Banks' loan rejection rates and the creditworthiness of the banks' corporate customers

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SUMMARY: *We offer micro-econometric evidence on the relationship between the banks' loan rejection rates and the creditworthiness of the banks' small and medium-sized corporate customers in 2007 and 2009-2010 based on a unique Danish firm- and bank-level dataset. We find lower acceptance rates for applications for bank loans from firms with weak economic performance than for firms with strong economic performance. This was the case both prior to but especially during the financial crisis in 2009-2010, where firms with higher profit ratios, solvency ratios and liquidity ratios had a significantly higher probability of having their loan application accepted than firms with poor economic performance. Firms that did not apply for debt financing in 2009-2010 due to fear of rejection or high interest rates had weaker economic performance measured by solvency ratio, profit ratio, short-term debt ratio and liquidity than firms which applied for debt finance.*

1. Introduction

In the wake of the international financial crisis since 2008, the real effects of banking crises have once again been among the top issues on the research agenda. One of the topical issues is the access to credit for Small and Medium-sized Enterprises (SMEs). It has been discussed if the recent financial crisis caused a »credit crunch«

and especially whether SMEs were subject to a »credit squeeze« due to a dysfunctional banking sector during the crisis.

A »credit squeeze« is usually defined as a situation in which the supply of credit is reduced considerably more than the weak economic development would normally warrant, making it difficult for creditworthy borrowers to obtain sufficient financing, cf. Stiglitz and Weiss (1981) and Bernanke and Gertler (1989). It has been a common finding in surveys on SMEs self-reported access to bank credit that the rejection rates for loan applications were markedly higher during the financial crisis than prior to the crisis. This might reflect that the financial crisis implied an extraordinarily large shock to the banks' lending capacity, for instance a reduction in the banks' capital base due to large loan impairment charges or difficulties in financing a large customer funding gap. Such a shock could be followed by a period of tight credit standards and reduced loan supply in order to maintain or re-establish a sufficient capital ratio or an adequate funding position. However, it could also merely reflect that the crisis reduced the re-payment capability of the corporate clients due to greater uncertainty about the future economic outlook, which made it necessary for prudent banks to tighten their credit standards.

In the paper at hand we offer micro-econometric evidence on the relationship between loan acceptance rates and the creditworthiness of the banks' corporate customers based on a unique dataset which combine »soft« firm-level survey data on SMEs self-reported access to credit with »hard« firm-level accounting data, firm-level information on bank-firm relationships and bank-level information. The survey data set contains information collected in 2010 on around 2,000 Danish SMEs' access to credit in 2007 and 2009-2010.

We find lower acceptance rates for applications for bank loans from firms with weak economic performance than for firms with strong economic performance. This was the case both prior to but especially during the financial crisis 2009-2010, where firms with higher profit ratios, solvency ratios and liquidity ratios had a significantly higher probability of having their loan application accepted than firms with poor economic performance. The banks tightened their credit standards during the financial crisis. However, banks with low capital adequacy ratios during the crisis did not have lower loan acceptance rates than banks with high capital adequacy ratios. This might indicate that it has not been the banks' own capitalisation, which has been the decisive factor for the decline in the banks' loan acceptance rates during the financial crisis but rather

the deterioration of the credit quality of the banks' corporate customers, which made it necessary for prudent banks to tighten their credit standards. Firms that did not apply for debt financing in 2009-2010 due to fear of rejection or high interest rates had weaker economic performance measured by solvency ratio, profit ratio, short-term debt ratio and liquidity than firms which applied for debt finance.

2. A brief review of related literature

The paper relates most closely to the strand of the micro-econometric literature that analyses credit rationing using survey data on SMEs self-reported access to credit. Recent papers within this line of research include Canton et al. (2012), Artola and Genre (2011), Ferrando and Griesshaber (2011), Lawless and McCann (2012), Ferrando and Mulier (2013), Rottmann and Wollmershäuser (2013) and Gaiotti (2013).

Since the identities of the firms in surveys on SMEs access to credit usually are confidential, few of these studies goes beyond the firm-level information contained directly in the surveys. One notable exception is Ferrando and Mulier, op. cit., that analyse around 11,000 firm-level responses to the ECB/European Commission euro area SME survey on access to finance in 2009-2011. Via a statistical matching procedure Ferrando and Mulier, op. cit., estimates firm-level balance sheet data from firms with similar characteristics. This analysis indicates that firms which are less profitable are more likely to suffer from financial constraints. However, the use of estimated balance sheet data introduces an element of uncertainty in the analysis.

The paper at hand adds to this strand of the literature in several ways. First, since our main data provider (Statistics Denmark) knows the identities of the firms in a recent survey on SMEs access to finance, we are able to analyse a unique firm- and bank-level data set that combines five different micro data sets at a firm and bank level. This allows us to combine »soft« firm-level survey data with »hard« firm-level accounting data and bank-level information without relying on statistical matching procedures. Second, we pay a special attention to the creditworthiness of those firms that decide not to apply for debt financing due to fear of rejection or high interest rates. The creditworthiness of such firms have not previously been analysed in the literature, probably due to lack of data. Third, our econometric approach takes into account selection effects which to the best of our knowledge have not been taken into account in previous econometric analysis of survey data on SMEs self-reported access to credit.

3. Data sources and sample selection

The core of our data set consists of 2,265 firm-level responses to a survey conducted by Statistics Denmark concerning Danish SMEs access to finance in 2007 and 2009-2010 (April 2009 – March 2010), cf. Statistics Denmark (2010). The firms all had be-

Tabel 1. Definition of key financial ratios etc.

