Bank Deposits and Relationship Lending[1]

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Abstract

I study whether deposit accounts affect the bank-firm lending relationship, using a dataset with detailed information about all Norwegian firms' bank deposit and loan account balances. I show that firms are more likely to increase borrowing from a bank where they hold deposit accounts. In regressions with both firm and bank fixed effects, I find that bank lending relationships where firms hold deposit accounts are less likely to end after the bank experiences write-downs on its loan portfolio, relative to other lending relationships. This finding is consistent with the hypothesis that a bank will prefer deposit-holding firm borrowers when forced to scale down its loan customer base, and is thus suggestive that deposit accounts provide some added value to the banking relationship.

1 Introduction

Finance theory suggests that bank lenders and firm borrowers enter into lending relationships to alleviate information asymmetries and agency costs. A bank lending relationship is said to exist when the incumbent lender can repeatedly deal with the borrower in a more efficient way than competing lenders can[1]. According to Boot (2000), the exact sources through which these relationships add value are poorly understood. This paper investigates one potential source: deposit accounts held by borrower firms with their bank lender. Exclusive access to borrowers' transactions accounts may provide lending banks with an information advantage relative to potential competing lenders. The information from the transactions accounts improves the bank's knowledge about the borrower, thus potentially reducing adverse selection problems, and it may facilitate the bank's monitoring of the firm. Additionally, there may be operational benefits of providing loans and deposits bundled together.

In this paper, I take advantage of a unique dataset with detailed information about all corporate bank deposit and loan accounts in Norway. By linking this dataset to the firms' financial accounting data and the banks' accounting data, I can do a more detailed and exhaustive study than has been done previously in the literature. Bank finance in general, and lending relationships in particular, are usually considered more important for small firms, as these firms are less transparent than larger firms, and the agency costs are therefore potentially larger. Since I use a dataset that includes all Norwegian limited-liability firms, it enables me to focus on small, unlisted companies.

I propose two research questions. First, I investigate whether deposits are related to the interest paid, amount of credit granted, and whether firms get access to new loans. I find that having a deposit account increases the interest rate paid, but also increases the future amount of credit received by the firm from the bank in the future, and reduces the likelihood that the relationship is ended.

For my second research question, I look at whether bank deposit accounts are important to firms when banks are facing problems and write-downs on their loans. Banks that experience adverse, exogenous shocks to their funding or capital may be forced to reduce their supply of bank loans[2]. If deposit accounts provide some added value to the banking relationship, the bank would presumably prefer to salvage relationship loans to deposit-holding firms at the expense of loans to firms without deposit accounts at the bank, in order to preserve this added value. Borrowers who hold a deposit account at the bank will in this case have an advantage relative to other borrowers. My findings support this hypothesis. In particular, when

[1] For an introduction to the theory of financial intermediation, see Freixas and Rochet (2008 (2nd ed.)).

[2] See e.g., Holmstrom and Tirole (1997).

a bank faces losses to its loan portfolio, borrower firms with deposit accounts at that bank are less likely to end their relationship. This effect is most critical when the bank's equity ratio is low.

Several papers have suggested economies of scope between lending and deposit taking. Berlin and Mester (1999) find that deposit funding enables banks to smooth lending rates, and thus provide a useful insurance service to the firm borrowers. They do not study economies of scope at the individual bank-firm relationship level, but in stead look at the bank's overall balance sheet to show that banks who fund themselves more heavily with deposits are better placed to smooth lending rates when exogenous shocks occur. Degryse and Cayseele (2000) suggest that access to information from a firm's checking account provides a lending bank with a unique advantage in monitoring borrowers. They do not have the data to test this hypothesis directly, but they find empirical evidence that firms who borrow from their "main bank", a definition which implies that it holds a checking account at that bank, pay lower interest rates. Mester et al. (2007) show that transactions accounts facilitate monitoring for relationship lenders. They use a sample of firm borrowers at a Canadian bank to show that banks intensify monitoring of firms who, based on information from the transactions accounts, seem to be in trouble. Elsas (2005) finds that checking accounts or payments services increase the probability that a bank is considered a main bank. In a recent paper using data from a German bank, Norden and Weber (2011) find that bank account activity provides useful information to the bank lender. Petersen and Rajan (1994), on the other hand, do not find evidence that deposit accounts reduce borrowing costs for firms.

