	0.9522

[a] If a firm reports that its credit financing was impaired by the financial crisis between 2007 and 2009 (see Table 1), it is asked in a second step: In what way was your credit financing impaired by the financial crisis?

[b] All possible answers are listed in this table.

[c] Multiple answers are possible.

[d] If a firm reports that its credit financing was not impaired by the financial crisis, the dummy variables for all sorts of impairment are set equal to zero.

4 Descriptive Statistics

4.1 Main bank relationship variables

Boot (2000) claims that relationship banking requires multiple interactions between a bank and its customer over time or across products through which non-public information about the customer is gathered by the bank. A key condition for relationship banking to be present is that these information remain proprietary to the bank. There are different approaches to identify a relationship lender in the context of empirical work (see Section 1 for a review).

Analysing data from Germany, we make use of the fact that the main bank concept is widespread among German firms. Using data from a survey among banks, Elsas (2005) relies on the "self-assessment by banks as to whether they are the Hausbank of a given customer or not" combined with "explanations for these assessments". We follow a similar approach but use firm-level data. We ask firms about the number of main bank relationships they maintain, leaving the definition of a main bank open. To assess features specific to main bank relationships, we ask firms about the key features of the two most important bank relationships and if they consider the respective bank to be a main bank or not. In Table 3 the possible relationship features are listed. We find that all of them (except "Others") are more often relevant in the relationships with a main bank than in relationships that are not reported to be a main bank relationship. The most important criteria for main banks are long duration of a relationship, personal support by the bank and a short distance between the headquarter of the firm and the bank.

Table 3: Key features of bank relationships

	Main bank		No main bank	
	N	Mean	N	Mean
Long duration	1633	0.8420	528	0.6023
Personal support	1629	0.6556	525	0.4210
Short distance	1624	0.5209	524	0.3874
Bank knows the company well	1619	0.4293	525	0.2267
Relationship survived difficult times	1619	0.3650	521	0.1574
Bank is (most) important creditor	1619	0.3175	521	0.1401
Others	1616	0.0241	522	0.0785

The number of close long-term bank relationships is a reasonable measure for relationship banking. If a firm spreads its business among many banks, first of all each single bank learns less about the firm. Secondly, it is likely that private information about the firm is available to all banks instead of remaining exclusive to a single bank. A focus on one main bank relationship, however, grants the bank access to a large amount information that remain proprietary to the bank. Table 4 provides the distribution of the number of main bank relationships of firms in our sample as well as the relation to their likelihood of reporting impaired credit financing.

If a firm does not follow the concept of a main bank relationship at all, it reports that it has zero main banks. This is the case for only 5 per cent of the firms in our sample, which underlines the importance of the main bank concept for German firms. The majority of the firms has one or two main banks. About 17 per cent report that they maintain more than three main bank relationships.

From the theoretical predictions in Section 2, we expect the fraction of firms with impaired credit financing to be lowest among those that follow the theoretical concept of a close and exclusive bank relationship most strictly. In line with this prediction, the percentage of firms with impaired credit financing is lowest among those with only one main bank. Among the firms without a main bank at all, this fraction is roughly four percentage points higher at almost 21 per cent.

If a firm maintains two main bank relationships, one could argue that the firm's business with banks is spread among two institutions, lowering the amount of information about the firm provided to each main banks. The information are also less likely to remain proprietary. Both points contradict the theoretical concept of relationship banking and should have a negative impact on the firms bank credit financing. Adding a second main bank can, however, be advantageous to the firm because it can avoid being captured in a single main bank relationship. If banks have an informational advantage against their

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competitors, they can charge higher interest rates from the firm. There should, however, not be an effect on the availability of credit because, given the information gathered, the bank will grant credit to the firm as long as it evaluates it to be creditworthy. As shown in Table 4, the fraction of firms reporting impaired credit financing is 22 per cent for firms with two main banks and therefore higher than among firms with one exclusive main bank relationship.

Having three or more main banks clearly contradicts the idea of having a close and exclusive bank relationship. An advantage from relationship banking can therefore not be expected. In line with this prediction, we find that 35 per cent of the firms with three or more main bank relationships find their credit financing impaired by the financial crisis.

The descriptive statistics of the firms' numbers of main bank relationships and the relation to impaired credit financing can be taken as first evidence for our general prediction. The concentration of bank business on one main bank relationship (i.e. following the concept of relationship banking in the narrowest definition) appears to alleviate the impairments of credit financing caused by the financial crisis.

The effect, however, could be driven by other factors. One could argue that firms with a low profitability have a higher demand for bank credit since their internal funds are more limited compared to profitable firms. Therefore they may maintain more bank relationships in order to increase the probability of at least one bank granting a loan or a line of credit. Since unprofitable firms can be expected to be more likely to experience impaired credit financing, the relation found between the number of main bank relationships and impaired credit financing could be driven by firm profitability, among other factors.

Table 4: Number of main bank relationships and impaired credit financing

	N	Mean	Credit financing impaired
No main bank	53	0.0501	0.2075
One main bank	428	0.4045	0.1706
Two main banks	391	0.3696	0.2199
More than two main banks	186	0.1758	0.3495
Total	1058	1.0000	0.2221

[a] The number of main bank relationships stems directly from the question: "How many main bank relationships does your firm maintain?" without any further pre-specification of what is defined to be a main bank.

