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The role of bank relationships when firms are financially distressed

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ABSTRACT

Banks are better suited than other financing partners to process information in order to make efficient liquidations. But their ability depends on bank characteristics and incentives. In addition, the strength of the main bank relationship influences the bank's ability to make efficient liquidations. I study the effect of bank characteristics and bank relationships in situations where firms are financially distressed. Do the chances of a financially distressed firm to improve or to close depend on the bank? Does the survival of a financially distressed firm depend on its main bank relationship? Using German data from 2000–2013, I analyze the effect of a bank's organizational complexity, non-performing customers, and the strength of main bank relationships at the bank and firm level. I find that high shares of non-performing clients provide negative incentives. Banks can make more efficient liquidations if they are regionally active and have close relationships with the firm.

1. Introduction

Firm–bank relationships are special in reducing information asymmetries between borrowers and lenders. Empirical and theoretical studies have documented the valuable features and characteristics of close firm–bank relationships, such as lower loan rates, less stringent collateral requirements, or insurance against adverse aggregate credit shocks (Berlin and Mester, 1999).

In addition, banks can insure against liquidity shocks. Banks gain proprietary information when screening and monitoring borrowers (Fama, 1985). Compared to the holders of publicly traded debt, banks have more incentives to use their own resources in order to evaluate the viability of firms (Diamond, 1984; Chemmanur and Fulghieri, 1994). As a consequence, banks make more efficient decisions on the liquidation of a firm versus renegotiation (Chemmanur and Fulghieri, 1994). Banks have access to private information, observing the behavior of a firm's management, and can influence the firm's decisions (Fama, 1985). This allows banks to "lean against the wind" and remain with their customers when they are most in need (Petersen and Rajan, 1995).

A bank's ability to offer valuable features to firms is influenced by, e.g., its liability structure (see Berlin and Mester, 1999 for loan rate smoothing) or banking market competition (Boot and Thakor, 2000). Further, banks differ in the composition of their business client portfolio and institutional background, which influences their ability and strategy to deal with financially distressed firms.

In this study, I analyze the influence of the main bank characteristics on the survival rate of financially distressed firms. In particular, I focus on the following questions: Does the probability of a firm's survival increase with its main bank's ability to process soft information? How do difficulties within the bank's portfolio affect the survival of financially distressed firms? Do firms with multiple bank relationships have coordination difficulties and exit the market with a higher probability? How do discontinuities in the main bank relationships affect the status of financially distressed firms?

There is a growing literature on banking and the financing of small and medium sized enterprises. While most studies are concerned with the access to finance, lending technologies, and terms and conditions, only a few studies have focused on financial distress and bank relationships. Dahiya et al. (2003) analyzed the effect of a firm's failure on the value of the bank. Studies of the recovery rates of distressed firms have tried to measure the effect of firm or entrepreneurial characteristics on losses, given default (e.g. Grunert and Weber, 2009). The studies most related to this one focus on banks' role in reducing the costs of financial distress in Japan during the 1990s (e.g. Peek and Rosengren, 2005; Fukuda et al., 2009; Shimizu, 2012). Compared to those studies, my dataset allows analyzing the effects for all firm sizes under "normal" economic conditions.

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For the empirical analysis, I use data on German firm–bank relationships to address these questions. The data set represents a 10% random sample of German firms active in the years 2000–2013. The panel covers semiannual firm observations. The data was collected by Creditreform, the largest German credit bureau. The dataset contains firm characteristics, such as the firm's industry, location, date of incorporation, main and further bank relationships. It was supplemented with information from the ZEW Bank Panel concerning bank type, bank portfolio, and local banking market characteristics. Based on the firm's payment status, I observe episodes of financial distress, as well as the status of the firm after distress. In addition to firm closure, I distinguish between firms that survive but remain in financial distress and firms with improved ratings.

The dataset allows analyzes on two levels. At the bank level, I analyze the effect of a bank's organizational complexity and non-performing customers on its share of financially distressed firms that either improve or close. At the firm level, I employ further variables describing the main bank relationship. Here my interest is in the financially distressed firm's probabilities of recovering and of closing.

My main findings are that small banks have higher shares of improved firms and lower shares of closed firms. Also, at the firm level, bank size has a positive effect on survival and improved ratings. Small banks tend to be more capable of processing soft information. This type of information can be important for efficient liquidations of financially distressed firms. I find "perverse incentives" similar to Peek and Rosengren (2005), in that banks with difficulties in their loan portfolio are more likely to keep distressed firms alive. I find the effect for both the bank and firm level. However, I also show that firms having a relationship with such a bank are more likely to become financially distressed in the first place. Strong main bank relationships have a positive effect on a firm's survival probability. Banks have little private information on firms that have only recently become their customers. Such banks find it harder to make efficient liquidations. Banks face coordination difficulties, free-rider problems, and information asymmetries if the firm has multiple bank relationships. However, if firms are able to renegotiate with several banks, they have a higher probability of improving their ratings. Banks have insufficient private information regarding new clients to make efficient liquidations. Firms that have recently switched their main bank show a higher probability of closure. I find mixed results regarding a bank's institutional background and governance structure. The bank level results show that *Sparkassen* and cooperative banks have higher shares of distressed firms that improved their rating and lower shares of distressed firms that closed. In contrast, the firm level results show that the probability of closure is higher for financial distressed firms that use a *Sparkasse* or cooperative bank as their main relationship.

The present paper is structured as follows. In Section 2, I introduce the hypotheses regarding the effects of firm–bank relationships on the survival of financially distressed firms. In Section 3, I describe the German banking market and discuss the potential effects of the institutional differences of German banks. In Section 4, I present the data set and the empirical models. In Section 5, I present the results of the xttobit model of the bank level and the multinomial probit model of the firm level analysis. In Section 5.1, I provide further robustness checks, such as a Heckman Probit model in order o control for potential selection biases, and discuss the results. I conclude in Section 6.

2. Hypotheses

Diamond (1984) argues that it is efficient for debtors to delegate monitoring to banks. Banks add value, producing information about creditors and deciding on the most efficient asset allocation. While banks monitor projects, they need to liquidate inefficient projects. In addition to publicly available information, banks use private information to justify the decision to liquidate and reallocate funds. Chemmanur and Fulghieri (1994) argues that lenders choose a financing partner according to their own risk as well as the financing partner's ability to identify bad projects. An important kind of added value for firms in financial distress is that banks with expertise make more efficient liquidations (Chemmanur and Fulghieri, 1994). Those banks are better able to evaluate firm liquidation value vs. going-concern value. This allows identifying viable firms, rather than liquidating every distressed firm. Banks need to invest in expertise in order to act as a relationship lender and add value for the borrowers (Boot and Thakor, 2000). They also rely on sufficient private information to identify good and bad projects once they receive a bad signal. In certain circumstances, banks have incentives not to liquidate insolvent firms but keep "zombie firms" alive (Caballero et al., 2008), e.g., if the banks themselves are in difficulties (Peek and Rosengren, 2005).

I elaborate four hypotheses on the effect of a bank's characteristics on its ability and incentives to make efficient liquidations. I focus on the bank's ability to process soft information, and the share of non-performing customers that are directly related with the bank's organization and portfolio. I elaborate hypotheses on the strength and duration of the relationship between a firm and a bank.

2.1. Soft information processing

Banks can use different types of information when it comes to financing or to renegotiating contracts (Berger et al., 2001; Main, 2006; Jimenez et al., 2009). Stein (2002) distinguishes between hard and soft information. Hard information can be verified, such as financial data or ratings. In contrast, degrees of trust or character assessment can be described as soft information. It is produced by an agent, e.g., a bank official, and cannot be directly verified by others. This type of information becomes especially valuable once a firm is financially distressed and needs to restructure its debt. Stein (2002) argues that banks are not all alike in their ability to process soft information. More complex or hierarchically organized banks are less able to process soft information.

In the case of financially distressed firms, soft information can have two effects. Either bad hard information is supported and the firm gets liquidated, as it would without considering soft information, or soft information attenuates the bank's decision. The liquidation rate of financially distressed firms should therefore decrease with the main bank's ability to process soft information.

Hypothesis 1. A financially distressed firm's probability of survival increases with its main bank's ability to process soft information.

2.2. Non-performing customers

The capacity of a bank to absorb financial shocks from a firm in its portfolio by providing additional financing is restricted once the bank itself suffers substantial losses. One should therefore expect that the probability of market exits of financially distressed firms increases with the bank's rate of loan defaults. In contrast, Peek and Rosengren (2005) find that distressed Japanese banks keep financing weak firms. They argue that troubled banks have an incentive to avoid the realization of additional losses on their own balance sheet by allocating funds to borrowers in financial distress. By avoiding or delaying the firm's bankruptcy, the bank is not required to report such non-performing loans. Peek and Rosengren (2005) observed this phenomenon in Japan during a

period of economic crisis. I test whether this holds under "normal" economic conditions for banks in a bank-based system.

Hypothesis 2. Financially distressed firms financed by banks which suffer losses have a lower probability of closing than financially distressed firms financed by banks that do not suffer from losses.

2.3. Strength and duration of bank relationships

Close relationships between a firm and its bank provide incentives for information production and monitoring, and allow for intertemporal transfers (e.g., Petersen and Rajan, 1995; Boot and Thakor, 2000). Sharpe (1990) and Rajan (1992) argue that with repeated lending, a single bank relationship may not be optimal. Superior information enables a single bank to extract monopoly rents. If this hold-up problem is too severe, firms can reduce banks' bargaining power using multiple bank relationships. In addition, banks might be unable to fund profitable projects for internal problems. Detragiache et al. (2000) argue that non-relationship banks face an adverse selection problem and might neglect funding. Firms can insure against this by building multiple relationships.

But for firms in financial distress, multiple bank relationships can be problematic for two reasons. First, there is a free-rider problem in monitoring, which leads to inefficiencies in renegotiation (Diamond and Dybvig, 1983). Hoshi et al. (1990) find that japanese firms with close relationships perform better after financial distress. They argue that renegotiation for those firms is less costly because free-riding problems and information asymmetries are less severe. Rajan (1992) argues that an increase in the number of bank relationships decreases the probability that a single bank is pivotal in renegotiation and increases the cost of renegotiation. Second, there is a risk of coordination failure, which increases with the number of lenders (Thakor, 1996). Coordination is even more difficult if the creditors are less concentrated (Bris and Welch, 2005). Brunner and Krahnen (2008) find that for distressed firms in Germany, the probability of coordination problems increases with the number of bank relationships, and decreases in the concentration of bank debt. They also find that the length of a workout plan increases and the likelihood of turnaround decreases with the number of banks coordinating. A bank's ability to produce private information also depends on the length of the duration of the relationship (Elsas, 2005). Degryse et al. (2011) show the effect of a discontinuity in bank relationships after bank mergers.

Hypothesis 3. Financially distressed firms with multiple lenders have a higher probability of closing than financially distressed firms with only one lender.

Hypothesis 4. Financially distressed firms' probability of surviving increases with the duration of the main bank relationship.

3. Ownership and governance within the German banking system

Bank ownership structure, and therefore governance, can provide banks with different risk taking incentives. Differences in governance can have direct and indirect effects on banks' dealings with financially distressed firms. I provide a brief introduction to the German banking system, followed by a discussion of its potential implications for this analysis.

The German banking system is often described as a "three pillar system," consisting of private banks, *Sparkassen/Landesbanken*, and cooperative banks, all of them active as universal banks (Krahnen and Schmidt, 2004; Engerer and Schrooten, 2004).[1] Table 1 presents statistics describing the German banking system by bank types in the years 2000–2013. The number of banks decreased significantly during the sample period due to mergers within the *Sparkassen* and cooperative banking sector. The market shares in terms of main banking relations remained stable.

