Corporate Financial Constraints, Bank Governance, and Financial System Stability

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Abstract

Financial constraints are frictions that prevent firms from funding all desired investments, which might affect firm value and aggregate economic activity. We investigate whether and how bank governance, especially private vs. non-private bank ownership, affects financial constraints of small and medium-sized enterprises (SMEs). We focus on SMEs because they are more opaque, bank-dependent and riskier than large firms. Given the significant differences between private and non-private banks' objectives, governance, and organizational structure we expect a different impact on corporate financial constraints. Based on a rich dataset on German SMEs from the period 1995-2007, we find that an increase in relative borrowings from non-private banks reduces corporate financial constraints significantly. There is no such effect for private banks, and the reduction of financial constraints becomes stronger in periods of low regional economic growth, and for the smallest and relatively risky firms. Our findings highlight two important features of a financial system that consists of private and non-private banks: aggregate corporate financial constraints are reduced and corporate borrowings become less cyclical, reducing the volatility of economic activity.

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1. Introduction

What do we know about the real effects of financial system architecture? Do differences in bank governance, especially bank ownership, affect economic activity? While there is considerable cross-country evidence that financial deepening has a positive impact on aggregate output and growth (e.g., King and Levine, 1993), there is little evidence on whether and how bank governance, especially private vs. non-private ownership, affects the corporate sector within a country, especially in developed countries. This is a timely and relevant issue for researchers, practitioners and regulators since bank governance has substantially changed in many developed countries during the 2007-2009 financial crisis.

Already before the crisis, government ownership of banks has been large and existing all around the world (e.g., La Porta et al., 2002). There has also been debate about changing the financial system architecture, especially bank ownership structure, in some countries in response to the Financial Sector Assessment Program (FSAP) of the International Monetary Fund. The dominant view has been that financial systems with fully private bank ownership are superior to systems with diverse bank governance structures.

In this paper we investigate real effects of bank governance. We consider the variation in corporate financial constraints as an indication of important real effects since they might affect firm value, economic activity and aggregate welfare. Financial constraints are frictions that prevent firms from funding all desired investments (e.g., Fazzari et al., 1988; Kaplan and Zingales, 1997; Cleary, 1999; Lamont et al., 2001; Love, 2003; Almeida et al., 2004; Whited and Wu, 2006; Almeida and Campello, 2007; Hadlock and Pierce, 2010). Cash flow problems, credit availability, and the price of credit represent major determinants of corporate financial constraints. Beck et al. (2005) show that financial and legal constraints to investments are most pronounced for smallest firms. We therefore focus on small and medium-sized enterprises (SMEs) since these firms are more opaque, more bank-dependent and riskier than large firms. We are aware that corporate financial constraints are not the only

way of capturing real effects but they are clearly relevant for individual firms' investment behavior and aggregate economic activity, as pointed out by Fazzari et al. (1988): *"Financial constraints have a clear macroeconomic dimension …, their behavior may help explain aggregate movements of investment."*

Because of significant differences between private and non-private banks' objectives, governance, and organizational structure we expect a different lending behavior and therefore a different impact on corporate financial constraints. Anecdotic statements from the banking industry and indirect evidence from the literature suggest that lending of private strictly profit-maximizing banks is more procyclical than that of state-owned banks (e.g., Foos, 2010; Engel and Middendorf, 2010). Similar arguments hold for deposit taking and liquidity creation (e.g., Berger et al., 2010; Norden and Weber, 2010a). Such differences in bank behavior help to stabilize a financial system. Stated differently, a financial system with private and state-owned banks exhibits a lower aggregate volatility of bank lending and liquidity creation. This is because the lending volume in such a system is relatively bigger in bad times and relatively lower in good times. This fact does not necessarily imply that a system with private and state-owned banks dominates a fully private banking system which is likely to have a higher procyclicality. Instead, it indicates that not only one but several optimal financial system designs may exist.