[b] "Credit financing impaired" equals one if the firm answers the following question with yes: Was the credit financing of your firm impaired by the financial crisis between 2007 and 2009?

4.2 Demand for new bank credit

A key control variable is demand for new bank credit. Facing higher asymmetric information caused by the financial crisis, banks will either ration the amount of credit supplied or lend at a higher interest rate and/or stricter non-price terms. It is an important question whether a bank reacts by being more restrictive on new credit contracts or also by changing terms and conditions of existing credit relationships.

Our data contains information about the most recent bank credit negotiations of a firm. Firms are asked if they have negotiated about a line of credit or a loan after the break-out of the financial crisis in 2007. If the firm has negotiated about either form of bank credit, then the demand variable equals one. If a firm has not negotiated, it is asked for the reason why it did not do so. If the firm did not negotiate with any bank because it did not have demand for bank credit, the demand variable is set to zero. If a firm, however, reports that it did not start negotiations because it did not expect them to lead to a contract completion or if the entrepreneur raised bank credit for the firm on private accounts, we set the variable indicating demand for new credit equal to one.

Table 5: Demand for new credit and impaired credit financing

	N	Mean	Credit financing impaired
Demand for new credit	1055	0.67	0.30
No demand for new credit	1055	0.33	0.05

[a] "Demand for new credit" equals one if the firm negotiated a line of credit or a loan since 2007. "Demand for credit" also equals one if the firm reports that it had demand for bank credit, but did not enter negotiations because it did not expect them to be successful, as well as in cases when a private loan is brought into the firm by the entrepreneur. "Demand for credit equals zero" only if the firm reports that it did not negotiate a line of credit or a loan because it had no demand for either of the two forms of bank credit.

[b] "Credit financing impaired" equals one if the firm answers the following question with yes: Was the credit financing of your firm impaired by the financial crisis between 2007 and 2009?

The third column of Table 5 shows that firms with new demand for bank credit are far more likely to report impaired credit financing than firms without new demand. This could be taken as first evidence that firms' credit financing is more likely to be impaired through new loan contracts than through existing credit relationships.

4.3 Firm characteristics

Other firm characteristics, which are used as control variables in the following estimation procedures, are summarised in Table 6. All the data on characteristics was collected in

the survey and may affect a firm's likelihood of experiencing impaired credit financing. Although we expect that relationship banking affects a firm's credit financing situation, a firm's fundamentals still determine its creditworthiness and should therefore be controlled for in our empirical analysis.

First of all, firm age is considered to facilitate access to bank credit since older firms have a track record of credit relationships indicating their creditworthiness. Beck, Demirgüc-Kunt, Laeven, and Maksimovic (2006) find older firms being less financially constrained in their empirical analysis. Young firms, in contrast, do not have a history of repaid bank credit and may therefore experience impaired credit financing caused by the financial crisis due to asymmetric information more often. We trim one per cent of the observations at the top to rule out the effect of extreme values in the firm age and also because the information about the year of foundation might be imprecise for very old firms. Firms in our final sample are on average 78 years old, the median is 75.5 years. We use ln(age) in our estimation to rule out level effects.

The legal status of a firm plays an important role because it defines the liability rules for owners in case of a default. If a firm is registered as a sole proprietorship, a KG or a GmbH & Co. KG, then the owners are completely liable in case of default. If a firm is incorporated (i.e. GmbH or an AG) then the liabilities of the owners are limited to the contributed capital. This makes it more difficult for the bank to resurrect its claims in case of a default. We would therefore expect that firms with limited liabilities are more likely to see their credit financing impaired. Almost two thirds of the firms in our sample are incorporated and thereby characterised by limited liabilities of their owners. Only a negligible fraction of the firms in our sample reports that they have some other legal status so that we cannot draw conclusions about the limitations to liabilities. These firms drop out of our empirical analysis.

Firm size also matters when it comes to access to finance. Large firms tend to have credit demand in order to finance large scale projects. On the one hand, access to large amounts of credit may be difficult when banks are short of lending capacities and want to diversify their risk exposure across several firms rather than clustering risks by granting large loans to few firms. On the other hand, credit financing impairments due to higher asymmetric information might be less likely for large firms because they are usually more transparent than small- and medium-sized enterprises. The average firm in our sample has 815 employees. Even after trimming by one per cent from the top, the distribution of employment in our sample is affected by extremely large firms. Without reporting the descriptive statistics here, small, medium and large firms each represent roughly a third of the sample.

The return on sales is the most direct measure of a firm's performance that is available to us. It is an important criterion for a bank's decision about the provision of credit to a firm and the setting of terms and conditions. Firms with a low profitability can be expected to

be more likely to experience credit financing impairments by the financial crisis. We have information about the return on sales from 2007 to 2010 from the survey data. For the analysis of the question whether credit financing was impaired by the financial crisis, we focus on the return on sales in 2008. We do so first because the returns on sales in 2009 and 2010 were unknown at the times when the impairment of credit financing occurred and second because the returns on sales in 2007 and 2008 are highly correlated in our sample so that the use of the 2007 data would not add much information. Firms that do not generate a positive return in 2008 represent 13 per cent of our sample. A return between zero and three per cent is reported by 29 per cent of the firms. A return on sales between three and seven per cent in 2008 occurs slightly more often. A return between seven and ten per cent is reported by 15 per cent. Only ten per cent of all firms have a return on sales above ten per cent in 2008.