The ***Sparkassen* sector** consists of *Sparkassen* and *Landesbanken*. *Sparkassen* are owned by the district or municipality, while *Landesbanken* are jointly owned by a federal state and that state's *Sparkassen* association.[2] Until 2005, *Sparkassen* and *Landesbanken* banks had a bailout guarantee.[3] It is argued that these guarantees weakened market discipline and increased banks' risk taking (Fischer et al., 2011). Local authorities control the majority of the board of supervisors and the boards' chair is usually linked with the position of the district administrator (e.g., a city mayor). Local politicians would lose their influence on the bank's lending strategy when it is in need of a merger due to high risk taking. The political influence is regulated by the *Sparkassen* act and should ensure that *Sparkassen* fulfill their mandate to provide finance and financial services to the people, companies, and authorities within the business area (e.g., article 6 SpG, 2005; Engerer and Schrooten, 2004). In their mission statement, *Sparkassen* promises to support firms "in critical periods [...] as long as economically justifiable" (DSGV, 2008).

In 2013, *Sparkassen* had on average 2.6 billion Euros in total assets. Table 1 shows that *Sparkassen* had the second largest market share in terms of total assets (column 4). Nearly half of all firms have their main bank relationship with a *Sparkasse* (column 8). *Landesbanken* have a similar market share in terms of total assets. Especially, large firms have their main relationship with a *Landesbank*.

Cooperative banks are owned by individuals holding cooperative shares. Market discipline is also reduced for cooperative banks, since shareholders are usually required to make additional though restricted payments in case of insolvency. The aim of cooperative banks is to "promote the acquisition and the business of members" (Engerer, 2006). So the members of a corporate society, who are at the same time customers, have a high stake in the bank and their charter value should reduce risk taking. The lending strategy of cooperative banks is quite similar to that of *Sparkassen*, and Hakenes and Schnabel (2010) state that under most circumstances, cooperative banks can perform the same functions as the *Sparkassen*. In 2013, cooperative banks had on average 763 million Euros in total assets. Their market share in terms of main bank relationships with enterprises is 27%.

Defaulting non-private banks are usually bailed out. Koetter et al. (2007) analyzed bank mergers in Germany. They show that failed banks are usually merged with a neighboring, healthy bank of the same banking group (either *Sparkassen* or cooperative banks). The experience of the financial crisis showed that the owner needed to bail out their *Landesbanken*. For example, the federal states of Bavaria, Baden-Wuerttemberg, and Sachsen, as well as the city of Stuttgart, needed to recapitalize their *Landesbanken*, and provided further guarantees.

Large banks and other commercial banks are in general ***private banks***. Mostly, these banks operate in the legal form of a public stock company or a limited liability company. The owners' liability is limited to the value of their shares. There are no restrictions on

[1] Table A.1 in the Appendix provides an overview of bank types and how banks are assigned to either group.

[2] Some *Landesbanken* are jointly owned by two or more federal states. HSH Nordbank (Hamburg) is the only *Landesbank* with a minority stake of a private investor (since 2006).

[3] The so-called *Gewährträgerhaftung* and *Anstaltslast* provided an unlimited cover for the owners in case of a bank's distress, that led to lower refinancing costs compared to private banks. For competitive reasons, both were abolished within the transition period from 19.07.2001 to 18.07.2005, while banks' risks from financial contracts are covered until 2015.

Table 1
The German banking market by bank type (2000–2013).

Bank type	No. of banks		Total assets (%)		Main bank relation (by firm size) (%)			
	2000 (1)	2013 (2)	2000 (3)	2013 (4)	Small (5)	Medium (6)	Large (7)	All (8)
Non-private banks	**575**	**430**	**46**	**33**	**49**	**37**	**31**	**49**
Sparkassen	562	421	20	17	46	33	23	46
Landesbanken	13	9	26	17	3	5	8	3
Cooperative banks	**1,796**	**1,080**	**16**	**16**	**27**	**15**	**8**	**27**
Private banks	**585**	**499**	**38**	**51**	**23**	**47**	**62**	**24**
Large banks	4	4	20	26	21	41	56	21
Other commercial banks	581	495	18	25	2	6	6	2

Note: Market shares are estimated based on the total sum of bank's total assets (columns 3 and 4) and main bank relationships (columns 5–8) related to firm size. Firm size is classified as follows: <100 employees as small firms; >100 & <10,000 employees as medium firms; ⩾1000 & ⩽50,000 employees as large firms.
Source: Deutsche Bundesbank, 2015 (columns (1)–(4)); ZEW Bank Panel and MUP (ZEW) 2015 (columns (5)–(8)); author's own calculations.
Bank types in bold presents summarieses banking groups. Non-private banks include Sparkassen and Landesbanken. Private banks include large banks and other commercial banks.

private banks' lending policies (Engerer, 2006) except overall banking regulation. In 2013, the market share of the four largest banks accounted for 21% in terms of main bank relationships. Larger firms are more likely to have their main bank relationship with a private bank (see Table 1 for details).

The differences in mandates or mission statements between private banks on the one side and cooperative and *Sparkassen* sector banks on the other, can have ambiguous effects on a firm's probability of financial distress and the survival of a distressed firm.

In general, creditors and depositors demand higher interest rates as compensation for an increased risk level. The creditors and depositors of protected banks have lower incentives to monitor and punish banks' risk taking behavior (Flannery, 1998). Merton (1977) argues that bailout guarantees therefore limit this disciplinary effect of markets, and banks have incentives to take greater risks. Banks with higher risk levels should have on average a higher probability of firm distress within their portfolio.

But owners take into account the charter value of the bank, which reflects its future income or influence. To preserve their banks's high charter value, owners tend to limit the bank's risk taking in order not to damage their own influence, which depends on the influence in the bank (Keeley, 1990). Theoretical considerations do not suggest the direction of the overall effect (Cordella and Yeyati, 2003; Hakenes and Schnabel, 2010).

In addition, governance can affect competition in loan markets. Stiglitz and Weiss (1981) argue that borrowers have risk-shifting incentives as the interest burden increases. As documented by Sapienza (2004), protected banks can pass on their lower refinancing costs to customers and offer lower interest rates for loans. Firms financed by private banks that have relatively high interest rates should be more prone to moral hazard and shift to riskier projects. Matthey (2010) argues that private banks compete with non-private banks in debt repayment rather than simply in terms of interest streams. Private banks can offer transaction-based lending that rules out renegotiation in financial distress in order to attract low-risk firms. The liquidation threat needs to be credible in order to prevent high-risk firms from free riding. Private banks should therefore be less likely to absorb the exogenous shocks from their clients, and clients should have a higher probability of defaulting.

4. Data and methodology

4.1. Description of the dataset

The core data comes from the Mannheim Enterprise Panel (MUP), maintained by the Centre for European Economic Research (ZEW). The MUP is a firm-level dataset based on data collected by Creditreform, the largest credit rating agency in Germany. Since 1999, ZEW has been receiving a copy of Creditreform's whole firm-level data warehouse twice a year (see Bersch et al., 2014 for a detailed description of the MUP). These data are cleaned and brought into a panel structure. The MUP covers almost all firms located in Germany. It contains information on the firm's industry code, location, legal form, size, owners, owners' characteristics, and rating scores. In addition, it provides information for each firm on its creditworthiness, its main bank relationship, and up to five further bank relationships. Based on this information and additional investigation, Creditreform offers rating information. Creditreform's rating is used for terms of payment agreements in the business to business context as well as for the credit scoring models of banks and leasing companies. Creditreform updates its rating information on a daily basis. Within the MUP, the firm's status is observed in either January or July.

There were roughly 3.1 million firms active in Germany in 2013. The stock of active firms in a given year is influenced by the stock of firms in the previous year, the number of newly founded firms, and firm closures. Within the sample period (2000–2013) the number of active firms in a given year remained relatively stable (Bersch et al., 2014). In this period 4.5 million firms were active for at least one observation. For data processing reasons, I use a 10% random sample of this total population. The sample consists of 3,512,997 firm-year observations, based on 319,423 firms.

I link the dataset with the ZEW Bank Panel. The Bank Panel covers all banks active in business lending in Germany. It includes bank characteristics, such as the banking group, bank size, market shares in business lending, default of portfolio firms, as well as characteristics of the local banking market. Each firm-year observation is merged with the characteristics of its main bank.

4.2. Financial distress, recovery and market exit

4.2.1. Identification of financial distress

I employ trade credit rating information identifying episodes of financial distress. Petersen and Rajan (1994) used the level of trade credit rating in order to identify financially constrained firms. Since I am interested in events of financial distress, I deviate from the identification used by Petersen and Rajan (1994). Two conditions must hold: First, a firm's credit rating needs to decline from the previous period. Second, the new credit rating must be poor. Similar techniques are used by banks adopting the Basel II internal rating based approach (IRBA) for external benchmarking of their portfolio.

I identify a payment status decline in the Creditreform data if the firm's payment status moves to a category with a higher number. I ignore changes from unknown to known payment status because it cannot be inferred whether or not the payment status has worsened. Table 2 presents a description of the payment status categories of the MUP.

Table 2
Classification of payment status in the MUP.

Code	Payment status	Description	Decline in payment status	Distress
0	Unknown	No information provided		
1	Excellent	Cash discount; does not use trade credit		
2	Sound	Within term of payment, makes use of trade credit	Yes	
3	Fair	Minor problems; occasionally payments are made later than term of payment	Yes	
4	Poor	Exceeds the agreed payment term up to 30 days/payment reminders	Yes	Yes
5	Bad	Exceeds the agreed payment term up to 3 months or longer/several payment reminders	Yes	Yes
6	Junk	Severe payment problems/ insolvency procedures	Yes	Yes

Note: This table presents the classification of the firm's status of payment by Creditreform. Decline in payment status is defined as a worsening of payment status code compared to the previous period. Observations with class 0 in the previous period are neglected. Distress is defined as a decline in payment status ending up in codes 4–6.
Source: MUP (ZEW) 2011.

In total, I identify 176,518 cases of payment status decline. A firm is defined as becoming financially distressed if it moves to category 4 (poor), 5 (bad), or 6 (junk) from any other category. In total, 61,443 episodes of distress are observed.

Fig. 1 presents the index time series for payment status downgrade and episodes of financial distress for German firms within the sample period (with base year 2005). The time series shows a spike of financial distress in 2004. The number of financially distressed firms decreased until the financial crisis in 2008/2009. Financial distress shows a small spike in 2009 but is falling again until 2012. I present the time series for the GDP and insolvencies in Germany as benchmarks. The figure shows that the GDP dropped by 5% during the financial crisis in 2008/2009 but recovered quickly afterwards. The time series for insolvencies behaves similar to that for financial distress, showing spikes in 2003/2004 and in 2009.

4.2.2. Status of financially distressed firms after two years: improve, unchanged, closure

Financially distressed firms can either survive or close. Unfortunately, I cannot observe whether a bank applies an audit to distinguish between viable and non-viable firms, or if a renegotiation has taken place. However, I can distinguish between firms that survive and those that exit the market. From this finding, I can infer that surviving firms successfully renegotiate their debt contracts. I consider firm closure within a two-year period after facing financial distress as being related to the fact of having been financially distressed.

	Share improved $\frac{\sum_{b=1}^{Bank} Improve_{ibt+2} \mid Distressed_{ibt}}{\sum_{b=1}^{Bank} Distressed_{ibt}}$	Share closure $\frac{\sum_{b=1}^{Bank} Closure_{ibt+2} \mid Distressed_{ibt}}{\sum_{b=1}^{Bank} Distressed_{ibt}}$	Share closure−Share improved
Y^*_{bt} with Lower limit :	0	0	−1
Y^*_{bt} with Upper limit :	1	1	1

The MUP contains two sets of information allowing the identification of a firm closure. First, information on insolvency procedures, because insolvency regulation is binding for limited liability firms. The vast majority of insolvent firms were liquidated. In Germany, only in rare cases is the insolvency procedure used for restructuring distressed firms. Unless the firm was restructured, I consider the date of opening the procedure as the date of firm closure. Second, information on firms which voluntarily closed without the insolvency procedure. Either Creditreform provides a date for the firm's closing, or the date of closure is predicted based on the last date Creditreform investigated the firm identified as closed (Bersch et al., 2014). In general, it is possible that a firm is acquired and then closed. The dataset does not provide a direct identification of mergers. The influence of mergers should be negligible because the number of mergers is low, especially for smaller firms. In addition, the focus of this paper is on distressed firms. Banks could either liquidate the assets of such a firm or sell all of its assets to another firm.

