Banks' Equity Stakes in Firms: A Blessing or Curse in Credit Markets?

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Abstract

We analyze how banks' equity stakes in firms influence their credit supply in crisis times. For identification, we exploit the 2008 Global Financial Crisis and merge unique supervisory data from the German credit register on individual bank-firm credit exposures with the security register data that include banks' equity holdings. We find that a large and ex-ante persistent equity position held by a bank in a firm is associated with a larger credit provision from the respective bank to that firm. In crisis times, however, equity stakes only foster credit supply to ex-ante riskier firms especially from relatively weak banks. This ex-ante risk-taking may be due to better (insider) information by the bank, including a traditional lending relationship over the crisis. However, this ex-ante riskier lending translates also into higher ex-post loan defaults, worse firm-level stock market returns and even more firm bankruptcy or restructuring cases. Our results therefore suggest that banks' equity stakes in their borrowers do not mitigate debt overhang problems of distressed firms in crisis times, but rather foster evergreening of banks' outstanding credit to those (zombie) firms.

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1 Introduction

Corporate leverage around the world is extremely high; this was the case before the COVID-19 crisis, but also before the 2008 financial crisis (ECB, 2020; IMF 2019, 2020; Group of 30, 2020). Excessive leverage for corporate leverage was present in previous crises, e.g., in Ireland, Spain and the UK in the 2008 Global Financial Crisis as well as in the countries that suffered the 1997-98 East Asia Financial Crisis (Freixas, Laeven and Peydró, 2015). This leverage was also high for US firms prior to the 2020 COVID crisis, including the riskier loans, the so-called leverage loans (see IMF, 2019).

There are some key frictions associated to excessive corporate leverage, notably debt overhang problems, with little incentives for lenders to provide more loans (Myers, 1977), or loan evergreening/ zombie lending, with high incentives to extend loans to firms with limited ex-post viability (Caballero, Hoshi and Kashyap, 2008).

Bank loans are still the most important external source of financing for firms in many countries (see for the euro area ECB, 2021). During the 2008 Global Financial Crisis, some banks entailed huge losses on their security portfolios impairing their ability to provide loans to the corporate sector, while others reduced their credit supply to increase risk-taking via their security holdings at fire-sales prices (Puri et al., 2011; Abbassi et al., 2015). This type of behavior contributed to calls for stricter separation of proprietary stock market investments and traditional banking businesses (Volcker's Rule in the U.S. Dodd-Frank Act, the U.K. Vickers Report and the E. U. Liikanen Report). However, there is also empirical evidence suggesting that a bank's propensity to lend to a non-financial firm is fostered if the bank holds some control rights in that firm (Ferreira and Matos, 2012). A bank's equity stake in a firm might mitigate hidden information and action problems between borrowers and creditors, and reduce the credit rationing (Kroszner and Strahan, 2001; Jiang et al., 2010). Further, a bank might be potentially more inclined to provide new loans to firms with debt overhang problems if the bank also holds some residual cash flow rights (Mahrt-Smith, 2006).

At the same time, there is evidence that under-capitalized banks roll-over loans to distressed firms in order to avoid or delay defaults, which would force banks to write-off their outstanding claims (Acharya et al., 2019b; Schivardi et al., 2017; Bittner et al., 2020). Such evergreening by a bank might be potentially aggravated if the bank also holds an equity stake in the respective firm, and hence the residual cash flow rights held by risky

banks might rather foster zombie lending by these banks.

Despite its importance for policy and academia there is scant evidence whether banks' equity holdings in firms during crisis times foster credit provision and whether this depends on bank and firm distress that helps to disentangle frictions, including debt overhang versus loan evergreening motives. A key problem is the lack of comprehensive, granular administrative data on bank-firm level equity positions matched with bank-firm level loan provision.

In this paper we overcome these challenges by using a unique, supervisory matched dataset provided by the Deutsche Bundesbank (German central bank) that allows us to observe the stock holdings by each German bank for every listed firm and its lending to the same firm. We further match these unique data with bank and firm level balance sheet information, including bank riskiness and firm ex-ante distress (Z-score) measures, as well as ex-post stock returns, credit events (delinquencies or restructuring and bankruptcy) and bank's own firm risk assessment. Moreover, we exploit the 2008 exogenous global financial crisis. Our sample is quarterly and covers the period from 2006 to 2011. The 2008 Global Financial Crisis that led to a substantial reduction in credit growth by German banks (see Figure 1, and Becker and Ivashina, 2018). It therefore allows us to analyze whether in crisis times, banks extend more credit to those firms in which they also hold an ex-ante sizable equity position, and whether this lending also depends on firm and/or bank distress.

Apart from the uniqueness of the available data on German banks, Germany provides an excellent laboratory to study the effect of banks' equity holdings in non-financial firms on banks' lending to those firms. German firms – even the larger and listed ones – are still very dependent on bank loans, while only very few firms issue other forms of debt. German banks are mostly universal banks and are traditionally also equity investors and securities traders. Further, the German banking industry and the German economy are the largest in the Euro Area. Moreover, the German financial system has various similarities with other financial systems in continental Europe and around the world, the so-called bank dominated financial systems (Allen and Gale, 2000). Finally, the German banking industry was one of the first and most severely affected by the U.S. subprime crisis; and the Lehman collapse generated an exogenous shock on German banks' lending capacity and incentives, which we use for identification.

Our analysis is at the bank-firm-quarter level; hence we can investigate the lending by those banks with an equity stake in a firm relative to the lending by other banks, even to the same firm in the same quarter (i.e., using firm-time fixed effects, see Khwaja and Mian, 2008). At the same time, we compare lending by the same bank to borrowers, in which the bank holds equity, with its lending to other borrowers in the same quarter (i.e., using bank-time fixed effects, see Jiménez, Ongena and Peydró, 2014). In addition to exploiting the crisis shock and different sets of fixed effects, we use only lagged, sizable and persistent ex-ante equity positions of banks in a firm, which captures banks' strategic equity investments typically part of their banking book. Moreover, focusing on lagged persistent equity holdings implies that these positions do not simply enter the portfolio because the bank has obtained a positive private signal about the firm, which would simultaneously increase its willingness to lend to that firm as well.[1] Further, we also control for relationship lending proxies at the borrower-lender level (Bolton et al., 2016). Finally, to understand the different frictions and motives for lending, we exploit heterogeneity in bank and firm riskiness, including *ex-ante* Z-score measures and *ex-post* credit events and stock market performance.

Our key robust findings are the following. Generally, banks on average provide more lending to firms in which they ex-ante hold sizable equity, but they do not provide differentially more lending to distressed firms (measured by their Z- Score). However, exploiting the 2008 crisis shock, we find that during crisis times banks extend relatively more credit to distressed firms if they ex-ante owned equity in the firms. Economically, during crisis times, a bank with an ex-ante equity position increases the supply of credit to an ex-ante distressed firm by 7.36% as compared to other banks without an equity position in that firm. This result is consistent with a reduction in debt overhang problems, but it may also be consistent with less benign motives. To analyze these motives, we consider the heterogeneity of banks' health.

Dissecting our sample by banks of different balance sheet strength, we find that during crisis times, holding an ex-ante large equity stake only increases lending by riskier banks (i.e., banks with a low Z-Score) to ex-ante distressed firms. Economically, in crisis times, a riskier bank with an ex-ante sizable equity position in an ex-ante riskier firm increases

[1] Note that this also eliminates concerns that banks try to exploit announcements effects of credit decisions on firms' stock prices and trade stocks based on their insider information about subsequent loan decisions.

its supply of credit to that riskier firm by 65.53% as compared to other banks. Differently, an ex-ante sizable equity position does not induce safer banks to lend more to ex-ante risky firms during the crisis.

While these results can be seen as a first evidence for the hypothesis that equity positions foster loan evergreening/zombie lending, it may also imply that risky banks tend to be more frequent and intense lenders to distressed firms. Thus, they continue lending to those firms in distress during crisis times. To partly address this issue, we first include explicit measures for established bank-firm lending relationships and consider specific relationship effects for distressed relationship borrowers during the crisis. However, we still observe that distressed banks tend to lend more to ex-ante riskier firms in crisis times if they also hold equity in those firms.

Nevertheless, the lending to ex-ante riskier firms could also be consistent with better (insider) information obtained by the bank with the equity stake in the distressed firm, as we identify distressed firms so far only based on ex-ante publicly observable information (the firm's lagged Z-Score). That is, we cannot exclude that our results might also be driven by private information (Agarwal and Ben-David, 2018). Banks with sizable equity positions in a firm might be more likely to obtain a private signal about the firm's credit quality and particularly weak banks might grant loans to those firms if they appear to be distressed based on public information while the banks' private signals suggest a higher credit quality.

To address this issue, we use *ex-post* risk measures for firms derived from both the credit register data as well as stock market data (as by construction all firms in our sample are listed). The credit register data reports different classes of credit events including the internal ratings reflecting the probability of default that each bank who applies an internal rating-based (IRB) approach assigned to each of its borrowers.

We find that, during the crisis as compared to normal times, ex-ante riskier banks with an ex-ante persistent sizable equity stake supply more credit to firms that are more likely: (i) to default ex-post; (ii) to experience ex-post (negative) credit events (e.g., bankruptcy or restructuring); and (iii) to suffer from a relatively large decline in their credit quality in the subsequent two years (proxied by the average internal rating that lending banks assign to the firms). This not only suggests that those lending decisions are not based on superior private information, but it also indicates that the evergreening exposes the (ex-

ante riskier) banks to additional elevated (ex-post) credit risk. Economic effects are also significant for the ex-post firm credit risk indicators. We find that in crisis times risky banks with an ex-ante persistent equity stake in a borrower provide 15.26 % more credit to a borrower who subsequently experiences a negative credit event, 15.95% more to a borrower who ex-post defaults, and 10.85% more to a firm that subsequently declares bankruptcy or needs restructuring.

Moreover, these risky banks might also engage in distress lending to a firm in order to benefit from the return on their equity holdings. However, when analyzing at the firm-level ex-post stock returns, our results suggest that those firms that obtain more credit from a risky bank with an equity stake in the firm in crisis times substantially underperform in the stock market (also as compared to the other firms at the same time). We document that a larger ratio of credit obtained from risky banks with an equity stake in the firm in crisis times is associated not only to future credit events and increasing default probabilities for those firms, but also to below average future stock returns. Our results therefore suggest that banks' equity stakes in their borrowers (non-financial firms) do not mitigate debt overhang problems of distressed firms in crisis times, but rather foster evergreening of banks' outstanding credit to those (zombie) firms.

These results have implications for the ongoing debate about regulation of the banking industry, in particular whether there are benefits and costs to limit banks' proprietary stock market investments. Our results suggest that banks' equity stakes held in firms on average do not increase firms' access to credit when banks face distress. However, the ex-ante less healthy banks in crisis times supply more loans to ex-ante risky firms if they ex-ante hold a sizable equity position in the firm. Moreover, this lending is substantially worse ex-post, both with regards to credit risk as well as to stock market returns. In addition, these negative credit outcomes for the already weaker banks may imply substantial costs for the economy and the taxpayers (i.e., negative externalities in terms of social costs of bank distress). Thus, our results suggest that limiting banks' stock market investments does not undermine banks' efficient provision to reduce corporate debt overhang problems, but they rather suggest that it would mitigate 'zombie lending' incentives by ex-ante distressed banks that have the potential to further ex-post destabilize those distressed banks.

Contribution to the literature. Our findings contribute to several strands of literature. There is a large literature on the role of relationship lending and borrower distress. Rajan (1992), for example, argues that theoretically the expected future margin a bank can extract from a borrower induces it to provide also credit to the borrower, while Bolton et al. (2016) analyze the differential effects in crisis times providing also detailed empirical evidence (see also Sette and Gobbi (2015)). An equity stake in a borrower is a more explicit way of establishing a relationship: Holding control rights might provide access to private and soft information and might also allow banks to benefit from an increased expected residual cash flow, which increases the willingness of (relationship) lenders to extend credit also to distressed borrowers. The effect of bank equity holdings in firms has been studied both theoretically by Mahrt-Smith (2006) and Santos (1999), and empirically in Santos and Wilson (2017), Jiang et al. (2010), Pan and Tian (2015), and Lin et al. (2009). Ferreira and Matos (2012) show that when a bank owns control rights, it is more likely to serve as lead arranger of a syndicated loan to a firm, with a higher margin in normal times but a lower margin in crisis periods. These results are also supported by Jiang et al. (2010) and Chava et al. (2019).