The rest of the paper is organised as follows. I describe the dataset and the empirical strategy in Section 2. Regression results are discussed in Section 3, while Section 4 concludes.

2 Data and Methodology

2.1 The Datasets

I use a dataset with detailed information of the end-of-year balance on all bank deposit and bank loan accounts, and interest accrued to the account during the year, for all Norwegian firms for 1997-2008. The dataset includes a unique firm identifier, which enables linking the observations with firm financial accounts, and there is a unique bank ID which provides a link to bank financial statements.

The bank account data are collected annually by The Norwegian Tax Administration for tax purposes, which suggests that its accuracy is good. The banks are required to report electronically to the Tax

Authorities for every account the following information: the account number; the name of the account holder and the unique organisation (ID) number; the deposit or loan balance as of 31 December; and interest accrued during the year. The interest accrued on loans includes, in addition to regular interest, any fees or commissions related to a loan. The database is confidential, but has been made available to us by the Norwegian Ministry of Finance[3] under strict confidentiality conditions regarding data access and the disclosure of the identities of the contracting parties. The database includes all bank accounts held by Norwegian firms at a domestically operating bank, including Norwegian branches of foreign banks.

The observations in the bank account database are linked to a financial accounts database, which contains annual accounting data for all Norwegian private and public limited companies for the period 1992-2008. Norwegian companies are required to have an authorised auditor, and must file their annual financial accounts with the National Registry of Company Accounts[4] by the end of July the year after the accounting year. The accounting database includes the profit and loss account, the balance sheet, selected items from the notes to the accounts, and other company related information such as, e.g., five-digit industry codes and legal form. The database is further described in Mjøs (2007) and Mjøs and Øksnes (2010).

The bank financial accounts information is compiled from the websites of the Norwegian Financial Services Association and the Norwegian Savings Banks Association[5]. I compute a bankruptcy prediction variable based on information about all Norwegian bankruptcies from the National Registry of Bankruptcies[6].

2.2 Empirical Strategy

I do the analysis on the firm-bank-year level. In other words, for every firm, I have one observation for each bank the firm holds an account with, for each year the firm holds an account at that bank. To address my first research question, whether there is a relation between deposits accounts and credit availability, I

[3] Approval gratefully received by letters dated 12 November 2008 and 27 August 2009

[4] Presented also in English at www.brreg.no.

[5] www.fnh.no and www.sparebankforeningen.no, respectively.

[6] Presented also in English at www.brreg.no.

estimate the following regression equations

$$\textit{Interest rate margin}_{ijt} = \textit{Deposit account}_{ijt-1}\beta^1 + Z_{ijt-1}\gamma^1 + \epsilon^1_{ijt} \quad (1)$$

$$\textit{Loan increase}_{ijt} = \textit{Deposit account}_{ijt-1}\beta^2 + Z_{ijt-1}\gamma^2 + \epsilon^2_{ijt} \quad (2)$$

$$\Delta \log(1 + \textit{Loan volume}_{ijt}) = \textit{Deposit account}_{ijt-1}\beta^3 + Z_{ijt-1}\gamma^3 + \epsilon^3_{ijt} \quad (3)$$

$$\textit{New account}_{ijt} = \textit{Deposit account}_{ijt-1}\beta^4 + Z_{ijt-1}\gamma^4 + \epsilon^4_{ijt} \quad (4)$$

$$\textit{Loan relationship terminated}_{ijt} = \textit{Deposit account}_{ijt-1}\beta^5 + Z_{ijt-1}\gamma^5 + \epsilon^5_{ijt} \quad (5)$$

where i denotes firm, j denotes bank, and t is the time index. The explanatory variable of interest is *Deposit account*, which is a dummy variable taking the value on when firm i holds a deposit account at bank j at date t, and zero otherwise. Z_{ijt-1} is a vector of control variables. The interest rate margin is computed as

$$\textit{Interest rate margin}_{ijt} = \frac{\textit{Interest paid}_{ijt}}{\frac{1}{2}(\textit{Bank Loan}_{ijt} + \textit{Bank Loan}_{ijt-1})} - \textit{NIBOR3m}_t$$

where $\textit{NIBOR3m}_t$ is the yearly average of the 3 month Norwegian Interbank Offered Rate, the standard reference rate in the Norwegian interbank market. To reduce the extent of noise in the data, I compute the interest rate margin only for firms with bank loans greater than NOK 100,000 in either year t or year $t-1$. $\textit{Loan increase}_{ijt}$ is a dummy variable that takes the value one if the amount borrowed by firm i from bank j increases from year $t-1$ to year t, and zero otherwise. The log of the change in loan volume is calculated as

$$\Delta \log(1 + \textit{Loan volume}_{ijt}) = \log(1 + \textit{Loan volume}_{ijt}) - \log(1 + \textit{Loan volume}_{ijt-1})$$