During its inquiries, Creditreform collects information on those market exits including the approximate date of market exit. Surviving firms can either remain financially distressed or improve again. I classify firms as improved if the over all rating score of a surviving firm improved. During the analysis, I focus on the status two years after financial distress in order to take into account any delay in the borrower's or lender's decision making process, as well as any delay in observing the firm's market exit.

Table 3 presents the numbers of sample firm - half-year observations with a payment status downgrade, financial distress, and status two years after financial distress. The majority of financially distressed firms close within two years (52%). Nearly one-third of all distressed firms maintain that status. Only 13% show improved ratings within two years after financial distress.

4.3. Econometric specification

My interest is in exploring the effects of the main bank's characteristics on the status of financially distressed firms. I analyze these effects at both the bank level and the firm level.

To examine the hypotheses in Section 2, I estimate the following regression equations:

Bank level xt-tobit regression

$$\begin{aligned} Y^*_{bt} = {} & \beta_1 \times \text{Bank type}_{bt} \\ & + \beta_2 \times \text{Bank size}_{bt} \\ & + \beta_3 \times \text{Share of nonperforming customers}_{bt} \\ & + \beta_4 \times \text{Portfolio risk}_{bt} \\ & + \beta_5 \times \text{Bank controls}_{bt} \\ & + \alpha_{bt} \\ & + \varepsilon_{bt} \end{aligned} \quad (1)$$

with either:[4]

[4] I use the following notation: i = firm; b = bank; t = time (years).

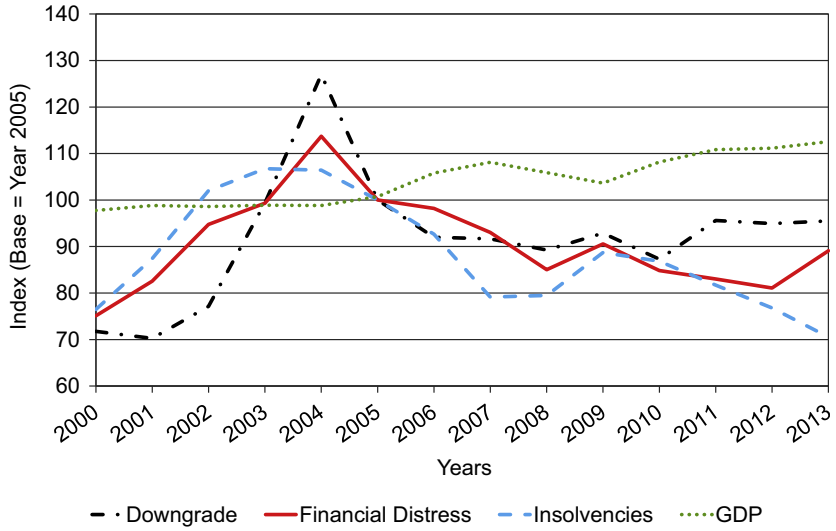

Fig. 1. Downgrade, financial distress, GDP and insolvencies (2000–2013). *Note*: The figure presents the trend in yearly cases of a decline in payment status and distress as observed by Creditreform, the number of insolvencies, and the GDP in Germany with respect to the base year 2005. *Source:* MUP, (ZEW) 2015, German Federal Statistical Office, Author's own calculation.

Firm level multinomial probit regression

$$\begin{aligned} p_{ij} = Pr(Y_i = j) = F_j(&\beta_1 \times \text{Bank type}_{ib} \\ &+ \beta_2 \times \text{Bank size}_{ib} \\ &+ \beta_3 \times \text{Share of nonperforming customers}_{ib} \\ &+ \beta_4 \times \text{Portfolio risk}_{ib} \\ &+ \beta_5 \times \text{Multiple bank relationship}_i \\ &+ \beta_6 \times \text{Switched main bank}_i \\ &+ \beta_7 \times \text{Bank Controls}_{bt} \\ &+ \beta_8 \times \text{Firm controls}_i \\ &+ \beta_9 \times \text{Regional controls}_i) \end{aligned} \tag{2}$$

4.3.1. Bank level

At the bank level, I estimate the effect of bank characteristics on the share of firms that were financially distressed in a particular period and either recovered or closed within two years. There are three extreme cases. First, non of the bank's portfolio firms had become distressed. In this case both variables (Share Improved and Share Closure) takes on the value zero. I use the dummy variable Nodistress to control for those banks in the regression. Second, non of the distressed firms either improve or close. In this case the variable takes on the value zero. Third, all distressed firms either improve or close within two years. In this case the variable takes on the value one. Because the dependent variable is bounded between 0 and 1 and due to the unbalanced panel structure, I estimate a Xt-Tobit model if random effects (see specification of Eq. (1)). I further use the difference in the share of closed and improved firms. Because the share of closure is in general higher, I subtract the share of improved. If the share of improved is larger than the share of closures the variable turns negative. This variable is bounded between −1 and 1.

4.3.2. Firm level

At the firm level, my interest is in the probability that a financially distressed firm either recovered or closed. The definition of an episode of financial distress requires that a change in payment status is observed. One could argue that the observation of a change in payment status is related to the main explanatory variables or to the data generating process. To control for potential biases, I estimate the probability of a firm's financial distress in a first step, and its probability of market exit in a second step. I employ the empirical model of a Heckman probit that is closely related to Van de Ven and Van Praag (1981) in order to control for a potential error term correlation of both steps. The identification of the Heckman probit requires exclusion restrictions. The variables used are described and motivated below.

4.4. Main explanatory variables (bank & firm level)

The main explanatory variables are provided in the Bank Panel. The definitions and descriptives statistics of the variables are provided in Table 4.

The bank type is assigned according to the bank groups described above. Table 3 shows the univariate results of bank type on a decline in payment status, financial distress and exit rate. Of the firms which have a private bank as a main bank 5.81% experience an episode of payment decline and 1.79% an episode of financial distress. Of firms with a *Sparkasse* or cooperative bank as their main bank, the shares of payment decline and financial distress are significantly lower. The share of financially distressed firms that closed was 55.8% for firms with a private bank as their main bank relationship. The share of financially distressed firms that closed was lower for firms with a *Sparkasse* (50.6%) or cooperative bank (50.8%) as their main bank relationship.

Hypothesis 1 states that there is a negative relation between a firm's market exit and its main bank's ability to process soft information. I test whether $\beta_2 \neq 0$ in Eqs. (1) and (2). Williamson (1973) argues that size is a proxy for organizational complexity and that larger organizations are generally more hierarchically structured. Soft information describes a banks' knowledge of the firm or entrepreneur that cannot be codified, such as trustworthiness, and is difficult to diffuse through the bank's hierarchy. In the empirical banking literature, bank size is often used as a proxy of a bank's ability to process soft information (e.g., Stein, 2002; Berger and Black, 2011). I use the bank's total assets as a proxy for bank size (e.g., Stein, 2002; Berger and Black, 2011).

The nearly full coverage of the stock of firms by the MUP allows generating information about the portfolio characteristics of each bank. Related to Hypothesis 2, I test for $\beta_3 \neq 0$ in Eqs. (1) and (2). The *Bank loan default rate* considers the potential losses a bank faced in a particular year. This measures the share of firms closing

Table 3
Downgrade, distress and status two years after distress by bank type.

		Sparkassen (1)	Cooperative banks (2)	Private banks (3)	Total (4)
Downgrade (payment status)	Number	89,080	44,990	42,448	176,518
	%	5.46	5.25	5.81	5.48
	Test private vs.	***	***		
Episode of financial distress	Number	31,610	15,440	14,393	61,443
	%	1.77	1.67	1.79	1.75
	Test private vs.	*	***		
Status 2 years after episode of financial distress					
Improved	Number	4,193	2,208	1,724	8,125
	%	13.26	14.30	11.98	13.22
	Test private vs.	***	***		
Unchanged	Number	11,435	5,383	4,645	21,463
	%	36.18	34.86	32.27	34.94
	Test private vs.	***	***		
Closed	Number	15,982	7,849	8,024	31,855
	%	50.56	50.84	55.75	51.84
	Test private vs.	***	***		

*Note:*The rows denoted with "Number" present the count of cases within the sample. The rows denoted with "%" give the percentage of firms with the particular bank type as main bank relation to which the respective variable applies. The rows "Test private vs." present test statistics of mean differences between private banks and either *Sparkassen* or cooperative banks. * and *** denote significance level on the 10% and 1% levels of significance.
Source: MUP (ZEW) 2015.

in a given year in proportion to the number of portfolio firms (bank size; both weighted by the number of employees of their portfolio firms).

I further control for risk in the main bank's portfolio. I use the share of firms with a Creditreform rating of either AAA–A, BBB+ –B-, CCC+ –C-, or DD–D within the bank's portfolio.[5]

Within the sample period, the number of banks significantly decreased due to mergers. The number of cooperative banks decreased by over 50% and the number of *Sparkassen* by 30%. The largest number of firms were affected by the merger of the second and third largest private banks (Commerzbank and Dresdner in 2008/2009). I test for the influence of bank mergers using an identification variable. The variable takes on the value one if the bank has been involved in a merger within the previous three years.

4.5. Explanatory variables at the firm level

4.5.1. Firm – main bank related variables

Hypothesis 3 asserts that firms with multiple bank relationships are more likely to exit the market, and I test for $\beta_5 \neq 0$ in Eq. (2). The MUP contains information about a firm's main bank and up to five further bank relationships. The median of the variable *Number of Bank Relations* is one while the mean is 1.28. These figures are considerably lower than found by other studies concerning Germany. Elsas and Krahnen (1998) report a median of five relationships to banks and Ongena and Smith (2001) find that the number of relationships is eight on average, while the median is five. The reason for this difference is that the average firm size in the data at hand is significantly lower than for the other studies, while the number of bank relationships is positively correlated with firm size. Firms with multiple bank relationships are of higher quality. Those firms also have significantly better ratings (10 point mean difference; rating varies between 100 and 600 points). The MUP does not contain information on each bank's financing share, which would be useful for controlling for multiple but asymmetric relationships.

Hypothesis 4 states that firms with increasing duration of their main bank relationship have a higher probability of surviving. Because the MUP starts as a panel in 1999, I cannot estimate the whole duration of the relationship between a firm and its main bank. Therefore I focus on firms that recently switched their main bank relationship. The rate of firms that switch their main bank is low. Table 4 shows that only 4% of all firms switched their main bank in the previous three years. Analyses based on the MUP show that firms that will switch in the following two years have better ratings than those that stay (mean difference of 4 points). Two years after switching their main bank relationship, the mean rating is higher (40 points mean difference). This indicates that those firms are more vulnerable to financial shocks. Comparing the share of switching firms in the full sample with the sample of distressed firms shows that the figure increases from 4% to 7%.