Our main differences (and hence contribution) with respect to the previous papers is on the question (crisis times, borrower and lender distress), frictions that we analyze (zombie lending/loan evergreening as well as debt overhang), data (administrative matched granular lender-borrower loans and bank-firm equity positions) and on the results. All these allow us to obtain new results and hence contribute to the literature. In particular, we find that in crisis times, equity stakes only foster credit supply from relatively weaker banks, and especially in the supply of credit to ex-ante riskier firms. This ex-ante risk-taking may be due to better (insider) information by the bank, including a traditional lending relationship over the crisis. However, this ex-ante riskier lending translates into higher ex-post loan defaults, worse firm-level stock market returns and even more likely firm bankruptcy or restructuring. Further, our results are over and above pure lender-borrower relationship lending measures. Our results therefore suggest that banks' equity stakes in their borrowers do not mitigate debt overhang problems of distressed firms during crisis times, but foster evergreening of banks' outstanding credit to those (zombie) firms.

Von Beschwitz and Foos (2018) is the closest paper to ours. Their work also uses

German credit register data to study the effect of banks' stock holdings in a firm on the banks' credit provision to that firm. While they rely on reported ownership through equity positions exceeding a significant threshold, our sample also comprises much smaller holdings of residual cash-flow rights as well. They exploit a tax relief on capital gains from shareholdings, while we exploit the 2008 financial crisis as an exogenous shock to banks' incentives in riskier lending. Importantly, we distinguish between the quality of the firms and of the banks, and moreover crisis versus normal times, which provide new results. Our results suggest that riskier banks with ex-ante equity stakes in their borrowers are the ones that supply more credit in crisis times, but notably to ex-ante riskier firms, with worse credit and stock performance ex-post, consistent with evergreening of banks' outstanding credit to those (zombie) firms.

By distinguishing between healthy and risky banks' credit supply, we also contribute to the growing literature of credit supply during distressed periods including liquidity and capital crunches, e.g., Presbitero et al. (2014), Puri et al. (2011), Jiménez el al. (2012, 2017), and Iyer et al. (2014). Giannetti and Simonov (2010) document distressed banks' zombie lending in the aftermath of the Japanese financial crisis, Albertazzi and Marchetti (2010) in the aftermath of the Lehman failure in Italy, and Storz et al. (2017) in the Euro area during the sovereign debt crisis. Schivardi et al. (2017) and Andrews and Petroulakis (2019) provide evidence for the negative consequences of zombie lending for factor allocation, productivity and firm failures, in Italy and the entire Euro zone, respectively. Acharya et al. (2019b) show that during the sovereign debt crisis the ECB's unconventional monetary policy contributed to zombie lending. Acharya et al. (2019a) and Bittner et al. (2020) point out the negative consequences of monetary policy induced zombie lending. Our contribution with respect to these papers is that we find that banks' holding equity in firms foster evergreening incentives in crisis times, especially from ex-ante weaker banks. In addition, by focusing on Germany in the immediate post-Lehman period, it becomes unlikely that our results are blurred by unconventional monetary policies which were not yet taken at that time. Hence, our results indeed point to a structural effect. This is supported further by the fact that Germany was not in a severe macroeconomic crisis as compared to other countries where zombie lending should be even easier to find.

The remainder of the paper is organized as follows: Section 2 discusses the data and the empirical strategy, Section 3 summarizes the results, while Section 4 briefly concludes.

2 Data and Methodology

2.1 Data

Our bank-firm level data set combines information from four different databases: (1) The credit register, (2) Securities Holdings Statistics, (3) bank balance sheet data and (4) firm balance sheet data (as well as stock returns) for a time period from 2006 to 2011. The first three databases are provided by the Deutsche Bundesbank, and the firm balance sheet data are obtained from Bureau van Dijk's Amadeus that contain comprehensive accounting and ownership information on public and private companies across Europe. These data sources enable us to observe both the lending and the equity investment at the bank-firm level and to combine this information with bank- and firm-specific balance sheet information.

The credit register (MiMiK) is the main data source for the individual credit exposures of German banks. The credit register contains for each German bank quarterly information on large credit exposures of 1.5 million euros (formerly 3 Million Deutsche Mark) and above. While due to the reporting threshold exposures to small and medium-sized firms might be underrepresented in this database, it is less of a concern here as our analysis focuses on listed corporations that are relatively large.[2]

The Securities Holdings Statistics (SHS) comprises all security holdings by each German bank covering both customer safe custody accounts as well as banks' proprietary holdings on a single security basis (Amann et al. (2012)). The database provides quarterly information on all securities held, such as negotiable bonds and debt securities, negotiable money market paper, stocks, participating certificates and mutual fund shares. In this paper, we only focus on listed stocks held by banks.

To match these two data sets, we follow a step-by-step procedure. First, we employ a

[2] Moreover, if the sum of the exposures to firms in a holding company group exceeds the threshold of 1.5 million euros, the individual exposure to a firm in that group is reported, even if it is below the threshold.

manual match (using firm names) to match the borrower firms in the credit register with the listed firms in Amadeus. This match results in 1,668 borrower firms of which 717 are German corporations. Amadeus also provides the International Security Identification Number (ISIN) for the companies' securities, which enables us to match the data set with the banks' stock holdings from the SHS.[3] At the end, we have 1,172 European borrowers, including 603 domestic firms. Finally, we match these data with bank balance sheet information using bank identifiers. The matched sample used in regressions include all the German banks which have to report to credit register and also hold stocks, and all their credit exposures and equity holdings in firms.

2.2 Key Variables and Identification Strategy

We are interested in studying whether a bank's ex-ante equity position in a particular firm during crisis times affects its lending decisions vis-a-vis this firm, especially when the firm is in distress. We want to assess whether residual cash-flow rights held by banks mitigate firms' debt overhang problems or whether equity stakes aggravate the soft-budget constraint syndrome by inducing particularly weak banks to evergreen their credit exposures to avoid losses.

Defining a reasonable measure that captures a bank's equity investment in a firm is the key for our analysis. Unfortunately, our data do not distinguish between banks' banking and trading books. Therefore, we do not have the information on which stock positions are 'available for sale' and which are considered as longer-term strategic investments. Thus, if we would simply use the stock position held by a bank at the end of the previous quarter to explain the bank's credit outstanding to the firm by the end of this quarter, we would not know whether or not these stocks were already sold by the time the credit was granted. We also cannot rule out that a bank purchases an equity position exactly because it intends to provide also a large loan to the firm speculating on the positive announcement effect of such a loan provision on the company's share prices (James, 1987). Using the contemporaneous equity held by the end of the quarter in which a credit is granted would not eliminate the former problem and aggravate the latter. Moreover, using the contemporaneous equity holdings increases the concerns of

[3] The security holdings data do not provide names or identifiers for firms except ISIN codes of their securities.

unobserved variables in the model: A bank that has an information advantage about a firm might consider its shares as undervalued and purchase more while charging the lowest risk premium when lending to that firm. Hence the bank will make the cheapest loan offer and therefore extend more credit to this firm relative to other banks.

In order to mitigate these concerns, we use the following key variable as a measure for a bank's ex-ante equity position in a firm: We construct a simple dummy variable '$Stable\&Large\ Shares_{ijt-1}$' which equals to one if two conditions are simultaneously met: (1) if the bank holds the same amount of shares in the respective firm not only in the previous quarter (t-1) but also in the quarter before (t-2) and (2) if the portfolio share of that stock is in the top tercile of the respective bank in quarter t-1. Condition (1) allows us to filter from the data equity positions that are strategic long-term investments of the bank most likely belonging to their banking book. Stock positions taken in the bank's proprietary stock market investments and that are 'available-for-sale' typically vary between different quarters. Dropping positions that increased or decreased within the previous quarter not only implies that we are very conservative in identifying stock positions of the banking book, but it also helps to further mitigate endogeneity concerns such as banks topping up their strategic stock investment in a firm with some further share purchases when receiving a positive private signal about a firm–that would simultaneously induce the bank to grant a larger loan as well. Condition (2) ensures that we focus on sizable stock positions that indeed matter for the bank's economic performance and are therefore more likely to affect the bank's lending decisions.

In order to foster our identification strategy further, we use the dramatic change in loan growth in Germany after 2008. Many large German banks were heavily exposed to the U.S. subprime crisis and suffered huge losses also in the aftermaths of the Lehman collapse. This exogenous shock impaired bank lending capacity and induced them to significantly tighten credit standards (Köhler-Ulbrich et al., 2016). Figure 1 shows the aggregate credit exposure extended by our sample banks to sample firms and reveals a clear trend of declining credit exposure started from 2009Q1. In order to disentangle further demand and supply side effects and account for observed and unobserved bank- and firm-specific variation, we include comprehensive sets of fixed effects (bank-time as well as firm-time fixed effects).

To be more specific, we explain the credit exposure of bank *i* to firm *j* in quarter *t*

using the *Stable&Large Shares*$_{ijt-1}$ dummy indicating a persistent large equity holding by bank *i* in firm *j* in quarter *t*-1. Particularly we are interested in whether a large persistent equity position of a bank in a firm could mitigate the debt overhang problem of distressed firms. So, we interact the *Stable&Large Shares*$_{ijt-1}$ dummy with the crisis dummy and a variable indicating firm ex-ante riskiness, and estimate the following model:

$$\begin{aligned} Credit_{ijt} = {} & \beta_1 Stable\&Large\,Shares_{ijt-1} + \beta_2 Stable\&Large\,Shares_{ijt-1} \times Crisis_t + \\ & \beta_3 Stable\&Large\ Shares_{ijt-1} \times Risky\ Firm_{jt-1} + \\ & \beta_4 Stable\&Large\ Shares_{ijt-1} \times Crisis_t \times Risky\ Firm_{jt-1} + \\ & \alpha_{it} + \alpha_{jt} + (\alpha_{ij}) + \varepsilon_{ijt} \end{aligned} \quad (1)$$

where $Credit_{ijt}$ is the logarithm of the outstanding credit of bank *i* to firm *j* in quarter *t*. [4] $Stable\&Large\ Shares_{ijt-1}$ is a binary variable equal to 1 if bank *i* had over the previous two quarters (quarter *t*-1 and *t*-2) a persistent large equity position in firm *j*, and zero otherwise.[5] $Crisis_t$ is a dummy variable that equals 1 for the quarters during and after the recent crisis, namely, after the third quarter of 2008.[6] To measure the ex-ante riskiness of a firm, we construct the Firm Z- Score (Altman (1968)). We calculate the original Z-Score and use the threshold for distressed firms as defined in Altman (1968).[7] Accordingly, firms having a Z-Score of less than 1.81 have a high chance of going bankrupt, and firms that have a Z-Score between 1.81 and 2.99 are in the 'gray zone', meaning that they are not clearly safe and might get in distress. So we define $Risky\ Firm_{jt-1}$ as a binary variable equal to one if firm Z-Score in the previous year is smaller than 2.99. α_{it} and α_{jt} are bank-time fixed effects and firm-time fixed effects

[4] We add one to the Euro amount of credit to incorporate also zero credit exposures. The definition of credit exposure in our credit register data is rather broad, including not only loan exposures but also other broadly-defined credit exposures, such as corporate bond exposures.

[5] Since we also have some bank-firm-quarters when the bank goes short on the firm's stock, we put the restriction that $Stable\&Large\ Shares_{ijt-1}$ cannot be one if it is a short position. We also try alternative approaches, i.e., dropping those bank-firm-quarters with short positions. Our results of interest remain stable.

[6] Actually, the contraction in lending is not visible in Germany before the start of 2009 (Deutsche Bundesbank, Monthly Report, 9/2009). This is also shown in Figure 1. Since our sample ends in 2011, when the impact of recession still lasts, we define the crisis dummy to be one for all the quarters after 2008Q3.

[7] We use the coefficient employed in Altman (1968) to calculate Z-Score, that is Z-Score = 0.012 * (Working capital/Total assets) + 0.014 * (Retained Earnings/Total assets) + 0.033 * (Earnings before interest and taxes/Total assets) + 0.006 * (Market value equity/Book value of total debt) + 0.999 * (Sales/Total assets).

respectively, and ε_{ijt} is the error term.[8] Given our interest in lender equity positions in a borrower, we cluster at bank-firm level throughout the paper to correct for potential dependency over time for each bank-firm pair.