Finally, we use export activities as a control variable because exporting firms are more exposed to the effects of the financial crisis than firms focussing on domestic clients. We therefore expect exporting firms to be more exposed to credit financing impairments by the financial crisis as well. In our sample, only 13 per cent of the firms are not engaged in export activities. Different levels of the fraction of turnover generated abroad are evenly represented in the sample.

We also control for 2-digit WZ code industries because the impairment of credit financing might be influenced by sector-specific factors.

Table 6: Descriptive Statistics: Firm characteristics

	N	Mean	Median	Std Dev
Age	944	77.83	75.5	51.29
Unlimited liabilities	944	0.37	0	0.48
Limited liabilities	944	0.62	1	0.48
Other legal status	944	0.01	0	0.10
Employees	944	815.39	110	3310.55
Return: 0%	944	0.13	0	0.33
Return: 0% to <3%	944	0.29	0	0.45
Return: 3% to <7%	944	0.33	0	0.47
Return: 7% to <10%	944	0.15	0	0.36
Return: 10% and more	944	0.10	0	0.30
Export	944	0.87	1	0.33

[a] "Return" is defined as the return on sales in 2008.

5 Sample representativity

As we use survey data, we are confronted with sample selection issues stemming from the response behaviour of firms. If a firm's credit financing impairment rendered a firm insolvent, this firm would not be in our sample. This is a bias for which we can not control, but since the number of bankruptcies in Germany was low during the financial crisis, it is reasonable to assume that sample selection due to bankruptcies does not affect our results. A second source of sample selection bias could be that firms with impaired credit financing are more likely to respond. Since the topic of the questionnaire was the firm's financing situation, one could argue that firms that did not need credit financing and those that did not experience problems with credit financing were not likely to participate because they did not consider themselves to have anything to contribute to the survey.

To check whether the firms with impaired credit financing are overrepresented in our sample, we link all firms to which we sent the questionnaire of the Ifo survey "Financing of the German Economy" to the firms in the Ifo Investment Survey. Since both surveys are based on the same address database, there is a significant overlap between the data sets. We compare how firms responding to the Ifo survey "Financing of the German Economy" (in the following referred to as "response" firms) differ from those who do did respond (in the following referred to as "non-response" firms) in terms of the information we get about them from the Ifo Investment Survey.

The first two columns of Table 7 show that response firms are slightly larger than non-response firms in terms of employment and turnover in 2010, but the difference is statistically insignificant. Since size is expected to be an important factor of credit financing impairment this is comforting with respect to sample selection issues.

Table 7: Comparison to the Ifo Investment Survey data

	Non-response	Response	p-value
Turnover (2010, in m Euro)	265.68	398.94	0.2811
N	1118	591	
Employment (2010)	808.49	1050.32	0.3881
N	1118	591	
Influence Finance 2007	2.96	2.93	0.4737
N	809	444	
Influence Finance 2008	3.05	3.03	0.5120
N	859	468	
Influence Finance 2009	3.38	3.41	0.4632
N	922	500	

[a] Influence Finance: Assessment of the influence of the financing situation on investment in the current year; 1 Strong animation, 2 Little animation, 3 No influence, 4 Little slowdown, 5 Strong slowdown.

Even stronger aspects in favour of sample representativity can be found in the lower part of Table 7. Every year, firms participating in the Ifo Investment Survey are asked to assess how the financing situation affects their investment in the current year. The answers range from 1 ("strong animation") to 5 ("strong slowdown"). If firms that experience impairment of their credit financing would be more likely to respond to the Ifo survey "Financing of the German Economy", we would expect the according answers in the Ifo Investment Survey to differ significantly between response and non-response firms. Table 7, however, shows no difference in the influence of financing on investment between the two groups.

Another way to rule out sample selection issues from response behaviour is to look at the fraction of firms that report impaired credit financing. We can compare the fraction of firms experiencing impaired credit financing in the Ifo survey "Financing of the German Economy" to the fraction of firms assessing their financing situation to slow down investment in the Ifo Investment Survey. Table 8 shows that the latter is the case for 14 per cent of the firms in 2007, 18 per cent in 2008 and 35 per cent in 2009. In Table 5 we show that in the Ifo survey "Financing of the German Economy" 30 per cent of the firms with credit demand report credit financing impairment. Considering that participants of the Ifo Investment Survey can report financing to be a slowdown in more than one year, the level of firms with impaired credit financing in our sample can be considered representative.

One could argue that firms with impaired credit financing are overrepresented in the

sample of the Ifo Investment Survey as well. This is unlikely because the main topic of the survey is the development and the structure of firms' investment activities. The motivation to take part in this survey should therefore not be driven or hampered by the firm's credit financing situation during the financial crisis, in particular not in the 2007 survey. The argument would also not explain why there is no significant difference in size between non-response and response firms in Table 7.