The nearly full coverage of the MUP is also used to measure the degree of local market competition. I consider the local banking market to correspond with the administrative districts (*Landkreise* and *kreisfreie Städte*). A bank is assigned to a district if at least one of its branches is located in this district. In the literature on competition in banking markets, variables describing the market structure are often used (Degryse and Ongena, 2008). *Bank intensity* is calculated as the ratio of banks active in business lending in a district per capita. This variable captures the possible alternative bank relationships a firm can have. The Herfindahl–Hirschman index (HHI) is calculated as the sum of squared market shares in the main firm–bank relationships in a district. However, bank intensity and the HHI do not necessarily describe competition. Local market concentration is often negatively related with market size, and market share could just reflect a bank's efficiency (Degryse and Ongena, 2008). Firms' switching between banks can be considered as an alternative measure, indicating that banks are competing against each other to attract new customers. In regions with low competition on the banking market, firms are locked into a bank relationship and banks can extract rents. In regions with a high level of competition in the banking market, firms can more easily switch. In such regions, banks can only extract rents to a lower extent and are less able to invest in specialization (Boot and Thakor, 2000). I use the ratio of firms that switch their main bank relationship to the total number of firms in the district. Recall that in the period of interest, a significant number of banks merged. A bank merger causes a discontinuity in relationships and firms are more likely to switch their bank relationship (Degryse et al., 2011). In order to rule out such merger effects, I consider only firms whose house bank was not involved in a merger. On average, 0.8% of all firms in a district change their main bank within a six-month period. The maximum rate of bank switches within a district was 7%.

[5] The PD profile of rating classes as defined by Creditreform are similar to those used by S&P, Moody's, or Fitch.

Table 4
Descriptive statistics of independent variables.

	Bank level	Firm level					
Variable	Mean	All Mean	Distressed Mean	Min	Max	Explanation	Source
Main bank related variables							
Sparkasse/Landesbank	0.32	0.51	0.51	0	1	1 if a public bank is the main financing partner	BP
Cooperative Bank	0.64	0.26	0.25	0	1	1 if a cooperative bank is the main financing partner	BP
Private bank	0.03	0.23	0.23	0	1	1 if a private bank is the main financing partner	BP
Total assets	488.2	165.0	158.0	0.01	2,202	Bank total assets (in Billion EUR)	BP
Regionally active bank	0.08	0.65	0.65	0	1	1 if bank business clients are located in less than five districts	BP
Bank merger	0.83	0.17	0.17	0	1	1 if the bank was involved in a merger within the last three years	BP
Share of firms rated AAA-A	0.04	0.06	0.07	0.00	0.98	$=\frac{\sum_{b=1}^{Bank} Firm_{i,b}\|Rating\ class}{\sum_{b=1}^{Bank}\text{Non defaulting Firm}_{i,b}}$	BP
Share of firms rated BBB+ BBB-	0.82	0.77	0.78	0.01	1	$=\frac{\sum_{b=1}^{Bank} Firm_{i,b}\|Rating\ class}{\sum_{b=1}^{Bank}\text{Non defaulting Firm}_{i,b}}$	BP
Share of firms rated BB+ B-	0.14	0.17	0.17	0.00	0.96	$=\frac{\sum_{b=1}^{Bank} Firm_{i,b}\|Rating\ class}{\sum_{b=1}^{Bank}\text{Non defaulting Firm}_{i,b}}$	BP
Share of firms rated CCC+ D	0.02	0.01	0.02	0.00	0.75	$=\frac{\sum_{b=1}^{Bank} Firm_{i,b}\|Rating\ class}{\sum_{b=1}^{Bank}\text{Non defaulting Firm}_{i,b}}$	BP
Share of non-performing customers	0.06	0.01	0.01	0	0.19	$=\frac{\sum_{b=1}^{Bank} Firm_{i,b}\times Emp_i\|firm\ closure=1}{\sum_{b=1}^{Bank} Firm_{i,b}}$	BP
Pre-crisis (2001–2007)	0.61	0.59	0.64	0	1	1 for observations in the years 2001–2007	MUP
Crisis (2008–2009)	0.16	0.23	0.21	0	1	1 for observations in the years 2008–2009	MUP
Post-crisis (2010–2013)	0.23	0.18	0.15	0	1	1 for observations in the years 2010–2013	MUP
Firm-main bank related variables							
Multiple bank relationships		0.22	0.19	0	1	1 if the firm has multiple bank relationships	MUP
Switched main bank		0.04	0.07	0	1	1 if the firm switched its main bank relationship within the previous three years	MUP
Main bank market share in region		0.06	0.06	0	0.87	$=\frac{\sum_{b=1}^{Bank} Firm_{i,b}\|District}{\sum_{d=1}^{District} Firm_{i,d}}$	BP
Regional banking market competition		0.01	0.01	0	0.09	$=\frac{\sum_{d=1}^{District} Firm_{i,d}\|\text{switch main bank}=1}{\sum_{d=1}^{District} Firm_{i,d}}$	BP
Firm related variables							
History of disterss		0.11	1.41	0	7	Number of previous episodes of distress	MUP
Debt collection (fully repaid)		0.08	0.33	0	1	1 if debitor completely payed back the debt Creditreform was asked to collect	MUP
Debt collection (partly repaid)		0.01	0.04	0	1	1 if debitor payed back a part of the debt Creditreform was asked to collect	MUP
Debt collection (open)			0.11	1		1 if debt collection is not yet finished	MUP
Limited liability		0.32	0.29	0	1	1 if the company has the legal form of a limited liability (GmbH, GmbH & Co. KG) or stock company (AG, SE)	MUP
Firm size		14.89	8.33	1	38,000	Number of employees	MUP
Firm size missing		0.25	0.34	0	1	1 if the number of employees is unknown	MUP
Firm age		19.05	13.95	1	1,011	Firm age in years	MUP
Management Team		0.68	0.74	0	1	1 if the firm is managed by a team	MUP
Master craftsmen		0.10	0.09	0	1	1 if the highest educational degree of all the members of the management team is a master certificate received from the chamber of industries and commerce or the chamber of crafts	MUP
University degree		0.16	0.14	0	1	1 if the highest educational degree within the management team is a University degree (either a German diploma, degree of doctor, or professorship)	MUP
Change in regional GDP		2.24	2.16	−28.9	43.0	Change in yearly GDP on the district level	So

Table 4 (*continued*)

Variable	Bank level	Firm level		Min	Max	Explanation	Source
		All	Distressed				
	Mean	Mean	Mean				
Located in East Germany		0.20	0.25	0	1	1 if the firm is located in Eastern Germany	MUP
Hightec Industry		0.02	0.02	0	1	1 if Cutting Edge and High Technology Industry	MUP
Lowtech Industry		0.08	0.08	0	1	1 if Manufacturing	MUP
Techn. services		0.06	0.04	0	1	1 if Technology-intensive Services	MUP
Company oriented services		0.12	0.10	0	1	1 if Industry/corporate-related Services	MUP
Construction		0.17	0.21	0	1	1 if Construction	MUP
Retail and Wholesale		0.29	0.28	0	1	1 if retail or wholesale	MUP
Transportation		0.05	0.07	0	1	1 if transportation	MUP
Exclusion restriction							
VVC Branch Quality		0.45		0	1	Index of investigation quality of Creditreform branches per period. Index varies between 0 (lowest quality) and 1 (highest quality). Index reflects the range of the predicted common factor after factor analysis of the following five components: 1 Share of firms with missing date of foundation; 2. Share of missing date of business registration for limited liabilities; 3. Missing information on the number of employees; 4. Share of active firms investigated; 5. Mean time elapsed between date of foundation and first observation	MUP
Investigation		0.38		0	1	1 if firm was investigated by Creditreform in the particular period	MUP
Number of observations	17,004	3,512,997	61,443				

Note: This table presents descriptive statistics of the main explanatory variables used in the probit regression of market exit of financially distressed firms. In this table, I use the following indices and abbreviations: *i* for firm; *b* for bank; *c* for clearing area; *d* for district; Emp for the number of employees; MUP for Mannheim Enterprise Panel; BP for ZEW Bank Panel; SO for German statistical office.
Source: MUP (ZEW) and ZEW Bank Panel 2015.

The nearly full coverage of the MUP also allows calculating the "bank regional market share." This variable reflects the share of firms with a relationship with a particular bank in all firms with a known bank relationship located in the same district.

4.5.2. Firm control variables

In line with other studies of firm survival, I include several variables grouped as internal factors or external factors. The definitions and descriptive statistics of the control variables are provided in Table 4. The proportion of financially distressed firms facing two or more episodes of financial distress, as indicated by the variable *History of Distress*, is 38%. Almost one-third of all firms are *Limited liability* companies.

Debt collection is unity if Creditreform was asked to collect debt from the firm in the particular period. The outcome of debt collection can be further distinguished as still open, completely repaid, partly repaid, or unpaid.

I use an indicator variable for firms managed by a team. 10% of all firms are run by entrepreneurs with a certificate of *Master Craftsman* and 16% with a university degree as their highest educational level.[6] The average firm size is 15 employees and the average firm age is 19 years in the full sample. In contrast, financially distressed firms are smaller (eight employees) and younger (an average age of 14 years). The variables *change in regional GDP* is estimated on the district level and cover regional differences in the business environments. *East Germany* controls for firms located in the former GDR. I further control for industry and year effects.

4.5.3. Exclusion restriction

Model identification requires an exclusion restriction, a variable that affects the selection equation but does not affect the main equation. Those variables should be correlated with the change in the firm's mode of payment status or affect the probability that such an event is observed. However, those variables should not be correlated with a firm's subsequent market exit (Cameron and Trivedi, 2009).

I use three variables as exclusion restrictions, which cover different aspects of the data generating process. These variables should affect the likelihood that a decline in payment status is observed by Creditreform. Once Creditreform has downgraded a firm's payment status, the firm is most likely to be under current observation. Therefore, there is neither a reason to believe that the same variables have an influence on the observation of market exit nor on the market exit itself.

The probability that an episode of financial distress is observed should increase with the quality of the investigation. I make use of the organizational structure of Creditreform. Creditreform's central business activities, subsidiaries, and joint ventures are all legally united under the Creditreform AG which is owned by a society, the Verband der Vereine Creditreform e.V. But firm information is collected by 130 independent, regional, separate companies, which are members of this society. Even if the investigation procedures adhere to certain standards, the sources and quality may differ between the Creditreform branches (Almus et al., 2000). A branch with a relatively "poor quality" is more likely to make an error of the second type, i.e., not observing the deterioration of payment behavior of a financially distressed firm.

I construct a *Creditreform branch quality index*. This variable is based on five measures of different aspects of quality, each calculated at the level of the local Creditreform offices per period. First, the share of firms with missing date of foundation. Second, the share of firms in the legal form of a limited liability company, yet

[6] A master certificate represents a higher degree of business qualification awarded either by the chamber of industry and commerce or the chamber of crafts.

Table 5
Tobit regression results—bank level.