[Table 1 Here]

In the next step, we want to disentangle whether the credit extension to ex-ante distressed firms in which banks have persistent shareholdings is also influenced by bank quality. In order to do so we use the cross section of banks in our sample, calculate the Z-Score for each bank in each quarter and define a dummy variable *Risky Bank*$_{it-1}$ taking the value of 1 if bank *i* is in the lowest third of banks' Z-Score distribution in quarter $t-1$.[9] We reestimate Equation (1) interacting this dummy with the previous triple interaction terms or splitting the sample based on bank Z-Score. This permits us to analyze whether particularly weak banks–with presumably stronger incentives to evergreen credit exposures–extend more loans to ex-ante distressed firms if they hold a persistent large stock position in these firms.

To further pin down the mechanism, we also analyze ex-post measures, in particular loan defaults, restructuring events, downgrades in banks' own risk assessments for each firm and stock performance. That is, not only do we analyze whether ex-ante riskier (less healthy) banks lend more to ex-ante riskier firms during crisis times if they have an ex-ante equity position in the firm, but also the ex-post performance in terms of credit risk and stock returns. Regarding banks' own risk assessments for each firm, we analyze the lender own risk assessment to the borrower, but also all current lenders' assessment of that borrower in order to avoid rating manipulation from the lender that holds the equity position in the firm.

[Table 2 Here]

[8] We are aware that estimation with bank-time and firm-time fixed effects implicitly requires that one firm should borrow from at least two banks in a certain quarter and one bank should lend to at least two firms in one quarter. Hence, we explicitly put two restrictions on the sample used for regressions throughout all tables (except for the last table for reasons explained there): Restriction 1, which is used always along with firm-time fixed effects, requires that a firm should borrow from at least two banks in that quarter and at least one of the banks holds shares in that firm. Restriction 2, which is used always along with bank-time fixed effects, requires banks to lend to at least two firms in that quarter.

[9] The bank Z-Score has a different definition, which is the ratio of the sum of Mean (ROA) and Equity Ratio by the end of year k-1 relative to the SD(ROA) (both mean and standard deviation of ROA are taken over the three years from k-3 to k-1 , and k is the year the quarter t belongs to).

Table 2 provides the summary statistics of variables used in our analysis. First in Panel A we report the figures for the original samples.[10] We have 117,778 bank-firm-quarter observations for the credit exposures. The mean value of these exposures is 12.04 million euros where the standard deviation exceeds 45 million euros. The security holdings data that were matched (using both banks and firms) to credit exposure data consists of 95,683 bank-firm-quarter observations for banks' investment portfolios. We look at the number of shares held, which has a mean value of 318,833. For the matched sample, we fill in zeros if we either have positive stock holdings of a bank-firm pair in a quarter but no credit provision reported or if we have a positive credit exposure but no stock holdings for a given bank-firm pair in a quarter.[11] Therefore, Panel B of Table 2 has more observations for the matched sample (474,166) and hence has also a different distribution. The main explanatory variable *Stable&Large Shares*$_{ijt-1}$ has a mean value of 0.042 in the matched sample. However, around 20% of the 95,683 bank-firm-quarter observations in the original sample have *Stable&Large Shares*$_{ijt-1}$ equal to one, which is not low considering the strictness of the definition of this indicator variable.

3 Results

3.1 Do banks' shareholdings improve credit supply to distressed firms?

Table 3 presents the results of our baseline regressions. The results in column 1 indicate that when including only time-varying bank fixed effects but not controlling for firm heterogeneity, large strategic equity investments of banks in a firm negatively affect the bank's lending decision vis-a-vis the respective firm. When controlling for time varying firm heterogeneity (column 2), we find that banks provide more credit to firms in which they ex-ante have a large strategic equity position, but not when these firms are distressed. A firm in distress does not obtain significantly more credit from a bank that also holds a sizable strategic equity position in the firm.

[10] These are the samples after identifying the banks and firms available in both data sets: credit register and security holdings.

[11] Note, we do not fill in zeros if there is neither a credit exposure nor any stock holdings reported for a bank-firm pair in a given quarter.

This is different in the crisis period. Exploiting the crisis shock, banks extend more credit supply to distressed borrowers in which they also ex-ante owned an equity stake. So, in times of overall tighter credit conditions, distressed firms' access to bank credit supply increases if the bank also holds ex-ante a large persistent stock position in the firm. Economically, during crisis times, a bank with an ex-ante persistent equity stake in an ex-ante distressed firm increases the supply of credit volume to that firm by 7.36% as compared to other lenders without an equity position.[12]

In column 3 we replicate our analysis focusing on persistent and even larger shareholding positions in the banks' portfolio. In detail, we consider only those equity positions of a bank that are stable for two quarters and in the top quartile of the respective banks' shareholdings in the respective quarter. The results do not only remain qualitatively intact but also become both economically and statistically more significant. This is also intuitive: When the bank has a larger equity position in a distressed firm during the crisis, it is willing to provide relatively more to this firm to avoid losses. In order to further support this intuition we modify the way we define persistent large positions. In column 4 we use an alternative binary variable equal to one if the position is persistent (stable for two quarters) and the ratio of the value of the shares held by bank *i* in firm *j* over bank *i*'s total assets is in the top quartile of such ratios across *all* banks in quarter t-1. This variable indicates *large* stock positions in firms relative to the size of each bank and presumably better captures the economic risk that the equity position poses for the respective bank as compared to all other banks. The results do neither qualitatively nor quantitatively change. The economic and statistical significance of the coefficients is closely in line with those of column 3.

For our final regression, we change again the way we define large shares. So far in our analysis we only focus on share positions that are sizable relative to the bank's balance sheet. However, in order to overcome a *debt overhang problem*, what might actually rather matter is the following: the extent to which a bank can benefit from holding equity in a distressed firm when granting a new loan to that firm and make it viable again. So next we want to investigate the case when the bank's shareholdings amount to a sizable fraction of the distressed firm's outstanding equity. Hence, we define a new dummy

[12] The economic effects discussed here and in other places are always based on specifications with only firm-time fixed effects and bank-time fixed effects. These results are robust to the inclusion of bank-firm fixed effects, which capture other persistent bank-firm specific characteristics (see Appendix Table A.5)

Stable&Very Large Shares, which equals one if the number of shares held by bank *i* in firm *j* is stable for two quarters, and also large with regards to both the bank's size and the firm's market value, and zero otherwise. This means that simultaneously 1) the Euro value of shares held by *i* in *j* relative to firm *j*'s market capitalization exceeds 0.1% and 2) the Euro value of shares held by *i* in *j* to bank *i*'s total assets are in the top tercile of that bank-quarter. That is to say, we put an extra restriction on top of the *Stable&Large Shares* dummy used in our baseline model. Although 0.1% of a firm's market capitalization may not seem very restrictive, using this indicator reduces the considered bank stock positions by 50% compared to the baseline case. Interestingly, the magnitude of the coefficient on the triple interactions between Stable & Very Large Shares, Crises and Risky firm (column 5) is six times larger compared to that in column 2.[13] This finding supports the view that the larger a bank's equity stake in a firm's market capitalization the more the bank is willing to lend to the firm if distressed during crisis times, consistent with the idea that the bank can reap a larger part of the positive effect on the firm's stock market valuation from rolling over the loan.

[Table 3 here]

To summarize, the results presented so far suggest that in times of crisis, banks supply more credit to ex-ante distressed firms if they also hold an ex-ante large persistent equity position in these firms.

3.2 Which banks provide more credit to distressed firms?

The results in the previous section are consistent with a reduction in debt overhang problems, but less benign motives are also possible. Next, we explore these motives and hence the characteristics of banks that continue lending to distressed firms in which they also hold a persistent and large fraction of their stock portfolio. In particular, we are interested in whether an ex-ante sizable equity position fosters zombie lending especially for banks that are themselves rather fragile. To provide a first impression, Figure 2 displays the average credit exposure using the original data for groups divided by

[13] The test on the equality between the coefficients on the triple interaction in column 2 and column 5 rejects the null that these coefficients are equal at 1% significance level.

Stable&Large Shares, *Risky Firm* and bank Z-Score terciles. Banks with the lowest Z-Score have the largest average credit exposure to risky firms if those banks also have a large and stable equity position in those firms.

In order to formally verify this, we use a quadruple interaction term exploiting the crisis shock. We define a dummy variable *Risky Bank* indicating whether bank *i*'s Z-Score was by the end of the previous year in the bottom tercile and interact this dummy with our key variable of interest, the triple interaction term between the dummy for a long-term stable share position of bank *i* in firm *j* (*Stable&Large Shares*$_{ijt-1}$), the crisis dummy (*Crisis*$_t$), and the dummy variable indicating whether firm *j* is in distress (*Risky Firm*$_{jt-1}$). Since Table 3 indicates that our results are robust to different definitions of persistent large stock positions of a bank in a firm, we continue our analysis using our baseline definition 'Stable & Large Shares (*Top Tercile*)' in Table 4.[14]

[Table 4 here]

Column 1 of Table 4 report the results of our first regression. As in our previous analysis, we find that in normal times stable banks tend to extend more credit to firms in which they hold a large persistent equity stake but cut back their lending to those firms once the firm is in distress. Moreover, in crisis times, these banks do not behave significantly different: neither do they cut credit supply by less or more to related firms, nor do they cut back credit supply more if those firms are in distress.

There is, however, a stark contrast by riskier banks, e.g., with Z-Score in the bottom tercile. In crisis times, low Z-Score banks significantly reduce their credit supply to firms in which they hold an equity stake, but they do supply more credit to firms in which they have a large persistent equity position if those firms are in ex-ante financial distress (quadruple interaction in column 1). Economically, during crisis times, a low Z-Score bank with an ex-ante persistent equity stake (as compared to without persistent equity stakes) in a risky firm increases the supply of credit by 65.53%.

To check the robustness of our results we also split the sample and run the same regressions separately for those banks with a Z-Score in the lowest third of the

[14] Results using the alternative measures for persistent large share positions and Risky Bank are presented in the Appendix Table A.1 to A.4.

distribution (column 2) and those banks with a Z-Score in the highest third of the distribution in a given year (column 3). The results confirm our previous analysis: safe banks tend to supply more credit to firms in which they hold large persistent equity positions in normal times and cut back their lending when these firms are in distress. In crisis times, those banks do not significantly change their credit supply (column 3). In contrast, distressed banks cut back their credit supply significantly to firms in which they have large stable shareholdings in crisis times, but they supply more credit if these firms are also in ex-ante financial distress (column 2).

In order to further assess the robustness of our findings, we define all banks with a Z-Score below the median as *Risky Bank* (column 4). We rerun our regressions using a quadruple interaction term and obtain both qualitatively and quantitatively very similar results compared to column 1. As a further robustness test, we replace both dummies identifying risky firms and risky banks with the continuous variables of firm Z-Score and bank Z-Score, respectively. As the results in column 5 indicate, the quadruple interaction between the dummy for persistent large share holdings, the crisis dummy, the firm's Z-Score as a continuous variable and the bank's continuously measured Z-Score is positive and significant, implying that a bank with a lower Z-Score tends to supply more credit to a firm also with a lower Z-Score, if the bank ex-ante holds persistent large share positions in the firm in crisis times. This is consistent with the results using binary variables for firm and bank quality.

In sum, the results in this section suggest that an ex-ante stable and sizable equity position of a bank in a firm does not increase the willingness for an average bank to extend credit to that firm in crisis times. It is only the relatively unstable banks (with comparatively low Z-Scores) for which a sizable equity investment fosters the supply of credit to distressed firms in crisis times. Results are consistent with ex-ante large stable share positions of banks in firms do not seem to alleviate credit constraints and debt overhang problems for ex-ante distressed firms in crisis times, but they rather foster evergreening by zombie banks. We will further analyze this channel in detail with ex-post measures of firm performance (credit risk and stock returns), but before that we analyze whether our ex-ante results are stemming from a bank-firm relationship effect, in which relationship banks could have better inside information on their borrowers.

3.3 Is it only a relationship lending effect?

Our previous results could be driven by relationship lending (see Botsch and Vanasco, 2019). For example, risky banks might be risky because they maintain close lending relationships to riskier borrowers, especially in crisis times. Banks might be more likely to hold large persistent share positions in firms with which they maintain a close lending relationship. In order to address this, we include a relationship lending measure at the bank-firm level, which is continuous and time varying. It captures the intensity of the bank-firm credit relationship by reporting the one quarter lagged fraction of firm *j*'s total bank loans (reported to the German credit register) obtained from bank *i*. The higher this ratio the more intense is the bank-firm credit relationship.