Our analysis is based on a rich proprietary dataset on financial statement information of small and medium-size enterprises from Germany. It covers the period from 1995 to 2007 and includes 166,300 firm-year observations. The data are representative for the German economy, where 96 percent of the firms are considered to be SMEs. We merged the firm-level data with regional macro-economic information and regional data on bank competition and bank branches. To identify effects from bank governance on corporate financial constraints we exploit information on the composition of firms' bank debt by bank type. We consider the percentage share of firms' borrowings from local state-owned banks (hereinafter: savings

banks) and its change over time to analyze the impact on financial constraints. German savings banks have been existing for more than two hundred years, are controlled by local governments, and their by-laws include a list of mandatory business objectives such as supporting local firms with credit, promoting household savings behavior, and striving for but not maximizing profits. The savings banks sector has the largest market share in bank lending in Germany, and the behavior of these banks has recently been studied in different contexts (e.g., Gropp et al., 2010; Puri et al., 2010). Despite of the significant size of the savings banks sector as a whole it is important to note that all of these banks operate locally. Banks with a similar governance structure exist in many other countries, for example, in Austria, Brazil, China, France, Italy, Norway, Spain and Switzerland.

We conduct the following empirical tests. First, we estimate standard investment-cash flow regression models in which we interact the percentage share of each firm's borrowings from savings banks with the firm's cash flow (for a similar approach in a different context see, e.g., Love, 2003). To distinguish between more or less likely constrained firms we split the sample based on widely used measures of financial constraints such as firm size, asset tangibility and the Whited and Wu (2006) index. In addition, we estimate a cash holdings-cash flow regression model following Almeida et al. (2004). Second, we conduct an event study-like analysis to examine the behavior of financial constraints of firms that increased their borrowings from savings banks. This test has the advantage that we compare exactly the same firms before and after the event. Third, to study the implications for financial system stability, we examine whether regional economic activity and firm-specific default risk influences the impact of bank governance on financial constraints. In this test, we also address the issue that financial constraints and financial distress are related but different concepts, as pointed out by Kaplan and Zingales (1997).

We find that a 10 percent increase of borrowings from savings banks reduces financial constraints of small and medium-sized enterprises by approximately 2.8 percent. This result is

highly statistically and economically significant and based on a cross-sectional time-series pooled analysis of the full sample and robust to different model specifications. We also account for potential endogeneity of the share of savings bank debt by using the percentage share of savings banks branches in a region as instrument for a firm's percentage share of borrowings from savings banks over total bank debt and obtain the same result. Furthermore, we confirm our findings with an OLS-IV regression model following Almeida et al. (2010).

When we split the sample into more and less likely constrained firms based on standard measures from the literature we find that the beneficial effect of borrowing from savings banks becomes larger for firms that are more likely to be constrained. Similar results are found from cash holdings-cash flow regression models. We further confirm our main result by using event study-like methodology. For this purpose, we compare financial constraints of the same firms before and after increases of the percentage share in borrowings from savings banks and find an even stronger reduction of financial constraints by 3.5 percent for an increase of borrowings from savings banks of 10 percent. The reduction of financial constraints is unique to savings banks because there is no such effect when firms increase their borrowings from other banks in absolute and relative terms.

We also explore the mechanism that reduces corporate financial constraints. Firms that increase their borrowings from savings banks face a decline in cash flows and rely more heavily on long-term bank debt to fund investments. Thus, cash flows and bank loans are more likely to be substitutes for these firms. We further find that the constraints-alleviating effect of borrowing from savings banks becomes relatively stronger when the regional GDP growth is low.

Our study contributes to the literature on corporate financial constraints and financial system architecture in several ways. First, our results challenge the view that state-owned banks per se exert negative influence on economic activity. This view has been largely based on evidence from countries in which financial development, the legal system and political

institutions are weak (e.g. La Porta et al., 2002). We identify positive effects from non-private bank ownership at the micro- and macro-level in a country with well-developed institutions. The micro-effect means that SMEs are more likely to implement their desired investment program when borrowing from savings banks. The result is even stronger during economic downturns. The macro-effect means that differences in bank lending behavior help to stabilize the financial system by reducing the volatility of bank lending over time. These findings are consistent with the cross-country evidence provided by Körner and Schnabel (2010). Second, we provide comprehensive evidence on financial constraints of SMEs, which has been largely neglected in the corporate finance literature although on average 70 percent of all firms in OECD countries are SMEs (one exception is Carbo-Valverde et al., 2009). Third, consistent with the literature that compares financing from bond markets vs. banks and banks vs. financing companies (e.g., Houston and James, 1996; Hadlock and James, 2002; Carey et al., 1998; Denis and Mihov, 2003) we show that the type of the lender is important for the availability, timing and terms of finance. Fourth, we provide an out-of-sample test by applying various measures of financial constraints to non-US firms. We confirm that small size, low asset tangibility and various indices are consistent measures to identify corporate financial constraints.