	Share improved		Share closure		Share closure–share improved	
	(1)	(2)	(3)	(4)	(5)	(6)
Sparkasse/Landesbank	0.022	0.025*	−0.057***	−0.053***	−0.097***	−0.092***
	(0.01)	(0.01)	(0.02)	(0.02)	(0.02)	(0.02)
Cooperative Bank	0.031**	0.030**	−0.068***	−0.063***	−0.119***	−0.113***
	(0.01)	(0.01)	(0.02)	(0.02)	(0.02)	(0.02)
Total assets (bank)	0.006***	0.008***	0.015***	0.013***	0.005	0.000
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Regionally active bank	0.014**	0.013**	−0.014**	−0.013**	−0.020**	−0.018**
	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
Bank merger (within the last three years)		0.016**		−0.003		−0.012
		(0.01)		(0.01)		(0.01)
Share of Non-Performing Customers		0.093		−0.418***		−0.754***
		(0.08)		(0.09)		(0.13)
Share of firms rated AAA–A		−0.046*		0.127***		0.165***
		(0.03)		(0.03)		(0.04)
Share of firms rated BBB+ –BBB-		−0.043**		0.042**		0.084***
		(0.02)		(0.02)		(0.03)
Share of firms rated CCC+ –D		0.665***		−0.501***		−0.889***
		(0.09)		(0.10)		(0.14)
Crisis (2008–2009)	0.016***	0.013***	−0.016***	−0.013**	−0.035***	−0.030***
	(0.00)	(0.00)	(0.00)	(0.00)	(0.01)	(0.01)
Post-crisis (2010–2013)	0.012***	0.011***	−0.050***	−0.050***	−0.061***	−0.063***
	(0.00)	(0.00)	(0.00)	(0.00)	(0.01)	(0.01)
Nodistress	−1.441	−1.437	−1.843	−1.879	−2.175	−2.218
	(27.45)	(24.20)	(24.36)	(24.34)	(48.32)	(48.49)
Constant	0.018	−0.024	0.239***	0.307***	0.318***	0.434***
	(0.04)	(0.04)	(0.05)	(0.05)	(0.06)	(0.07)
sigma_u						
Constant	0.061***	0.061***	0.077***	0.077***	0.100***	0.100***
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
sigma_e						
Constant	0.201***	0.200***	0.220***	0.220***	0.297***	0.295***
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Observations	17,630	17,630	17,630	17,630	17,630	17,630
LR Chi2	39	121	256	339	178	308
log likelihood	−936.82	−896.22	−801.22	−760.18	−6915.43	−6851.05

Note: This table presents coefficients of the xt-tobit regression. Standard errors are presented in parentheses below. *, **, and *** denote significance level on the 10%, 5%, and 1% levels of significance.
Source: MUP and Bankpanel (ZEW) 2015, author's own calculations.

missing the date of its first registration. Third, the share of firms with missing information on the number of employees. Those three pieces of information can usually be collected at little cost. In addition, firm age and size are mostly reported as important variables predicting market exit (see for example studies by Audretsch (1991) and Franks and Sussman (2005)). Fourth, the share of active firms investigated in the particular period within the branch portfolio. The quality of the data pool is assumed to increase with the share of up to date firm information. Fifth, the mean time elapsed between the firm's foundation and the first observation.[7] Branches with high quality and good business networks are more likely to shorten the time required to identify new businesses in their region.[8]

I employ a factor analysis to predict the common factor of the described quality indicators for each period (OECD, 2008). The eigenvalues of the first factor varies between 1.67 and 1.94 and the scoring coefficients have the expected signs. The index is a transformation of the relative distances between the predicted factors, and range between 0 and 1. An index value of one indicates the branch with the best quality in a given period. Creditreform updates firm information either automatically, based on external information, such as business registry information, or investigation by its own staff. It is more likely that an episode of financial distress is observed if the particular firm was investigated in this period. The dummy variable *Investigation* takes on the value one if the Creditreform staff did some investigations concerning the firm in the particular period, and zero otherwise.

5. Empirical results

In this section I present the results of the analysis at the bank level and the firm level.

Bank level regressions Table 5 presents the coefficients of the Xttobit regression model with random effects. Columns (1) and (2) present the results for the dependent variable Share Improved, columns (3) and (4) Share Closure, and columns (5) and (6) the difference in the Share Closure and Share Improved.

The bank type variables for both *Sparkassen* and cooperative banks compared to private banks are positive for improving and negative for closure. This indicates that the share of distressed firms that improve within two years is higher for non-private banks and the share of closure is lower. The effect on the difference between the shares of closures and improvers is also negative. Therefore, the chance that a distressed firm closes within two years is lower within the portfolio of a *Sparkasse* or a cooperative bank than for a private bank. These findings support the view that *Sparkassen* and cooperative banks are more likely to support distressed and viable firms while private banks have incentives to make tough liquidation decisions (Matthey, 2010).

The findings on bank complexity and their ability to process soft information is mixed. If large banks, as a measure of complexity,

[7] I use only firms that are observed for the first time with a known date of foundation.
[8] For confidentiality reasons, I do not report statistics of the individual variables describing Creditreform branch quality.

are less able to process soft information, a negative relation between bank size and the share of financially distressed firms with improved ratings would be expected. In contrast, I find a positive relation. I also observe a positive effect of bank size on its share of distressed and closed firms. I do find the expected effect for regionally active banks. These banks seem to make the 'right' liquidation decisions because they show higher shares of improved and lower shares of closed firms. Regionally active banks might be better able to process soft information and local knowledge.

I employ other variables, describing the risk within a bank's portfolio. Banks with larger shares of low-risk firms (Creditreform rating AAA–BBB-) have lower shares of improving and higher shares of closed firms. The difference between closure and improving is also positive. Therefore banks with a high quality portfolio, that requires lower general loan loss provisions, seem to be stricter when it comes to restructuring distressed firms. In contrast, banks with a larger share of high-risk firms (Creditreform rating CCC+ –D) have higher shares of distressed firms that improve and lower shares of those that close. The effect of the share of non-performing business clients is even more severe. This variable shows no effect on the share of improvers. But it is negative for the share of closures and for the difference between the share of closures and the share of improvers. These findings support the interpretation by Peek and Rosengren (2005) that troubled banks have perverse incentives. They argue that a troubled bank has incentives to minimize additional defaults in their portfolio.

In columns (2), (4), and (6), I employ further variables describing a recent reorganization of a bank due to a merger, and risk within a bank's portfolio. Degryse et al. (2011) argue that a bank merger is a discontinuity in the borrower–lender relationship. They present the effects of bank mergers on small and medium sized firms in terms of switching or dropping the relationship with that bank. I use a variable that identifies banks that had been involved in mergers within three years prior to the year of observation. Those banks are more likely to reorganize their loan portfolio, which leads to lower survival rates of financially distressed firms. Surprisingly, I find a positive effect on the share of improved firms and no effect on the closures. A potential reason for this finding is that unlike Degryse et al. (2011), I am not able to distinguish between target and acquiring banks.

The German banking market was strongly affected by the financial crisis in 2008–2009. Several banks needed to be bailed out, and many *Sparkassen* provided additional funds to recapitalize their *Landesbanken* (Fischer et al., 2011). Therefore, one might expect higher closure rates of distressed firms during the crisis. I find the reverse. This effect can be explained by two major trends in the aftermath of the financial crisis. First, the German economy recovered quickly after the financial crisis. Fig. 1 shows the economic situation in Germany from 2000 to 2013. The GDP dropped in 2009 by 5% but recovered quickly afterwards. Government support, such as the "reduced working hours" program, helped firms to recover quickly. These program might also have prevented additional episodes of financial distress or insolvencies in the short run during the crisis. Fig. 1 shows also a negative trend of insolvencies afterwards.

The second trend is related to changes in the German financial and banking sector. German banks were mostly affected due to overseas activities or term transformation. These led to regulatory interventions either by instructions to dismiss executives, restrict bank activities, or to allow bailouts in the form of capital injections. Berger et al. (2014) find that such instructions reduced a bank's liquidity creation and led to a reduction in lending. They further find weaker effects during the crisis. This negative effect on banks' ability can be overcompensated. First, banks drastically reduced their exposure in overseas markets and redirected free resources to national investments, especially to corporate or small and medium sized enterprises. In addition, several measures taken by the European Central Bank, such as lowering interest rates and quantitative easing, also led to reduced funding costs for firms.

Firm level regressions Table 6 presents the results of the firm level regressions. I employ 61,443 observations of episodes of distress (see Table 3). I present the results of a probit regression (columns (1) and (2)) on firm closure within two years after financial distress using both "improved" and "unchanged" jointly as the base group. In columns (3)–(6), I present the results of the mulitnomial probit regression with the status "unchanged" as the base category. The Hausman test for an irrelevant alternative assumption shows that the differences between the groups are significant. The results are not changed when using the main bank id for robust clustered standard errors, since multiple firms may have the same bank relationship. Nor do they change when using robust clustered standard errors with the firm id, since there are firms with multiple episodes of financial distress during the sample period.

Characteristics of the main bank and local banking market In contrast to the bank level regression, the *Sparkassen* and cooperative bank dummies are both positive in the regression on firm closures (column (1), (2), (4), and (6)). This finding is also contrary to the descriptive statistics in Table 3. There are also no significant effects on the "improved" status after financial distress.

The results of the main explanatory variables from estimating Eq. (2) support the hypotheses. I find a similar effect as with the bank level regressions. The probability of a financially distressed firm's closure increases with the size of its main bank. The effect remains stable for the multinomial probit regression. There are no significant effects on the probability of improving the credit rating. Larger banks usually are more hierarchically structured and are less able to process soft information. Bank size and hierarchy influence the guidelines about the handling of financially distressed firms. For example, it has been specified whether a firm is still supervised by its account manager or has been passed on to a specialized department. This finding suggests that larger banks have stricter guidelines. Soft information, such as trustworthiness, cannot be codified, and only with difficulty is it passed on to the new account manager. The new department is less likely to process soft information, but more likely to liquidate such a firm.

The findings for the *Share of non-performing customers* support Hypothesis 2. An increasing loan default rate in business lending has a negative effect on subsequent closure. This finding supports the results of the bank level regressions. It also supports the findings on the perverse incentives of troubled banks to minimize additional losses on the balance sheet by Peek and Rosengren (2005). In addition, I find a negative effect for the category "improved" compared to the base category "unchanged" (column 5). Troubled banks are more likely to keep non-viable firms alive. The other variables regarding the main bank's risk profile are not significant.

In general, firms with multiple bank relationships have better ratings. The mean rating is about 10 points lower for firms with multiple bank relationships (Creditreform rating 100–600, with 100 as the best rating score). The difference in rating scores is highly significant. Firms with multiple bank relationships are also larger. However, simple regressions show that there is no interaction effect between rating and firm size on multiple bank relationships. If those firms get into financial distress, I observe mixed effects on their status two years after. On the one hand those firms have a higher probability for firm closure. An increasing number of stakeholders increases the difficulties in coordinating the various bank lenders. This finding would be in line with previous studies on debt renegotiation and restructuring (Franks and Sussman, 2005; Brunner and Krahnen, 2008). But I also observe that firms with multiple bank relationships have a higher probability of improving than of maintaining an unchanged status.

Table 6
Estimation results probit and multinomial probit regression results—status of distressed firms after two years.