We note that our main identification comes from differences in banks' lending to distressed firms during the crisis. Thus, it might not be sufficient to include only the relationship variable as a time varying control variable to account for relationship lending effects. In order to fully control for the relationship effects, we add to our baseline regression the full set of interaction terms between the relationship measure, the measure for ex-ante distressed firms, the measure for risky banks and the crisis dummy.

We want to explore whether our key finding that particularly risky banks holding equity in an ex-ante distressed firm supply more credit to this firm during the crisis is also robust to accounting for relationship lending effects. For our first test, we rerun the first regression presented in Table 4 with the full quadruple interactions and include in addition the full interactions between the relationship measure, Risky Firm dummy, Risky Bank dummy and the Crisis dummy (column 1). In a further set of regressions we split the sample and rerun the same regression as in column 1 but on a subsample comprising only comparably unstable banks, i.e. the third of banks with the lowest Z-Score (column 3), and on a subsample comprising the relatively solid banks, i.e. the third of banks with the highest Z-Score (column 5). Next to each column with the relationship variable and its interactions with other variables, we copy from Table 4 the corresponding estimates without relationship variable.

[Table 5 here]

Overall, our results regarding the relationship lending effect are quite robust to either quadruple interactions or the sample split: Banks have more credit outstanding with

relationship borrowers in particular if the borrower is in distress. But in crisis times, particularly the riskier banks supply significantly *less* credit to distressed relationship borrowers than in normal times. The effect of large stable equity positions on banks' lending decisions is in stark contrast to the relationship effect. When taking full account of the relationship lending effects we still find that in crisis times, persistent equity position of a bank in a firm fosters the bank's willingness to lend to the firm if both sides are in ex-ante financial distress. However, comparing the results with and without relationship controls (column 1 and 2) reveals that by accounting for persistent bank-firm credit relationships the effect of risky banks' shareholdings on their credit supply to risky firms in crisis times has been almost halved. We find similar effects when we divide the sample between weaker banks (column 3 and 4) versus strong banks (column 5 and 6).

3.4 Do banks suffer from the evergreening?

Our previous results indicate that, during crisis times, banks – especially weak banks – extend more credit to ex-ante distressed firms in which they hold an ex-ante large and persistent equity position. This result is consistent with evidence for evergreening. However, this result could also be consistent with better (inside) information from banks with equity positions. Moreover, controlling for bank-firm lending relationships weakens somewhat estimated coefficients, though results are still strong economically and statistically.

Importantly, so far, we identify distressed firms based on ex-ante publicly observable information, which is the firm's lagged Z-Score. We cannot exclude that banks with sizable equity positions in a firm might obtain private signals about the true quality of the firm. Particularly weak banks might find it attractive to extend credit to firms that appear to be in distress based on public information, while the banks' private signal indicates that they are actually of good credit quality and hence reduce debt overhang problems in crisis times. Following this line of reasoning we would expect that those firms that obtain credit should turn out to be of higher credit quality and stock returns ex-post. In order to test for this channel we use three different measures for firms' ex-post performance: The subsequently reported credit events of the firm, the firm's subsequent stock price movement, and the ensuing average probability of default reported by the different

lenders of the firm.

Reported credit events

Besides the credit exposures, our credit register data also comprises information about credit events at the exposure level. Each bank reports a default code for a given borrower, which reflects the severity of a borrower's credit events and provides an evaluation of the creditworthiness of the exposure by the bank in the respective quarter. Panel B of Table 1 provides an overview of the categories of credit events and the respective coding.

[Table 1 Panel B here]

While our credit event data is reported at the bank-firm level, this information suffers from several biases: 1) banks–in particular weak ones–might have an incentive to delay the reporting of credit events to the regulator, 2) especially those weak banks that roll-over existing loans might do so particularly to avoid having to report a credit event, 3) the lender that first experiences a credit event might be the one lending at the shortest maturity, 4) distressed firms might selectively default on loans to specific lenders. In order to mitigate these selection effects we aggregate our credit event information at the borrower level.

To be more specific, for our first test we group these codes into three categories at the borrower-quarter level: If all lenders to firm *j* report a 0 (no credit events) in all quarters of the two subsequent years we consider this as *no default*; if any lender to *j* reports a code of 1 or above in the next two years we consider this as a subsequent *credit event*; if at least one of the lenders to *j* reports a code 3 or above in the next two years, we consider this as indicating a subsequent *default*. Using *credit event* and *default* as two alternative identifiers for ex-post (credit) risky firms, we test whether weaker banks supply larger credit in crisis times to firms (in which they have large ex-ante persistent share positions) that turn out to be risky ex-post, i.e. experiencing subsequently a credit event or default. Thus we use a triple interaction of the binary variable for a *Stable & Large Share* position, the crisis dummy and the indicator for an ex-post risky firm on lending by a bank to a firm. In order to identify whether particularly risky banks extend more credit to an ex-post risky firm in crisis times when they hold a persistent large share position in that firm, we further interact this triple interaction term with a dummy variable for risky banks. That is, we replace the *ex-ante* firm risky dummy from Table 4

into an *ex-post* firm risky measure.

Columns 1 and 2 of Table 6 report our regression results for the two respective identifiers of ex-post risky firms. While we do not find that stable banks follow a particular lending policy, risky banks maintain generally larger credit exposures to ex-post risky firms, i.e. firms that experience in the subsequent two years a credit event or default. In crisis times, risky banks generally cut back their credit supply to those ex-post risky firms. While generally, during the crisis, risky banks also cut back their credit exposure to firms in which they hold an ex-ante stable large equity position, risky banks increase their exposures to those firms in which they held an equity stake that turned out ex-post to be risky, i.e. that those that are more likely to experience a credit event or default within the subsequent two years. This finding suggests that risky banks are unlikely making their lending decisions to risky firms in which they ex-ante hold an equity stake based on private information about the borrowers' superior credit quality. On the contrary it rather suggests that the evergreening of risky banks with ex-ante shareholdings exposes those banks to elevated credit risk and loan losses ex-post.

[Table 6 here]

In order to test the robustness of these findings and further dissect whether the evergreening is indeed related to higher loan losses we next split the credit events into those that presumably involve a material credit loss to the bank (those events coded 6, 7, 8) and less severe credit events (events coded 1 to 5 and 9). We define a new dummy variable *severe default* equal to one if at least one bank lending to the respective firm reports one of the former events, and equal to zero otherwise. If none of the lenders (to a particular firm) reports a severe default but at least one lender reports one of the later credit events, this is indicated by the dummy variable *modest event*. In order to assess whether the evergreening to risky firms with ex-ante larger persistent equity positions by risky banks is also associated with larger fraction of those loans being not (fully) repaid, we separately interact these two dummies with the triple interaction between the dummy *Stable & Large Shares* indicating persistent large share positions of a bank in a firm, the crisis dummy and the respective dummy indicating a risky bank.

Results reported in column 3 of Table 6 indicate that risky banks with an ex-ante large persistent equity stake extend more credit supply in crisis times only to those firms that subsequently severely default. Those firms that experienced only relatively modest credit

events do not receive significantly more credit from risky banks with an equity stake during crisis times.

Economic effects of these results are also significant. As the coefficients in column 1-3 reveal, in crisis times, ex-ante risky banks with an ex-ante persistent equity stake in a firm provide 15.26% more credit supply to a borrower who subsequently has a negative credit event, 15.95% more to a borrower who ex-post defaults, and 10.85% more to a firm that subsequently declares bankruptcy or needs a restructuring.

In order to further verify the finding in column 3, we split the sample in columns 4 and 5. For the third of banks with the lowest Z-Score – the riskiest banks – we find that they generally lend more to firms in which they also hold an equity stake, but they cut back their credit supply to those firms in crisis times. While they also reduce their lending to firms that subsequently *severely default*, this is reversed during the crisis (column 4). In contrast, for firms that subsequently experience only a *modest credit event*, risky banks do not significantly change their credit supply before or after the crisis. At the same time for safe banks – in the upper third of the Z-Score distribution – we do not find any significant heterogeneity in credit supply to firms with subsequent modest credit events or severe default before or after the crisis (column 5). Note also that the estimated coefficients of the triple interaction term in columns 4 versus 5 are statistically significantly different to each other, i.e. weaker versus stronger banks supply credit to ex-post risky firms in crisis times differently.

To sum up, the main results in this paper are not consistent with the idea that ex-ante risky banks with ex-ante persistent equity stakes make their lending decisions to risky firms in crisis times based on reliable superior private information about the borrowers' superior credit quality. On the contrary, results rather suggest that the observed credit supply indeed reflects evergreening and shows that the evergreening associated to large persistent equity positions does expose ex-ante fragile banks to elevated credit losses.

Stock returns

Next we use the stock returns in the two subsequent years after a credit decision as an alternative proxy for the ex-post quality of the borrower. On the one hand this aims to test the robustness of our previous results as we would expect that a firm's stock price also severely drops in case of an imminent default. On the other hand, looking at the

firm's stock returns also allows us to check whether the evergreening and the associated elevated credit risks taken by banks when holding stocks in a firm is (at least partially) offset by an increase in the value of the stock position banks hold in this firm. To be more specific, we calculate for each firm the two-year holding period stock return from the end of quarter t to the end of $t+8$ and rank firms according to their subsequent ex-post returns. We define a time-varying dummy variable that indicates for each quarter whether a particular firm belongs to the third of firms with the lowest stock returns over the two subsequent years. In column 6 of Table 6 we use this as an alternative dummy variable identifying an 'ex-post risky firm'. Following the previous approach, we interact it with the triple interaction term for ex-ante risky banks' lending to a firm in which they ex-ante hold a stable large share position in the crisis period.

Interestingly, we find that generally when a bank cuts back its lending to a firm, in which it holds equity, the share price subsequently declines. Or vice-versa the bank cuts back its lending to those firms, in which it holds shares ex-ante, that will subsequently have below average returns. During the crisis period, this effect is not significantly different.

This is in stark contrast to what we observe for risky banks. In crisis times they significantly increase their credit supply to those firms in which they hold an ex-ante equity stake that subsequently have stock returns in the bottom tercile. These results are confirmed if we split our sample into risky and stable banks instead of using a quadruple interaction term. As the results reported in column 7 and 8 of Table 6 show, here only risky banks cut back lending to those firms in which they hold an ex-ante equity stake and that subsequently deteriorate most severely in value. However, in the crisis we again find that the risky banks – and only those – extend more credit supply to those firms.

These results suggest that our main finding of this paper (higher credit supply to ex-ante riskier firms by banks with equity positions) does not reflect superior information of the lending bank or a mitigation of the debt overhang problem but rather indicates evergreening, as in crisis times fragile banks with ex-ante equity stakes not only experience larger loan losses from their exposures to those firms, but also suffer from an underperformance of the related stock positions. That is, our results suggest that banks' equity stakes in their borrowers do not mitigate debt overhang problems of distressed firms in crisis times, but rather foster evergreening of banks' outstanding credit to those

(zombie) firms.

Borrower's deteriorating credit quality

Besides the reported credit events our credit register data also contains information on the probability of default (PD) of a firm assigned by each bank using the internal rating based (IRB) approach to each borrower. [15] Due to differences in the internal rating models, different banks might assign different PDs to a certain borrower in the same quarter. We are interested in how the credit quality of those firms evolve in which a bank holds an ex-ante large persistent equity stake and to which the bank grants further loans during times of tight credit conditions. Thus we calculate at the bank-firm level the percentage change of the PD in the two year subsequent to a lending decision. We acknowledge that the bank-firm PD might be noisy (due to different IRB models, private information, different maturities etc.) and could potentially be affected by resulting biases. Therefore, for our main tests, we use the information aggregated at the firm level to identify the firms whose credit quality deteriorates most severely. We employ two approaches in aggregating the data. For our first approach, we identify at the bank-firm level the percentage growth rate of the PD from quarter t to t+8. Then we rank for each quarter t the maximum subsequent PD growth rate across all reporting banks at the firm level and identify those firm-quarter observations in the top tercile with a binary variable 'MAX PD growth Top Tercile'. For our second approach, we derive the average subsequent PD growth rate across all reporting banks at firm-quarter level, sort the firms for each quarter according to their mean subsequent PD growth rate, and assign a binary variable 'MEAN PD growth Top Tercile' identifying those firm-quarter observations in the upper third of the distribution as 'ex-post risky firm'. We use these two approaches to ensure that our results not only hold for the most conservative estimation of the PD deterioration but also for the average.

