

Banking consolidation and small business finance - empirical evidence for Germany

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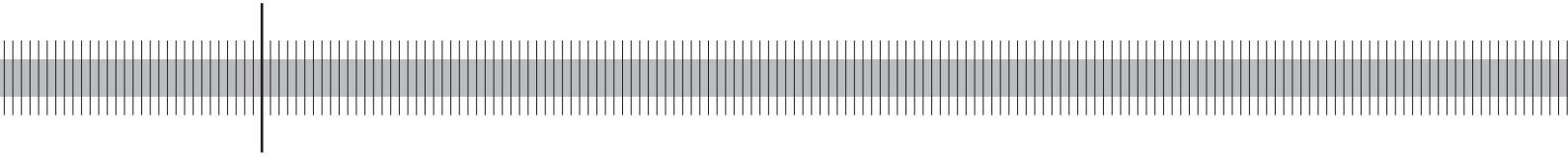
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Abstract

Since the early 1990s an unprecedented process of consolidation has taken place in the banking sector in most industrialised countries raising concern of policymakers that it may reduce access to credit for the small business sector. While most of the existing empirical studies have focused on the U.S., this paper is the first one empirically investigating the effects of banking consolidation in Germany. As small and medium sized German companies traditionally almost exclusively rely on bank credit and as they represent the vast majority of the corporate sector reduced credit availability for those companies could particularly endanger economic growth.

Based on an exceptional panel dataset comprising merged data of the German credit register and balance sheet data of German firms and banks we find - contrary to public fear - that the ongoing banking consolidation in Germany does not have a significant negative impact on the financing of small and medium-sized enterprises (SME). We measure the financing opportunities of SMEs based on the bank debt/assets ratio and the logarithmized credit size and control both explicitly for bank mergers and for the increase in the average bank size in the course of the consolidation process. In addition, we observe that the concentration in the banking market is insignificant for SME financing and that there is no significant difference between commercial banks, savings banks and private banks.

Keywords: Banking consolidation, bank mergers, SME financing

JEL classification: G1, G2, G21

Non technical summary

Over the last years, the fear of a worsening credit access for middle-market firms has been regularly evoked, particularly in Germany. The reasons were principally two-fold: the introduction of Basel II and the ongoing banking consolidation. While the Basel II conditions have meanwhile been tailored in a way that avoids disadvantages for SMEs, the potential adverse effects of banking consolidation are still subject to lively discussions in the public, notably as consolidation will be ongoing in the upcoming years.

As theory does not provide for an unambiguous answer with regard to the potential effects of banking consolidation, it rests an empirical matter to assess the total impact of banking consolidation on small business finance. However, empirical studies have almost exclusively been carried out for the US; the current study is the first empirical study for Germany.

The outcome of this study points to the conclusion that banking consolidation in Germany has not worsened SMEs' access to bank credit. More specifically, neither do bank mergers have a significant effect on the volume of SME's bank credit nor does an increasing bank size in the context of banking consolidation negatively affect SME's portion of financing by bank debt. This outcome is based on a comprehensive dataset, comprising merged data on banks, firms and the banking market. However, smaller SMEs tend to be underrepresented in the dataset due to the fact that the German credit register does only include credit exceeding the threshold of €1.5m.

Nicht-technische Zusammenfassung

In den letzten Jahren wurde wiederholt über die mögliche Gefahr einer Verschlechterung der Kreditbedingungen für den Mittelstand diskutiert. Als Gründe wurden hierbei insbesondere die Einführung von Basel II sowie mögliche negative Auswirkungen der Bankenkonsolidierung genannt. Während den Bedenken im Zusammenhang mit Basel II mittlerweile durch Regelungen Rechnung getragen wurde, die eine Belastung des Mittelstandes vermeiden, ist letztere Diskussion nach wie vor sehr aktuell, da mit einem weiteren Fortschreiten der Konsolidierung gerechnet wird.

Die Theorie liefert keine eindeutige Prognose hinsichtlich der Auswirkungen der Bankenkonsolidierung, und empirische Studien zu diesem Thema beziehen sich überwiegend auf die Vereinigten Staaten. In dieser Arbeit wird erstmalig der Zusammenhang zwischen den Finanzierungsbedingungen von Unternehmen und der Konsolidierung im Bankensektor speziell für Deutschland untersucht.

Die vorliegende Studie legt den Schluss nahe, dass die Bankenkonsolidierung bisher nicht mit negativen Auswirkungen auf die Mittelstandsfinanzierung einhergegangen ist. Sowohl der Zusammenhang zwischen Fusionen von Banken und der Summe der Bankkredite von Unternehmen als auch der Zusammenhang zwischen der (zunehmenden) Größe einer Bank und dem Anteil der Bankkreditfinanzierung eines Unternehmens ist ökonomisch vernachlässigbar. Die Ergebnisse basieren auf einem hochwertigen und umfangreichen Datensatz, in dem allerdings kleine Mittelständler unterrepräsentiert sind, da Unternehmen erst ab einer Gesamtverschuldung von mindestens 1,5 Mio. Euro berücksichtigt wurden.

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Banking Consolidation and Small Business Finance - Empirical Evidence for Germany¹

1 Introduction

Over the past few decades, improvements in information technology, financial deregulation and liberalisation² have contributed to create a more competitive environment and have encouraged an unprecedented consolidation in the banking sector within and across many industrial countries. In the U.S. and the Euro area, M&A activity in the financial institution sector has led to a drastic and continuous decline in the number of banks and increased concentration. While the number of banks in the U.S. already fell by more than one-third until the end of the 1990s, the number of credit institutions in the Euro area has also declined substantially, from around 9,500 in 1995 to 6,400 in 2004.³

Consolidation in the banking industry has raised concerns among policymakers that this may lead to a reduced availability of credit for small businesses, primarily due to the decrease in the number of small banks specialised in this type of lending. Generally speaking, a decline in small business lending may be harmful for the economy firstly because of the substantial contribution of small and medium-sized enterprises (SME)⁴ to national output and job creation. In 2003, SMEs accounted for around 70% of total employment and generated around 40% of all turnover in Germany.⁵ A similar importance of SMEs can be perceived in many European countries. Secondly, with the exception of the United States, SMEs tend to rely more on debt financing than large firms. Given that within the Euro area, Germany, the largest banking market in Europe, has experienced by far the largest reduction in the number of banks⁶, and that German SMEs, also known in Germany as the "Mittelstand"⁷, almost exclusively rely on bank credit, it becomes obvious to evaluate

¹We particularly thank Beatrice Weder, Thilo Liebig, Frank Heid and Christoph Memmel for stimulating comments and contributions to this study. Moreover, we would like to thank the participants of the Workshop "Forschung zu Finanzstabilität mit Hilfe von Bankdaten der Bundesbank" held at the Deutsche Bundesbank December 5, 2005 and the participants of the GBAS workshop held at the Goethe University Frankfurt March 20, 2006.

²The causes of consolidation have been well documented (e.g. Berger et al. (1999)).

³European Central Bank (2005), p.79.