$\textit{New account}_{ijt}$ is a dummy variable that takes the value one if firm i borrows with a *new* bank account from bank j in year t, and zero otherwise. The opening of new bank accounts is often associated with the granting of new loans, and I interpret the creation of a new account as indicative that the bank and the firm have made some active credit decisions. Changes in borrowed amounts at existing bank accounts, on the other hand, may reflect previously determined contract terms.

$\textit{Loan relationship terminated}_{ijt}$ is a dummy variable that is equal to one if the amount borrowed by firm i from bank j at date t is zero, when the firm borrowed a positive amount from that bank at date $t-1$. This includes both the instances when all loans have been paid down but the firm keeps at least one deposit account with the bank, and the instances when the relationship the firm has with the bank is abandoned altogether and the firm thus holds no accounts with bank j in year t. I expect this variable to give a strong indication of a deterioration in the bank-firm relationship.

2.3 Control Variables

Table (1) provides a list of the variables used in the analysis. Note that the control variables included in Z_{ijt-1} are lagged one year, relative to the dependent variables, to reduce potential endogeneity problems. This lag, together with the need for lagged variables to compute the dependent variables, means that my sample effectively starts in 1998 rather than 1997. *Size* is measured as the logarithm of a firm's total assets. Larger companies are usually more transparent than smaller companies, which could affect their access to credit. Also, if the granting of a loan has some fixed cost element, small loans may become prohibitively expensive. Fixed and tangible assets can potentially be used as collateral, which a company can put forth against a loan. I therefore include *Fixedassets_assets*, which is the share of total assets that consists of non-current fixed tangible assets, e.g., property, machinery and equipment.

High earnings and large amounts of cash on the balance sheet increase a company's opportunities to finance projects by internal financing. I include Return on Assets, *ROA*, and *Cash_assets* as control variables. Since it is an economic flow variable, the timing of *ROA* is slightly different than the other variables. ROA_{it-1} is return on assets to firm i during year t, i.e. profitability during the year following the index date $t-1$.

A company's bankruptcy risk affects its ability to raise external finance and the terms at which it can borrow. I estimate a bankruptcy probability using a logit regression, where the dependent variable for a firm-year observation takes the value 1 if it is the last year the company files its annual financial accounts and it also enters a formal bankruptcy process within three years. The explanatory variables used are the same as those used by Norges Bank's Sebra Model (Eklund et al. (2001)): earnings/total assets, (liquid assets - short term debt)/turnover, unpaid indirect taxes[7]/total assets, trade credit/total assets, equity/total assets, book equity < paid-in equity (0/1), dividend payments (0/1), industry average equity/total assets, industry average trade credit/total assets, industry standard deviation for earnings/total assets, age dummies (years ≤ 8), and total assets. I first estimate updated parameters for every year in the sample, using information that was available up to and including that year. I then use these parameter estimates to compute an updated bankruptcy probability each year, using the most recent accounting information available at the time. This out-of-sample bankruptcy prediction reflects the public information at the time.

Bankloan_assets is the ratio of the firm's total bank loan to total firm assets, and controls for the firm's financial leverage. *Bankloan_assets_rel* is the ratio of the relationship loan to total firm assets. This variable takes into account that the size of the relationship loan relative to the firm may have systematic effects

[7]Typically VAT.

on other variables. Old firms have a longer history, and external financiers thus may have access to more information about the firm, reducing information asymmetries. I therefore include the log of the firm's age as a control variable. Whether a firm has more than one bank relationship may affect the firm-bank interactions in ways other than through the existence of a deposit account. I therefore include a dummy variable, *Multibank*, equal to one if the firm has bank loan accounts at more than one bank.