[Table 7 here]

We aim to investigate whether particularly risky banks supply in crisis times higher credit to ex-post risky firms in which they hold an ex-ante large persistent equity position, in which credit quality subsequently deteriorates based on PDs. To address this, we run

[15] Since only banks that adopted the IRB approach report a PD rating for existing exposures, the cross section for this exercise is smaller as compared to the regressions using the reported credit events.

again a regression to explain the credit supply from the bank to the firm with a quadruple interaction between the dummy variable identifying a risky bank with a Z-Score in the lowest third of the distribution, the crisis dummy, the dummy for a large and persistent share position of the bank in the firm and the dummy for a firm that experiences subsequently a severe decline in its credit quality based on the PDs.

Column 1 and 2 of Table 7 report our results using our most conservative identifier for a firm of deteriorating credit quality ('MAX PD growth Top Tercile'). Interestingly, banks with an ex-ante persistent equity stake supply less credit supply in crisis times to firms that subsequently deteriorated in credit quality. Differently, ex-ante riskier banks increase their credit supply in crisis times to firms of severely deteriorating credit quality in which they have an ex-ante equity stake (as compared to normal times and ex-ante stronger banks). This finding holds also if we include bank-time and firm-time fixed effects, not just firm fixed effects.

When we use the less conservative identifier 'MEAN PD growth Top Tercile' for a firm with deteriorating credit quality, our results are substantially weaker with firm fixed effects. However, if we include bank-time and firm-time fixed effects we still find a marginally significant quadruple interaction term suggesting that indeed in the crisis, risky banks with a larger persistent equity position supply more credit to firms whose credit quality severely deteriorate subsequently.

Finally, we use the deterioration in a firm's PD as reported by the respective lender. More specifically we calculate for each IRB bank and each quarter the percentage change over the subsequent two years in the reported PD for each of its borrowers and create a new dummy variable 'Bank-Firm PD growth Top Tercile' equal to one if the reported bank-firm level PD growth is in the highest third of the distribution in quarter t, zero otherwise. We run the equivalent regressions with a quadruple interaction both using firm fixed effects and bank-time fixed effects (column 5) as well as firm-time and bank-time fixed effects (column 6). As the results show in these specifications we do not find any significant effect. That is, given these last results and the results based on columns 1, 2 and 4 (based on all the banks lending to that firm in that quarter), results on columns 5 and 6 suggest that risky banks that engage in evergreening exposures to firms in which they hold a stock position do underestimate the reported PD of those firms as compared to other banks. Note that the lack of results in columns 5 and 6 compared to the other ones are not due to a substantial decline

in the number of observations compared to the other regressions, but the estimated coefficients even change the estimated sign.[16]

4 Conclusion

In this paper we analyze how banks' equity stakes in firms influence their credit supply in crisis times. For empirical identification, we exploit the 2008 Global Financial Crisis and merge unique supervisory data from the German credit register on individual bank-firm credit exposures with the security register data that include banks' equity holdings.

Our results suggest that a large and ex-ante persistent equity position held by a bank in a firm is associated with a larger credit provision from the respective bank to that firm. In crisis times, however, equity stakes only foster credit supply to ex-ante riskier firms especially from relatively weak banks. This ex-ante risk-taking may be due to better (insider) information by the bank, including a traditional lending relationship over the crisis. However, this ex-ante riskier lending translates also into higher ex-post loan defaults, worse firm-level stock market returns and even more firm bankruptcy or restructuring cases. Our results therefore suggest that banks' equity stakes in their borrowers do not mitigate debt overhang problems of distressed firms in crisis times, but rather foster evergreening of banks' outstanding credit to those (zombie) firms.

[16] Only when the bank has a credit exposure to the firm in both quarters t and t+8 we have reported PD and are able to calculate the PD growth rate. This explains why the number of observations drops significantly in Column 5 and 6, as compared to Column 1 to 4 in which the bank-firm level PD growth rates are aggregated at the firm level. Also due to the thinly reported bank-firm level PD, adopting the restrictions as we had from previous tables will render some coefficients missing in estimated results in Column 5 and 6. To make the columns in this table comparable, we drop the restrictions in all specifications in this table, such that the number of observations in Column 1-4 will be slightly larger than that in the previous tables.

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Figures

Figure 1:

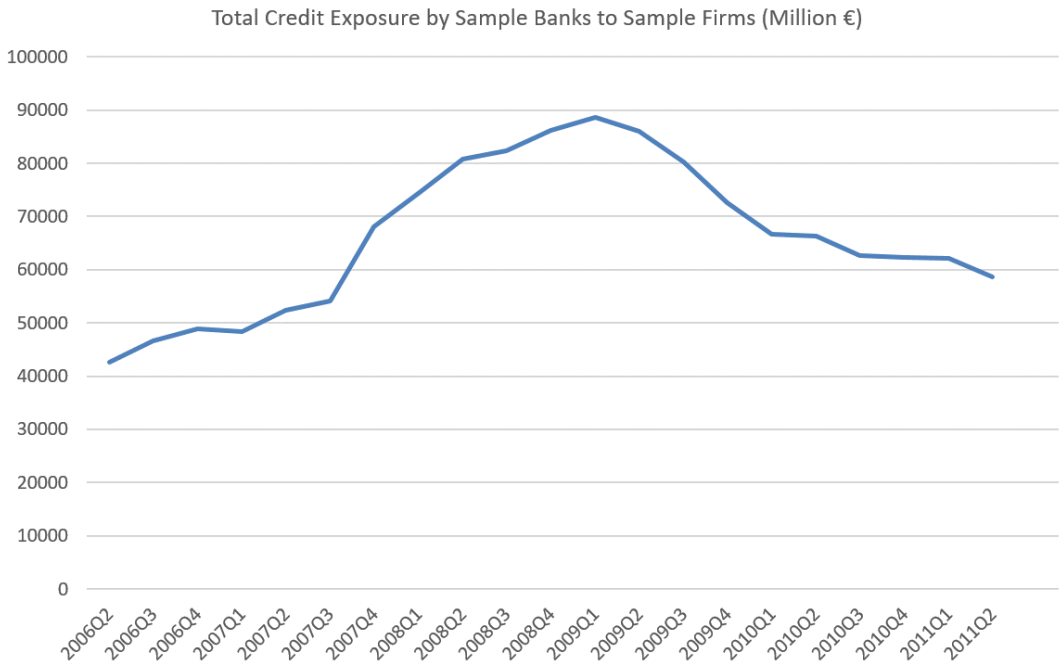

Figure 2:

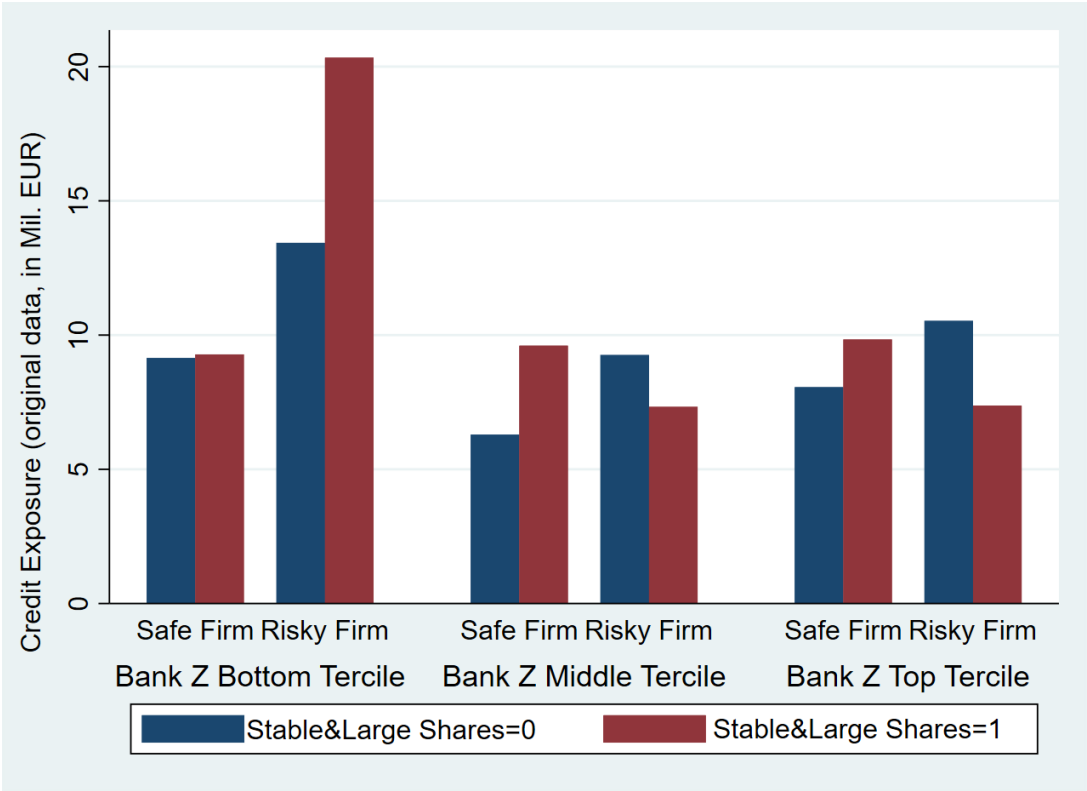

Table 1
Panel A: Variable Definitions

Variable Name	Definition and Measurement	Data Source
Bank-firm level variable		
Log Credit Exposure	Logarithm of credit exposure by bank i to firm j in quarter t.	Credit register
Number of Shares	Number of shares held by bank i in firm j in quarter t-1.	Securities Holdings Statistics
Duumy Shareholdings	Binary variable equal to 1 if number of shares held by bank i in firm j in quarter t-1 is not equal to zero, zero if no shares held.	Securities Holdings Statistics
Stable&Large Shares (*Top Tercile , Top Quartile or Top Quartile, across all banks)*	Binary variable equal to 1 if bank i has in firm j the same amount of shares over the quarter t-1 and t-2, and the value of shares over bank's total assets is above *66.67* (or *75*) percentile of those shares held in all the firms by bank i (or by all banks in the case of *across all banks*) in quarter t-1, zero otherwise. Stable&Large Shares cannot be one if it is a short position.	Securities Holdings Statistics
Stable& Very Large Shares	Binary variable equal to 1 if two conditions are simultaneously met: 1) Stable&Large Shares (*Top Tercile*) equals to one, and 2) the value of shares held by bank i in j relative to firm j's market capitalization exceeds 0.001 in t-1; zero otherwise.	Securities Holdings Statistics
Crisis	Binary variable equal to 1 for quarters after 2009 Q1; zero otherwise.	
Relationship	The ratio of credit exposure of bank i to firm j in quarter t-1 to firm j's total credit exposure in quarter t-1.	Credit register
Ex-Post Risky Firm *(Bank-Firm PD growth Top Tercile)*	Binary variable equal to 1 if the percentage growth rate of the bank-firm level PD from quarter t to t+8 is in the top tercile of the distribution in quarter t, zero otherwise.	Credit register
Firm level variable		
Firm Z-Score	The original Altman Z-Score in the previous year, that is Z-Score =0.012*Working capital/Total assets+0.014*Retained Earnings/Total assets+0.033*Earnings before interest and taxes/Total assets+0.006*Market value equity/Book value of total debt+0.999*Sales/Total assets	Amadeus
Risky Firm	Binary variable equal to 1 if the Firm Z-Score in the previous year is below 2.99, zero otherwise.	Amadeus
Ex-Post Risky Firm *(Credit Event)*	Binary variable equal to 1 if any lender of firm j reports a credit event code of 1 or above in any quarter of the two subsequent years (quarter t+1 to t+8), zero otherwise.	Credit register
Ex-Post Risky Firm *(Default)*	Binary variable equal to 1 if at least one of the lenders to firm j reports a credit event code 3 or above in the two subsequent years, zero otherwise.	Credit register
Ex-Post Risky Firm *(Severe Default -Restrucruting & Bankruptcy)*	Binary variable equal to 1 if at least one bank lending to firm j reports one of the severe credit events involving a material credit loss to the bank (those events coded 6, 7, 8), zero otherwise.	Credit register
Ex-Post Risky Firm *(Modest Event)*	Binary variable equal to 1 if none of the lenders to firm j report a severe default (those events coded 6, 7, 8), but at least one lender reports one of the modest credit events (events coded 1 to 5 and 9); zero otherwise.	Credit register
Ex-Post Risky Firm *(Firm Stock Return Bottom Tercile)*	Binary variable equal to 1 if the two-year holding period return from the end of quarter t to the end of quarter t+8 for firm j's stock is in the bottom tercile of the distribution in quarter t, zero otherwise.	Amadeus