⁴According to the definition of the European Commission for an enterprise to be classified as an SME it must have no more than 249 employees, its turnover (annual balance sheet) must not exceed €50 millions (€43 millions), and no more than 25 percent of the capital of the enterprise must be controlled by one or more other enterprises.

⁵Institut für Mittelstandsforschung Bonn (IfM Bonn). For stylized facts on SMEs in the euro area and further details on SME financing pattern and possible constraints see European Central Bank (2007).

⁶From 1995 till 2004 the number of credit institutions declined from 3,785 to 2,148 (European Central Bank (2005), p. 79), while the number of branches has remained fairly stable. Yet, Germany still hosts most banks in Europe and remains the most fragmented banking market.

⁷In contrast to the term "SME" which is commonly used in most countries, the German "Mittelstand" is not only defined by size patterns but also by characteristics like private ownership, freedom in decision making and contracting, individual responsibility of entrepreneurs for success or failure of the own enterprise (Institut für Mittelstandsforschung (2004), p. 1).

the effects of banking consolidation on small business finance in Germany.⁸ However, while there is a growing empirical literature on banking consolidation, most of the existing studies have focused on the U.S. banking market. This paper is the first one presenting empirical evidence on the impact of banking consolidation on small business finance in Germany. We thereby also take up the fear that banking consolidation in Germany worsens small business financing, which has been the subject of a lively public discussions over the last years, for example in the context of Basel II.

Based on a panel data set comprising merged data of the German credit register and balance sheet data of German firms and banks, we investigate the relationship between the importance of bank financing for small businesses and banking size. We use the bank debt/asset ratio and the logarithmized credit size, respectively, as the dependent variables and find that the ongoing banking consolidation in Germany has, if at all, only a very small negative impact on the financing structure of SMEs by controlling both explicitly for bank mergers and for the increase of the average bank size in the course of the consolidation process. Moreover, we do not find that concentration affects SME financing and there are no differences between the three German banking pillars. These results have been found to be robust under various model settings.

The paper is structured as follows: Section 2 provides a literature overview on the theory and empirical evidence of banking consolidation and SME financing. In section 3, we set up hypotheses based on our methodological procedure. Section 4 gives an overview on the data and variables. Section 5 presents the regression results and section 6 concludes.

2 Literature

2.1 Theory

While it has been shown that banking consolidation has many benefits, including increased efficiency⁹ and better diversification that also supports macroeconomic stability¹⁰, concern had been raised that it may adversely affect the availability of credit to small firms. Consolidation in most countries has involved a large number of small banks traditionally specialised in providing credit to small businesses. It is feared that the larger and more complex banks emerging from consolidation will be less likely to lend to these companies. The main argument for this reasoning is the observation that larger banks typically have a smaller propensity to lend to small firms, i.e. small business lending generally makes up a smaller share of larger banks' total loans. Using this as a starting point, one might expect that smaller banks initially constrained in lending to small firms may, once reorganized into larger banks, shift their portfolios of loans in favor of larger borrowers or even shift their asset composition away from traditional lending activities. Furthermore, as smaller

⁸For recent data on the financial structure of German SMEs see Deutscher Sparkassen und Giroverband (DSGV) (2006).

⁹For a review of the existing literature see Amel et al. (2004). For Germany, Koetter (2005) found relatively limited advantages of mergers with respect to efficiency gains.

¹⁰See Walkner and Raes (2005), p.7.

firms are more opaque in terms of information than larger ones and as small banks enjoy comparative advantages in overcoming information asymmetries, a decrease in small business credit may also be observed because these loans are less profitable for larger banking organizations.

However, as banking industry consolidation is a dynamic process, it can be expected that market participants will adapt their strategies. The likely effect on small business lending cannot be simply inferred from this static comparison of the actual lending behavior of small and large banks. Further dynamic effects of changes in efficiency, competition and the organizational structure have to be considered which potentially outweigh the negative effects. In a competitive market, efficiency gains through cost savings due to technological advances (e.g. use of credit scoring and credit factories) or better risk diversification are likely to be passed through to borrowers who may benefit from more favorable loan conditions. Following Baumol (1982) the potential new entries will restrain the competitors from exploiting their market power. These new competitors may enter the market and pick up any small business loan dropped by merged institutions and so in equilibrium there would be no changes in small business lending. Another argument in this direction is put forward by Demsetz (1973). Taking concentration as endogenous, he argues that more efficient banks will charge lower prices and gain higher market shares, leading to higher prices in markets with big differences in efficiencies than in markets with similar efficiencies. By contrast, loan conditions may deteriorate if banks are able to exploit their market power.¹¹ However, competition might also increase small business lending because it forces banks to search for additional profit opportunities.

As the theoretical literature can only identify possible positive and negative effects of banking consolidation, it rests an empirical matter to assess the total impact of banking consolidation on small business finance and to try to disentangle the afore mentioned effects.

2.2 Empirical evidence

While there has been extensive empirical work on the impact of banking consolidation on small business finance in the U.S., only a few papers focused on the European banking market and none of them deals with Germany.

In the empirical literature three main approaches have been followed. A first group of studies investigates the relationship between bank size and access to small business finance, inspired by the above mentioned fact that large banks devote less of their loan granting to SMEs.¹² Strahan and Weston (1998) find that M&A between smaller banks lead to an increase in small business lending, whereas mergers between larger banks tend to negatively influence small business lending. These studies for the US-market focus, due to data restrictions on the bank side, mainly on the lending process of a bank. Craig and Hardee (2004) in contrast focus on the effect on the firms' financing structure. The results of their study suggest that in a market with higher market shares of large banks, small firms will receive less credit.

¹¹Hannan (1991a) and Hannan (1991b).

¹²See, for example, Peek and Rosengren (1996), Strahan and Weston (1996).

However, Peek and Rosengren (1998) emphasize that besides the bank size the pre-merger specialization of the bank is also important for the post-merger behavior. The empirical outcome is that acquiring banks with a high portion of SME lending before the merger tend to try to offset the negative effect induced by the merger. For France Dietsch (2003) argues that consolidation made credit more easily accessible to SMEs.

A second strain of studies evaluates the effects of M&A in the banking sector by investigating the loan granting policy of the banks being involved and the determinants of their borrower relationships. The major questions analyzed in this context are: Do borrowers from a merging bank have a higher probability of being suspended from credit? Do the conditions/credit prices of the loans change after a merger? Are there direct effects on the other lenders in the concerned market? In a study on the Italian market, Sapienza (2002) focuses on credit prices and the probability that banks stop cultivating relationship banking in the aftermath of a merger. According to this study, mergers affecting a substantial market share lead to an increase in interest rates and small firms have an overall higher probability of losing their lending relationship after a bank merger than larger firms. Using a very similar database, other authors study the effects of mergers on the quantity and quality of credit. The studies reveal that mergers tend to temporarily decrease volume and quality while acquisitions have an opposite effect.¹³ For the US-market Berger et al. (1998) find a negative impact of consolidation on SME financing but point out that much of this effect would be offset either by direct effects (internal restructuring after acquisitions) or by external effects (changes of the lending behavior of competitors in the same market).