	Probit		Multinomial probit			
	Closure (1)	Closure (2)	Improved (3)	Closure (4)	Improved (5)	Closure (6)
Bank related variables						
Sparkasse/Landesbank	0.099***	0.097***	0.036	0.142***	0.033	0.157***
	(0.03)	(0.03)	(0.05)	(0.04)	(0.05)	(0.04)
Cooperative bank	0.110***	0.119***	0.080	0.170***	0.063	0.189***
	(0.04)	(0.04)	(0.06)	(0.04)	(0.06)	(0.04)
Total assets (bank)	0.018***	0.018***	0.010	0.027***	0.005	0.023***
	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
Regionally active bank	−0.006	−0.007	0.056*	0.008	0.056	0.008
	(0.02)	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)
Bank merger (within the last three years)		−0.028			−0.003	−0.039*
		(0.02)			(0.03)	(0.02)
Share of non-performing customers		−3.128**			−9.372***	−6.059***
		(1.58)			(2.52)	(1.94)
Share of firms rated AAA–A		0.039			−0.246	−0.051
		(0.09)			(0.16)	(0.12)
Share of firms rated BBB+ –BBB-		−0.035			0.003	−0.062
		(0.07)			(0.10)	(0.08)
Share of firms rated CCC+ –D		−1.045*			0.735	−1.076
		(0.53)			(0.80)	(0.66)
Crisis (2008–2009)	−0.036**	−0.032**	0.189***	0.010	0.176***	0.010
	(0.02)	(0.02)	(0.03)	(0.02)	(0.03)	(0.02)
Post-crisis (2010–2013)	−0.056***	−0.058***	0.335***	0.024	0.309***	0.014
	(0.02)	(0.02)	(0.03)	(0.02)	(0.03)	(0.02)
Firm bank related variables						
Multiple bank relationships	0.056***	0.048***	0.061**	0.093***	0.058**	0.089***
	(0.02)	(0.02)	(0.03)	(0.02)	(0.03)	(0.02)
Switched main bank (previous three years)	0.175***	0.179***	0.043	0.241***	0.042	0.235***
	(0.03)	(0.03)	(0.04)	(0.03)	(0.04)	(0.03)
Main bank market share in region	−0.188*	−0.227**	0.065	−0.238**	−0.005	−0.298***
	(0.10)	(0.10)	(0.13)	(0.10)	(0.13)	(0.10)
Regional banking market competition	0.094	0.235	−1.434	−0.182	−1.338	−0.113
	(1.21)	(1.23)	(2.22)	(1.74)	(2.22)	(1.75)
Firm and regional controls						
History of distress	−0.031***	−0.032***	−0.127***	−0.079***	−0.128***	−0.080***
	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
Debt collection (fully paid back)	−0.282***	−0.285***	0.394***	−0.250***	0.393***	−0.251***
	(0.01)	(0.01)	(0.02)	(0.02)	(0.02)	(0.02)
Debt collection (partly paid back)	−0.156***	−0.165***	0.334***	−0.110***	0.332***	−0.112***
	(0.03)	(0.03)	(0.05)	(0.04)	(0.05)	(0.04)
Debt collection (not yet paid back)	0.232***	0.226***	0.074**	0.327***	0.075**	0.327***
	(0.02)	(0.02)	(0.04)	(0.03)	(0.04)	(0.03)
Limited liability	0.766***	0.760***	0.334***	1.112***	0.332***	1.111***
	(0.02)	(0.02)	(0.03)	(0.02)	(0.03)	(0.02)
Firm size (ln)	0.052***	0.052***	0.174***	0.146***	0.171***	0.145***
	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
Firm size missing	0.559***	0.556***	−0.699***	0.613***	−0.697***	0.613***
	(0.02)	(0.02)	(0.03)	(0.02)	(0.03)	(0.02)
Firm age	−0.001***	−0.001***	0.000	−0.002***	0.000	−0.002***
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Management team	0.054***	0.051***	−0.098***	0.046**	−0.096***	0.049**
	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)
Master of craftsmen	−0.030	−0.026	0.077**	−0.021	0.076**	−0.021
	(0.02)	(0.02)	(0.04)	(0.03)	(0.04)	(0.03)
University degree	−0.006	−0.003	−0.014	−0.015	−0.016	−0.016
	(0.02)	(0.02)	(0.03)	(0.02)	(0.03)	(0.02)
Industry dummies	Yes	Yes	Yes	Yes	Yes	Yes
Change in regional GDP	−0.006***	−0.006***	−0.000	−0.007***	−0.000	−0.008***
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Located in East Germany	0.013	0.031	0.022	0.028	0.046*	0.057***
	(0.02)	(0.02)	(0.02)	(0.02)	(0.03)	(0.02)
Constant	−0.771***	−0.423***	−1.138***	−0.896***	−0.950***	−0.697***
	(0.16)	(0.11)	(0.22)	(0.17)	(0.24)	(0.19)
Observations	61,443	61,443	61,443		61,443	
LR Chi2	5677	5944	9550		9582	
log likelihood	−38803.18	−37727.86	−54424.97		−54405.79	

Note: This table presents coefficients of the probit and multinomial probit regression. Standard errors are presented in parentheses below. *, **, and *** denote significance level on the 10%, 5%, and 1% levels of significance.
Source: MUP and Bankpanel (ZEW) 2015, author's own calculations.

Table 7
Heckprob model results on firm distress and closure.

	Model 1		Model 2	
	Distress	Closure	Distress	Closure
Variables	(1)	(2)	(3)	(4)
Exclusion restriction				
VVC Branch Quality*	0.061***		0.059***	
	(0.02)		(0.01)	
Investigation*	0.245***		0.246***	
	(0.01)		(0.01)	
Bank related variables				
Sparkasse/Landesbank	0.016	0.079**	0.031	0.087***
	(0.03)	(0.03)	(0.02)	(0.02)
Cooperative Bank	−0.014	0.102***	0.013	0.110***
	(0.03)	(0.03)	(0.03)	(0.03)
Total assets (bank)*	0.006*	0.013***	0.008***	0.011**
	(0.00)	(0.00)	(0.00)	(0.00)
Regionally active bank	0.012	−0.008	0.015	−0.008
	(0.01)	(0.02)	(0.01)	(0.02)
Share of Non-Performing Customers*			4.153***	−4.263***
			(1.06)	(1.25)
Share of firms rated AAA–A*			0.057	−0.011
			(0.05)	(0.07)
Share of firms rated BBB+ –BBB-*			−0.120***	0.006
			(0.03)	(0.05)
Share of firms rated CCC+ –D*			0.111	−0.836*
			(0.21)	(0.44)
Bank merger (within the last three years)*			−0.046***	−0.008
			(0.01)	(0.02)
Crisis (2008–2009)	−0.321***	0.107***	−0.314***	0.107***
	(0.01)	(0.02)	(0.01)	(0.02)
Post-crisis (2010–2013)	−0.444***	0.149***	−0.432***	0.144***
	(0.01)	(0.02)	(0.01)	(0.02)
Firm bank related variables				
Multiple bank relationships	−0.036***	0.062***	−0.036***	0.060***
	(0.01)	(0.01)	(0.01)	(0.01)
Switched main bank (previous three years)	0.085***	0.106***	0.080***	0.104***
	(0.01)	(0.02)	(0.01)	(0.02)
Main bank market share in region*	0.163***	−0.094	−0.121***	−0.133
	(0.03)	(0.08)	(0.04)	(0.08)
Regional banking market competition*	0.161	−0.270	1.414***	−0.167
	(0.22)	(1.04)	(0.44)	(1.03)
Firm and regional controls				
History of distress	1.010***	−0.415***	1.010***	−0.417***
	(0.01)	(0.03)	(0.01)	(0.03)
Debt collection (fully paid back)	0.211***	−0.348***	0.211***	−0.348***
	(0.01)	(0.01)	(0.01)	(0.01)
Debt collection (partly paid back)	0.078***	−0.177***	0.077***	−0.180***
	(0.02)	(0.02)	(0.02)	(0.02)
Debt collection (not yet paid back)	0.237***	0.096***	0.236***	0.095***
	(0.01)	(0.02)	(0.01)	(0.02)
Limited liability	0.151***	0.596***	0.152***	0.593***
	(0.01)	(0.02)	(0.01)	(0.02)
Firm size (ln)	−0.051***	0.064***	−0.051***	0.063***
	(0.00)	(0.01)	(0.00)	(0.01)
Firm size missing	0.084***	0.470***	0.082***	0.470***
	(0.01)	(0.02)	(0.01)	(0.02)
Firm age	−0.003***	0.000	−0.003***	0.000
	(0.00)	(0.00)	(0.00)	(0.00)
Change in regional GDP	0.000***	−0.005***	0.000***	−0.005***
	(0.00)	(0.00)	(0.00)	(0.00)
Located in East Germany	0.006	0.006	0.003	0.023
	(0.01)	(0.02)	(0.01)	(0.02)
Management Team	0.031***	0.035**	0.030***	0.038***
	(0.01)	(0.01)	(0.01)	(0.01)
Master craftsmen	−0.119***	0.024	−0.118***	0.024
	(0.01)	(0.02)	(0.01)	(0.02)
University degree	−0.060***	0.023	−0.058***	0.022
	(0.01)	(0.01)	(0.01)	(0.01)
Industry dummies	Yes	Yes	Yes	Yes
Constant	−2.712***	0.802***	−2.712***	0.896***
	(0.10)	(0.19)	(0.09)	(0.18)
$\hat{\rho}$ Constant	−0.606***		−0.610***	
	(0.06)		(0.05)	
Observations	3,512,997		3,512,997	
LR Chi2	9703		9872	
log likelihood	−2.33e+05		−2.33e+05	

Note: This table presents coefficients of the heckman probit regression. Standard errors are presented in parentheses below. *, **, and *** denote significance level on the 10%, 5%, and 1% levels of significance.
Source: MUP and Bankpanel (ZEW) 2015, author's own calculations.
* Variables are led by one year.

Firms that are about to switch their main bank have slightly better ratings. An analysis based on the MUP shows that the mean rating score of firms that will switch is 4 points lower than those that stay with their bank. A discontinuity in the main bank relationship is costly in terms of firm risk. As described in Section 4, the mean rating score increased for firms that recently switched their main bank relationship. The regression results show that firms that switch their main bank have an increased probability of closing, given that the firm is financially distressed. There are no effects on improved status.

The measures on local banking market competition do not show significant effects on a firm's probability of closure or improved status. Other measures, such as bank intensity or bank concentration measures in the firm's region, also have no significant effect (not reported). The main bank's market share in the firm's region shows a significant negative effect on firm closure (columns (1), (2), (4), and (6)). Banks with a large regional market share have better knowledge and potentially private information that might help in restructuring the firm.

Results of control variables There are further interesting results about the control variables. Creditreform also offers debt collection for trade credit partners. Firms from which Creditreform was asked to collect debt have a lower probability of market exit. Further analysis shows that this result is driven by firms that were able to repay the debt completely or at least in part. Firms for which debt collection is still going on have some chance of repaying their debt. Those firms still have a lower probability of market exit, although the economic effect is lower than for full or part repayment. Only firms from which Creditreform was unable to collect debt have a higher probability of market exit.

Firms possessing the legal form of a limited liability company are more likely to become financially distressed but also have a higher probability of subsequent market exit. This is in line with Harhoff et al. (1998), who found that high-risk firms are more likely to choose limited liability for their legal form.

There are two interesting results regarding firm exit in connection with regional aspects. First, even 10 to 20 years after reunification, firms located in East Germany are more likely to exit the market (column (6)). This reflects still existing regional differences in product and banking markets in spite of the time that has passed since German reunification. Second, financially distressed firms' being located in regions with an increasing local GDP has a negative effect on the probability of their market exit. But there is no significant effect on improved status.

5.1. Controlling for distress probability—the Heckman probit model

The firm level results presented above require that a change in payment status be observed. One could argue that the observation of a change in payment status is related to the main explanatory variables or to the data generating process. If so, the results would be biased. To control for potential biases, I estimate the probability of a firm's financial distress as the first step, and the probability of either status in the second step. Because the results in Table 6 show that most interesting effects are on firm closure, and in order to reduce the complexity of the regression model, I focus the further analysis on firm closure. I employ the empirical model of a Heckman probit, which is closely related to Van de Ven and Van Praag (1981), in order to control for a potential error term correlation at both steps. For model identification, I employ the exclusion restriction described in Section 4.4.

Table 7 presents the coefficients of the Heckman probit model on firm financial distress and consecutive closure. Model 1 in columns (1) and (2) presents the base specification. Model 2 in columns (3) and (4) presents the specification including bank portfolio risk information. As in the probit regression model, I estimated the market exit two years after the period of financial distress. Robust clustered standard errors are used, based on the bank id.

I find strong and significant results for the Creditreform quality index and investigation. The quality index is found to be both statistically and economically significant. Creditreform branches with relatively higher quality are more capable of detecting episodes of firms' financial distress. A firm that was investigated by the Creditreform staff in a particular wave has a higher probability that financial distress is observed than does a firm without such an investigation. The variable that indicates whether the same bank has a main relationship with the Creditreform branch and with the firm is significant only in the base specification. The effect vanishes as soon as I control for the type of the firm's main bank relationship. The correlation coefficient $\hat{\rho}$ for the market exit regression is found to be significantly different from zero at the 1% level. Estimates obtained from a normal probit model are likely to be inefficient.

A comparison of Tables 6 and 7 shows that most results remain stable after controlling for potential selection bias. There are two exceptions. First, the negative effect of the main bank's regional market share on firm exit is no longer significant. Second, the dummy variables for the crisis period and the post-crisis period switch from negative to positive. The results show also that both variables are negative for the first step. Therefore, firms during and after the crisis were less likely to get into financial distress but were more likely to close. Potentially, firms were less able to absorb financial shocks in the pre-crisis period. Compared to distressed firms during and after the crisis, those firms might have been less viable. The results from the first step provide some interesting findings on their own. In addition, these lead to a better understanding and interpretation of the findings on market exit.