Table 1 Panel A Continued

Variable Name	Definition and Measurement	Data Source
Ex-Post Risky Firm *(MAX PD growth Top Tercile)*	Binary variable equal to 1 if the firm is in the top tercile of the distribution for 'maximum subsequent PD growth rate' in quarter t. Maximum subsequent PD growth rate is derived by first calculating the percentage growth rate of the bank-firm level PD from quarter t to t+8, then for each firm-quarter taking the maximum subsequent PD growth rate across all banks.	Credit register
Ex-Post Risky Firm *(MEAN PD growth Top Tercile)*	Binary variable equal to 1 if the firm is in the top tercile of the distribution for 'mean subsequent PD growth rate' in quarter t. Mean subsequent PD growth rate is derived by first calculating the percentage growth rate of the bank-firm level PD from quarter t to t+8, then for each firm-quarter taking the average subsequent PD growth rate across all banks.	Credit register
Bank level variable		
Bank Z-Score	A ratio equal to the sum of Mean (ROA) and Equity Ratio by the end of year k-1 over SD (ROA) (both mean and standard deviation of ROA are taken over the three years from k-3 to k-1 , and k is the year the quarter t belongs to).	Bank Balance Sheet Data
Risky Bank *(Bank Z Bottom Tercile)*	Binary variable equal to 1 if the bank is in the lower 33.33 percentile of the bank z-score distribution in the respective year.	Bank Balance Sheet Data
Risky Bank *(Bank Z Bottom Half)*	Binary variable equal to 1 if the bank is in the lower 50 percentile of the bank z-score distribution in the respective year.	Bank Balance Sheet Data
Risky Bank *(Bank Z Bottom Quartile)*	Binary variable equal to 1 if the bank is in the lower 25 percentile of the bank z-score distribution in the respective year.	Bank Balance Sheet Data

Note.This table provides the variable name, definition, measurement and data source.

Table 1
Panel B: Classification of Credit Events

Code	Description of credit event
0	No default
1	Material deterioration in credit quality--more than 90 days past due (excluding the cases in Code 2)
2	Material deterioration in credit quality--loans to public authorities or real estate loans in the retail exposure class --more than 180 days past due
3	Full payment unlikely--credit obligation put on non-accrued status
4	Full payment unlikely--significant specific credit adjustment
5	Full payment unlikely--credit obligation sold at material credit-related economic loss
6	Full payment unlikely--restructuring
7	Full payment unlikely--institution has filed for debtor's bankruptcy
8	Full payment unlikely--debtor has filed insolvency petition
9	Full payment unlikely--other reasons

Table 2
Panel A: Summary Statistics - Original Sample

Variable	Sample	Unit	Number of Obs.	Mean	Std. Dev.	10th p.	25th p.	Median	75th p.	90th p.
Credit Exposure	Original	EUR mln	117,778	12.044	45.146	0.00	0.00	2.188	8.025	25.000
Shareholdings	Original	Number	95,683	318,833	13,000,000	140	500	4,400	21,000	124,833
Firm Z-Score	Original	Scale	4,938	3.704	18.383	0.813	1.466	2.283	3.487	5.271
Bank Z-Score	Original	Scale	4,420	103.343	1,149.992	10.660	17.704	31.307	59.859	119.740

Note.This table provides the number of observations, mean, standard deviation, 10th percentile, 25th percentile, median, 75th percentile and 90th percentile for the original variables.

Panel B: Summary Statistics - Matched (Filled in) Sample

Variable	Unit	Number of Observations	Mean	Std. Dev.
Credit Exposure	EUR mln	474,166	2.991	23.094
Log Credit Exposure	Logarithm	474,166	2.708	5.895
Number Shares	Number	474,166	64,337.950	5,827,547.000
Value Shares	EUR	474,166	902,630.900	79,000,000.000
Dummy Shareholdings	Binary	474,166	0.180	0.384
Stable&Large *(Top Tercile)*	Binary	450,536	0.042	0.200
Stable&Large *(Top Quartile)*	Binary	450,536	0.033	0.179
Stable& Very Large Shares	Binary	406,058	0.004	0.063
Firm Z-Score	Scale	393,490	2.630	7.958
Bank Z-Score	Scale	358,000	67.486	436.969
Relationship	Scale	452,613	0.025	0.121

Note.This table provides the number of observations, mean, standard deviation for variables used in the regressions.

Table 3: Explaining Bank Credit Supply with Stable and Large Shareholding and Firm Quality

	(1)	(2)	(3)	(4)	(5)
Dependent Variable	Log (Bank-Firm Exposure)				
Stable & Large Shares variable being used	Top Tercile		Top Quartile	Top Quartile, across all banks	Very large Shares
Stable&Large Shares * Crisis * Risky Firm	0.439	1.201*	1.653**	1.427**	7.728***
	[0.407]	[0.708]	[0.771]	[0.595]	[2.618]
Stable&Large Shares	-0.683***	1.219**	1.310**	0.989**	8.512***
	[0.261]	[0.474]	[0.535]	[0.415]	[1.314]
Stable&Large Shares * Crisis	-0.122	-0.882	-1.205*	-1.076*	-7.077***
	[0.346]	[0.657]	[0.711]	[0.554]	[2.286]
Stable&Large Shares * Risky Firm	-0.466	-1.467***	-1.595***	-1.397***	-3.906**
	[0.304]	[0.510]	[0.572]	[0.442]	[1.888]
Risky Firm	0.988***				
	[0.087]				
Crisis * Risky Firm	0.155				
	[0.102]				
Observations	278,867	144,986	144,986	144,986	141,725
R-squared	0.170	0.314	0.314	0.314	0.316
Bank*Time FE	Yes	Yes	Yes	Yes	Yes
Firm*Time FE	No	Yes	Yes	Yes	Yes

Note. The table reports estimates from ordinary least squares regressions. The dependent variable is the natural logarithm of credit exposure by banks to firms. Table 1 contains all variable definitions. Coefficients are listed in the first row, robust standard errors clustered at firm-bank level are reported in the row below, and the corresponding significance levels are adjacent to the coefficient. The Stable&Large Shares variable being used in each column is indicated in the column header. "Yes" indicates that the set of fixed effects is included. *** Significant at 1%, ** significant at 5%, * significant at 10%.

Table 4: The Impact of Bank Quality

	(1)	(2)	(3)	(4)	(5)
Dependent Variable	Log (Bank-Firm Exposure)				
Risky Bank variable being used	Bank Z Bottom Tercile			Bank Z Bottom Half	Bank and Firm Z-Score (Continuous Variable)
Sample	All	Bank Z Bottom Tercile	Bank Z Top Tercile	All	All
Stable&Large Shares * Crisis * Risky Firm * Risky Bank	4.240**			4.392***	0.009**
	[1.750]			[1.620]	[0.004]
Stable&Large Shares * Crisis * Risky Firm	-0.561	4.082***	0.754	-1.121	-0.196
	[0.944]	[1.350]	[1.320]	[1.081]	[0.255]
Stable&Large Shares * Crisis * Risky Bank	-3.658**			-3.793**	-0.011**
	[1.634]			[1.512]	[0.005]
Stable&Large Shares	1.057*	1.467	1.565**	1.183**	-0.689*
	[0.565]	[0.950]	[0.702]	[0.551]	[0.368]
Stable&Large Shares * Crisis	0.563	-3.387***	-0.768	1.058	0.343
	[0.888]	[1.238]	[1.233]	[1.016]	[0.578]
Stable&Large Shares * Risky Firm	-1.239**	-1.689*	-1.373*	-1.322**	0.290***
	[0.616]	[1.014]	[0.782]	[0.614]	[0.110]
Stable&Large Shares * Risky Bank	0.442			0.086	-0.001
	[1.046]			[0.892]	[0.003]
Risky Firm * Risky Bank	0.236			-0.002	-0.000
	[0.277]			[0.274]	[0.000]
Stable&Large Shares * Risky Firm * Risky Bank	-0.340			-0.128	0.001
	[1.126]			[0.973]	[0.001]
Crisis * Risky Firm * Risky Bank	-0.496			-0.482	0.001*
	[0.382]			[0.392]	[0.001]
Observations	121,537	49,599	35,834	121,537	121,537
R-squared	0.319	0.309	0.385	0.319	0.319
Firm*Time FE	Yes	Yes	Yes	Yes	Yes
Bank*Time FE	Yes	Yes	Yes	Yes	Yes

Note. The table reports estimates from ordinary least squares regressions. The dependent variable is the natural logarithm of credit exposure by banks to firms. Table 1 contains all variable definitions. Coefficients are listed in the first row, robust standard errors clustered at firm-bank level are reported in the row below, and the corresponding significance levels are adjacent to the coefficient. The Stable&Large Shares variable being used in this table is Stable&Large Shares *(Top Tercile)*. The identifier for Risky Bank variable and the sample of regression in each specification are indicted in column header. "Yes" indicates that the set of fixed effects is included. *** Significant at 1%, ** significant at 5%, * significant at 10%.

Table 5: Controlling For Bank Firm Relationships

	(1)	(2)	(3)	(4)	(5)	(6)
Dependent Variable	Log (Bank-Firm Exposure)					
Sample	All		Bank Z Bottom Tercile		Bank Z Top Tercile	
Stable&Large Shares * Crisis * Risky Firm * Risky Bank	2.672*	4.240**				
	[1.489]	[1.750]				
Stable&Large Shares * Crisis * Risky Firm	-0.218	-0.561	3.087***	4.082***	0.829	0.754
	[0.855]	[0.944]	[1.119]	[1.350]	[1.189]	[1.320]
Stable&Large Shares * Crisis * Risky Bank	-2.764**	-3.658**				
	[1.381]	[1.634]				
Stable&Large Shares	0.305	1.057*	0.895	1.467	0.568	1.565**
	[0.463]	[0.565]	[0.755]	[0.950]	[0.610]	[0.702]
Stable&Large Shares * Crisis	0.268	0.563	-3.035***	-3.387***	-0.806	-0.768
	[0.799]	[0.888]	[1.018]	[1.238]	[1.104]	[1.233]
Stable&Large Shares * Risky Firm	-0.643	-1.239**	-1.256	-1.689*	-0.659	-1.373*
	[0.514]	[0.616]	[0.823]	[1.014]	[0.683]	[0.782]
Stable&Large Shares * Risky Bank	0.501	0.442				
	[0.858]	[1.046]				
Risky Firm * Risky Bank	0.226	0.236				
	[0.241]	[0.277]				
Stable&Large Shares * Risky Firm * Risky Bank	-0.443	-0.340				
	[0.936]	[1.126]				
Crisis * Risky Firm * Risky Bank	-0.408	-0.496				
	[0.345]	[0.382]				
Relationship * Crisis * Risky Firm * Risky Bank	-0.675					
	[5.137]					
Relationship * Crisis * Risky Firm	-6.396*		-7.691**		-1.008	
	[3.537]		[3.670]		[7.107]	
Relationship * Crisis * Risky Bank	1.662					
	[3.539]					
Relationship	27.762***		27.197***		26.775***	
	[1.835]		[1.934]		[2.242]	
Relationship * Crisis	1.771		3.328		6.415	
	[2.395]		[2.696]		[5.379]	
Relationship * Risky Firm	13.915***		13.116***		15.618***	
	[2.842]		[2.922]		[3.487]	
Relationship * Risky Bank	-1.118					
	[2.447]					
Relationship * Risky Firm * Risky Bank	-1.243					
	[3.726]					
Observations	121,537	121,537	49,599	49,599	35,834	35,834
R-squared	0.412	0.319	0.417	0.309	0.459	0.385
Firm*Time FE	Yes	Yes	Yes	Yes	Yes	Yes
Bank*Time FE	Yes	Yes	Yes	Yes	Yes	Yes

Note. The table reports estimates from ordinary least squares regressions. The dependent variable is the natural logarithm of credit exposure by banks to firms. Table 1 contains all variable definitions. Coefficients are listed in the first row, robust standard errors clustered at firm-bank level are reported in the row below, and the corresponding significance levels are adjacent to the coefficient. The Stable&Large Shares variable being used in this table is Stable&Large Shares *(Top Tercile)*. The Risky Bank variable being used is Risky Bank *(Bank Z Bottom Tercile)*. The sample of regression in each specification is indicted in column header. Alongside each specification with Relationship variable, we take from previous tables similar estimates using the same samples but without Relationship. "Yes" indicates that the set of fixed effects is included. *** Significant at 1%, ** significant at 5%, * significant at 10%.