A third group of studies focuses on the impact of increased banking market concentration on the access to and conditions of SME bank finance. In a study on the US banking market Avery and Samolyk (2000) found that consolidation in rural markets negatively affect loan growth as well as consolidation in concentrated urban markets. However, they confirm previous empirical findings that mergers between small banks tend to increase small business lending. Another study by Beck et al. (2003) focusing on a sample of 74 countries, including both developed and non-developed ones, revealed that higher market concentration worsens SMEs' access to credit, but this effect is found to be less pronounced for developed countries.

DeYoung et al. (1999) directly address the market entrance of banks. They find that young or newly founded banks have a higher propensity to lend to small businesses than older banks do. Hence, they argue that a continuous stream of de novo banks could help to overcome the negative effects of consolidation. When market entry would be free, new banks would emerge and pick up the dropped borrowers from (merged) banks.

Although the results of these empirical studies suggest that the feared negative consequences of banking consolidation on small business credit have generally been over-estimated, they also show that the specific results very much depend on the characteristics of the relevant banking market and the set-up of the empirical study. Other studies' findings may therefore not hold true for the German market, in particular as the German banking market is unique with its three pillar system, the

¹³Bonaccorsi di Patti and Gobbi (2001).

traditionally important role of relationship lending and the remaining high degree of fragmentation.¹⁴ This study seeks to overcome this gap by providing first evidence on the impact of banking consolidation on German SME financing.

3 Empirical approach

3.1 Hypothesis

In general, consolidation in the banking market leads to a lower number of larger banks competing in the same market, i.e. banking consolidation produces larger banks and a higher concentration in the banking market. As discussed before this might negatively affect credit availability for SMEs because the lending policy of banks changes. Accordingly, we seek to analyze how consolidation in the banking sector affects the financing structure of firms, especially SMEs. We rely on two different approaches, a *direct* and an *indirect* approach, in order to make comprehensive use of the information contained in the data set and to thereby more thoroughly test for the robustness of the results. The advantages and potential shortcomings of each approach will be discussed below.

First, we seek to directly investigate the behavior of banks involved in M&A activities (*merger effect*). As described before, a popular belief is that banks might reduce their lending to SMEs after a merger, e.g. through cutting credit relationships. We therefore test the following hypothesis¹⁵:

Hypothesis 1: If a bank is involved in M&A activities, its SME credit financing worsens.

More precisely the question we seek to answer in this context is: Does the total amount of bank credit of a firm change after one of their lending banks has merged with or is acquired by another bank? In case that the total amount of bank credit of a firm does not substantially change after the consolidation, we assume that there is either no negative effect or competition in the banking market seems highly intensive to overcome potential negative effects, e.g. as other banks extend existing loans or pick up borrowers whose loan contracts had been terminated.

Second, we investigate the indirect consolidation effect of an increasing size of banks on the financing structure of firms (*size effect*). Based on the fact that large banks devote smaller parts of their portfolio to small business loans, we examine a second hypothesis:

Hypothesis 2: The size of banking institutions negatively affects the financing conditions of SMEs, i.e. reducing the availability of bank credit for the latter.

Our research question is: When controlling for firm and market characteristics, does the size of the lending bank still matter for the financing structure of a firm

¹⁴For a detailed description on the German banking market see Krahen and Schmidt (2004) and IMF (2004).

¹⁵Other interesting effects of banking consolidation in Germany that are not covered by this study are efficiency gains or losses for banks (see e.g. Koetter (2005)) and the emergence of alternative financing opportunities, for example.

(the portion of bank debt)? This approach does not directly assess the effects of consolidation, but should lead to a first assessment whether an increasing bank size should implicitly raise concern with regard to small business finance or not.

Besides these two effects, we also investigate whether *concentration in the lender market* influences the financing structure of SMEs. Assuming that the relatively low margin level in Germany reflects the limited ability of banks in demanding risk-adjusted premia¹⁶, we would expect that concentration has no effect or rather a negative one. Moreover, given the specific structure of the German banking market, we try to assess if differences exist in the lending policy across the three pillars¹⁷ resulting from banking consolidation.

In line with DeYoung et al. (1999), we recognize that both the size effect and the effect of increasing concentration may be counteracted by the entrance of new banks into the market. However, given that these new entrants will neither instantaneously allocate a substantial market share nor contribute to a significant drop in bank size, we assume that this fact is not among the major drivers of our results. Furthermore, given that the German banking market tends to be overbanked, market entrance is rather unlikely, at least in most regions.

3.2 Methodology

We use two panel data sets for our analysis. The initial data set is based on information about lending relationships between banks and firms, each observation linking one firm to one single lender. We refer to this panel as the *lending relationship level*. The second data set allows us to get an even deeper insight into the effects on the firm level by aggregating over the firm dimension. In the following, we will refer to this second data set as the *firm level* data set. While this allows us to take into account that one firm might have more than one lending relationship, this aggregation procedure leaves us with some additional problems regarding the incorporation of information on the lender(s) that will be discussed in section 4.

The *merger effect*, i.e. to determine whether the total amount of credit changes in the course of banking consolidation, is tested by means of the firm level panel. We capture the determinants of the credit demand of firms by a set of firm-specific variables and control for the concentration in the regional market. Using a fixed-effects panel approach with subscripts *i* for firm, *m* for regions and *t* for years,¹⁸ we use the following regression model similar to e.g. Bonaccorsi di Patti and Gobbi (2003) and Dietsch (2003):

$$Y_{it} = \alpha_i + \beta_1 \text{Merger_dummies}_{it} + \beta_2 \text{HHI}_{mt} + \beta_3 A_{it} + \beta_4 D_t + \epsilon_{it} \quad (1)$$

The dependent variable, Y_{it} , is defined as the logarithm of the total amount of credit per firm and year. The main focus in this model lies on a set of dummy variables ($\text{Merger_dummies}_{it}$) to control for the potential effects of M&A activities on the amount of credit. We use three different merger dummies: The first one takes

¹⁶See Paul et al. (2004), for example.

¹⁷The three pillars are private/commercial banks, savings banks and cooperative banks.

¹⁸The dataset provides annual data and each firm is located in one regional market.

the value one if at least one of the lending banks of the firm has merged within the current year¹⁹, the second dummy controls for mergers in the preceding year and the third dummy for mergers two years before. The economic reasoning behind the use of lagged merger-dummies is as follows: the effects of the changed internal structure of the bank may not directly affect the amount of credit, contracts are usually signed for longer horizons and a modified lending policy may take several years to be fully implemented.²⁰

Furthermore, we control for changes in the local banking market structure by introducing the Hirschmann-Herfindahl-Index on a regional basis (HHI_{mt}) as an explanatory variable. A vector of firm characteristics, A_{it} , (including the legal form, the industry sector affiliation, the default probability, the equity ratio, the turnover to assets ratio and the number of lenders per firm) and a vector of year dummies (D_t) complete our list of control variables. Finally, ϵ_{it} represents the individual error term.