The rest of the paper is organized as follows. In Section 2 we describe the institutional background and our dataset. In Section 3 we discuss the empirical design. In Section 4 we conduct a series of tests to investigate whether borrowing from private or state-owned banks affects the cross-sectional and time variation of corporate financial constraints, and we examine implications for financial system stability. In Section 5 we conclude.

2. Institutional background and data

2.1. The German banking system and public sector banks

Germany, the third-largest economy in the world, has a bank-based financial system (e.g., Allen and Gale, 2000). The German economy is dominated by SMEs that largely depend on bank finance and public bank ownership is relatively high in Germany, making this country an interesting case to study.

The German banking system is a typical universal banking system comprising three major pillars: the private banks, the credit cooperatives and the public sector banks (for details see, e.g., Krahnen and Schmidt, 2004; Norden and Weber, 2010a; Puri et al., 2010). Banks in these three pillars have different objectives, governance, and organizational structures. The public banking sector consists of savings banks and Landesbanks. While savings banks operate locally and focus on deposit taking and lending, the bigger Landesbanks serve as regional money center banks for the smaller savings banks. The owners of German savings banks are the municipalities of the geographic area in which the savings banks operate. According to the German central bank, the Bundesbank, approximately 34 percent of total bank assets in Germany were held by publicly owned banks as per 2009, highlighting the importance of public sector banking in Germany.

An important feature of savings banks in Germany (and many other countries) is that they have the legal mandate to not pursue strictly profit maximizing strategies. The by-laws of these banks stipulate to operate only in the region they are headquartered in, which is commonly referred to as the regional principle. Furthermore, their by-laws require them to support the local economy and to provide credit to local firms, particularly to SMEs. The traditional clients of savings banks have thus been local SMEs as well as retail customers. Banks with similar ownership structures exist in many other countries, for example, Austria, Brazil, China, France, Norway, Russia, and Spain (e.g., La Porta et al., 2002). Therefore, the setting that we analyze and the findings that we document in this study are not unique to the German context, but we are confident that they can be generalized to other countries where banks have similar objectives and governance structures.

2.2. Dataset

We use a rich proprietary dataset that includes firm-specific financial statement variables to analyze the impact of public bank ownership on corporate financial constraints and the potential implications for financial system stability. The data come from the Association of German Savings Banks, whose database has recently been used in a number of related studies. For example, Puri et al. (2010) investigate how the U.S. financial crisis affects retail lending in Germany and Gropp et al. (2010) examine effects of the abolishment of public guarantees on German public banks' risk taking behavior.

Specifically, our dataset includes detailed firm-specific information covering both balance sheet as well as profit and loss variables in the time period 1995 to 2007. All firms in the sample were or are clients of savings banks and have received at least one loan from a savings bank. A significant fraction of these firms are also clients of a private commercial bank or credit cooperatives. None of the firms in the sample is publicly listed. The sample includes 166,300 firm-year observations and covers 68,646 German SMEs. Thus, on average, each firm is included in the sample for about three years. We do not have information about firms that are exclusive clients of private or cooperative banks. We address this issue by comparing the firms from our sample to the overall population of German firms.

According to the German federal statistical office the overall population of German firms amounts to approximately 3.5 million, hence, our dataset covers only a small subset of this population in terms of the absolute number of firms (2.2 percent). In order to check the representativeness of our dataset and results, we compared firms from our sample with the aggregate data provided by the Bundesbank, which is representative of the entire population of German firms. This comparison was done along several important dimensions including asset structure, liability structure, profitability, and cost structure. While this comparison did not yield identical sample characteristics, they are overall qualitatively similar. This together

with the fact that savings banks are of key importance for German SMEs makes us confident that the sample we analyze is representative for the entire population of German SMEs.