Solvency ratio	Capital and reserves as a ratio of total liabilities end of year.
Profit ratio	Result before financial items as a ratio of turnover.
Short-term debt ratio	Short-term debt as a ratio of total liabilities end of year.
Liquidity ratio (narrow)	Cash and deposits etc. as a ratio of total assets end of year.
Liquidity ratio (broad)	Securities, other equity, cash and deposits etc. as a ratio of total assets end of year.
Implied interest costs on gross debt	Interest costs etc. relative to total gross debt end of year.
Number of employees	Number of full-time employees
Export share	Export turnover in per cent of total turnover.

tween 5 and 249 employees in 2005 (and at least 5 employees in 2009) and were located within manufacturing, building and construction, trade and transport etc., information and communication or other industries. The information regarding 2007 and 2009-2010 was collected in the same questionnaire forwarded to the firms in 2010. One should therefore properly treat the information regarding 2007 with some caution and in general one has to keep in mind that survey responses are always subjective.

Statistics Denmark who conducted the survey knows the identity of each participating firm. We were therefore able to let Statistics Denmark enrich the survey data with data from a range of other data sets.

For the majority of the firms participating in the survey – around 2,000 firms – we were able to obtain summary firm-level accounting data (including turnover, result before financial items, capital and reserves, total assets/liabilities and employment) from Statistics Denmark's Accounts statistics. This information has been derived from the firms' reporting to the Danish tax authorities.

For around 1,000 firms we were furthermore able to get information regarding short-term debt, total debt, gross interest costs and liquid assets from Statistics Denmark's Accounts statistics. The key financial ratios etc. used in the paper are defined in Table 1.

In addition, we were able to obtain information on export share for around 1,000 firms based on Statistics Denmark's Enterprise statistics.

For around 60-65 per cent of the firms in the data set that applied for bank loans we obtained information on the identity of the firms' main bank relationship. A private data vendor (EXPERIAN A/S) provided this information, which only relates to firms organised as public or private limited liability companies. We thus have no bank-relationship information for sole proprietorships.

Finally, we collected a range of bank-level key performance indicators for all the firms' main bank relationships. This information has been published on the website of the Danish FSA.
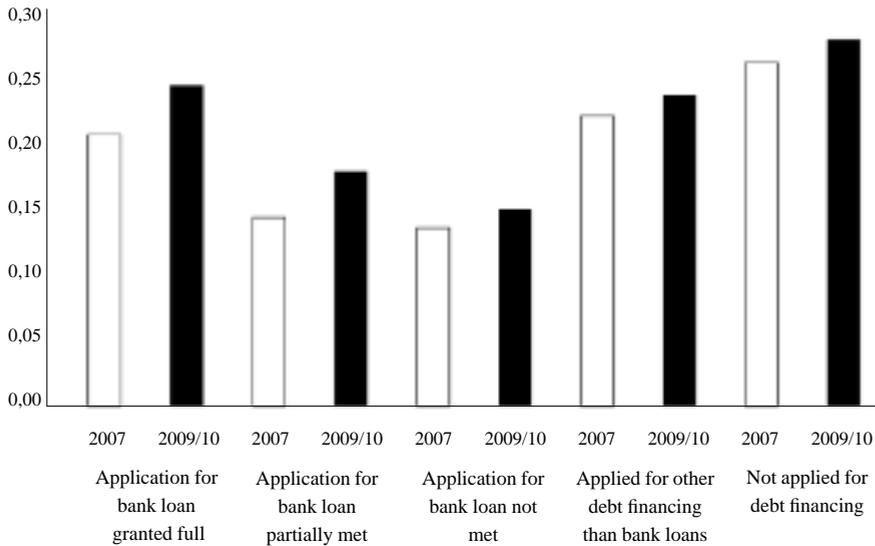
Figure 1. Firms' applications for bank loans in 2007 and 2009-2010 – median of solvency ratio year before application.

*Source:* Own calculations on the basis of the data listed in section 3.

4. Descriptive statistics and exploratory data analysis

As a starting point, we offer a descriptive statistical overview of the data set. For each of the two data points (2007 and 2009-2010) we divide the companies into five main groups:

– Companies whose application for a bank loan has been granted full.
– Companies whose application for bank loan has been partially met.
– Companies whose application for bank loan has not been met.
– Companies which have applied for other debt financing than bank loans.
– Companies which have not applied for debt financing.

The majority of the firms did not apply for any debt financing, neither in 2007 nor in 2009-2010. It can also be noted that around 10 per cent of the companies experienced a total or partial refusal of their application for a bank loan in 2009-2010 compared to only 2 per cent in 2007. Of the companies which applied for a bank loan in 2007, 90 per cent got their application fully approved. In 2009-2010, the corresponding figure was only 54 per cent.