Turning to our second hypothesis, we analyze the *size effect* by referring to the *ratio bank debt to assets* for each firm i at time t as the dependent variable similar to Craig and Hardee (2004). We choose this variable as we expect that the financing structure of a firm (namely the amount of bank financing) varies with the size of the lending bank (all else being equal).²¹ Our analysis is twofold: first we use the *lending relationship* panel, which can be seen as a natural experiment in our case and second we run the same regression for the *firm level* panel.

Based on the lending relationship level, we are able to test our hypothesis while holding all firm variables constant, i.e. we determine our results based on constant firm parameters but changing bank characteristics. The main advantage of this analysis is that we use the full information set on lenders. The fixed-effects regression model takes the following form:

$$Y_{it} = \alpha_i + \beta_1 BankSize_{jt} + \beta_2 HHI_{mt} + \beta_3 A_{it} + \beta_4 B_{jt} + \beta_5 D_t + \epsilon_{it} \quad (2)$$

The size of a bank ($BankSize_{jt}$) is measured by the total assets (in bn €). To control for potential bank-specific effects we include a vector B_{jt} with dummies for savings banks, cooperative banks and commercial banks, other financial institutions being the omitted category. The remaining explanatory variables are identical to the first regression model, namely a vector of the firm characteristics A_{it} (whereas we drop the number of lenders for the relationship level data set) and a concentration measure, the HHI as well as the individual error terms.

The potential shortcoming of this specification is that it disregards information about the weight of each credit for each borrower: A lending relationship only representing a small share of a firms' total credit has the same weight as a lending relationship being the only one for a firm. Therefore, we test the size effect in a

¹⁹More specifically, the dummy takes the value 1 at time t if a merger took place between July, 1 of year $t-1$ and June, 31 of year t .

²⁰In the empirical literature, a differentiated time pattern for the adjustments after a merger has been found, for example, by Bonaccorsi di Patti and Gobbi (2003) and Degryse et al. (2004).

²¹However, we acknowledge that an increasing bank size may also result simply from cross-sectional differences or inter-temporal changes in our dataset and due to natural growth in the banking sector, for example.

next step with the firm level panel. We replace the measure of a banks' size by the indebtedness-weighted average bank size (see section 4 for further explanations), using this as a proxy for the representative lender of the firm. We furthermore drop the dummies controlling for the pillars.

The advantage of this latter specification (a straightforward panel specification) comes along with the disadvantage that information about the lender is lost. In sum, we expect that by using both panels we are able to exploit the advantages of both specifications and ultimately verify the robustness of our results.

As our focus lies on small and medium-sized enterprises and as we would expect to find different effects for small and large firms, respectively, we split our sample into two subsamples, "SMEs" and "Large firms", and run the regressions accordingly.²²

4 Data set description

We start out our empirical analysis with an exceptional dataset comprising merged and edited data of the German credit register, balance sheet data of German firms and balance sheet data of German banks.²³ The data set thus includes data from profit and loss accounts as well as from the balance sheets of the firms. Information about the lenders is taken from profit and loss accounts, balance sheets and audit reports. The credit register gives information about the amount of credit per relationship. We use the period from 1996 to 2002 as the coverage of all underlying datasets is best for this period. The high quality of the merge of the datasets has been ensured by means of different robustness checks.²⁴

Crucial factors that determine firms' access to credit are their creditworthiness and profitability, respectively, the reason being that firms with sub-investment grade ratings are more likely to have borrowing difficulties. Accordingly, we calculate several firm ratios (turnover to assets, equity to assets, bank debt to assets) and a logit-model based default probability of firms.²⁵ On the basis of the credit register we count the number of lending relationships per firm (number of lenders), being perceived as a proxy for the firms' financing opportunities in terms of a more extensive bargaining power.

As credit demand and credit supply also depend on the general economic environment, which can vary from year to year, we include year dummies and a measure of the concentration in the regional banking market. For the latter purpose we identify 67 regions to which each firm is assigned and calculate the Hirschman-Herfindahl-Index from the credit register data.²⁶

²²The tables in the text show the results for the full sample and the two subsamples, whereas the tables for the robustness checks in the appendix show the SME subsample results.

²³Further information about the merged dataset can be found in Schmieder (2006).

²⁴For this purpose, we consider only observations with a reasonable coverage ratio (the ratio of total credit debt as reported in the credit register to the bank debt taken from the balance sheet of the firms) and firms reporting more than €1.5 millions bank debt in their balance sheet, as this is the threshold for the credit register.

²⁵See Krüger et al. (2005). The default probability is calculated based on a logistic regression rating model in a cross-sectional context with more than 200 defaults.

²⁶Assuming that the relevant market for each firm is its regional one, this is done as follows:

Table 1: Number of Observations per year

| Year | Lending relationship level panel | Firm level panel |
|--------------|----------------------------------|------------------|
| | No. Observations | No. Firms |
| 1996 | 8,914 | 2,730 |
| 1997 | 10,007 | 2,896 |
| 1998 | 10,892 | 3,160 |
| 1999 | 12,357 | 3,528 |
| 2000 | 13,627 | 3,945 |
| 2001 | 15,161 | 4,440 |
| 2002 | 14,720 | 4,374 |
| Total | 85,678 | 25,073 |

As mentioned above, we also use a data set aggregated on the firm level. The aggregation procedure leaves us with the challenge of how to treat information on the potential numerous lenders of each firm. In order to be still able to analyze the size effect, we calculate an average for the lending banks. While we have information on the individual loan size, we use this as weights to control for the importance lenders have for the specific borrower.²⁷

The lending relationship level panel dataset comprises a total of 85,678 observations from the period of 1996 to 2002 corresponding to 6,165 firms (cf. Table 1).²⁸ The firm level panel exhibits 25,073 observations²⁹, i.e. each firm has on average 3.4 lending relationships per year.³⁰ The distribution of the number of observations for the two panels over time is shown below. SMEs make up around 75% of the observations on the firm level.

Descriptive statistics for the firms in our sample can be found in Table 5 and Table 6 in the Appendix. We show summary statistics for the full sample and for both subsamples on the basis of the firm level and on the relationship level data set for the variables used in the regression. The main differences between SMEs and large firms can be observed in both panels: SMEs finance themselves more by bank debt and less by equity than large firms. Their default probability is only slightly higher and the ratio of turnover to assets is smaller. There is also a clear difference between SMEs and larger firms in terms of the number of lending relationships:

We use the amount of total credit granted in one region and calculate the portion each individual bank grant, square this and sum it up for each year and each region. The HHI varies from 0.008 to 0.37.

²⁷This calculation requires some caveats. First, we thereby assume that the firms' overall indebtedness is contained in the dataset, which may, given the nominal credit exposure threshold of Å1.5m in the German credit register, not be fulfilled for some of the smaller firms. Second, given the specific purpose and structure of the German credit register, the aggregation of the indebtedness may be related to double-counting, as the database is designed to mainly reflect the complex interrelationship between firms on the disaggregated level.

²⁸Depending on the variable specification used for the regression, the sample size may decrease considerably due to missing values and excluded outliers for both panels.

²⁹The aggregation can be clarified based on a straightforward example. Let us assume that firm 1 borrows 300 euros from the bank A, 200 euros from bank B and 500 euros from bank C. Accordingly, the lender dimension will be reduced as follows: firm 1 borrows 1000 euros from 3 banks and the bank with the largest exposure has a loan share of 0.5.