2.3. Main variables and descriptive statistics

Table 1 provides descriptive statistics for our main variables. The dependent variable used in most of the regressions is total investment (I) relative to the capital stock (I/K) measured at the beginning of the period. On average, firms' investments in each period amount to 48 percent of their capital stock. In line with the financial constraints literature (e.g., Fazzari et al., 1988 and 2002; Love, 2003; Almeida and Campello, 2007; Almeida et al., 2010), we use total cash flow (CF), defined as earnings before extraordinary items and depreciation, divided by the beginning-of-period capital stock as the main proxy for the cash flow sensitivity of investments (CF/K), that is, as an indicator whether a firm is financially constrained or not. According to this literature, a significant relationship between I/K and CF/K suggests that firms are cash-flow sensitive, i.e., that their investments depend significantly on the availability of cash-flows. This can be interpreted as a sign that firms are financially constrained because a decrease in cash flow implies that a lower level of investment can be funded.[4] We see that the average firm has a cash flow to capital ratio of 1.8.

Our main explanatory variable is the percentage share of a firm's borrowings from public sector (savings) banks. We define this variable as total loans provided by savings banks to total bank debt (SB). This ratio reflects a firm's mix between public and private sector bank debt and indicates the relative importance and reliance of firms on bank debt provided by public sector banks. The table shows that the sample firms cover large amounts of their bank

[4] There has been debate in the literature about how to measure financial constraints. Several authors argue that cash flow is not an appropriate measure of financial constraints and suggest other proxies instead. See, for instance, Kaplan and Zingales (1997, 2000), Cleary (1999), Gomes (2001), Alti (2003), Whited and Wu (2006), Hadlock and Pearce (2010).

debt with public sector debt, on average 70 percent. Its standard deviation is 36 percent, indicating that there is substantial variation in the cross section and over time.

(Insert Table 1 here)

Table 1 also reports variables that are subsequently used as control variables. First, firms in our sample are rather small, the median of total assets is roughly 600,000 Euros and the median of total sales (S) is roughly 950,000 (not included in the table). This average firm size is representative for the German economy, which is dominated by SMEs. For instance, the German federal office of statistics reports that 96 percent of all German firms have total annual sales of less than 2 million Euros and 91 percent less than 10 employees.[5] Most investment-cash flow sensitivity models include Tobin's Q (or a modified version of it) to capture firms' growth and investment opportunities. However, this is not possible in our case because the firms are not publicly listed. We thus include firms' previous year sales growth (ΔSA) as proxy for investment opportunities. All empirical results remain unchanged if we use the level of sales instead or if we exclude sales growth from the regressions. The average firm displays a sales growth of approximately 7 percent per year.

Furthermore, the table includes firms' tangible assets in million Euros and the Whited and Wu index (Whited and Wu, 2006; subsequently labeled WW index). Both variables are used subsequently to sort firms into groups of more or less likely constrained firms. The calculation of tangible assets and their use as a sorting criterion follows the study of Almeida and Campello (2007).

The table further shows the regional GDP growth in percent and firms' Altman Z-Score (Altman, 1968). We are aware that the original Altman Z-Score was estimated on a set of

[5] The respective percentages for our sample are 99.7 percent for both sales and the number of employees if we follow the definition of SMEs from the European Commission. The latter defines SMEs as firms with sales below 50 million Euros and less than 250 employees.

large, U.S. industrial companies, hence, using the unadjusted version of this Z-Score for our sample of German SMEs is clearly a simplification. However, we believe that this simplification is justified since various studies have documented that the Z-Score works well outside the US (e.g., Agarwal and Taffler, 2007; Gropp et al., 2010). We will use both variables for the analyses of how public ownership impacts financial system stability.

An important feature of our dataset is that it includes firms from several industries. Table 2 shows the industry distribution of the sample firms (column 1) as well as the industry-specific medians of all variables contained in Table 1, except for the GDP. Industry classifications follow the Compustat industry definition. The table shows that the bulk of firms are from the wholesale retail (29 percent), manufacturing (22 percent), construction (18 percent), and services sector (17 percent). This industry distribution is not surprising because we are analyzing SMEs. Moreover, it is similar to the industry distribution of the entire population of German firms reported by the German federal statistical office. The dominant industries in the overall population of German firms are the same that dominate in our sample. This further indicates that our sample is representative for the population of German firms.