Figure 1 illustrates the relationship between the outcome of a firm's applications for a bank loan in 2007 and 2009-2010 and the firm's solvency ratio in the year preceding
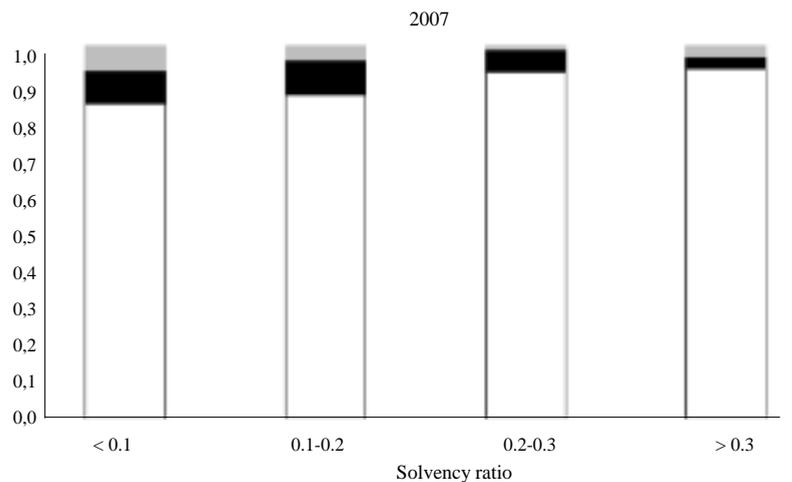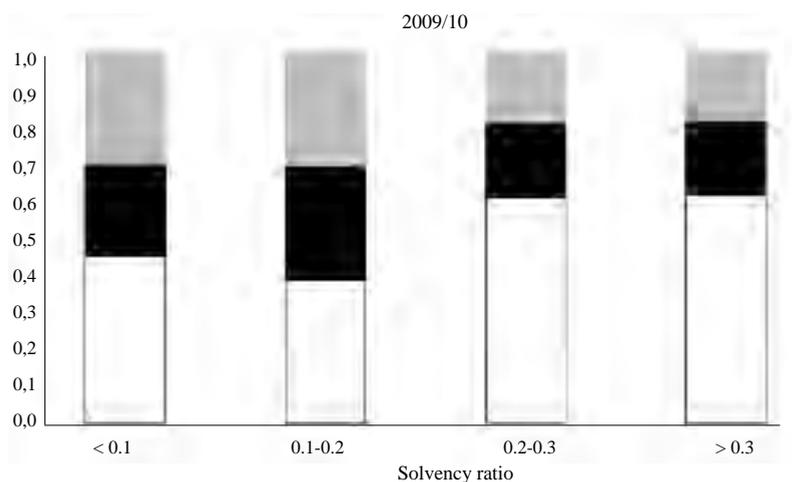
Figure 2. Outcome of firms' applications for bank loans – distributed by the solvency ratio of the firms.

Source: Own calculations on the basis of the data listed in section 3.

the loan application. As shown, the median of the solvency ratio in 2008 was significantly lower in the groups of firms, which got their application for bank loans in 2009-2010 totally or partly rejected, than in the group of companies which got their application for bank loans fully accepted. It was also lower than in the groups of companies, that either did not seek debt financing or companies seeking other types of debt financing than bank loans. The same picture emerges regarding applications for bank loans in 2007 and for applications for bank overdrafts in 2007 and 2009-2010. The fact that the solvency ratio for the median company in all groups of enterprises in 2009-2010 was higher than in 2007 should be seen in light of the general tendency towards consolidation in the business sector during the crisis.

Figure 2 shows the outcome of firms' application for bank loans distributed by the solvency ratio of the firms. Both in 2009-2010 and in 2007, the most solid companies had higher acceptance ratios than firms with low solidity. The refusal rates were significantly higher in 2009-2010 than in 2007, which indicate that banks tightened their credit standards during the financial crisis. This is also consistent with a recent analysis of changes in Danish banks' credit standards during the financial crisis, cf. Abildgren and Kuchler (2013). The tightening of the bank's credit standards during the crisis might in principle be attributed to factors on the credit-supply side (e.g. decline in the banks' lending capacity due to lack of capital or funding) and/or factors on the credit-demand side (e.g. greater perceived uncertainty about the future economic outlook for the corporate sector brought about by the financial crisis).

The above analysis indicates that there has been a correlation between the firms' solvency ratio and the outcome of the banks' processing of loan applications during the financial crisis as well as before the financial crisis. A similar impression is obtained by considering companies' profit ratios. Companies with high profit ratios clearly experienced lower rejection rates on their applications for bank loans than firms with low profit ratios, cf. figure 3. We also found that the groups of companies which got their applications for bank loans in 2009-2010 totally or partly rejected were characterized by a higher median short-term debt ratio, a lower median degree of liquidity and higher implied interest costs on gross debt than the other groups of firms. This also suggests that companies, whose application for a bank loan was rejected, loanwere characterized by a lower credit score than other firms.

There does not seem to be any systematic relationship between firm size and outcome of a loan application to a bank, cf. Figure 4 which shows the outcome of firms' application for bank loans distributed by the number of employees at the firm. However, it is worth noting that micro firms with fewer than 15 employees had the highest acceptance rates during the financial crisis in 2009-2010. Although one has to keep in mind that survey responses are always subjective and subject to some uncertainty,
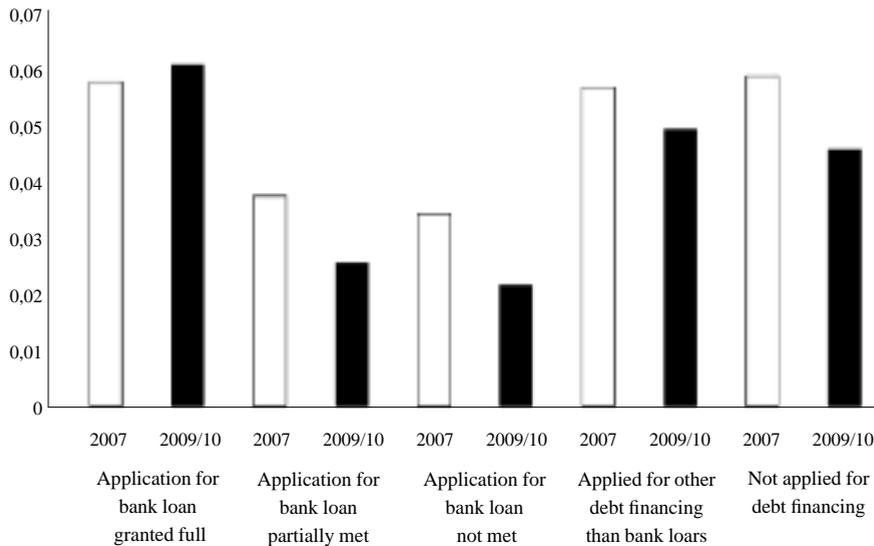
Figure 3. Firms' applications for bank loans in 2007 and 2009-2010 – median of profit ratio year before application.