Table 8: Data: Ifo Investment
Survey

	N	Mean
Slowdown 2007	1421	0.14
Slowdown 2008	1461	0.18
Slowdown 2009	1538	0.35

[a] Slowdown: Share of firms assessing the financing situation as a "Little slowdown" or a "strong slowdown" in the current year.

6 Estimations

6.1 Impaired credit financing

Using regression analysis, we first investigate whether relationship banking has an effect on the likelihood of experiencing impaired credit financing in general and then turn to the important question through which channels this potential effect unfolds. Therefore, we apply a binary probit model in which the dependent variable is the dummy variable "Credit financing impaired" defined as described in Table 1. The model is defined as

$$C_i = \alpha_i + \beta B_i + \gamma D_i + \delta X_i + \eta I_i + \epsilon_i \tag{1}$$

where C_i is the dummy variable for impaired credit financing, B_i is a set of dummy variables indicating the number of main bank relationships, D_i indicates demand for new bank credit. X_i contains a set of firm characteristics and I_i is the vector of industry dummies. Table 9 summarises the marginal effects of stepwise regressions. The specifications differ with respect to the control variables included.

In Estimation (1) we control for industry dummy variables only. In line with the descriptive statistics in Section 4.1, we find that firms with no main bank, one main bank

or two main banks are all significantly less likely to experience impaired credit financing than firms with three or more main banks. The effect of having no main bank is smallest and significant at the 10 per cent level only. It appears to be most advantageous to have only one main bank.

As expected, we find a large and significant marginal effect of demand for new credit in Estimation (2). Having demand for new bank credit increases the probability of experiencing impaired credit financing by more than 20 per cent. The estimation also underlines the importance of controlling for demand for new credit, which is widely neglected in previous empirical studies on the effects of relationship banking. The marginal effects of having one or two main banks are significantly reduced compared to Estimation (1) suggesting that parts of these effects are driven by the fact that firms with new demand for credit maintain more bank relationships.

Estimation (3) shows that the marginal effects of the firm characteristics have the expected signs. Limited liabilities increase the probability of impaired credit financing as do export activities and a low return on sales. There is still a size effect, but it is small compared to the other marginal effects. We do not find a significant age effect, which might be caused by the structure of our sample in which older firms are more prevalent. Considering the size of the marginal effects, we can conclude that firm characteristics are a driving force of credit financing impairment, which was to be expected. Like demand for new credit in Estimation (2), controlling for firm characteristics has an impact on the marginal effects of the numbers of main bank relationships, which indicates that Estimation (1) suffered from omitted variables bias.

The complete setup in Estimation (4) offers results for the effect of the number of main bank relationships on the likelihood of impaired credit financing, controlling for new demand for credit as well as firm characteristics and industry-specific factors. We find that the focus on one main bank relationship lowers the probability of impaired credit financing by 7 per cent. The marginal effect is significant at the five per cent level. Having no main bank relationship at all is not significantly different from having three or more main banks in that concern. Neither is the maintenance of two main bank relationships.

The result suggests that following the theoretical idea of a close and exclusive bank relationship strictly does indeed lower the probability of experiencing problems with credit financing caused by the financial crisis. In the next step we want to test how exactly relationship banking helps to circumvent impairment of credit financing. To shed light on this matter, we will assess how relationship banking affects the likelihood of different sorts of impairment.

Table 9: Binary probit marginal effects: Dependent variable "Credit financing impaired"

	(1)	(2)	(3)	(4)
No main bank (d)	-0.0936*	-0.0368	-0.0896*	-0.0393
	(0.05)	(0.07)	(0.05)	(0.07)
One main bank (d)	-0.1539***	-0.1063***	-0.1087***	-0.0706**
	(0.03)	(0.03)	(0.04)	(0.04)
Two main banks (d)	-0.1117***	-0.0695**	-0.0573	-0.0300
	(0.04)	(0.03)	(0.04)	(0.04)
Demand (d)		0.2393***		0.2234***
		(0.02)		(0.02)
log(Age)			0.0065	0.0035
			(0.02)	(0.02)
Limited liabilities (d)			0.0850***	0.0850***
			(0.03)	(0.03)
log(Employees)			0.0257**	0.0197*
			(0.01)	(0.01)
Return: 0% (d)			0.3732***	0.3066***
			(0.08)	(0.09)
Return: 0% to <3% (d)			0.2204***	0.1500**
			(0.06)	(0.06)
Return: 3% to <7% (d)			0.0358	-0.0155
			(0.06)	(0.05)
Return: 7% to <10% (d)			0.0462	0.0006
			(0.07)	(0.06)
Exporting (d)			0.0862**	0.0687*
			(0.04)	(0.04)
Industry dummies	Yes	Yes	Yes	Yes
Pseudo R-squared	0.0417	0.1196	0.1239	0.1945
N	880	880	880	880

[a] * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

[b] Std. err. in parentheses.

[c] "Credit financing impaired" equals one if the firm answered the following question with yes: Was the credit financing of your firm impaired by the financial crisis between 2007 and 2009?

[d] Baseline category for main bank relationship dummy variables is "Three or more main banks".