Table 6: Bank's Accrued Losses Due to the Evergreening: Ex-Post Firm Credit Risk and Stock Returns

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Dependent Variable	Log (Bank-Firm Exposure)							
Identifier for Ex-Post Risky Firm	Credit Event	Default	Severe Default (Restructuring & Bankruptcy)			Firm Stock Return Bottom Tercile		
Sample	All	All	All	Bank Z Bottom Tercile	Bank Z Top Tercile	All	Bank Z Bottom Tercile	Bank Z Top Tercile
Stable&Large Shares * Crisis * Ex-Post Risky Firm * Risky Bank	9.708**	8.189*	9.807**			2.070*		
	[4.911]	[4.758]	[4.913]			[1.193]		
Stable&Large Shares * Crisis * Ex-Post Risky Firm	-3.834	-2.169	-3.872	6.857*	-5.193	0.119	2.319**	0.044
	[2.793]	[2.442]	[2.796]	[3.838]	[4.641]	[0.727]	[0.958]	[1.056]
Stable&Large Shares * Crisis * Risky Bank	-9.641**	-8.105*	-9.654**			-0.505		
	[4.862]	[4.703]	[4.860]			[0.743]		
Stable&Large Shares	-1.277	0.053	-1.271	7.334*	-4.684	0.432	0.675	0.732*
	[1.957]	[1.876]	[1.952]	[4.047]	[3.900]	[0.289]	[0.521]	[0.384]
Stable&Large Shares * Crisis	3.772	2.101	3.765	-6.753*	5.047	-0.061	-0.596	-0.123
	[2.769]	[2.413]	[2.766]	[3.785]	[4.624]	[0.425]	[0.619]	[0.576]
Stable&Large Shares * Ex-Post Risky Firm	1.340	-0.007	1.323	-7.379*	5.100	-0.973**	-1.512**	-0.650
	[1.963]	[1.886]	[1.968]	[4.082]	[3.908]	[0.465]	[0.724]	[0.544]
Stable&Large Shares * Risky Bank	7.790*	6.508	7.806*			0.308		
	[4.673]	[4.657]	[4.672]			[0.557]		
Ex-Post Risky Firm * Risky Bank	3.349***	3.348***	3.511***			-0.044		
	[0.777]	[0.737]	[0.780]			[0.222]		
Stable&Large Shares * Ex-Post Risky Firm * Risky Bank	-7.716	-6.422	-7.801*			-0.436		
	[4.706]	[4.691]	[4.709]			[0.825]		
Crisis * Ex-Post Risky Firm * Risky Bank	-2.687***	-2.592***	-2.830***			0.297		
	[0.867]	[0.806]	[0.871]			[0.288]		

Table 6 Continued

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Stable&Large Shares * Ex-Post Risky Firm (Modest Event)			1.573	-6.748	5.933			
			[2.042]	[4.377]	[3.940]			
Stable&Large Shares * Crisis * Ex-Post Risky Firm (Modest Event)			-3.082	6.874	-7.667			
			[3.035]	[4.278]	[4.937]			
Ex-Post Risky Firm (Modest Event) * Risky Bank			1.969**					
			[0.838]					
Stable&Large Shares * Ex-Post Risky Firm (Modest Event) * Risky Bank			-7.120					
			[4.920]					
Crisis * Ex-Post Risky Firm (Modest Event) * Risky Bank			-1.461					
			[0.959]					
Stable&Large Shares * Crisis * Ex-Post Risky Firm (Modest Event) * Risky Bank			8.619					
			[5.366]					
Observations	131,118	131,118	131,118	53,818	38,484	107,628	43,583	32,238
R-squared	0.314	0.314	0.314	0.307	0.381	0.313	0.302	0.381
Firm*Time FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Bank*Time FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Note. The table reports estimates from ordinary least squares regressions. The dependent variable is the natural logarithm of credit exposure by banks to firms. Table 1 contains all variable definitions. Coefficients are listed in the first row, robust standard errors clustered at firm-bank level are reported in the row below, and the corresponding significance levels are adjacent to the coefficient. The Stable&Large Shares variable being used in this table is Stable&Large Shares *(Top Tercile)*. The Risky Bank variable being used is Risky Bank *(Bank Z Bottom Tercile)*. The identifier for Ex-Post Risky Firm variable and the sample of regression in each specification are indicted in column header. "Yes" indicates that the set of fixed effects is included. *** Significant at 1%, ** significant at 5%, * significant at 10%.

Table 7: Deteriorating Credit Quality

	(1)	(2)	(3)	(4)	(5)	(6)
Dependent Variable	Log (Bank-Firm Exposure)					
Identifier for Ex-Post Risky Firm	MAX PD growth Top Tercile		MEAN PD growth Top Tercile		Bank-Firm PD growth Top Tercile	
Stable&Large Shares * Crisis * Ex-Post Risky Firm * Risky Bank	1.651***	1.840***	0.980	1.206*	-1.081	-0.563
	[0.569]	[0.588]	[0.636]	[0.664]	[4.095]	[4.892]
Stable&Large Shares * Crisis * Ex-Post Risky Firm	-0.735*	-0.904**	-0.422	-0.609	3.765	3.897
	[0.391]	[0.409]	[0.421]	[0.448]	[3.579]	[4.182]
Stable&Large Shares * Crisis * Risky Bank	-0.964**	-1.240***	-0.500	-0.743*	-0.528	-0.754
	[0.428]	[0.447]	[0.394]	[0.411]	[2.244]	[2.723]
Stable&Large Shares	-0.277	-0.413*	-0.240	-0.376*	0.250	0.238
	[0.212]	[0.218]	[0.190]	[0.196]	[0.954]	[1.151]
Stable&Large Shares * Crisis	0.287	0.606**	0.044	0.335	-1.145	-0.626
	[0.288]	[0.299]	[0.248]	[0.259]	[1.690]	[1.980]
Ex-Post Risky Firm	0.066		0.085		0.044	0.207
	[0.066]		[0.070]		[0.298]	[0.406]
Stable&Large Shares * Ex-Post Risky Firm	0.096	0.157	0.029	0.126	-0.489	0.147
	[0.260]	[0.270]	[0.269]	[0.280]	[1.359]	[1.638]
Crisis * Ex-Post Risky Firm	-0.070		-0.156		0.271	-0.038
	[0.091]		[0.104]		[0.595]	[0.738]
Stable&Large Shares * Risky Bank	0.488	0.549	0.180	0.214	0.757	0.406
	[0.330]	[0.340]	[0.295]	[0.303]	[1.320]	[1.571]
Ex-Post Risky Firm * Risky Bank	0.112	0.133	0.150	0.190	-0.019	-0.035
	[0.125]	[0.132]	[0.132]	[0.140]	[0.377]	[0.490]
Stable&Large Shares * Ex-Post Risky Firm * Risky Bank	-0.917**	-0.964**	-0.302	-0.301	-0.668	-0.845
	[0.415]	[0.425]	[0.448]	[0.462]	[1.794]	[2.209]
Crisis * Ex-Post Risky Firm * Risky Bank	0.045	0.010	0.023	-0.065	-0.141	-0.201
	[0.159]	[0.170]	[0.173]	[0.186]	[0.709]	[0.880]
Observations	158,306	158,198	158,306	158,198	10,811	9,493
R-squared	0.327	0.343	0.327	0.343	0.468	0.479
Firm FE	Yes	No	Yes	No	Yes	No
Bank*Time FE	Yes	Yes	Yes	Yes	Yes	Yes
Firm*Time FE	No	Yes	No	Yes	No	Yes

Note. The table reports estimates from ordinary least squares regressions. The dependent variable is the natural logarithm of credit exposure by banks to firms. Table 1 contains all variable definitions. Coefficients are listed in the first row, robust standard errors clustered at firm-bank level are reported in the row below, and the corresponding significance levels are adjacent to the coefficient. The Stable&Large Shares variable being used in this table is Stable&Large Shares *(Top Tercile)*. The Risky Bank variable being used is Risky Bank *(Bank Z Bottom Tercile)*. The identifier for Ex-Post Risky Firm variable is indicted in column header. "Yes" indicates that the set of fixed effects is included. *** Significant at 1%, ** significant at 5%, * significant at 10%.

Appendix

Appendix Table A.1: Using Alternative Measures for Stable&Large Shares and Risky Bank-- The Impact of Bank Quality

	(1)	(2)	(3)	(4)	(5)
Dependent Variable	Log (Bank-Firm Exposure)				
Risky Bank variable being used	Bank Z Bottom Quartile			Bank Z Bottom Half	Bank and Firm Z-Score (Continuous Variable)
Sample	All	Bank Z Bottom Quartile	Bank Z Top Quartile	All	All
Stable&Large Shares * Crisis * Risky Firm * Risky Bank	4.119**			4.024**	0.008**
	[1.948]			[1.703]	[0.004]
Stable&Large Shares * Crisis * Risky Firm	0.188	4.758***	2.738*	-0.559	-0.305
	[0.919]	[1.701]	[1.611]	[1.106]	[0.288]
Stable&Large Shares * Crisis * Risky Bank	-3.541**			-3.216**	-0.013**
	[1.791]			[1.579]	[0.007]
Stable&Large Shares	0.958	1.774	2.505***	1.265**	-0.649
	[0.601]	[1.097]	[0.943]	[0.611]	[0.420]
Stable&Large Shares * Crisis	-0.093	-3.959**	-2.746*	0.487	0.698
	[0.851]	[1.552]	[1.494]	[1.023]	[0.666]
Stable&Large Shares * Risky Firm	-1.197*	-1.715	-1.835*	-1.299*	0.268**
	[0.656]	[1.183]	[1.069]	[0.680]	[0.130]
Stable&Large Shares * Risky Bank	0.998			-0.002	0.001
	[1.161]			[0.979]	[0.005]
Risky Firm * Risky Bank	0.065			0.012	-0.000
	[0.301]			[0.273]	[0.000]
Stable&Large Shares * Risky Firm * Risky Bank	-0.570			-0.255	0.001
	[1.261]			[1.062]	[0.001]
Crisis * Risky Firm * Risky Bank	-0.308			-0.432	0.001*
	[0.396]			[0.391]	[0.001]
Observations	121,537	40,385	26,013	121,537	121,537
R-squared	0.319	0.310	0.409	0.319	0.319
Firm*Time FE	Yes	Yes	Yes	Yes	Yes
Bank*Time FE	Yes	Yes	Yes	Yes	Yes

Note. The table reports estimates from ordinary least squares regressions. The dependent variable is the natural logarithm of credit exposure by banks to firms. Table 1 contains all variable definitions. Coefficients are listed in the first row, robust standard errors clustered at firm-bank level are reported in the row below, and the corresponding significance levels are adjacent to the coefficient. The Stable&Large Shares variable being used in this table is Stable&Large Shares *(Top Quartile)*. The identifier for Risky Bank variable and the sample of regression in each specification are indicted in column header. "Yes" indicates that the set of fixed effects is included. *** Significant at 1%, ** significant at 5%, * significant at 10%.