Source: Own calculations on the basis of the data listed in section 3.

there are at least no indications that very small firms should have been subjected to particularly high rejection rates for bank-loan applications during the financial crisis. This might reflect the fact that a relatively larger share of the assets of firms with 5-14 employees are in buildings and plots that are easy to pledge as collateral. Moreover, the small firms applying for bank loans have higher profit ratios than larger firms applying for bank loans.

Generally, SMEs are highly oriented towards the domestic market, and around 70 per cent of the firms in our analysis have an export share below 1 per cent. There does not seem to be any systematic relationship between export share and outcome of a loan application to a bank. This seems to be true for loan applications both in 2007 as well as in 2009-2010.

For about 60-65 per cent of the companies, which have applied for bank loans, we have information about the company's principal banker, cf. Figure 5. There are no indications that the rejection rate for loan applications has been significantly higher for banks in the FSA group 2-4 (i.e. medium-sized and small banks) than for banks in the FSA group 1 (i.e. large banks), although banks in group 2-4 have generally had substantially larger loan impairment charge ratios than banks in group 1. In 2007 – prior to the financial crisis – the customer funding gaps of banks in FSA group 1 and of banks in FSA group 2-4 were roughly of the same size, in both cases around 24-25 per

2007

15,-25

25,50

Number of employees

☐ Application for bank loan granted full   ■ Application for bank loan partially met

▨ Application for bank loan not met

2009/10

5-14   15,25   25-50   50-100   >100

Number of employees

☐ Application for bank loan granted full   ■ Application for bank loan partially met

▨ Application for bank loan not met
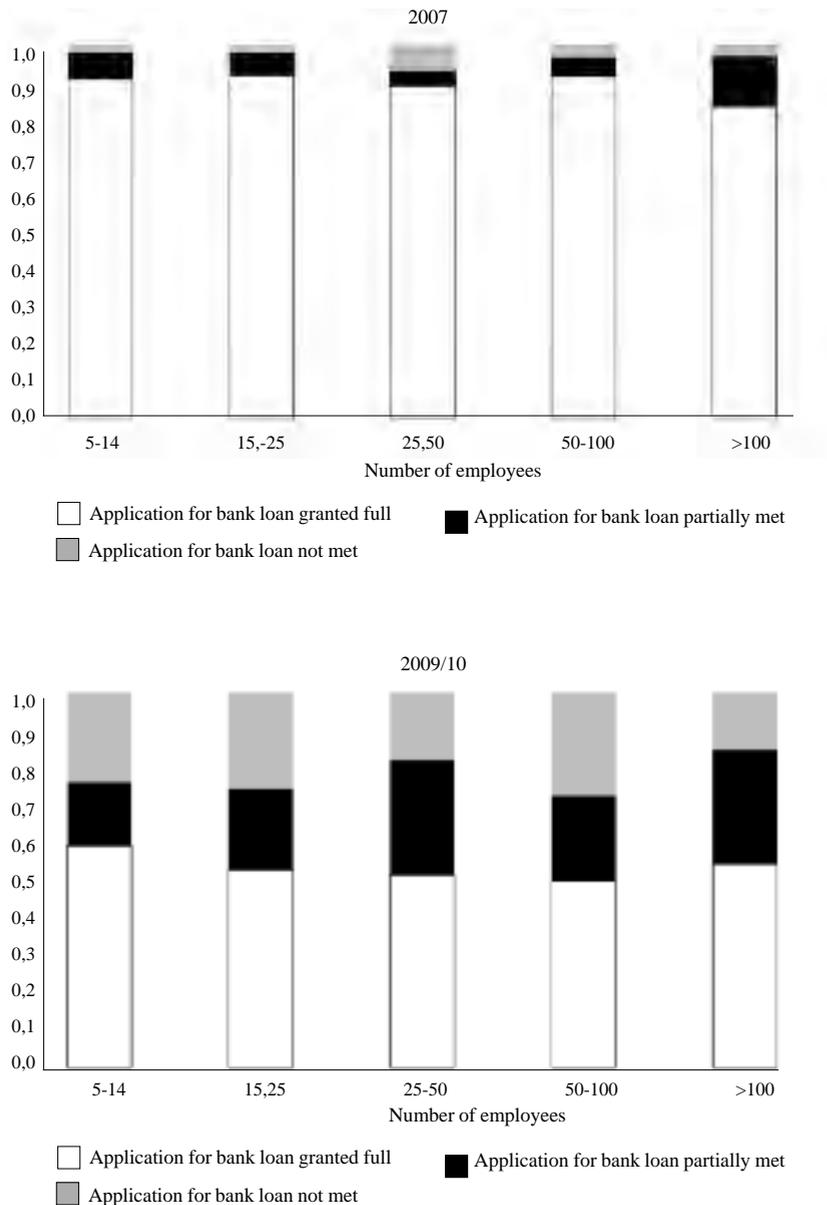
Figure 4. Outcome of firms' applications for bank loans – distributed by the number of employees at the firm.