³⁰Calculated as 85,678/25,073.

while a median SME has a relationship with two banks, a median larger firm exhibits five. Furthermore, the fact that more than 25% of the SMEs have only one lending relationship clearly outlines the importance of housebanks in Germany

Based on the firm level data set SMEs have on average (median) 44.6% of their assets financed by bank debt and only 13.4% by equity (compared to 27.5% bank debt and 20% equity for large firms). A median SME has €10m of assets and a turnover of €15.4m, the median indebtedness is €3.8m and the corresponding values for a median large firm are €54.2m of assets, a turnover of €94.6m and a total indebtedness of €16.4m.³¹

For the lending relationship data set, the descriptive statistics are similar. For the number of lenders, however, the numbers are higher than for the firm level data as the lending relationships are counted more than once in this data set. For the same reason, also the total assets and the turnover become higher, while the other ratios remain relatively similar.

The decision of a bank to grant credit is driven on the one hand by the firm characteristics, but on the other hand also the banks' characteristics may play an important role. Table 7 in the Appendix shows the size distribution of the banks. The median of the total assets of banks in our sample is €0.68bn. The corresponding median for the commercial banks is €0.75bn, €1.18bn for the savings banks (excluding the Landesbanks) and €0.35bn for the cooperative banks (excluding the central cooperative institutions).

It is often argued in this context that savings banks and cooperative banks have a different lending policy than private banks, which is accounted for in our studies by means of bank pillar dummies for the relationship level panel. The average portion of credit granted to firms is 44% for the commercial banks, 34% for the Landesbanks and savings banks, 13% for the cooperative banks including their central institutions and 9% for other banks.³² This outcome shows that our dataset seems to be less representative for cooperative banks, as the portion for the cooperative bank sector is substantially lower than it would be expected in practice, what will be taken into account when it comes to the interpretation of our panel estimates.

5 Empirical Results

5.1 Results

Table 2 shows the results of our first regression investigating whether there is a direct effect of M&A activities on the credit exposure of firms (*Merger-Effect*). For the aforementioned reasons, we would expect to find a negative effect, while the time-structure of the effect is not clear a priori. In our SME sub-sample we find a significant negative direct effect (*Merge-Dummy*), while the effect one year after the merger (*Merge-Dummy (t-1)*) is insignificant and turns out to be positive and

³¹Besides, we include the firms' industry sector and legal form as control variables.

³²Or, focussing on the number of observations, 46% of the credits are from commercial banks, 30% from savings banks and the Landesbanks and 12% from cooperative banks and their central institutions.

significant two years later (*Merge-Dummy (t-2)*). However, given that the dependent variable is measured in logarithms, so that the effect expressed in percentage changes of the total amount of credit is quite decent, -1.5% for the mergers in the same year and +1.3% for mergers two years before. For the full sample, we observe that only the positive effect two years after the merger remains significant, whereas all other effects turn to be insignificant. This may be explained by the fact that for our second sub-sample of large firms, only the direct effect is significant (though positive in contrast to our findings for the SMEs) and all other effects are insignificant.

Table 2: *Merger-Effect* Regression results

Dependent variable: logarithmized total indebtedness

| | Full sample | SME | Large firms |
|----------------------------|--------------------------|--------------------------|--------------------------|
| Merge-Dummy | 0.009735 (-1.61) | -0.014765** (-2.29) | 0.032659** (-2.41) |
| Merge-Dummy (t-1) | 0.007523 (-1.19) | -0.005818 (-0.86) | 0.008998 (-0.64) |
| Merge-Dummy (t-2) | 0.017624*** (-2.81) | 0.012783* (-1.88) | 0.011488 (-0.82) |
| Concentration (HHI) | -0.017342 (-0.22) | -0.092973 (-1.13) | 0.063019 (-0.35) |
| Default probability | 3.229589*** (-5.45) | 2.344752*** (-4.22) | 11.558767*** (-4.91) |
| Equity/Assets | -0.830281*** (-22.68) | -0.696132*** (-19) | -1.176845*** (-11.91) |
| Turnover/Assets | -0.127513*** (-20.83) | -0.151456*** (-21.65) | -0.133107*** (-9.42) |
| Number of lenders per firm | 0.129493*** (-63.63) | 0.192835*** (-62.72) | 0.087712*** (-27.89) |
| Constant | 8.579309*** (-469.96) | 8.222893*** (-445.06) | 9.642820*** (-165.96) |
| Observations | 23,831 | 17,971 | 5,860 |
| Number of firms | 6,165 | 4,975 | 1,598 |
| R-squared | 0.29 | 0.34 | 0.27 |
| within R-squared | 0.294 | 0.342 | 0.269 |
| between R-squared | 0.49 | 0.539 | 0.551 |
| overall R-squared | 0.502 | 0.542 | 0.546 |

Notes: Year-, Legal form- and Industry-Dummies included. Absolute value of t-statistics in parentheses. * significant at 10%; ** significant at 5%; *** significant at 1%.

The outcome of an initially negative but relatively small effect of banking consolidation on SME financing that turns out to be counteracted afterwards is supported by the results for the *Size-Effect* (cf. Table 3 for the relationship level results and Table 4 for the firm level results). On the relationship level, the banks' size has a significant and negative, but limited effect on the ratio of bank debt to assets for both the SMEs and the total sample, while the effect for large firms is also negative but only significant at the 10% level. On the firm level, the bank size has a highly significant negative effect on SMEs. However, this effect is again very small. As the banks' size is measured in billion Euros and the dependent variable is a ratio, the ratio of bank debt to assets of a SME would decrease by 0.034 percentage points given an increase of the banks total assets by 1 trillion. Supposing that two median-sized banks would merge, their size would increase by 0.677bn Euros, so that this merger

would affect the borrower by reducing their bank debt to assets ratio by 0.000023 percentage points. This effect can be considered to be very small and negligible.

Table 3: *Size-Effect* Regression results, Relationship level

Dependent variable: Bank debt/Firm's assets

| | Full sample | SME | Large firms |
|-------------------------------------|--------------------------|--------------------------|--------------------------|
| Bank size (assets in bn €) | -0.000005*** (-2.87) | -0.000006** (-2.15) | -0.000004* (-1.9) |
| Commercial Banks | -0.000119 (-0.13) | 0.000554 (-0.38) | -0.000517 (-0.45) |
| Landesbanks | 0.000727 (-0.66) | 0.001396 (-0.8) | 0.000448 (-0.34) |
| Savings Banks | -0.002026** (-1.98) | -0.001308 (-0.86) | -0.002477* (-1.87) |
| Cooperative banks Head Institutions | 0.000779 (-0.48) | 0.000444 (-0.18) | 0.001105 (-0.57) |
| Cooperative banks | -0.001627 (-1.27) | -0.001439 (-0.79) | -0.001264 (-0.73) |
| Concentration (HHI) | -0.045156*** (-4.47) | -0.014735 (-0.99) | -0.096856*** (-7.13) |
| Default probability | 2.752197*** (-35.47) | 2.411672*** (-25.44) | 4.398331*** (-27.62) |
| Equity/Assets | -0.354519*** (-73.08) | -0.320741*** (-48.73) | -0.398890*** (-54.29) |
| Turnover/Assets | -0.016963*** (-20.61) | -0.017143*** (-12.89) | -0.016318*** (-14.28) |
| Constant | 0.486385*** (-145.61) | 0.521869*** (-109.94) | 0.427557*** (-79.33) |
| Observations | 74,683 | 42,388 | 32,295 |
| Number of firms | 6,137 | 4,949 | 1,598 |
| R-squared | 0.13 | 0.11 | 0.17 |
| within R-squared | 0.13 | 0.114 | 0.165 |
| between R-squared | 0.226 | 0.211 | 0.102 |
| overall R-squared | 0.216 | 0.198 | 0.159 |

Notes: Year-, Legal form- and Industry- Dummies included. Omitted category for bank pillar affiliation of lender: other financial institutions. Absolute value of t-statistics in parentheses.