6.2 Channels of relationship banking

The data set contains detailed information about the sorts of impairment the firm has experienced (see Section 3.1). Every sort of impairment can be assigned to one of the four channels of relationship banking described in Section 2. We run binary probit estimations to figure out the determinants of all six sorts of impairment and then draw conclusions on whether or not the focus on a close and exclusive bank relationship has a significant impact through the different channels. In all estimations, we control for demand for new credit, the set of firm characteristics and industry dummy variables as we did in Estimation (4) of Table 9. Table 10 presents the marginal effects of all estimations.

The information channel is captured by the dependent variable "More information required by the bank". With respect to Hypothesis 1, we find that the strict focus on one main bank relationship reduces the probability that more information is required by the bank by 8.6 per cent compared to having three or more main banks. The effect is highly statistically significant. There is no such effect found for firms without a main bank or firms with two main banks. We take this as strong evidence that the exclusive provision of information to a single main bank through a main bank relationship unfolds a positive effect during the crisis through the information channel. An explanation could be that the information that is gathered by the bank during a relationship reduces asymmetric information, which were particularly severe during the crisis. Thereby, interim monitoring becomes easier for the bank and the likelihood of further requests for information is lowered.

We test whether the results for the information channel also hold for the availability of bank credit (see Hypothesis 2) using Estimations (2) and (3). In order to cover the channel of credit availability, variables for "Existing line of credit reduced" and "Constrained availability of new loans/lines of credit" are used as dependent variables. Surprisingly, the number of main banks does not have a significant effect on either of the two sorts of impairment. This suggests that relationship banking does not affect the likelihood of experiencing problems concerning the quantity of credit available to the firm. Hypothesis 2 is therefore not confirmed by our data. A potential explanation is that the decision about a reduction of a credit line as well as the granting of new bank credit is primarily driven by hard information about the firm, which are used in the credit risk models. Since these are not affected by relationship banking, it is reasonable that we do not find a statistically significant relationship in this concern. It could, however, also be the case that credit rationing in the crisis was not caused by asymmetric information, but by reduced lending capacities of banks due to liquidity constraints. If the latter is the case, our expectation that banks lend first to firms to which they have a close relationship, would not be confirmed by the data.

As our results show that relationship banking affects credit financing through the in-

formation channel, but not through the availability of credit, it is interesting to further assess how it affects credit financing at the contract level. We start by looking at the price component of existing loan contracts in Estimation (4). The variable "Interest rate increase for existing loans/lines of credit" is seized to capture the price term channel. The focus on one main bank relationship lowers the likelihood of an interest rate increase for an existing loan or line of credit by almost four percentage points compared to having three or more main bank relationships. Not having a main bank at all, however, has a negative marginal effect of more than four per cent that is statistically significant at an even higher level. The same is the case for having two main banks. Since not having a main bank is just as advantageous as focussing strictly on one compared to having three or more, this does not support Hypothesis 3. It can also be taken as evidence that adding a second main bank can resolve a hold-up problem with respect to interest rates faced by firms with only one main bank.

Remaining at the contract level, we finally assess how impairments of non-price components of loans or lines of credit are affected by relationship banking. The variables "Shorter maturities offered" and "More collateral required" are assigned to the channel of non-price terms. Estimation (5) uses the dummy variable indicating that banks offered credit only at shorter maturities as the dependent variable. Firms that have three or more main banks still constitute the baseline category. Compared to them, the focus on one main bank has a significantly negative marginal effect of two per cent, which is rather small compared to the effect relationship banking had on the provision of information. There is no such effect at all for firms without a main bank or those with two. When looking at collateral requirement in Estimation (6) the picture is the same, but the marginal effect of maintaining only one main bank relationship on collateral is relatively high at 4.5 per cent. One could argue that the decision about the maturity and especially about the collateral of a loan or line of credit is much more based on soft information than the setting of the interest rate, which is why relationship banking affects the former, but not the latter.

The analysis of the channels of relationship banking allows the following conclusions. A close and exclusive bank relationship offers the bank the opportunity to gather soft information about the firm. This reduces the likelihood that the bank requires more information explicitly from the firm and it also reduces firms' risk of experiencing impairments of non-price components of loan or line of credit contracts. Banks' decisions about credit availability and the interest rate level, which could be more likely to be based on hard rather than soft information, are not significantly affected by the benefits of relationship banking.

Table 10: Binary probit marginal effects: Dependent variable according to source of impairment