I also include some variables to control for bank and bank loan market characteristics. *Banksize_loan*, the national bank loan market share of the bank, takes into account that the size of banks may systematically affect their lending decisions. I include a measure of local market competition, *Bankregion_hhi_utlaan*, measured as the Herfindahl-Hirschman Index for the local bank loan market. Finally, I include the bank's equity-to-assets and the loss-to-assets ratios. The losses used in the latter ratio are overall accounting write-downs on the bank's loans, reported on a separate line in the bank's annual profit and loss statement. The loss-to-assets ratio is demeaned by the bank's time-series average over the years it exists in the sample.

Finally, I include region-, geographic centrality-, firm industry-, and time-dummy variables.

2.4 Sample Selection

I exclude some firms based on certain criteria. First, I exclude non-limited liability firms. These firms are not generally required to submit their financial statements to the Accounts Registry. They are also harder to distinguish from the owners' personal finances. Additionally, most bank credit to the corporate sector is granted to limited liability firms, suggesting that these firms should be the focus of interest. Second, I exclude all bank accounts held by financial institutions and government-owned companies. Third, I only consider commercial banks, savings banks, and other financial intermediaries who operate as profit-maximising entities. Some Norwegian financial intermediaries are owned by the government, and their profit-maximising objective may not be entirely clear. Examples of such entities are institutions to promote new, innovative firms, or to finance exporting firms. To avoid such potential political considerations to contaminate the analysis, I focus on ordinary banks.

Finally, I exclude some of the smallest firms and bank-firm relationships from the sample. For a relationship to be of any significant importance, I expect that the amounts involved must be above some minimum level. If the amount borrowed by a firm is very low, the bank is unlikely to spend much effort to monitor the firm, since the potential benefits of doing so are likely to be small. I therefore exclude all firms whose

average total assets during the years they are present in the sample are less than NOK 500,000[8] Such small firms are often single-owner firms, typically with little or negligible economic activity. In addition, in the empirical analyses I only include bank-firm relationships where the firm borrows at least NOK 100,000[9] in year $t-1$

2.5 Descriptive Statistics

Table (2) shows the total number of firms and firm-bank relationships for each year during the sample period 1997-2008. Panel A shows the number of firms present for each year, while Panel B shows the number of unique firm-bank relationships. I define a relationship to exist between a firm and a bank if the firm has an account at that bank. We see that the number of firms and the number of bank-firm relationships increase over the sample period. First, note that most firms hold at least one deposit account, i.e. few firms have a borrowing account without having at least one deposit account at some bank. When we look at the individual bank-firm relationships in Panel B, however, we see that many firms borrow from a bank with whom they do not hold a deposit account. The majority of the firms are both borrowers and depositors. The average number of bank-firm relationships per firm is around 1.5.

Table (3) shows descriptive statistics for the borrowing firms included in the sample used for the empirircal analyses. Firm-bank relationships where the firm did not borrow at least NOK 100,000 are thus excluded. Note that this loses more than half the firm-bank-year observations from the previous table. The table shows the number of observations (N), mean, standard deviation (sd), and the median for each variable. Some of the variables have been winsorised at the 1st and 99th percentile, indicated in the table by $^{(*)}$. The median firm has total assets of around NOK 4.2 million, while the mean of total assets is NOK 58.9 million. The median amount deposited by a firm is NOK 170 thousand, and the median amount of borrowing is NOK 1.4 million. The mean values are substantially higher than median values, suggesting that the distributions are right-skewed, as we might had expected.

The mean interest rate margin is 3.6 percentage points, and the median is 2.6 percentage points. We note that on average 27.3 percent of loan balances in a firm-bank-relation increased from last year, while a new borrowing account was opened in 24.7 percent of the firm-bank-years. The median bank loan-to-assets ratio is 39.3 percent, suggesting bank loans are an important source of financing for these firms. The

[8]The average exchange rate USD/NOK was 7.20 during our sample period. The amount in USD based on this exchange rate is therefore $69,500.

[9]Based on a USD/NOK exchange rate of 7.20, this amounts to $13,900.

median relationship-loan-to-assets ratio is 33.1 percent. The fact that this ratio is not much lower than the firm's overall bank loan-to-assets ratio reflects that most firms borrow from only one bank. The median value of the deposits-to-assets ratio is only 3.7 percent. This is probably not quite unexpected, as the sample includes only borrowing firms. On average, 16.5 percent of relationships were terminated in any given year.