The results of the Heckman probit show a significant and negative effect of *Bank Loan Default rate* on market exit, as in the previous probit regression. The results of the first step of the Heckman probit show a significant and positive effect of *Bank Loan Default rate* on financial distress. These findings support the interpretation of perverse incentives of troubled banks by Peek and Rosengren (2005) only in part. Troubled or distressed banks are not willing or able to absorb the financial shocks of their portfolio firms. Compared to sound banks, relatively more clients of a troubled banks become financially distressed. A troubled bank then has incentives to minimize additional defaults in their portfolio.

Multiple bank relationships help to receive additional liquidity. The results of the Heckman probit model show that a firm with multiple bank relationships has a significantly positive correlation with having a lower probability of financial distress. The effect on market exit between the Heckman probit regression and the probit regression does not vary significantly. In contrast, firms that have recently switched their main bank might find it harder to receive additional funding in difficult times. The new bank has less private information about the firm. The results show that such firms have a higher probability of delaying payments and becoming financially distressed.

5.2. Discussion of the type bank of the bank

As discussed in Section 3, banks differ in their institutional background. These differences affect their liquidation policy as well as their portfolio risk. I find mixed results between the bank level and firm level analysis. The institutional background of a bank also has a potential influence on its risk taking. Merton (1977) argues that creditors and deposit holders of protected banks do not have incentives to relate the level of interest rates demanded to the bank's risk level. Banks that lack such a disciplining market behavior have incentives to increase their portfolio risk

(Flannery, 1998). During the sample period, *Sparkassen* sector banks were protected by guarantees provided by the local authorities. Keeley (1990) argues that bank risk-taking is influenced by its charter value. The charter value (current value and future earnings) is owner specific. If the bank goes bankrupt or must be sold, owners would not only lose the current but the future value as well as their political influence on the bank's business policy. Due to this threat, protected banks tend to decrease risk taking.

The presented results could be biased by bank type if there are severe differences in the portfolio risk between bank types. In general, a financially sound firm is more capable of absorbing a financial shock on its own, shifting internal funds. If a bank portfolio consists of a larger share of sound firms, the probability should be lower that an episode of financial distress of a portfolio firm is observed. The empirical findings on differences in portfolio risk are mixed. Gropp et al. (2011) find evidence that the charter value effect dominates the market discipline effect. Fischer et al. (2011) observed that risk taking increased for *Landesbanken* after the abolishment of explicit public guarantees. Analysis from the MUP (Figs. A.1 and A.2 in the Appendix) show that the credit portfolio of *Sparkassen* sector banks and cooperative banks is first and second order stochastic dominant over private banks' credit portfolio in terms of risk. Cooperative banks have the highest share of firms with good risks. But tests on differences between bank types of the cumulative distribution and kernel density are not significant. In contrast, Iannotta et al. (2007) found that for a sample of European banks, public sector banks have poorer loan quality and higher insolvency procedure risk and Koetter et al. (2007) documented a high share of distress bank mergers that are related to *Sparkassen* sector banks and cooperative banks. In the regressions presented in this paper, I control for differences in portfolio risk structure using the variable *Loan default rate* and the share of different rating classes.

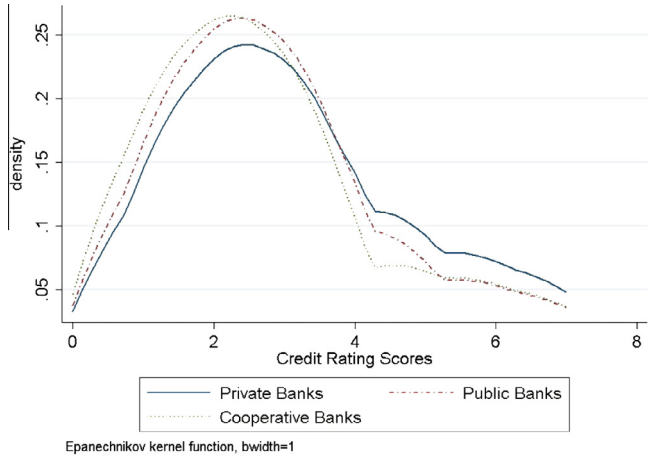

Fig. A.1. Kernel density of bank type's credit risk (2005). *Note:* Credit rating score 1 indicates low and 6 high risk. Calculation is based on the number of firms financed by each bank type where a credit risk score was assigned by Creditreform in August 2005. *Source:* MUP (ZEW) 2011, Author's own calculation.

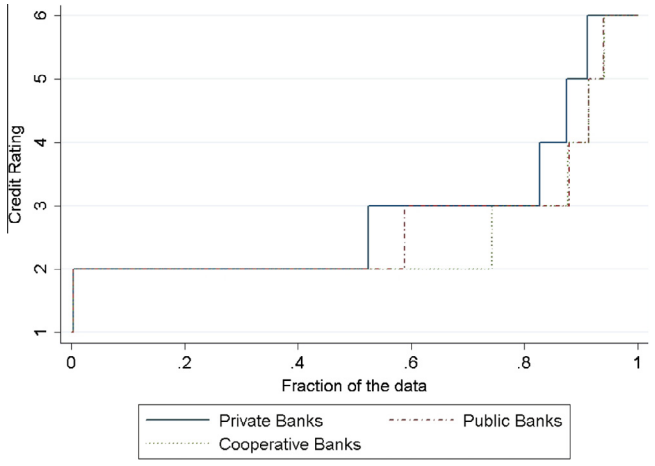

Fig. A.2. Risk portfolio related by bank type (2005) – Cumulative distribution. *Note:* Credit rating score 1 indicates low and 6 high risk. Calculation is based on the number of firms financed by each bank type where a credit risk score was assigned by Creditreform in August 2005. *Source:* MUP (ZEW) 2011, Author's own calculation.

5.3. Discussion of the data and the model

The findings of other firm survival studies suggest that young firms have a high probability of exiting the market (Headd, 2000; Bates, 2005). For German firms, Egeln et al. (2010) found a peak of market exit rate in the age range from three to four years. As a robustness check, I re-estimated the model when excluding young firms up to the age of seven years. The results remain overall stable. The available data as well as the corresponding empirical model have some limitations that need to be considered for the interpretation of the results. Insolvency procedures are to be made public by the courts and information is incorporated in the Creditreform data base in a timely manner. But there is no centralized, publicly available body of information on voluntary market exits, and identification is based on Creditreform's investigation efforts. Therefore, insolvency procedures could be over-represented compared to voluntary market exits. An appropriate assumption would be that firms which were not investigated or whose information was not updated for a long time have closed. However, this would not solve the problem. Accordingly, the observations of deteriorating mode of payment are rare for these firms. Only limited liability firms need to file insolvency procedures. In the regressions, the firm's legal form controls for the type of market exit.

In addition to firms exiting the market after financial distress, the panel also contains observations on firms that fail without a deteriorating mode of payment. Three cases can be considered. First, the deteriorating state is simply not observed. The selection equation incorporated in the model should mitigate this possible selection bias. Second, a firm's status already refers to the worst case. For this reason, further deterioration is not possible. The third case is related to the institutions of German bankruptcy legislation for indebted firms. Those firms need to file for bankruptcy, while bankruptcy is for balance sheet rather than for solvency reasons. Logically, a deteriorating status of the mode of payment is not observed.

6. Conclusion

Banks can "lean against the wind" and continue financing troubled but viable firms. They can do so because banks can make more efficient liquidations. As debtors delegate monitoring to banks, the banks have the ability to collect and process soft information. A bank's receiving a bad signal related to a firm's private information helps it to make more efficient decisions on firm restructuring or liquidation. But banks are not alike in their ability to process soft information, nor in their incentives to do so. Banks differ in lending strategy, organizational structure, economic situation, and rent seeking potential. I analyze the effects of bank size, share of non-performing customers, and bank governance on a bank's decision to liquidate or not a financially distressed firm. Firms can influence the strength of their main bank relationship. I further study the effects of multiple bank relationships and main bank switches.

I employ a rich dataset which allows studying the effects at both the bank level and the firm level. The core database has a nearly full coverage of the population of firms in Germany. This

dataset is used to generate insights into the banks' business client portfolios. Banks that have better abilities to process soft information, so as to make the right decision on liquidation, should show higher shares of financially distressed firms with improved ratings. Firms with 'perverse' incentives should have lower shares of financially distressed firms which closed. The bank sample covers over 17,000 bank-year observations in the period 2000–2013. At the firm level, I estimate the probability that a financial distressed firm closes, remains unchanged, or improves its rating. In addition to the variable set used for the bank level analysis, I employ variables describing the main bank relationship, local bank market conditions, as well as information describing the firm. In total, I make use of 3.5 million firm-semiannual observations with over 61,000 episodes of financial distress in the period 2000–2013.

I find mixed effects on bank size. At the bank level, the shares of improved ratings increase and closed firms decreases with bank size. If more complex banks make less efficient liquidations, a decreasing share of improved firms would be expected. This result could be driven by a positive correlation between firm and bank size, while larger firms have ceteris paribus lower default probabilities. But I find that regionally active banks show the expected patterns. Efficient liquations by regionally active banks should be taken into account in the discussion of mergers in the banking industry.

Peek and Rosengren (2005) find that troubled Japanese banks have incentives for inefficient liquidations in order not to increase the burden on their balance sheet. I find similar results for Germany. The share of non-performing customers has a negative effect on the bank's share of financially distressed firms that close. In addition, the firm's probability of closure also increases. But I also observe that troubled banks increase the firm's probability of getting into financial distress in the first place. The results remain robust when controlling for risk in the bank's portfolio.

The results on bank governance at the bank level differ from those at the firm level. While public banks have a mission to support distressed but viable firms, private banks might have incentives for tough liquidation decisions in order to attract low risk customers. This view is supported by the analysis at the bank level. *Sparkassen* and cooperative banks show lower shares of distressed firms that close. These banks tend to make efficient liquidation decisions because these banks also have higher shares of distressed firms with improved ratings. However, I find that a firm's probability of closing after financial distress is higher for *Sparkassen* and cooperative bank clients compared to private bank clients.

The strength of the firm's main bank relationship also has significant effects. Firms with multiple bank relationships are better able to absorb financial shocks. Those firms have a lower probability of financial distress. But coordination problems and free-riding make it difficult for banks to restructure the firm. Banks do not have sufficient private information to process a bad signal from a new customer. Firms that recently switched their main bank have a higher probability of getting into financial distress and closing afterwards.

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Table A.1
Description of bank types within the German banking market.