	(1)	(2)	(3)	(4)	(5)	(6)
No main bank (d)	-0.0241	0.0002	-0.0157	-0.0472**	0.0139	-0.0255
	(0.05)	(0.03)	(0.04)	(0.02)	(0.02)	(0.03)
One main bank (d)	-0.0860***	0.0131	-0.0259	-0.0373*	-0.0208**	-0.0450**
	(0.03)	(0.02)	(0.02)	(0.02)	(0.01)	(0.02)
Two main banks (d)	-0.0341	0.0293	-0.0018	-0.0464**	-0.0086	-0.0171
	(0.03)	(0.02)	(0.02)	(0.02)	(0.01)	(0.02)
Demand (d)	0.1481***	0.0535***	0.1142***	0.0966***	0.0198***	0.1046***
	(0.02)	(0.01)	(0.02)	(0.02)	(0.01)	(0.01)
log(Age)	0.0090	0.0034	-0.0108	0.0087	0.0024	-0.0090
	(0.01)	(0.01)	(0.01)	(0.01)	(0.00)	(0.01)
Non-incorporated (d)	-0.0377*	-0.0163	-0.0125	-0.0591***	-0.0139*	-0.0281*
	(0.02)	(0.01)	(0.02)	(0.02)	(0.01)	(0.02)
log(Employees)	0.0117	0.0138***	0.0118**	0.0168***	0.0024	0.0059
	(0.01)	(0.00)	(0.01)	(0.01)	(0.00)	(0.01)
Return: 0% (d)	0.1873**	0.1365*	0.1129*	0.2104**	0.0245	0.1294
	(0.08)	(0.08)	(0.06)	(0.08)	(0.03)	(0.09)
Return: 0% to <3% (d)	0.1078*	0.0748*	0.0163	0.0797*	0.0201	0.1325**
	(0.06)	(0.05)	(0.04)	(0.05)	(0.02)	(0.07)
Return: 3% to <7% (d)	0.0226	0.0136	-0.0233	0.0056	-0.0001	0.0460
	(0.05)	(0.03)	(0.03)	(0.04)	(0.02)	(0.05)
Return: 7% to <10% (d)	0.0486	-0.0277	-0.0045	0.0166	0.0125	0.0730
	(0.06)	(0.02)	(0.04)	(0.05)	(0.03)	(0.07)
Exporting (d)	0.0475*	-0.0171	0.0289	0.0197	-0.0020	-0.0163
	(0.03)	(0.02)	(0.03)	(0.03)	(0.01)	(0.03)
Industry dummies	Yes	Yes	Yes	Yes	Yes	Yes
Pseudo R-squared	0.1450	0.1631	0.1182	0.1686	0.1177	0.1225
N	872	872	872	872	872	872

[a] * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

[b] Std. err. in parentheses.

[c] Dependent variables in estimations: (1) "More information required by the bank"; (2) "Existing line of credit reduced"; (3) "Constrained availability of new loans/lines of credit"; (4) "Interest rate increase for existing loans/lines of credit"; (5) "Shorter maturities offered"; (6) "More collateral required".

[d] Baseline category for main bank relationship dummy variables is "Three or more main banks".

6.3 Robustness

In the previous section we have presented estimation results suggesting that the focus on one close and exclusive main bank relationship lowers the likelihood of experiencing credit financing impairments during the financial crisis. This result could, however, be driven by reverse causality. If a firm has problems with getting credit from banks to which it has a close relationship, it could react by setting up further relationships to other banks, thereby increasing the likelihood of getting credit from at least one bank and also improving its

bargaining position against its relationship banks. From this perspective, our estimation results could also be taken as evidence that firms with impaired credit financing have more bank relationships instead seeing it the other way around.

Since our study is based on cross-sectional data, we do not observe the dynamics of the number of main bank relationships and are therefore not able to estimate a causal model to rule out that reverse causality drives our results. The fact that we use the number of main bank relationships, however, makes it unlikely that the impact of reverse causality is significant. It is reasonable to expect that firms contact other banks if they experience impaired credit financing, but it is unlikely that they refer to these new business relationships to banks as main bank relationships within our data set. As Table 3 shows, a long duration of the bank relationship is a key criterion for a firm to refer to the respective bank as a main bank. Business relationships to banks that are established during the financial crisis, would not fulfill this criterion. This would be an argument that our findings are not affected by reverse causality.

A second argument against reverse causality can be derived from adjusting the sample of firms in our estimations. Our data set contains detailed information about the business relationships to the two most important banks and whether they are seen as main banks by the firm. Among other features, firms report the duration for these bank relationships. We therefore know whether the two most important bank relationships were established during or after the financial crisis or if they were established before. This does still not provide information about firms adding a main bank relationship beyond its second one, but at least we can identify firms that had dynamics in their structure of bank relationships, which could be caused by the financial crisis and its impact on firms' credit financing.

For 63 firms in our sample, the most important bank relationship was established in 2007 or later. This is the case for the second most important bank relationships of 117 firms. Considering only banks that are reported to be main banks, this drops to the most important bank relationships of 53 and the second most important bank relationships of 51 firms. In order to be as restrictive as possible, we drop all firms for which either the first or the second most important bank relationship started in 2007 or later no matter whether the respective institutions are main banks or not. We then re-run the estimations of the previous sections.

Table 11 shows that 115 firms are dropped due to potential dynamics in the number of main bank relationships. The comparison to Table 9 shows that the results do not change significantly after dropping firms that could potentially cause reverse causality problems. The marginal effect of having only one main bank relationship is still slightly above 7 per cent even when using only firms with long relationships to their two most important banks.