3 Empirical Results

3.1 Deposits and Credit Availability

Table (4) shows regression coefficients on the deposit account dummy. This dummy variable takes the value one if the relationship has a positive deposit account balance, and zero otherwise. The table has four columns with regression estimates. Column (1) shows a standard OLS regression, with control variables for firm characteristics, bank and loan market characteristics, geography-, industry- and time-fixed effects. Column (2) includes firm fixed effects. Firm-invariant control variables are therefore excluded in this specification. Column (3) includes bank fixed effects, while Column (4) has both firm and bank fixed effects. Standard errors are clustered at the bank level. Clustering at the bank level rather than at the more conventional firm level is likely to lead to more conservative inference. As a robustness test, I rerun the regressions with standard errors clustered at the firm level. The results remain significant, and the standard errors are typically smaller by a magnitude greater than five.

We see that the existence of a positive deposit account balance increases interest rate margins paid by the firm, but it also increases credit granted. The probability that the loan amount will increase, the increase in the amount itself, and the likelihood that a new borrowing account will be opened in the firm-bank relationship are all higher when the firm holds a deposit account in the relationship. This finding is robust across the various specifications.

The most robust of these specifications is likely to be Column (4), which includes both firm and bank fixed effects. I will therefore only comment on this column. The economic significance on the dependent variables of having a bank account in the lending relationship is large. The interest rate margin increases by almost one percentage point when the deposit dummy variable changes from zero to one. Compared to a median interest rate margin of 2.6 percentage points, the deposit account increases the margin by almost forty percent. For the credit quantity variables, the deposit dummy increases the probability that the loan

amount will rise over the next year by almost nine percentage point. The loan amount increases by 19 percent more relative to non-deposit relationships[10], and the likelihood of a new borrowing account being opened goes up by around five percentage points. Finally, the likelihood that a relationship will be ended is 2.7 percentage points lower when the firm has a deposit account. On average, lending relationships are terminated 16.5 percent of the time. This suggests that deposit accounts reduces the probability of termination by one sixth.

Based on these results, it seems that the existence of deposit accounts is related to the extent to which firms borrow in the bank-firm-relationships. However, the decision whether to hold a deposit account and borrow from the same bank is endogenous, and it is hard to interpret what these parameter estimates really say about underlying economic relationships. We need some identifying assumption to be able to disentangle supply and demand effects. If we can find a situation where credit demand exceeds the bank's supply of loans, the bank's actions and choice of borrowers in these circumstance may tell us something about how it values its access to borrowers' deposit accounts. I propose that when banks are in distress, such a situation is likely to occur. This leads to my second research question, where I study whether deposit-account-holding firms have relatively better access to credit when the bank is in a financially weak position.

3.2 Deposits and Banks' Losses

Several finance papers, one of the more important among them being Holmstrom and Tirole (1997), argue that negative shocks to a bank's funding or capital may affect its ability to grant loans. Agency costs mean that bank financiers require the bank to back its lending with a minimum amount of its own capital. Losses to the bank, which lowers its capital, may thus require the bank to reduce its supply of credit. One interesting question in this respect is whether it will prefer certain borrowers above others. In this paper, I study whether deposit accounts are valuable to banks in their lending. In particular, when the bank experiences loan write-downs and may be forced to reduce its credit supply, will it prefer to reduce it to borrowers who do not hold a deposit account with the bank? If the bank prefers borrowers with deposit accounts, this suggests that such accounts are valuable to the bank lending.

I therefore introduce new variables, where bank characteristics are interacted with the deposit account dummy. I define *lossdum* as a dummy variable that takes the value one if the bank's total loan losses are above its time series mean, and zero otherwise. Banks sometimes reverse booked loan losses, leading to

[10]The dependent variable is the difference in logs. The effect on loan amount increase is thus computed $e^{0.1735 \cdot (1-0)} - 1 \approx 0.19$.

negative accounting loan write-downs. Since I primarily aim to study the effect of bank problems on the access to credit, I focus on the positive-valued accounting losses. The timing of the reversal of previously booked loan write-downs also may be more related to accounting rules than to changes in the underlying health of the bank's loan portfolio.