* significant at 10%; ** significant at 5%; *** significant at 1%.

The coefficient of our measure for the concentration in the lenders' market is insignificant in most of the specifications. Only for the regression on the relationship level for the full sample and the large firm sub-sample the effect turns to be negative and significant, but this result may be driven by some large firms being overrepresented in this sample (because of a high number of lending relationships).

The other firm-specific control variables show the same results for all three specifications and are in line with our expectations: Both the firms' equity ratio and the ratio of turnover to assets are significant and negative, while the default probability and the number of lenders exhibit a positive sign and are again highly significant.

The pillar dummies are not significant for the SME sub-sample, i.e. there is no significant difference between the pillars as regards their SME financing policy according to our definition. However, given that the database has been shown to be misbalanced in terms of the portion of lending relationships (particularly for the

Table 4: *Size-Effect* Regression results, Firm-level*Dependent variable: Bank debt/Firm's assets*

| | Full Sample | SME | Large firms |
|------------------------------------|--------------------------|--------------------------|--------------------------|
| Average bank size (assets in bn €) | -0.000033*** (-3.68) | -0.000034*** (-3.18) | -0.000028 (-1.61) |
| Concentration (HHI) | -0.007034 (-0.36) | 0.000134 (-0.01) | -0.036747 (-1.07) |
| Default probability | 2.404830*** (-16) | 2.044871*** (-12.47) | 5.465522*** (-11.93) |
| Equity/Assets | -0.303729*** (-32.91) | -0.293863*** (-27.33) | -0.315792*** (-16.62) |
| Number of lenders per firm | 0.010370*** (-20.46) | 0.015560*** (-17.57) | 0.007366*** (-12.23) |
| Turnover/Assets | -0.014354*** (-9.23) | -0.013501*** (-6.53) | -0.012747*** (-4.64) |
| Constant | 0.450609*** (-96.85) | 0.478126*** (-87.64) | 0.326499*** (-28.75) |
| Observations | 23,831 | 17,971 | 5,860 |
| Number of firms | 6,165 | 4,975 | 1,598 |
| R-squared | 0.13 | 0.12 | 0.18 |
| within R-squared | 0.129 | 0.119 | 0.179 |
| between R-squared | 0.112 | 0.145 | 0.104 |
| overall R-squared | 0.118 | 0.149 | 0.137 |

Notes: Year-, Legal form- and Industry-Dummies included. Absolute value of t-statistics in parentheses. * significant at 10%; ** significant at 5%; *** significant at 1%.

cooperative banks), this result has to be interpreted with caution. For the large firms, the outcome is analogous, with the exception of the savings banks, which exhibit a significant and negative sign indicating that large firms borrowing from savings banks tend to have less bank debt.

5.2 Robustness of the results

In order to ensure the robustness of our estimates, we run a series of additional regressions for all three specifications as shown in Table 8, Table 9, and Table 10 in the Appendix, with a sole focus on the SME cases.

For the merger-effect panel (Table 8), we vary both the firm side and the bank side. As clearly shown, the merger effects remain stable and the signs of the additional firm variables added are in line with our expectations. The only exception is the case where the firm side variables are removed "Firm-variation"), as the merge dummy for the first year becomes positive in that case. However, at the same time the predictive power of the regression decreases substantially, indicating that essential information on the firm side is lost and is being somehow captured in the merge dummy.

The same result occurs for the size-effect panel, both on the relationship level (Table 9) and on the firm-level (Table 10): For all four specifications in both cases, the size effect remains significant, negative, but very limited. Similarly, the signs for the control variables remain stable, with the exception of the POLS regression for

the relationship level panel, where there is a significant and negative effect for commercial banks, the savings banks and the cooperative banks. However, this outcome has to be interpreted in a very cautious way: first, the relationship level specification assigns excess weight to larger banks with a higher number of lending relationships in the panel data and second, the panel is relatively unbalanced in terms of its distribution across the bank pillars. Another difference to the fixed-effect specifications is that the POLS regression indicates a positive effect of concentration in the lenders' market, which would point out that banking consolidation in terms of a reduction of the concentration has a negative effect on SME financing. Again, the effect remains very limited, though. The results of the OLS regression indicate that further research is necessary at a later point in time to track whether the banking consolidation tends to remain rather insignificant on SME financing in Germany.

6 Conclusion

Recently, there has been a lively debate on a worsening of SME financing triggered by various developments, notably a tendency to risk-adjusted pricing, a standardization of credit origination and last but not least by banking consolidation. The debate was particularly addressed in Germany, but also in many other countries that have been enforced by similar developments.

The aim of this study was to trace these worries and to analyze the effect of banking consolidation in Germany on SME financing. The focus of the analysis was two-fold: First, we explicitly controlled for the effect of bank mergers on the total indebtedness of firms (and SMEs). Second, we also tested the effect of an increase in the lenders' size and market concentration in the course of banking consolidation on the firms' bank debt/asset ratio.

Our results suggest that the ongoing banking consolidation in Germany does principally not have a strong negative impact on the SME financing, particularly when directly controlling for mergers. Similarly, when controlling for the bank debt/asset ratio, there is a very limited, almost negligible tendency to observe a reduced SME financing. Moreover, we do not find that bank market concentration affects SME financing.

We acknowledge, however, that the current concentration in the German banking market is still among the lowest in the European Union and the market among the most fragmented ones. This observation points out that the outcome of a similar study at a later stage may reveal different results. Moreover, the results require some caveat. First, the analysis does not control for credit rationing, as the sample does only include firms that obtained credit. Second, very small firms (with assets below €5m) tend to be underrepresented in the dataset or those included may not be representative.