Source: Own calculations on the basis of the data listed in section 3.
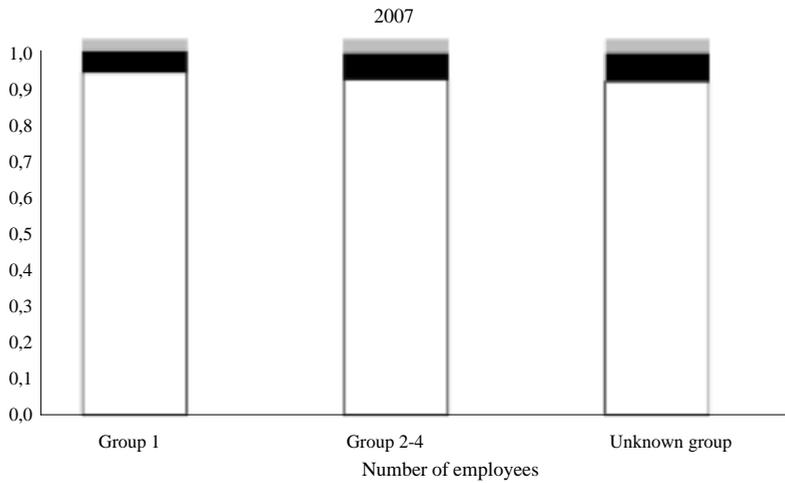
2007

□ Application for bank loan granted full		■ Application for bank loan partially met
▨ Application for bank loan not met		

2009/10
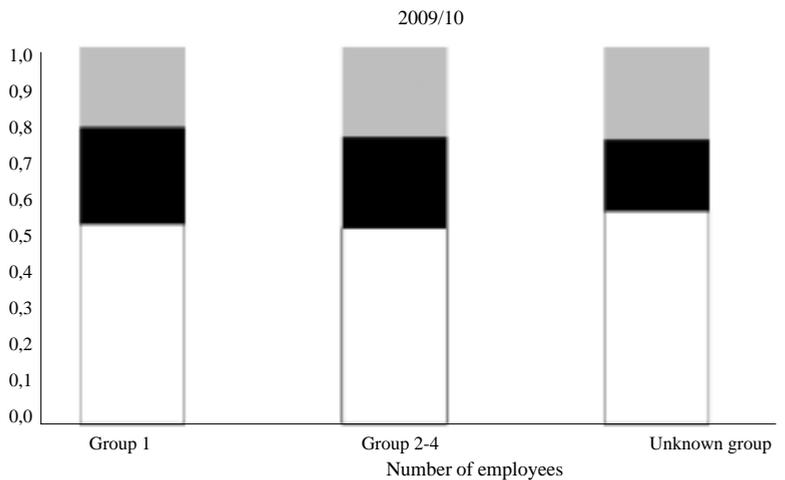
□ Application for bank loan granted full		■ Application for bank loan partially met
▨ Application for bank loan not met		

Figure 5. Outcome of firms' applications for bank loans – distrbuted by the firms' bank relationship.

Source: Own calculations on the basis of the data listed in section 3.
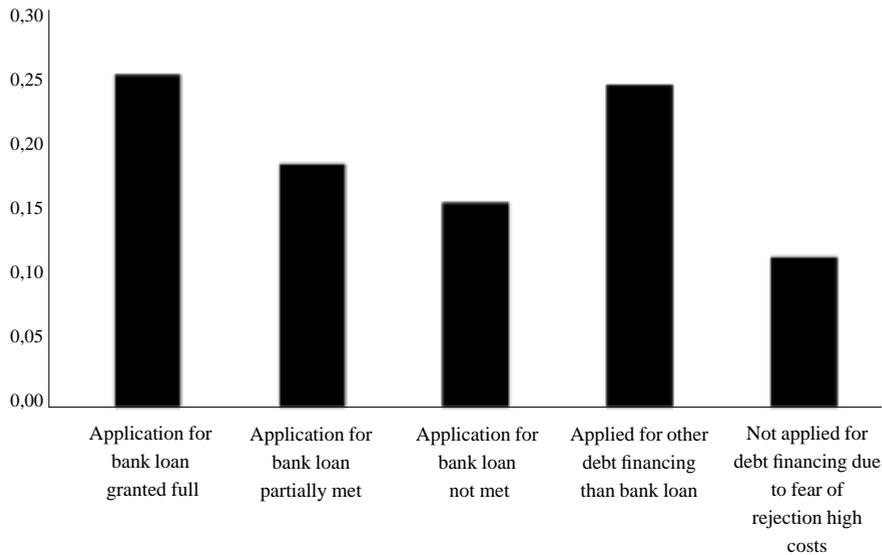
Figure 6. Firms' applications for debt financing in 2009-2010 – median of solvency ratio year before application.

Source: Own calculations on the basis of the data listed in section 3.

cent of total lending. In contrast, the loan impairment charge ratio for banks in group 1 was 1.5 per cent of loans and guarantees in 2009, whereas the corresponding ratio for banks in group 2 and 3 was respectively 5.6 and 4.2. This indicates that it has not been the banks' own capitalisation, which has been the decisive factor for the decline in the banks' loan acceptance rates during the financial crisis but rather the deterioration of the credit quality of the banks' corporate customers. This might reflect the comprehensive government interventions to safeguard financial stability during the crises, which included the opportunity for banks' to receive government capital injections.