I interact the *lossdum* variable with *Bank equity*, i.e. the bank's equity as a fraction of total assets, and the deposit dummy, respectively. I also include an interaction term with all three variables. The newly defined variables are summarised as follows:

$$
\begin{aligned}
lossdum_{jt-1} &= 1_{Bank\ total\ losses_{jt-1} > \frac{1}{T_j}\Sigma_\tau Bank\ total\ losses_{j\tau}} \\
eqXdep_{ijt-1} &= Bank\ equity_{jt-1} X Deposit\ dummy_{ijt-1} \\
lossXdep_{ijt-1} &= lossdum_{jt-1} X Deposit\ dummy_{ijt-1} \\
eqXloss_{jt-1} &= Bank\ equity_{jt-1} X lossdum_{jt-1} \\
eqXlossXdep_{ijt-1} &= Bank\ equity_{jt-1} X lossdum_{jt-1} X Deposit\ dummy_{ijt-1}
\end{aligned}
$$

T_j denotes the total number of years the bank exists in the sample. The variables are lagged one year relative to the dependent variable in the regressions. I define the vector X_{itj-1} to include the new variables described above. Since the multicollinearity of the the new explanatory variables reduces the power of the regressions, I focus on the variable that I expect to be the strongest indicator of a deterioration in a firm-bank lending relationship: whether a loan relationship is terminated, i.e. *Loan relationship terminated*. Regression results using the dependent variables from regressions (1)-(4) generally tend to give insignificant results, and I therefore exclude these here. It is important to note that a main reason why these results turn out not to be significant is the conservative inference using bank-clustered standard errors. The new regression equation is

$$
Loan\ relationship\ terminated_{ijt} = X_{itj-1} + Deposit\ account_{ijt-1}\beta^5 + Z_{ijt-1}\gamma^5 + \epsilon^5_{ijt} \tag{6}
$$

The regression results are reported in Table (5). I will keep my comments to my preferred specification in Column (4). The *Deposit account* dummy is no longer statistically significant, suggesting that its influence is now accounted for through some of the interaction terms. Four of the reported parameter estimates are statistically significant, and I will focus on these variables. First, the estimated coefficient on *lossdum* is 0.15. This suggests that a relationship is more likely to end when the bank's loan write-downs are larger

than usual. The coefficient estimate on *eqXloss* is negative and significant, which says that bank loan losses are less likely to lead to terminations when the bank's equity-to-assets ratio is high[11].

The key coefficients in this section are the estimates for *lossXdep* and *eqXlossXdep*. Having a deposit account with the bank reduces the likelihood that the relationship ends when the bank suffer high losses by 15 percentage points, and largely offsets the effect of *lossdum*. The coefficient on *eqXlossXdep* of 0.016 indicates that deposit accounts are particularly important when the bank experiences high losses and its level of capital (equity-to-assets) ratio is low.

The results therefore give positive evidence that banks in distress prefer borrowers who also hold deposit accounts at their bank. The findings are consistent with the literature that advocates an important role for transactions accounts in the provision of bank loans. However, as a caveat to the results I should note that I can not reject that the four variables discussed, *lossXdep*, *eqXlossXdep*, *lossdum*, and *eqXloss*, are jointly equal to zero.

4 Conclusions

This paper studies two research questions. First, I show that deposit accounts are related to better credit availability, but also higher interest rate margin, for borrowing firms. Second, I look at the relevance of deposit accounts to firm-bank relationships when the bank faces loan write-downs and may be forced to scale down its loan portfolio. To the extent of my knowledge, this is the first paper to look at this effect. I take advantage of a detailed dataset that includes all Norwegian corporate bank accounts, both deposits and loans. I find that firm borrowers with deposit accounts are more likely to remain borrowers at a bank when the bank faces high loan losses, relative to other borrowers not holding deposits at that bank. This suggests that deposit accounts provide added value to the firm-bank lending relationship.

I have not looked in more detail into what are the exact mechanisms regarding the deposit account that create value. Is it reduced information asymmetries, increased opportunity for the bank to monitor the borrower, or does it give the bank some ability to advise the firm and create added value through improvements in the firm's operations and finances. This is a potential topic for future research.

[11] Note that the measurement unit of *Bank equity* is in percentage points. This implies that a one percentage point increase in the bank's equity-to-assets ratio reduces the likelihood of ending a lending relationship when the bank's loan losses are higher than usual by 1.56 percentage points.