Table 11: Binary probit marginal effects: Dependent variable "Credit financing impaired"

	(1)	(2)	(3)	(4)
No main bank (d)	-0.0832	-0.0287	-0.0747	-0.0252
	(0.06)	(0.07)	(0.06)	(0.07)
One main bank (d)	-0.1600***	-0.1133***	-0.1080***	-0.0720*
	(0.04)	(0.03)	(0.04)	(0.04)
Two main banks (d)	-0.1148***	-0.0727**	-0.0593	-0.0318
	(0.04)	(0.03)	(0.04)	(0.04)
Demand (d)		0.2243***		0.2090***
		(0.02)		(0.02)
log(Age)			-0.0031	-0.0088
			(0.02)	(0.02)
Limited liabilities (d)			0.0736**	0.0710**
			(0.03)	(0.03)
log(Employees)			0.0274***	0.0217**
			(0.01)	(0.01)
Return: 0% (d)			0.3709***	0.3080***
			(0.09)	(0.09)
Return: 0% to <3% (d)			0.2087***	0.1438**
			(0.07)	(0.07)
Return: 3% to <7% (d)			0.0382	-0.0098
			(0.06)	(0.06)
Return: 7% to <10% (d)			0.0544	0.0044
			(0.07)	(0.07)
Exporting (d)			0.0745*	0.0550
			(0.04)	(0.04)
Industry dummies	Yes	Yes	Yes	Yes
Pseudo R-squared	0.0382	0.1112	0.1146	0.1802
N	765	765	765	765

[a] * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

[b] Std. err. in parentheses.

[c] "Credit financing impaired" equals one if the firm answered the following question with yes: Was the credit financing of your firm impaired by the financial crisis between 2007 and 2009?

[d] Baseline category for main bank relationship dummy variables is "Three or more main banks".

We follow the same procedure for the estimations of the channels of relationship banking during the financial crisis. The results are presented in Table 12 and are directly comparable to Table 10. Again, the general picture does not change when we drop firms that have established important bank relationships during the financial crisis. Even for the 761 firms left in the sample, we find that relationship banking affects credit financing through the channel of information provision and non-price terms of credit. We do not find any effects of having a close and exclusive bank relationship in estimations representing the availability of credit and also the results for the interest rate channel do not change compared to 10.

The regression analysis without firms with young important bank relationships support our argumentation that the stability and the long-term character of main bank relationships allow us to rule out that our findings are significantly driven by reverse causality.

Table 12: Binary probit marginal effects: Dependent variable according to source of impairment

	(1)	(2)	(3)	(4)	(5)	(6)
No main bank (d)	-0.0296	-0.0102	-0.0235	-0.0549***	0.0123	-0.0222
	(0.05)	(0.02)	(0.04)	(0.02)	(0.02)	(0.04)
One main bank (d)	-0.0843***	0.0089	-0.0201	-0.0488**	-0.0219**	-0.0421*
	(0.03)	(0.02)	(0.02)	(0.02)	(0.01)	(0.02)
Two main banks (d)	-0.0331	0.0182	-0.0019	-0.0505**	-0.0147	-0.0191
	(0.03)	(0.02)	(0.02)	(0.02)	(0.01)	(0.02)
Demand (d)	0.1479***	0.0427***	0.1000***	0.0955***	0.0164**	0.1036***
	(0.02)	(0.01)	(0.02)	(0.02)	(0.01)	(0.02)
log(Age)	-0.0010	0.0038	-0.0155	0.0038	0.0011	-0.0101
	(0.01)	(0.01)	(0.01)	(0.01)	(0.00)	(0.01)
Non-incorporated (d)	-0.0340	-0.0178	-0.0117	-0.0584***	-0.0133*	-0.0273
	(0.02)	(0.01)	(0.02)	(0.02)	(0.01)	(0.02)
log(Employees)	0.0136*	0.0132***	0.0133**	0.0167***	0.0021	0.0071
	(0.01)	(0.00)	(0.01)	(0.01)	(0.00)	(0.01)
Return: 0% (d)	0.2126**	0.1192	0.1654**	0.1834**	0.0183	0.1232
	(0.09)	(0.08)	(0.08)	(0.08)	(0.03)	(0.09)
Return: 0% to <3% (d)	0.1107*	0.0555	0.0323	0.0542	0.0131	0.1168*
	(0.06)	(0.04)	(0.04)	(0.05)	(0.02)	(0.06)
Return: 3% to <7% (d)	0.0284	0.0043	-0.0016	0.0011	-0.0045	0.0478
	(0.05)	(0.03)	(0.04)	(0.04)	(0.02)	(0.05)
Return: 7% to <10% (d)	0.0474	-0.0245	0.0117	0.0142	0.0115	0.0678
	(0.07)	(0.02)	(0.05)	(0.05)	(0.03)	(0.07)
Exporting (d)	0.0402	-0.0165	0.0317	0.0191	-0.0077	-0.0202
	(0.03)	(0.03)	(0.03)	(0.03)	(0.01)	(0.03)
Industry dummies	Yes	Yes	Yes	Yes	Yes	Yes
Pseudo R-squared	0.1523	0.1577	0.1243	0.1667	0.1350	0.1148
N	761	761	761	761	761	761

[a] * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

[b] Std. err. in parentheses.

[c] Dependent variables in estimations: (1) "More information required by the bank"; (2) "Existing line of credit reduced"; (3) "Constrained availability of new loans/lines of credit"; (4) "Interest rate increase for existing loans/lines of credit"; (5) "Shorter maturities offered"; (6) "More collateral required".

[d] Baseline category for main bank relationship dummy variables is "Three or more main banks".