Finally, our data set contains information that can illustrate the problem of self-selection. We have information which enables us to split the group of companies which have not applied for debt financing into two sub-groups:

– Companies which have not applied for debt financing because they expected that they would have their application for debt finance rejected or that debt financing would be too expensive.
– Other companies which have not applied for debt financing.

As can be seen from Figure 6, firms which have not applied for debt financing due to fear of rejection or high interest rates had weaker economic performance measured

by solvency ratio than firms which had applied for debt finance, and we found the same result regarding profit ratio, short-term debt ratio and liquidity.

5. Econometric analysis of the effect of firms' creditworthiness on the probability of loan acceptance

Inspired by the descriptive analysis in section 4 we now turn to an econometric analysis of the impact of firm and bank characteristics on the probability of having an application for a bank loan accepted. A conventional approach to study market outcomes is to estimate demand and supply curves in a simultanous equations framework. Though the purpose of this paper is not the estimation of demand and supply equations, we are inspired by such a framework in the choice of variables. The modelling framework can be thought of as related to banks' credit scoring models; although the variation across banks in addition allows us to extend the analysis to take into account bank specific effects.

The models focus on estimation of the probability of having a bank loan application accepted as a function of firm characteristics, which represent the creditworthiness of the firm, as well as bank characteristics intended to capture the variation in credit supply across banks. We start by estimating a simple baseline model of the probability of loan acceptance using data on solvency and profit ratio, which are available for most firms in the sample. The model is estimated separately for the years 2007 and 2009/2010, to allow for different effects of the explanatory variables in the two periods. Subsequently, the model is extended to include additional firm-specific variables which are only available for roughly half of the firms in the sample. Firms which do apply for bank loans are not a random sample of all firms. In fact, the descriptive analysis showed that the application decision is related to some of the explanatory variables of interest. Therefore, our main results are based on a model taking into account sample selection. As an extension of the model, we include key performance indicators of the firm's principal bank connection to test whether loan rejection rates before and during the crisis can be explained mostly by firm or bank characteristics.

For the basic model, we use a standard probit specification. The probit model is often formulated in terms of a latent variable model, which is also useful here to facilitate the description of the selection model used later. Assume that the underlying model has the following form:

$$y_1^* = x\beta + u_1 \tag{1}$$

where y_1^* can be thought of as the creditworthiness of the firm in the eyes of the bank, x is a vector of explanatory firm-specific variables and u_1 is an error term which is in-

dependent of x and which follows a normal distribution. However, we cannot observe y_1^*, all we observe is whether the loan application is accepted or not, that is:

$$y_1^* = 1[\, y_1^* > 0\,] \tag{2}$$

where $1[\cdot]$ is an indicator function taking a value of 1 if the expression in the square brackets is true and 0 otherwise. This implies a scaling of y_1^* so that values of credit-worthiness higher than 0 lead to acceptance of the loan application and values below 0 lead to rejection. The distribution of y_1^* conditional on x is therefore:

$$P(y_1 = 1 \,|\, x) = P(x\beta + u_1 > 0 \,|\, x) = \phi(x\beta) \tag{3}$$

where Φ is the standard normal cumulative distribution function. This expression is used to generate the likelihood function in order for the probit model to be estimated by maximum likelihood.

Results from estimation of the baseline models are shown in Table 2. Decisions regarding loan applications in 2007 seem to be largely unrelated to the firm characteristics included in the models. During the strong credit growth prior to the financial crisis, around 90 per cent of the firms which applied for a bank loan got their application fully approved. However, in 2009-2010, the acceptance rate is substantially lower, namely 54 per cent, and the outcome of a loan application is significantly related to the profitability of the firm. A firm which has a profit ratio corresponding to the 75th percentile has a 6 percentage points higher probability of having its loan application accepted than a firm with a profit ratio corresponding to the 25th percentile, all other variables held constant.

Only those firms, which applied for bank credit, are included in the models in Table 2. From the descriptive analysis in section 4, it is clear that there is an issue of self-selection. Firms which do not apply for a bank loan may have a number of reasons why they do not do so. Some firms do not need to take out any loans during the given year, for example because they finance their activities by retained earnings. Other firms evidently applied for debt financing other than bank loans, while some firms did not apply for debt financing at all, because they expected that their application would be rejected or that debt financing would be too expensive. Hence, there is heterogeneity in the group of firms which do not apply for debt financing; and the firms which do apply differs from the group of firms which do not apply. Furthermore, the selection effect need not be the same in the two time periods, so that characteristics of firms which apply for a bank loan in the two periods may differ.

An additional self-selection issue arises because of the fact that a seemingly weak firm (by the measures used in the analysis) which do apply for a bank loan may in fact

Table 2. Estimated probit models of acceptance of bank loan application.

| | 2007 | | 2009-2010 | | 2007 | | 2009-2010 | |
	Coef.	M.E.	Coef.	M.E.	Coef.	M.E.	Coef.	M.E.
Solvency ratio	*0.751	0.130	*0.405	0.162	0.251	0.041	0.417	0.166
Profit ratio	-0.009	-0.002	**1.017	0.405	-0.018	–	**1.698	0.674
Implied interest costs					-0.040	–	-2.315	-0.919
Liquidity ratio (broad)					6.055	0.994	1.129	0.448
Short-term debt ratio					-0.880	–	-0.162	-0.064
Constant	***1.13		-0.036		**1.49		0.040	
Observations	337		386		168		207	

Note: Coef. = Coefficient estimate; M.E. = Marginal Effect of a unit change in the explanatory variable on the probability of having the application for a bank loan accepted. Marginal effects are evaluated at the mean of the values of the explanatory variables. Only firms applying for bank loans are included. The null hypothesis on testing (double-sided) for significance of parameter estimates is that the parameter is equal to zero. *, ** and *** indicates rejection of the null hypothesis at a significance level of respectively 10, 5 and 1 per cent.
Source: Own calculations on the basis of the data listed in section 3.

be less weak than a firm with similar observed characteristics which do not apply for a bank loan – the difference may just not be captured by the explanatory variables. Because of the presence of self-selection, we estimate a bivariate probit model with sample selection.