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A Tables and Figures

Table 1: **Description of variables**

Firm Characteristics	
Size	$\log(Total\ assets_{it-1})$
Fixedassets_assets	$\frac{Fixed\ assets_{it-1}}{Total\ assets_{it-1}}$
ROA	$\frac{Pre\text{-}tax\ earnings_{it+1}}{Total\ assets_{it}}$
Bkcyprob	Probability of bankruptcy ("Sebra" model) out-of-sample prediction.
Cash_assets	$\frac{Cash_{it-1}}{Total\ assets_{it-1}}$
Bankloan_assets	$\frac{Bank\ Loan_{it-1}}{Total\ assets_{it-1}}$
Logfirmage	$\log(firmage)$
Multibank	Dummy variable equal to one if firm has more than one bank relationships, zero otherwise.
Bank and Bank Loan Market Characteristics	
Banksize_loan	National bank loan market share of the bank
Bankreg.._hhi_ut..	Herfindahl-Hirschman Index for regional bank loan market
Bank equity	Bank's equity as a fraction of total assets
Bank losses	$\frac{Bank\ Loan\ Losses_{jt}}{Bank\ Total\ Assets_{jt}} - \frac{1}{T_j}\Sigma_\tau \frac{Bank\ Loan\ Losses_{j\tau}}{Bank\ Total\ Assets_{j\tau}}$, T_j = number of years bank exists.

Table 2: **Number of firms and bank-firm relationships.** The table shows all firm-bank relationships for firms whose average assets during the sample period exceeds NOK 500,000.

Panel A: Number of firms.

Year	Total	Depositor only	Borrower only	Both depositor and borrower
1997	82,495	18,344	1,008	63,141
1998	88,558	21,316	988	66,253
1999	92,922	23,035	974	68,911
2000	98,857	27,262	955	70,637
2001	102,458	31,971	949	69,537
2002	103,797	33,437	936	69,423
2003	104,888	33,957	917	70,012
2004	108,324	35,681	1,359	71,280
2005	113,743	38,224	1,308	74,208
2006	120,312	42,521	940	76,846
2007	130,937	48,183	894	81,853
2008	135,794	51,143	876	83,771

Panel B: Number of firm-bank relationships.

Year	Total	Depositor only	Borrower only	Both depositor and borrower
1997	141,323	55,730	11,875	73,697
1998	148,558	61,211	12,073	75,255
1999	145,379	57,040	11,381	76,938
2000	153,435	64,159	12,090	77,150
2001	158,081	71,367	12,602	74,095
2002	155,700	69,424	12,211	74,048
2003	154,707	68,091	12,317	74,261
2004	153,858	64,950	14,208	74,679
2005	162,242	68,699	15,329	78,013
2006	171,329	75,565	14,632	80,928
2007	187,109	85,341	15,356	86,218
2008	197,705	94,395	14,914	88,204

Table 3: **Summary statistics.** Summary statistics for firms whose average assets during the sample period exceeds NOK 500,000, and excludes bank-firm relationships where borrowing is lower than NOK 100,000 for that particular year. $^{(*)}$ denotes that the variable has been winsorised at the 1st and 99th percentile.

Variable	N	mean	sd	median
Interest rate margin$^{(*)}$	552,552	0.036	0.046	0.026
Loanincrease	552,939	0.273	0.446	0.000
$\Delta \log(1 + \textit{Loan Volume})$	552,939	-1.742	4.556	-0.099
New account	552,939	0.247	0.431	0.000
Relationship terminated	584,589	0.165	0.371	0.000
Depositor dummy	584,589	0.848	0.359	1.000
Deposit balance	584,589	2,333.392	41,548.561	170.129
Bank loan balance	584,589	13,250.375	112,256.564	1,462.644
Total assets	584,589	58,860.926	1,118,830.949	4,180.000
Size	584,589	8.548	1.524	8.338
Fixedasset_assets	584,350	0.430	0.348	0.371
ROA	567,051	0.069	0.278	0.078
Bankruptcy probability	556,930	0.016	0.025	0.006
Deposits_assets $^{(*)}$	584,589	0.091	0.129	0.037
Bankloan_assets $^{(*)}$	584,589	0.440	0.286	0.393
Relationship loan_assets	584,589	0.392	0.282	0.331
Logfirmage	579,054	1.936	1.084	2.079
Multibank	584,589	0.248	0.432	0.000
Banksize_loan	584,589	0.082	0.086	0.033
Bankregion_hhi_ut..	579,622	0.162	0.060	0.146
Bank equity	538,681	7.107	2.440	6.570
Bank losses (demeaned)	565,598	-0.022	0.440	-0.053