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Appendix

Table 5: Summary statistics for firms, Firm-level panel

| | 25 th percentile | Median | 75 th percentile | N |
|---|-----------------------------|--------|-----------------------------|--------|
| <i>Full Sample</i> | | | | |
| Bank debt/Assets | 0.265 | 0.4073 | 0.5526 | 24,863 |
| Equity/Assets | 0.0674 | 0.1504 | 0.2662 | 24,863 |
| Assets (in 1,000 €) | 6,921 | 13,961 | 34,711 | 25,073 |
| Turnover (in 1,000 €) | 10,011 | 21,336 | 47,074 | 25,073 |
| Total Indebtedness (in 1,000 €) | 2,622 | 5,113 | 12,255 | 25,073 |
| Default probability | 0.0016 | 0.0031 | 0.0054 | 24,399 |
| Turnover/Assets | 0.9501 | 1.6654 | 2.4062 | 25,073 |
| Number of lenders | 1 | 2 | 4 | 25,073 |
| <i>Small and medium-sized enterprises</i> | | | | |
| Bank debt/Assets | 0.3116 | 0.446 | 0.5814 | 18,984 |
| Equity/Assets | 0.0573 | 0.134 | 0.2481 | 18,984 |
| Assets (in 1,000 €) | 5,847 | 9,976 | 18,543 | 19,185 |
| Turnover (in 1,000 €) | 7,778 | 15,380 | 26,353 | 19,185 |
| Total Indebtedness (in 1,000 €) | 2,279 | 3,835 | 7,533 | 19,185 |
| Default probability | 0.0018 | 0.0033 | 0.0058 | 18,523 |
| Turnover/Assets | 0.8402 | 1.6008 | 2.3206 | 19,185 |
| Number of lenders | 1 | 2 | 3 | 19,185 |
| <i>Large firms</i> | | | | |
| Bank debt/Assets | 0.1558 | 0.2747 | 0.4086 | 5,879 |
| Equity/Assets | 0.1171 | 0.2004 | 0.3061 | 5,879 |
| Assets (in 1,000 €) | 32,157 | 54,155 | 123,075 | 5,888 |
| Turnover (in 1,000 €) | 66,113 | 94,554 | 169,653 | 5,888 |
| Total Indebtedness (in 1,000 €) | 8,692 | 16,357 | 35,897 | 5,888 |
| Default probability | 0.0013 | 0.0024 | 0.0041 | 5,876 |
| Turnover/Assets | 1.268 | 1.8599 | 2.7569 | 5,888 |
| Number of lenders | 3 | 5 | 7 | 5,888 |

Notes: Changing numbers of observations are due to missing values for some variables

Table 6: Summary statistics for firms, relationship level panel

| | 25 th percentile | Median | 75 th percentile | N |
|---|-----------------------------|---------|-----------------------------|--------|
| <i>Full Sample</i> | | | | |
| Bank debt/Assets | 0.2368 | 0.3786 | 0.5269 | 85,678 |
| Equity/Assets | 0.0944 | 0.1839 | 0.2989 | 85,678 |
| Assets (in 1,000 €) | 13,251 | 34,990 | 133,789 | 85,678 |
| Turnover (in 1,000 €) | 14,645 | 37,248 | 103,764 | 85,678 |
| Total Indebtedness (in 1,000 €) | 1,343 | 2,414 | 5,113 | 85,082 |
| Default probability | 0.0018 | 0.0032 | 0.0055 | 81,020 |
| Turnover/Assets | 0.5094 | 1.3922 | 2.1536 | 85,678 |
| Number of lenders per firm | 3 | 5 | 8 | 85,678 |
| <i>Small and medium-sized enterprises</i> | | | | |
| Bank debt/Assets | 0.2979 | 0.4343 | 0.571 | 50,006 |
| Equity/Assets | 0.0741 | 0.1614 | 0.2841 | 50,006 |
| Assets (in 1,000 €) | 8,283 | 16,302 | 37,653 | 50,006 |
| Turnover (in 1,000 €) | 7,302 | 17,461 | 30,117 | 50,006 |
| Total Indebtedness (in 1,000 €) | 1,266 | 2,060 | 3,760 | 49,465 |
| Default probability | 0.002 | 0.0036 | 0.0062 | 45,491 |
| Turnover/Assets | 0.195 | 1.2695 | 2.0381 | 50,006 |
| Number of lenders per firm | 2 | 3 | 5 | 50,006 |
| <i>Large firms</i> | | | | |
| Bank debt/Assets | 0.1279 | 0.2124 | 0.3134 | 35,672 |
| Equity/Assets | 0.177 | 0.3001 | 0.4429 | 35,672 |
| Assets (in 1,000 €) | 43,594 | 101,525 | 352,725 | 35,672 |
| Turnover (in 1,000 €) | 75,853 | 130,308 | 275,051 | 35,672 |
| Total Indebtedness (in 1,000 €) | 1,524 | 3,278 | 7,669 | 35,617 |
| Default probability | 0.0016 | 0.0028 | 0.0046 | 35,529 |
| Turnover/Assets | 0.7882 | 1.5289 | 2.3205 | 35,672 |
| Number of lenders per firm | 5 | 7 | 13 | 35,672 |

Notes: Changing numbers of observations are due to missing values for some variables

Table 7: Summary statistics for the bank size (total assets in Million Euros)

| | 25 th percentile | Median | 75 th percentile | N |
|-------------------------------------|-----------------------------|---------|-----------------------------|--------|
| All Banks | 317 | 677 | 1,550 | 1450 |
| Other financial Institutions | 2,190 | 9,700 | 25,500 | 88 |
| Commercial Banks | 311 | 747 | 2,790 | 188 |
| Landesbanks | 50,900 | 83,800 | 127,000 | 14 |
| Savings Banks | 712 | 1,180 | 2,070 | 515 |
| Cooperative Banks Head Institutions | 26,200 | 38,300 | 101,000 | 4 |
| Cooperative Banks | 220 | 351 | 576 | 636 |
| <i>Relationship-level Data Set</i> | | | | |
| All Banks | 3,100 | 29,300 | 238,000 | 79,344 |
| Other financial Institutions | 22,600 | 29,500 | 40,700 | 9,098 |
| Commercial Banks | 15,100 | 226,000 | 356,000 | 36,660 |
| Landesbanks | 80,700 | 137,000 | 265,000 | 8,950 |
| Savings Banks | 1,300 | 2,530 | 5,340 | 15,297 |
| Cooperative Banks Head Institutions | 34,800 | 111,000 | 154,000 | 2,681 |
| Cooperative Banks | 342 | 632 | 1,370 | 6,658 |
| <i>Firm-level Data Set</i> | | | | |
| Average Banksize | 7,182 | 72,463 | 191,040 | 25,073 |

Table 8: Robustness checks *Merger-Effect*, Firm-level (only SMEs)