To be more specific, the basic model of interest is represented by equations 1-3. However, it is clear that y_1 is only observed when a firm has applied for a bank loan. Let y_2 be a dichotomous variable taking the value 1 when a firm in the given year has applied for a bank loan and 0 otherwise. We then have that y_1 is observed if and only if $y_2 = 1$. We model this selection process by a probit model as well:

$$y_2 = 1\left[\, z\delta + u_2 > 0 \right] \tag{4}$$

where z is a vector of firm-specific variables which determine selection and u_2 is a normally distributed error term. The selection issue means that u_1 and u_2 may be correlated, i.e. corr $(u_1, u_2) = p$. Van de Ven and Van Pragg (1981) derive the likelihood function under these assumptions.

Proper identification of the model requires at least one exclusion restriction, that is, at least one explanatory variable which is included in z (the selection equation) but not in x (the outcome equation).[1] As we found in section 4 that the size of the firm was

1. If no exclusion restrictions are used (that is, if $x = z$), identification of the model is possible through the functional form. However, in such cases, collinearity between the selection equation and the outcome equation means that estimates have no structural interpretation.
2. This relation is likely to be less apparent if firms successfully apply for debt financing from other sources. If successful in attracting other types of financing, firms may be less interested in bank financing. In the empirical models that follow, we find a significant positive relation between applications for loans from other sources than banks and bank loan applications.

Table 3. Results: Bivariate probit models with sample selection.

	2007		2009-2010		2007		2009-2010	
	Coef.	M.E.	Coef.	M.E.	Coef.	M.E.	Coef.	M.E.
Probability of acceptance of bank loan application								
Solvency ratio	*0.766	0.106	**0.453	0.135	0.214	0.022	*0.797	0.186
Profit ratio	-0.009	-0.001	**0.897	0.268	-0.018	-0.002	**1.534	0.357
Implied interest costs					-0.103	-0.011	-1.986	-0.463
Liquidity ratio (broad)					6.035	0.618	**1.830	0.426
Short-term debt ratio					-0.906	-0.093	0.337	0.079
Constant	***1.253		***0.614		**1.474		0.491	
Selection equation								
Solvency ratio	***-0.214		***-0.346		**-0.693		***-1.005	
Profit ratio	0.002		*-0.138		0.001		*-0.209	
Implied interest costs					*1.863		0.314	
Liquidity ratio (broad)					***-2.123		***-1.302	
Short-term debt ratio					*-0.497		**-0.630	
LN(No. of employees)	-0.060		-0.074		-0.048		0.027	
LN(Total assets)	**0.081		**0.077		0.070		0.048	
Applied for loan (other source)	***1.155		***1.083		***1.058		***0.865	
Constant	***-1.631		***-1.044		**-1.072		-0.671	
ϱ	-0.095		***-0.511		0.040		**-0.688	
Observations	1,917		1,996		927		1,035	

Note: Coef. = Coefficient estimate; M.E. = Marginal Effect of a unit change in the explanatory variable on the probability of having the application for a bank loan accepted. Marginal effects are evaluated at the mean of the values of the explanatory variables. The selection equation models the probability that a company applied for a bank loan. ϱ is not directly estimated in the ML-estimatiion; the significance test reported is a test for atanh(ϱ) = 0. The null hypothesis on testing (double-sided) for significance of parameter estimates is that the parameter is equal to zero. *, ** and *** indicates rejection of the null hypothesis at a significance level of respectively 10, 5 and 1 per cent.
Source: Own calculations on the basis of the data listed in section 3.

largely unrelated to the outcome of a credit application, we include two measures of firm size in the selection equation, namely the logarithm of number of employees and the logarithm of total assets. We also include a variable indicating if the firm has applied for debt financing from other sources than a bank (i.e. from the firm's owner / manager, employees of the firm, family / friends, other non-financial firms, mortgage banks or other sources). If a firm has applied for debt financing from other sources than a bank, it may be more likely to also apply for a bank loan, since it is in need of external financing. Hence, we hypothesise that there is a relation between the extent to which a firm applies for debt financing from other sources than banks, and whether the firm applies for debt financing from a bank. However, the number of sources from which the firm applies for credit should not be related to the bank's decision to accept or reject the loan application. The bank's decision should in principle be based on the creditwort-

hiness of the firm (and the firm's ability to pose collateral) and not whether it has applied for other types of financing.

Table 3 reports the results from estimation of the bivariate probit models with sample selection. As a first observation, results of the estimation of the main outcome equation produces largely similar results to those from the standard probit model reported in Table 2, in particular for the models relating to 2007. In addition, the value added of using a selection model for 2007, compared to the standard probit model in Table 2, is limited, as the estimate of ϱ is not significantly different from zero. On the other hand, it is clearly important to take selection into account when estimating the models based on data from 2009-2010.