Bank type	Bank or banking group	Description
Private banks	Large banks: *Deutsche bank AG*, *Commerzbank AG*, *Dresdner Bank AG*[a], *HypoVereinsbank*[b], *Postbank*[c]	Publicly listed companies
	other commercial and real estate banks, branches of foreign banks	In general, legal form of limited liability; some are publicly listed companies; including branches of foreign banks
Non-private banks	*Sparkasse*	Owned by area municipalities
	Landesbanken[d]	Clearing houses for *Sparkassen*; Banks are jointly owned by *Sparkassen* and the *Länder*
Cooperative banks	Cooperative banks	Owned by members of the cooperative society
	Central bank for cooperative banks[e]	Clearing houses for cooperative banks. Banks jointly owned by cooperative banks
Excluded public banks	*Deutsche Bundesbank*	Central bank
	Development/special purposes banks[f]	Public development banks are governmentally owned and operate either on *Länder* or federal level

[a] *Dresdner Bank AG* merged with *Commerzbank AG* in 2008.
[b] *HypoVereinsbank* merged with *UniCredit* in 2005.
[c] *Deutsche Postbank AG* merged with *Deutsche Bank AG* in the period 2008–2010.
[d] Following institutions are classified as *Landesbanken*: *HSH Nordbank* (before 2003: *Hamburgische Landebank*, *Landesbank Schleswig–Holstein*), *Norddeutsche Landesbank Girozentrale (Nord/LB)*, *Landesbank Rheinland-Pfalz Girozentrale* (LRP; merged with LBBW in 2005), *Landesbank Saar* (SaarLB), *Bremer Landesbank*, *Landesbank Berlin* (LBB), *Westdeutsche Landesbank* (WestLB), *Landesbank Hessen-Thüringen Girozentrale* (Helaba), *Landeskreditkasse Kassel*, *Landesbank Sachsen* (merged with merged with LBBW in 2008), *Landesbank Baden-Württemberg/Baden-Württembergische Bank* (LBBW), *Bayerische Landesbank* (BayernLB), *Deutsche Kreditbank*, *DekaBank*, *Deutsche Wertpapier Service Bank AG*, *NLB FinanzIT*, LBS.
[e] Following institutions are classified as central banks for cooperative banks: *DZ Bank AG*, WGZ Bank AG(*Westdeutsche Genossenschaftliche Zentralbank*), *Deutsche Apotheker und Ärztebank eG*.
[f] Following institutions are classified as public development banks: *Landestreuhandbank Rheinland-Pfalz*, *LfA Förderbank Bayern*, *L-Bank*, *Investitionsbank Berlin*, *Investitionsbank des Landes Brandenburg*, *Bremer Aufbau-Bank GmbH*, *Hamburgische Wohnungsbaukreditanstalt*, *LTH-Bank für Infrastruktur*, *Investitionsbank Hessen*, *Landesföderinstitut Mecklenburg-Vorpommern*, *Niedersachsen-Bank* (N-Bank), *Investitions- und Strukturbank Rheinland-Pfalz* (ISB) GmbH, *Sächsische Aufbaubank*, *Investitionsbank Sachsen-Anhalt*, *Investitionsbank Schleswig-Holstein*, *Thüringer Aufbaubank*, *Kreditanstalt für Wiederaufbau* (KfW), *Deutsche Ausgleichsbank* (DtA, merged with KfW in 2003).

Appendix A

See Table A.1.

References

Almus, M., Engel, D., Prantl, S., 2000. The Mannheim foundation panels of the Centre for European Economic Research (ZEW), Documentation 00–02, Centre for European Economic Research (ZEW), Zentrum für Europäische Wirtschaftsforschung GmbH, L7 1, 68161 Mannheim, Germany.
Audretsch, D.B., 1991. New-firm survival and the technological regime. Review of Economics & Statistics 73 (3), 441–450.
Bates, T., 2005. Analysis of young, small firms that have closed. Journal of Business Venturing 20, 343–358.
Berger, A., Black, L.K., 2011. Bank size, lending technologies, and small business finance. Journal of Banking & Finance 35, 724–735.
Berger, A.N., Goldberg, L.G., White, L.J., 2001. The effects of dynamic changes in bank competition on the supply of small business credit. European Finance Review 5, 115–139.
Berger, A.N., Bouwman, C.H.S., Kick, T.K., Schaeck, K., 2014, Bank risk taking and liquidity creation following regulatory interventions and capital support, SSRN eLibrary.

Berlin, M., Mester, L.J., 1999. Deposits and relationship lending. The Review of Financial Studies 12, 579–607.
Bersch, J., Gottschalk, S., Mueller, B., Niefert, M., 2014. The Mannheim enterprise panel (MUP) and firm statistics for Germany. ZEW Discussion Paper Series, 14–104.
Boot, A.W.A., Thakor, A.V., 2000. Can relationship banking survive competition? Journal of Finance 55 (2), 679–713.
Bris, A., Welch, I., 2005. The optimal concentration of creditors. Journal of Finance 60 (5), 2193–2212.
Brunner, A., Krahnen, J.P., 2008. Multiple lenders and corporate distress: Evidence on debt restructuring. Review of Economic Studies 75, 415–442.
Caballero, R.J., Hisho, T., Kashyap, A.K., 2008. Zombie lending and depressed restructuring in Japan. American Economic Review 98 (5), 1943–1977.
Cameron, A.C., Trivedi, P.K., 2009. Microeconometrics using Stata. Stata Press, College Station, Texas.
Chemmanur, T.J., Fulghieri, P., 1994. Reputation, renegotiation, and the choice between bank loans and publicly traded debt. Review of Financial Studies 7 (3), 475–506.
Cordella, T., Yeyati, E.L., 2003. Bank bailouts: Moral hazard vs. value effect. Journal of Financial Intermediation 12 (4), 300–330.
Dahiya, S., Saunders, A., Srunuvasani, A., 2003. Financial distress and bank lending relationships. Journal of Finance 58 (1), 375–399.
Degryse, H., Ongena, S., 2008. Competition and regulation in the banking sector: a review of the empirical evidence on the sources of bank rents. In: Thakor, A.V., Boot, A.W.A. (Eds.), Handbook of Financial Intermediation and Banking. Elsevier, Amsterdam.
Degryse, H., Masschelein, N., Mitchell, J., 2011. Staying, dropping, or switching: The impacts of bank mergers on small firms. Review of Financial Studies 24 (4), 1102–1140.
Detragiache, E., Garella, P., Guiso, L., 2000. Multiple versus single banking relationships: theory and evidence. Journal of Finance 55, 1133–1161.
Diamond, D.W., 1984. Financial intermediation and delegated monitoring. Review of Economic Studies 51, 393–414.
Diamond, D.W., Dybvig, P.H., 1983. Bank runs, deposit insurance, and liquidity. Journal of Political Economy 91, 401–419.
DSGV, 2008. Fair. Menschlich. Nah. Leitlinien der Sparkassen für eine nachhaltige Geschäftspolitik im Interesse der Kunden und der örtlichen Gemeinschaft, Technical report, Deutscher Sparkassen- und Giroverband (DSGV).
Egeln, J., Falk, U., Heger, D., Höwer, D., Metzer, G., 2010. Ursachen für das Scheitern junger Unternehmen in den ersten fünf Jahren ihres Bestehens, Technical report, Centre for European Economic Research (ZEW), Zentrum für Insolvenz und Sanierung, and Creditreform.
Elsas, R., 2005. Empirical determinants of relationship lending. Journal of Financial Intermediation 14, 32–57.
Elsas, R., Krahnen, J.P., 1998. Is relationship lending special? Evidence from credit-file data in Germany. Journal of Banking & Finance 22, 1283–1316.
Engerer, H., 2006. Vom Dreisäulensystem zum Baustein des europäischen Hauses – Wandel vom Eigentum und Wettbewerb im deutschen Banksektor. DIW Vierteljahreshefte zur Wirtschaftsforschung 75 (4), 11–32.
Engerer, H., Schrooten, M., 2004. Deutscher Bankensektor im Umbruch – Sparkassen und Genossenschaftsbanken relativ gut positioniert. DIW Wochenbericht 71 (24), 345–349.
Fama, E.F., 1985. What's different about banks? Journal of Monetary Economics 15, 29–39.
Fischer, M., Hainz, C., Rocholl, J., Steffen, S., 2011, Government guarantees and bank risk taking incentives, SSRN eLibrary.
Flannery, M.J., 1998. Using market information in prudential bank supervision: a review of the U.S. empirical evidence. Journal of Money, Credit, and Banking 30, 273–305.
Franks, J., Sussman, O., 2005. Financial distress and bank restructuring of small to medium size UK companies. Review of Finance 9 (1), 65–96.
Fukuda, S.-I., Kasuya, M., Akashi, K., 2009. Impaired bank health and default risk. Pacific-Basin Finance Journal 17 (2), 145–162.
Gropp, R., Hakenes, H., Schnabel, I., 2011. Competition, risk-shifting, and public bail-out policies. Review of Financial Studies 24 (6), 2084–2120.
Grunert, J., Weber, M., 2009. Recovery rates of commercial lending: Empirical evidence for German companies. Journal of Banking & Finance 33 (3), 505–513.
Hakenes, H., Schnabel, I., 2010. The threat of capital drain: a rationale for public banks? Journal of Institutional and Theoretical Economics 166 (4), 662–689.
Harhoff, D., Stahl, K., Woywode, M., 1998. Legal form, growth and exit of West German firms – empirical results for manufacturing, construction, trade and service industries. Journal of Industrial Economics 46, 453–488.
Headd, B., 2000. Business success: factors leading to surviving and closing successful. Office of Advocacy, U.S. Small Business Administration Working Paper.
Hoshi, T., Kashyap, A., Scharfstein, D., 1990. The role of banks in reducing the costs of financial distress in Japan. Journal of Financial Economics 27 (1), 67–88.
Iannotta, G., Nocera, G., Sironi, A., 2007. Ownership structure, risk and performance in the European banking industry. Journal of Banking & Finance 31, 2127–2149.
Jimenez, G., Salas, V., Saurina, J., 2009. Organizational distance and use of collateral for business loans. Journal of Banking & Finance 33, 234–243.
Keeley, M.C., 1990. Deposit insurance, risk, and market power in banking. American Economic Review 80 (5), 1183–1200.
Koetter, M., Bos, J.W., Heid, F., Kool, C.J., Kolari, James W., Porath, D., 2007. Accounting for distress in bank mergers. Journal of Banking & Finance 31 (10), 3200–3217.
Krahnen, J.P., Schmidt, R.H. (Eds.), 2004. The German Financial System. Oxford Univ. Press, Oxford, UK.
Main, A., 2006. Distance constraints: the limits of foreign lending in poor economies. Journal of Finance 61, 1465–1505.
Matthey, A., 2010. Do public banks have a competitive advantage? European Journal of Finance 16 (1), 45–55.
Merton, R.C., 1977. An analytic derivation of the cost of deposit insurance and loan guarantees an application of modern option pricing theory. Journal of Banking & Finance 1, 3–11.
OECD, 2008. Handbook on constructing composite indicators, Technical report, Organization for Eonomic Co-operation and Development, Paris.
Ongena, S., Smith, D.C., 2001. The duration of bank relationships. Journal of Financial Economics 61, 449–475.
Peek, J., Rosengren, E.S., 2005. Unnatural selection: perverse incentives and the misallocation of credit in Japan. American Economic Review 95 (4), 1144–1166.
Petersen, M.A., Rajan, R.G., 1994. The benefits of lending relationships: evidence from small business data. Journal of Finance 44, 3–37.
Petersen, M.A., Rajan, R.G., 1995. The effect of credit market competition on lending relationships. Quarterly Journal of Economics, 407–443.
Rajan, R.G., 1992. Insiders and outsiders: the choice between informed and arm's-length debt. Journal of Finance 47 (4), 1367–1400.
Sapienza, P., 2004. The effects of government ownership on bank lending. Journal of Financial Economics 72 (2), 357–384.
Sharpe, S.A., 1990. Asymmetric information, bank lending, and implicit contracts: A stylized model of customer relationships. Journal of Finance 45, 1069–1087.
Shimizu, K., 2012. Bankruptcies of small firms and lending relationship. Journal of Banking & Finance 36 (3), 857–870.
SpG, 2005. Sparkassengesetz für Baden-Württemberg (spg) in der Fassung vom 19. juli 2005, Gesetzblatt für Baden-Württemberg pp. 587–601.
Stein, J.C., 2002. Information production and capital allocation: Decentralized versus hierarchical firms. Journal of Finance 57 (5), 1891–1921.
Stiglitz, J.E., Weiss, A., 1981. Credit rationing in markets with imperfect information. American Economci Review 71 (3), 393–410.
Thakor, A.V., 1996. Capital requirements, monetary policy, and aggregate bank lending: theory and empirical evidence. Journal of Finance 51, 279–324.
Van de Ven, W.P., Van Praag, B., 1981. The demand for deductibles in private health insurance. Journal of Econometrics 17, 229–252.
Williamson, O.E., 1973. Markets and hierachies: some elementary considerations. American Economci Review 63 (2), 316–325.