7 Conclusion

For a long time close and exclusive bank relationships were a prominent feature of the German economy (as well as of other continental European countries). With the widespread use of new information technologies, however, credit risk model became popular and the process of information processing changed significantly. This change also manifests itself in the banking regulation, which puts more emphasis on the use of credit risk models, which are based on hard information. Therefore, it was perceived that relationship bank-

ing is a somewhat superseded concept. Our results, however, show that a close and exclusive bank relationship still facilitates credit financing for private firms. We clearly see that the main bank's demand for additional information is lower than that of other banks. This results suggests that during the financial and economic crisis, in which uncertainty for firms soared and asymmetric information between banks and firms increased, the flow of soft information about the firm to the bank is important. With respect to the credit contract, a close and exclusive bank relationship translates into fewer problems with respect to maturity and collateral requirements. There is, however, no significant effect on the availability of credit. This might be due to the fact that banks use hard information in their credit risk models on which they base their decision about granting a loan. For the interest rate it seems that a firm can benefit from a close and exclusive main bank relationship, but having a second main bank can also be advantageous by resolving potential hold-up problems for the firm.

References

BECK, T., A. DEMIRGÜÇ-KUNT, L. LAEVEN, AND V. MAKSIMOVIC (2006): "The determinants of financing obstacles," *Journal of International Money and Finance*, 25, 932–952.

BECK, T., R. LEVINE, AND N. LOAYZA (2000): "Finance and the Sources of Growth," *Journal of Financial Economics*, 58, 261–300.

BERGER, A. N., AND G. F. UDELL (1995): "Relationship Lending and Lines of Credit in Small Firm Finance," *The Journal of Business*, 68(3), 351–381.

BHARATH, S. T., S. DAHIYA, A. SAUNDERS, AND A. SRINIVASAN (2011): "Lending relationships and Loan Contract Terms," *The Review of Financial Studies*, 24(4), 1141–1203.

BOOT, A. W. (2000): "Relationship Banking: What Do We Know?," *Journal of Financial Intermediation*, 9, 7–25.

BOOT, A. W., AND A. V. THAKOR (1994): "Moral Hazard and Secured Lending in an Infinitely Repeated Credit Market Game," *International Economic Review*, 35(4), 899–920.

COLE, R. A. (1998): "The importance of relationships to the availability of credit," *Journal of Banking and Finance*, 22, 959–977.

COLE, R. A., L. G. GOLDBERG, AND L. J. WHITE (2004): "Cookie Cutter vs. Character: The Micro Structure of Small Business Lending by Large and Small Banks," *Journal of Financial and Quantitative Analysis*, 39(2), 227–251.

DEGRYSE, H., AND P. VAN CAYSEELE (2000): "Relationship Lending within a Bank-Based System: Evidence from European Small Business Data," *Journal of Financial Intermediation*, 9, 90–109.

ELSAS, R. (2005): "Empirical determinants of relationships lending," *Journal of Financial Intermediation*, 14, 32–57.

FAMA, E. F. (1985): "What's Different About Banks?," *Journal of Monetary Economics*, 15, 29–39.

HARHOFF, D., AND T. KOERTING (1998): "Lending relationships in Germany - Empirical evidence from survey data," *Journal of Banking and Finance*, 22, 1317–1353.

INDERST, R., AND H. M. MUELLER (2007): "A lender-based theory of collateral," *Journal of Financial Economics*, 84, 826–859.

JIMENEZ, G., S. ONGENA, J.-L. PEYDRO, AND J. SAURINA (2012): "Credit Supply versus Demand: Bank and Firm Balance-Sheet Channels in Good and Crisis Times," European Banking Center Working Paper No. 2012-003.

KAPLAN, S. N., AND L. ZINGALES (1997): "Do Investment-Cash Flow Sensitivities provide useful Measures of Financing Constraints?," *The Quarterly Journal of Economics*, 112(1), 169–215.

LEHMANN, E., AND D. NEUBERGER (2001): "Do lending relationships matter? Evidence from bank survey data in Germany," *Journal of Economic Behaviour & Organization*, 45, 339–359.

OECD (2011): "The Impact of the Financial Crisis on the Insurance Sector and Policy Responses," No. 13, OECD Publishing.

PETERSEN, M. A., AND R. G. RAJAN (1994): "The Benefits of Lending Relationships: Evidence from Small Business Data," *Journal of Finance*, 49(1), 3–37.

——— (1995): "The Effect of Credit Market Competition on Lending Relationships," *The Quarterly Journal of Economics*, 110(2), 407–443.

RAJAN, R. G., AND A. WINTON (1995): "Covenants and Collateral as Incentives to Monitor," *The Journal of Finance*, 50(4), 1113–1146.

RAJAN, R. G., AND L. ZINGALES (1998): "Financial Dependence and Growth," *American Economic Review*, 88(3), 559–586.

SHARPE, S. A. (1990): "Asymmetric Information, Bank Lending, and Implicit Contracts: A Stylized Model of Customer Relationships," *The Journal of Finance*, 45(4), 1069–1087.

STIGLITZ, J. E., AND A. WEISS (1981): "Credit Rationing in Markets with Imperfect Information," *The American Economic Review*, 71(3), 393–410.

THAKOR, A. V. (1996): "Capital Requirements, Monetary Policy, and Aggregate Bank Lending: Theory and Empirical Evidence," *The Journal of Finance*, 51(1), 279–324.