Dependent variable: logarithmized total indebtedness

| | Baseline | Firm- variation | Without firm- side dummies | Baseline |
|--------------------------------|--------------------------|-------------------------|-------------------------------|--------------------------|
| Merge-Dummy | -0.014765** (-2.29) | 0.017887** (-2.52) | -0.014936** (-2.32) | -0.014691** (-2.28) |
| Merge-Dummy (t-1) | -0.005818 (-0.86) | 0.014669* (-1.94) | -0.006352 (-0.93) | -0.005357 (-0.79) |
| Merge-Dummy (t-2) | 0.012783* (-1.88) | 0.037780*** (-4.99) | 0.012805* (-1.89) | 0.013436** (-1.97) |
| Concentration (HHI) | -0.092973 (-1.13) | -0.038839 (-0.42) | -0.084942 (-1.04) | -0.092772 (-1.13) |
| Default probability | 2.344752*** (-4.22) | | 2.363404*** (-4.26) | 2.345976*** (-4.22) |
| Equity/Assets | -0.696132*** (-19) | | -0.688229*** (-18.8) | -0.695303*** (-18.98) |
| Turnover/Assets | -0.151456*** (-21.65) | | -0.152348*** (-21.81) | -0.151315*** (-21.63) |
| Number of lenders per firm | 0.192835*** (-62.72) | | 0.194048*** (-63.45) | 0.192707*** (-62.66) |
| ln(Sales) | | 0.184296*** (-21.09) | | |
| Debt/Equity | | 0.000015*** (-2.6) | | |
| Number of lenders (3-6) | | 0.360756*** (-38.35) | | |
| Number of lenders (7-10) | | 0.657997*** (-28.21) | | |
| Number of lenders (>10) | | 0.918573*** (-17.12) | | |
| Av. bank size (assets in bn €) | | | | -0.000053 (-1.41) |
| Constant | 8.222893*** (-445.06) | 6.445623*** (-78.14) | 8.225779*** (-470.33) | 8.226098*** (-441.92) |
| Observations | 17,971 | 17,302 | 18,041 | 17,971 |
| Number of firms | 4,975 | 4,871 | 4,979 | 4,975 |
| R-squared | 0.34 | 0.22 | 0.34 | 0.34 |
| within R-squared | 0.342 | 0.223 | 0.343 | 0.342 |
| between R-squared | 0.539 | 0.308 | 0.544 | 0.538 |
| overall R-squared | 0.542 | 0.333 | 0.545 | 0.54 |

Notes: Absolute value of t-statistics in parentheses. * significant at 10%; ** significant at 5%; *** significant at 1%.

Table 9: Robustness checks *Size-Effect*, Relationship level (only SMEs)

Dependent variable: Bank debt/Firm's assets

| | FE-Regression Baseline | FE-Regression Firm- variation | FE-Regression Without firm- side dummies | POLS Baseline |
|-------------------------------|---------------------------|-------------------------------------|--|--------------------------|
| Bank size (assets in bn €) | -0.000006** (-2.15) | -0.000006** (-2.24) | -0.000006** (-2.21) | -0.000074*** (-14.35) |
| Commercial Banks | 0.000554 (-0.38) | 0.0009 (-0.59) | 0.000605 (-0.42) | -0.007398** (-2.56) |
| Landesbanks | 0.001396 (-0.8) | 0.002166 (-1.19) | 0.001397 (-0.8) | -0.003467 (-0.98) |
| Savings Banks | -0.001308 (-0.86) | -0.000663 (-0.42) | -0.001292 (-0.85) | -0.022161*** (-7.62) |
| Coop. Banks Head institutions | 0.000444 (-0.18) | 0.001507 (-0.57) | 0.000483 (-0.19) | -0.011406** (-2.22) |
| Cooperative Banks | -0.001439 (-0.79) | -0.000685 (-0.36) | -0.001415 (-0.78) | -0.027657*** (-8.15) |
| Concentration (HHI) | -0.014735 (-0.99) | 0.005717 (-0.37) | -0.014869 (-1) | 0.077500*** (-3.5) |
| Default probability | 2.411672*** (-25.44) | | 2.419003*** (-25.51) | 0.637549*** (-4.47) |
| Equity/Assets | -0.320741*** (-48.73) | | -0.319475*** (-48.65) | -0.540899*** (-91.97) |
| Turnover/Assets | -0.017143*** (-12.89) | | -0.017237*** (-12.95) | -0.014634*** (-17.57) |
| ln(Sales) | | 0.000004* (-1.68) | | |
| Debt/Equity | | -0.024578*** (-17.37) | | |
| Number of lenders (3-6) | | 0.033452*** (-21.08) | | |
| Number of lenders (7-10) | | 0.060618*** (-21.79) | | |
| Number of lenders (>10) | | 0.092770*** (-18.66) | | |
| Constant | 0.521869*** (-109.94) | 0.674543*** (-47.82) | 0.521792*** (-173.42) | 0.601392*** (-119.52) |
| Observations | 42,388 | 42,809 | 42,388 | 42,388 |
| Number of firms | 4,949 | 4,962 | 4,949 | |
| R-squared | 0.11 | 0.03 | 0.11 | 0.27 |
| within R-squared | 0.114 | 0.029 | 0.112 | |
| between R-squared | 0.211 | 0.119 | 0.186 | |
| overall R-squared | 0.198 | 0.065 | 0.173 | |

Notes: Omitted category for bank pillar affiliation of lender: other financial institutions.
 Absolute value of t-statistics in parentheses. * significant at 10%; ** significant at 5%;
 *** significant at 1%.

Table 10: Robustness checks *Size-Effect*, Firm-level (only SMEs)

Dependent variable: Bank debt/Firm's assets

| | FE-Regression Baseline | FE-Regression Firm- variation | FE-Regression Without firm- side dummies | POLS Baseline |
|--------------------------------|---------------------------|-------------------------------------|--|--------------------------|
| Av. bank size (assets in bn €) | -0.000034*** (-3.18) | -0.000039*** (-3.3) | -0.000037*** (-3.35) | -0.000117*** (-13.97) |
| Concentration (HHI) | 0.000134 (-0.01) | 0.005828 (-0.22) | 0.002048 (-0.08) | -0.001526 (-0.04) |
| Default probability | 2.044871*** (-12.47) | | 2.055774*** (-12.56) | 0.975244*** (-4.81) |
| Equity/Assets | -0.293863*** (-27.33) | | -0.295076*** (-27.33) | -0.522659*** (-59.98) |
| Number of lenders per firm | 0.015560*** (-17.57) | | 0.015971*** (-18.1) | 0.002176*** (-3.08) |
| Turnover/Assets | -0.013501*** (-6.53) | | -0.013764*** (-6.68) | -0.012585*** (-9.82) |
| ln(Sales) | | -0.028573*** (-11.3) | | |
| Debt/Equity | | 0.000007*** (-3.84) | | |
| Number of lenders (3-6) | | 0.036145*** (-13.71) | | |
| Number of lenders (7-10) | | 0.064819*** (-9.84) | | |
| Number of lenders (>10) | | 0.097243*** (-6.35) | | |
| Constant | 0.478126*** (-87.64) | 0.708600*** (-29.65) | 0.482958*** (-93.22) | 0.539332*** (-84.97) |
| Observations | 17,971 | 17,164 | 18,041 | 17,971 |
| Number of firms | 4,975 | 4,858 | 4,979 | |
| R-squared | 0.12 | 0.03 | 0.12 | 0.27 |
| within R-squared | 0.119 | 0.031 | 0.122 | |
| between R-squared | 0.145 | 0.12 | 0.133 | |
| overall R-squared | 0.149 | 0.095 | 0.137 | |

Notes: Absolute value of t-statistics in parentheses. * significant at 10%; ** significant at 5%; *** significant at 1%.

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