Table 3 underlines the previously found weak relation between firm characteristics and outcome of loan applications in 2007. We find only a marginally significant impact of the solvency ratio of the firm on the outcome. Only relatively few firms, which did apply for bank loans in 2007, had their application rejected. However, for 2009-2010, there is a clear relation between firm characteristics and the probability of having a loan application accepted. Firms with higher profit ratios, solvency ratios and liquidity ratios have a significantly higher probability of having their loan application accepted. Consider for example two otherwise identical firms which differ with an interquartile range (based on the sample values) on each of these variables, all other things equal. Our results imply that the probability of having a loan application accepted for the firm with high profit, solvency and liquidity ratios is 2.9, 5.1 and 6.2 percentage points higher, respectively, than for the firm with low values on each of these dimensions (evaluated at the mean of the other explanatory variables).

The descriptive analysis in section 4 indicated that a smaller group of firms did not apply for debt financing, since they believed that they would have their application rejected or that a loan would be too expensive. These firms had, in general, weak economic performance. However, the selection equations indicate that most firms, which do apply for a bank loan, have poorer performance than firms which do not. Overall, this might reflect that the group of firms which do not apply for a bank loan is dominated by well-performing firms, although a minority is so poorly performing that they choose not to apply in expectation that their application would be rejected.

As noted in section 3, we are able to identify the principal bank connection of the firms for slightly less than two-thirds of the firms that applied for bank loans. To assess the impact of the bank connection, we include a dummy for large banks, as well as the loan impairment charge ratio and the solvency ratio of the bank in 2007 and 2009, respectively. Bank characteristics may influence both the outcome of the loan application and the firms' tendency to submit loan applications to specific banks. For example, firms could self-select towards banks expected to offer better conditions. This

Table 4. Results: Impact of bank and firm characteristics on outcome of loan applications.

| | 2007 | | 2009-2010 | |
	Coef.	M.E.	Coef.	M.E.
Probability of acceptance of bank loan application				
Solvency ratio	1.263	0.059	***1.789	0.424
Profit ratio	-0.039	-0.002	**1.758	0.416
Implied interest costs	-4.588	-0.215	0.583	0.138
Liquidity ratio (broad)	6.233	0.293	**2.555	0.605
Short-term debt ratio	-0.769	-0.036	0.616	0.146
Bank: Group 1	0.517	0.033	-0.036	0.009
Bank: Loan impairment charge ratio	0.001	0.000	*-0.054	-0.013
Bank: Solvency ratio	9.685	0.455	-0.405	-0.096
Constant	0.056		0.037	
Selection equation				
Solvency ratio	*-0.751		***-1.037	
Profit ratio	0.001		-0.354	
Implied interest costs	1.742		-0.914	
Liquidity ratio (broad)	***-2.362		***-2.091	
Short-term debt ratio	-0.286		-0.406	
Bank: Group 1	-0.090		**-0.324	
Bank: Loan impairment charge ratio	0.266		0.009	
Bank: Solvency ratio	-5.786		*-2.774	
LN(No. of employees)	-0.015		-0.038	
LN(Total assets)	0.057		0.052	
Applied for loan (other source)	***0.983		***0.923	
Constant	-0.378		0.070	
ϱ	-0.201		**-0.670	
Observations	695		713	

Note: Coef. = Coefficient estimate; M.E. = Marginal Effect of a unit change in the explanatory variable on the probability of having the application for a bank loan accepted. Marginal effects are evaluated at the mean of the values of the explanatory variables. The selection equation models the probability that a company applied for a bank loan. ϱ is not directly estimated in the ML-estimatiion; the significance test reported is a test for atanh(ϱ) = 0. The null hypothesis on testing (double-sided) for significance of parameter estimates is that the parameter is equal to zero. *. ** and *** indicates rejection of the null hypothesis at a significance level of respectively 10, 5 and 1 per cent.
Source: Own calculations on the basis of the data listed in section 3.

is taken into account in the models by the inclusion of bank characteristics in both the selection and outcome equations.

Due to the significant reduction in the number of observations when bank connection is included in the models, we choose to report results including bank connection variables separately, cf. Table 4. Though the number of observations is reduced, results for firm characteristics are qualitatively similar to those reported in Table 3. The size of the bank does not have an impact on the outcome of an application for a bank loan; although in 2009-2010, firms which have as their main bank connection one of the lar-

ge banks are found to be less likely to apply for a bank loan. The interpretation of this is not clear, however, since firms' choice of bank connection may be impacted by unobserved firm characteristics which may also impact the availability of alternative funding sources.

In 2009-2010, we find a marginally significant relation between higher loan impairment charge ratios at the bank, and lower probability of loan acceptance. However, the solvency ratio of the bank has no impact on the outcome of the firm's credit application. This might suggest that it has not been the banks' own capitalisation, which has been the decisive factor for the decline in the banks' loan acceptance rates during the financial crisis but rather the deterioration of the credit quality of the banks' corporate customers and greater uncertainty about the future economic outlook for the corporate sector brought about by the financial crisis. However, it should also be noted that the combination of an insignificant coefficient on the solvency ratio and a marginally significant coefficient on the loan impairment charge ratio might reflect that the banks operate with a target for their solvency ratio. In such a case the solvency ratio would be roughly constant (and thereby uncorrelated with acceptance rates) whereas the negative and significant coefficient on loan impairment charge ratio could reflect that banks tightened their credit standards in order to reduce credit exposure and thereby facilitate their way back to their target capitalization rate.

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