Table 4: **Regressions.** Coefficient estimates for deposit indicator variable, which takes the value one if the firm has a positive deposit balance at the firm-bank relationship, and zero otherwise. The sample includes firms whose average assets during the sample period exceeds NOK 500,000, and excludes bank-firm relationships where borrowing is lower than NOK 100,000 for that particular year. Standard errors clustered at the bank level are reported in parentheses. Control variables are not reported.

Dependent variable	N	(1)	(2)	(3)	(4)
Interest rate margin	459,906	0.0112^{***}	0.0126^{***}	0.0095^{***}	0.0098^{***}
		(0.0016)	(0.0016)	(0.0019)	(0.0017)
Loan increase	460,226	0.0984^{***}	0.01122^{***}	0.0795^{***}	0.0888^{***}
		(0.0091)	(0.0093)	(0.0100)	(0.0081)
$\Delta \log(1 +$ *Loan volume*	469,226	0.2609^{***}	0.1338^{**}	0.2390^{**}	0.1735^{***}
		(0.0607)	(0.0419)	(0.0731)	(0.0408)
New account	460,226	0.0681^{***}	0.0525^{***}	0.0704^{***}	0.0481^{***}
		(0.0099)	(0.0058)	(0.0113)	(0.0056)
Loan relationship terminated	474,182	-0.0440^{**}	-0.0349^{***}	-0.0331	-0.0273^{*}
		(0.0144)	(0.0099)	(0.0171)	(0.0114)
Control variables					
Firm characteristics		Yes	Yes	Yes	Yes
Bank and loan market characteristics		Yes	Yes	Yes	Yes
Firm fixed effects		No	Yes	No	Yes
Bank fixed effects		No	No	Yes	Yes
Firm geography dummies		Yes	No	Yes	No
Firm industry dummy		Yes	No	Yes	No
Time fixed effects		Yes	Yes	Yes	Yes

Standard errors in parentheses

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 5: **Regressions.** The dependent variable is *Loan relationship terminated*, which is a dummy variable that equals one if the relationship is ended. The sample includes firms whose average assets during the sample period exceeds NOK 500,000, and excludes bank-firm relationships where borrowing is lower than NOK 100,000 for that particular year. Standard errors clustered at the bank level are reported in parentheses. Parameter estimates for other control variables are not reported.

Variable	(1)	(2)	(3)	(4)
Deposit account dummy	0.0010	-0.0056	0.0091	0.0008
	(0.0173)	(0.0164)	(0.0230)	(0.0255)
eqXdep	-0.0037	-0.0014	-0.0030	-0.0010
	(0.0026)	(0.0022)	(0.0030)	(0.0037)
lossXdep	-0.1838**	-0.1651*	-0.1642*	-0.1538*
	(0.0690)	(0.0688)	(0.0750)	(0.0715)
eqXlossXdep	0.0202**	0.0178*	0.0170*	0.0160*
	(0.0076)	(0.0073)	(0.0079)	(0.0078)
lossdum	0.1884**	0.1713*	0.1630*	0.1525*
	(0.0693)	(0.0694)	(0.0755)	(0.0700)
eqXloss	-0.0208**	-0.0181*	-0.0167*	-0.0156*
	(0.0077)	(0.0076)	(0.0077)	(0.0076)
Bank equity	0.0014	-0.0016	0.0066	0.0060
	(0.0028)	(0.0031)	(0.0039)	(0.0038)
Bank losses (demeaned)	0.0015	0.0007	0.0089	0.0068
	(0.0046)	(0.0035)	(0.0090)	(0.0040)
Other control variables				
Firm characteristics	Yes	Yes	Yes	Yes
Bank and loan market characteristics	Yes	Yes	Yes	Yes
Firm fixed effects	No	Yes	No	Yes
Bank fixed effects	No	No	Yes	Yes
Firm geography dummies	Yes	No	Yes	No
Firm industry dummy	Yes	No	Yes	No
Time fixed effects	Yes	Yes	Yes	Yes
N	474182	474182	474182	474182

Standard errors in parentheses

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$