Appendix Table A.2: Using Alternative Measures for Stable&Large Shares and Risky Bank--Controlling for Bank Firm Relationships

	(1)	(2)	(3)	(4)	(5)	(6)
Dependent Variable	Log (Bank-Firm Exposure)					
Sample	All		Bank Z Bottom Quartile		Bank Z Top Quartile	
Stable&Large Shares * Crisis * Risky Firm * Risky Bank	2.236	4.119**				
	[1.702]	[1.948]				
Stable&Large Shares * Crisis * Risky Firm	0.597	0.188	3.492**	4.758***	1.856	2.738*
	[0.837]	[0.919]	[1.469]	[1.701]	[1.446]	[1.611]
Stable&Large Shares * Crisis * Risky Bank	-2.376	-3.541**				
	[1.564]	[1.791]				
Stable&Large Shares	0.470	0.958	0.851	1.774	1.293	2.505***
	[0.484]	[0.601]	[0.921]	[1.097]	[0.834]	[0.943]
Stable&Large Shares * Crisis	-0.408	-0.093	-3.317**	-3.959**	-1.634	-2.746*
	[0.768]	[0.851]	[1.345]	[1.552]	[1.328]	[1.494]
Stable&Large Shares * Risky Firm	-0.910*	-1.197*	-1.099	-1.715	-1.175	-1.835*
	[0.542]	[0.656]	[1.007]	[1.183]	[0.946]	[1.069]
Stable&Large Shares * Risky Bank	0.386	0.998				
	[0.984]	[1.161]				
Risky Firm * Risky Bank	0.062	0.065				
	[0.265]	[0.301]				
Stable&Large Shares * Risky Firm * Risky Bank	-0.133	-0.570				
	[1.083]	[1.261]				
Crisis * Risky Firm * Risky Bank	-0.238	-0.308				
	[0.360]	[0.396]				
Relationship	27.736***		26.924***		27.683***	
	[1.922]		[2.039]		[2.162]	
Crisis * Relationship	0.801		5.725*		15.749	
	[2.409]		[3.033]		[9.799]	
Risky Firm * Relationship	13.284***		14.089***		16.218***	
	[2.858]		[3.134]		[4.036]	
Crisis * Risky Firm * Relationship	-5.549		-10.032**		-10.499	
	[3.386]		[4.115]		[11.587]	
Risky Bank * Relationship	-1.222					
	[2.758]					
Crisis * Risky Bank * Relationship	4.706					
	[3.954]					
Risky Firm * Risky Bank * Relationship	0.098					
	[4.110]					
Crisis * Risky Firm * Risky Bank * Relationship	-3.592					
	[5.550]					
Observations	121,537	121,537	40,385	40,385	26,013	26,013
R-squared	0.412	0.319	0.421	0.310	0.477	0.409
Firm*Time FE	Yes	Yes	Yes	Yes	Yes	Yes
Bank*Time FE	Yes	Yes	Yes	Yes	Yes	Yes

Note. The table reports estimates from ordinary least squares regressions. The dependent variable is the natural logarithm of credit exposure by banks to firms. Table 1 contains all variable definitions. Coefficients are listed in the first row, robust standard errors clustered at firm-bank level are reported in the row below, and the corresponding significance levels are adjacent to the coefficient. The Stable&Large Shares variable being used in this table is Stable&Large Shares *(Top Quartile)*. The Risky Bank variable being used is Risky Bank *(Bank Z Bottom Quartile)*. The sample of regression in each specification is indicted in column header. Alongside each specification with Relationship variable, we take from previous tables similar estimates using the same samples but without Relationship. "Yes" indicates that the set of fixed effects is included. *** Significant at 1%, ** significant at 5%, * significant at 10%.

Appendix Table A.3: Using Alternative Measures for Stable&Large Shares and Risky Bank-- Bank's Accrued Losses Due to the Evergreening: Ex-Post Firm Credit Risk and Stock Returns

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Dependent Variable	Log (Bank-Firm Exposure)							
Identifier for Ex-Post Risky Firm	Credit Event	Default	Severe Default (Restructuring & Bankruptcy)			Firm Stock Return Bottom Tercile		
Sample	All	All	All	Bank Z Bottom Quartile	Bank Z Top Quartile	All	Bank Z Bottom Quartile	Bank Z Top Quartile
Stable&Large Shares * Crisis * Ex-Post Risky Firm * Risky Bank	7.896*	8.195*	8.122*			0.702		
	[4.398]	[4.489]	[4.400]			[1.404]		
Stable&Large Shares * Crisis * Ex-Post Risky Firm	-1.395	-1.741	-1.429	7.935**	1.216	0.865	1.568	1.091
	[1.998]	[1.994]	[2.005]	[3.762]	[2.722]	[0.754]	[1.226]	[1.303]
Stable&Large Shares * Crisis * Risky Bank	-7.769*	-8.014*	-7.778*			-0.111		
	[4.331]	[4.415]	[4.328]			[0.873]		
Stable&Large Shares	0.213	0.690	0.200	7.086*	-1.970	0.354	0.964	1.414***
	[1.877]	[1.830]	[1.873]	[4.204]	[3.562]	[0.292]	[0.656]	[0.501]
Stable&Large Shares * Crisis	1.378	1.691	1.385	-7.519**	-1.565	-0.271	-0.387	-0.905
	[1.976]	[1.963]	[1.972]	[3.687]	[2.662]	[0.426]	[0.791]	[0.680]
Stable&Large Shares * Ex-Post Risky Firm	-0.198	-0.686	-0.238	-7.103*	2.932	-1.059**	-1.345	-1.082
	[1.884]	[1.842]	[1.893]	[4.249]	[3.591]	[0.496]	[0.915]	[0.776]
Stable&Large Shares * Risky Bank	6.137	5.720	6.155			0.714		
	[4.635]	[4.645]	[4.633]			[0.661]		
Ex-Post Risky Firm * Risky Bank	3.533***	3.644***	3.701***			0.215		
	[0.835]	[0.781]	[0.839]			[0.244]		
Stable&Large Shares * Ex-Post Risky Firm * Risky Bank	-5.728	-5.306	-5.973			-0.255		
	[4.680]	[4.692]	[4.682]			[0.978]		
Crisis * Ex-Post Risky Firm * Risky Bank	-2.694***	-2.809***	-2.839***			0.091		
	[0.838]	[0.787]	[0.843]			[0.305]		
Stable&Large Shares * Ex-Post Risky Firm (Modest Event)			0.772	-4.077	4.185			
			[1.934]	[4.696]	[3.514]			
Stable&Large Shares * Crisis * Ex-Post Risky Firm (Modest Event)			-0.876	5.877	0.715			
			[2.314]	[4.430]	[3.097]			

Appendix Table A.3 Continued

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Ex-Post Risky Firm (Modest Event) * Risky Bank			2.172**					
			[0.897]					
Stable&Large Shares * Ex-Post Risky Firm (Modest Event) * Risky Bank			-4.215					
			[4.877]					
Crisis * Ex-Post Risky Firm (Modest Event) * Risky Bank			-1.503					
			[0.932]					
Stable&Large Shares * Crisis * Ex-Post Risky Firm (Modest Event) * Risky Bank			5.910					
			[4.861]					
Observations	131,118	131,118	131,118	43,847	27,928	107,628	35,378	23,624
R-squared	0.314	0.314	0.315	0.310	0.406	0.313	0.303	0.404
Firm*Time FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Bank*Time FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Note. The table reports estimates from ordinary least squares regressions. The dependent variable is the natural logarithm of credit exposure by banks to firms. Table 1 contains all variable definitions. Coefficients are listed in the first row, robust standard errors clustered at firm-bank level are reported in the row below, and the corresponding significance levels are adjacent to the coefficient. The Stable&Large Shares variable being used in this table is Stable&Large Shares *(Top Quartile)*. The Risky Bank variable being used is Risky Bank *(Bank Z Bottom Quartile)*. The identifier for Ex-Post Risky Firm variable and the sample of regression in each specification are indicted in column header. "Yes" indicates that the set of fixed effects is included. *** Significant at 1%, ** significant at 5%, * significant at 10%.

Appendix Table A.4: Using Alternative Measures for Stable&Large Shares and Risky Bank-- Deteriorating Credit Quality

	(1)	(2)	(3)	(4)	(5)	(6)
Dependent Variable	Log (Bank-Firm Exposure)					
Identifier for Ex-Post Risky Firm	MAX PD growth Top Tercile		MEAN PD growth Top Tercile		Bank-Firm PD growth Top Tercile	
Stable&Large Shares * Crisis * Ex-Post Risky Firm * Risky Bank	1.556**	1.747**	0.257	0.423	-4.279	-4.213
	[0.686]	[0.708]	[0.767]	[0.795]	[3.023]	[3.858]
Stable&Large Shares * Crisis * Ex-Post Risky Firm	-0.481	-0.647	0.036	-0.081	8.506***	9.359***
	[0.411]	[0.428]	[0.434]	[0.460]	[2.429]	[3.128]
Stable&Large Shares * Crisis * Risky Bank	-0.613	-0.873	0.012	-0.195	2.364	1.933
	[0.510]	[0.532]	[0.467]	[0.485]	[2.286]	[2.830]
Stable&Large Shares	-0.020	-0.152	-0.062	-0.193	1.252	1.081
	[0.218]	[0.224]	[0.194]	[0.200]	[1.004]	[1.139]
Stable&Large Shares * Crisis	-0.046	0.279	-0.309	-0.033	-3.213*	-2.346
	[0.290]	[0.301]	[0.241]	[0.252]	[1.740]	[2.089]
Ex-Post Risky Firm	0.043		0.100		0.094	0.256
	[0.060]		[0.064]		[0.295]	[0.399]
Stable&Large Shares * Ex-Post Risky Firm	-0.086	-0.030	-0.004	0.078	-1.410	-0.575
	[0.267]	[0.276]	[0.288]	[0.299]	[1.534]	[1.822]
Crisis * Ex-Post Risky Firm	-0.008		-0.159*		0.349	0.212
	[0.083]		[0.095]		[0.468]	[0.637]
Stable&Large Shares * Risky Bank	0.386	0.436	0.139	0.162	-0.323	-0.608
	[0.401]	[0.413]	[0.358]	[0.367]	[1.398]	[1.602]
Ex-Post Risky Firm * Risky Bank	0.213	0.239*	0.136	0.178	-0.115	-0.121
	[0.136]	[0.145]	[0.143]	[0.153]	[0.398]	[0.505]
Stable&Large Shares * Ex-Post Risky Firm * Risky Bank	-0.705	-0.736	-0.149	-0.123	0.404	0.059
	[0.507]	[0.519]	[0.566]	[0.581]	[1.880]	[2.267]
Crisis * Ex-Post Risky Firm * Risky Bank	-0.128	-0.178	0.025	-0.070	-0.365	-0.792
	[0.166]	[0.178]	[0.181]	[0.194]	[0.641]	[0.853]
Observations	158,306	158,198	158,306	158,198	10,811	9,493
R-squared	0.327	0.343	0.327	0.343	0.469	0.480
Firm FE	Yes		Yes		Yes	
Bank*Time FE	Yes	Yes	Yes	Yes	Yes	Yes
Firm*Time FE		Yes		Yes		Yes

Note. The table reports estimates from ordinary least squares regressions. The dependent variable is the natural logarithm of credit exposure by banks to firms. Table 1 contains all variable definitions. Coefficients are listed in the first row, robust standard errors clustered at firm-bank level are reported in the row below, and the corresponding significance levels are adjacent to the coefficient. The Stable&Large Shares variable being used in this table is Stable&Large Shares *(Top Quartile)*. The Risky Bank variable being used is Risky Bank *(Bank Z Bottom Quartile)*. The identifier for Ex-Post Risky Firm variable is indicted in column header. "Yes" indicates that the set of fixed effects is included. *** Significant at 1%, ** significant at 5%, * significant at 10%.

Appendix Table A.5: Explaining Bank Credit Supply with Stable and Large Shareholding and Firm Quality: Adding Bank-Firm FE

	(1)	(2)	(3)	(4)
Dependent Variable	Log (Bank-Firm Exposure)			
Stable & Large Shares variable being used	Top Tercile	Top Quartile	Top Quartile, across all banks	Very large Shares
Stable&Large Shares * Crisis * Risky Firm	0.935**	1.304***	0.983***	2.757**
	[0.402]	[0.423]	[0.363]	[1.093]
Stable&Large Shares	0.701***	0.640**	0.825***	1.638*
	[0.241]	[0.270]	[0.234]	[0.927]
Stable&Large Shares * Crisis	-0.768**	-0.922**	-0.918***	-1.385**
	[0.349]	[0.363]	[0.319]	[0.661]
Stable&Large Shares * Risky Firm	-0.681**	-0.728**	-0.789***	-0.831
	[0.267]	[0.300]	[0.254]	[1.011]
Observations	144,026	144,026	144,026	140,782
R-squared	0.743	0.743	0.743	0.743
Bank*Time FE	Yes	Yes	Yes	Yes
Firm*Time FE	Yes	Yes	Yes	Yes
Bank*Firm FE	Yes	Yes	Yes	Yes

Note. The table reports estimates from ordinary least squares regressions. The dependent variable is the natural logarithm of credit exposure by banks to firms. Table 1 contains all variable definitions. Coefficients are listed in the first row, robust standard errors clustered at firm-bank level are reported in the row below, and the corresponding significance levels are adjacent to the coefficient. The Stable&Large Shares variable being used in each column is indicated in the column header. "Yes" indicates that the set of fixed effects is included. *** Significant at 1%, ** significant at 5%, * significant at 10%.