Finally, Table 2 indicates that there is considerable variation in the main variables between industries.

(Insert Table 2 here)

This is particularly true for CF/K, TA, tangible assets and the SB ratio. We therefore include industry fixed effects as control variables to capture these inter-industry differences in subsequent analyses.

3. Empirical strategy

We employ different empirical methods to analyze our main research question. In our first set of results, we perform a cross sectional-time series pooled OLS regression on the full sample including 166,300 firm-year observations. Specifically, we estimate the following model for cash flow-investment sensitivities:

$$Investment_{i,t} = \alpha + \beta_1 * \Delta SA_{i,t-1} + \beta_2 * CashFlow_{i,t} + \beta_3 * SB_{i,t} + \beta_4 * (CashFlow_{i,t} * SB_{i,t}) \quad (1)$$
$$+ \sum_j industry_j + \sum_t year_t + \varepsilon_{i,t}$$

where *Investment* equals I/K and *CashFlow* equals CF/K. All variables are as defined above. The sales growth of the last prior period (ΔSA) accounts for investment opportunities of the firm. While studies on large firms often use Tobin's Q as measure of growth and investment opportunities (despite the measurement problems associated with this metric, which have been well-documented in the literature), we cannot make use of Tobin's Q because the firms in our sample are not publicly listed. All empirical results remain if we use the level of sales instead and if we exclude sales growth from the regressions.

We further include industry and time fixed effects. We chose to use industry rather than firm fixed effects for the following reasons. Many studies on financial constraints use firms from only one industry, hence, in that case it is warranted to control for firm-specific effects rather than industry effects. However, our sample contains firms from nine different industries. Moreover, Table 2 shows that some of the main variables display a considerable variation between industries. The use of industry fixed effects captures this variation.[6] To demonstrate that this does not drive our results, we also estimate equation (1) using firm fixed effects. Finally, we consider heteroskedasticity-consistent robust standard errors which are clustered at the firm-level (e.g., Froot, 1989, Petersen, 2009).

[6] In a recent study, Denis and Sibilkov (2010) also use a sample of firms from different industries and industry-specific fixed effects. They provide further arguments for the use of industry rather than firm fixed effects.

This basic investment-model has been widely used in the empirical corporate finance literature (e.g. Fazzari et al., 1988; Love, 2003; Moyen, 2004; Almeida and Campello, 2007; Almeida et al., 2010; Denis and Sibilkov, 2010). The main idea is that firms are financially constrained if the coefficient β_2 is positive and statistically significant. Our main interest is in the direction and significance of the coefficient β_4 of the interaction term *CashFlow*SB*. This interaction term allows us to test whether and how the mix of bank debt (i.e., borrowings from private vs. state-owned banks) matters for corporate financial constraints. A significantly negative coefficient would indicate that a higher reliance on savings bank debt alleviates firms' financial constraints.

One potential problem of this model setup is that the savings bank ratio is a choice variable of the firm and might, hence, be subject to endogeneity. We account for this potential problem by using an instrumental regression setup. Specifically, we instrument the savings bank ratio by the share of savings bank branches relative to all bank branches in a region. Data on the number of branches by bank type come from the Bundesbank and are mapped to our dataset via the regions the savings bank operate in. Most important, this variable is completely exogenous to individual firms and can, hence, not be chosen by them. At the same time, it is plausible to argue that the reliance of firms on savings bank debt should be influenced by the availability and access to savings bank debt, which depends on the number of savings bank branches in a certain region. This is exactly the kind of instrument needed to account for the potential endogeneity of the savings bank ratio. We estimate the following OLS-IV regression:

$$Investment_{i,t} = \alpha + \beta_1 * \Delta SA_{i,t-1} + \beta_2 * CashFlow_{i,t} + \beta_3 * ShareSavingsbanks_{i,t} + \beta_4 * (CashFlow_{i,t} * ShareSavingsbanks_{i,t}) + \sum_j industry_j + \sum_t year_t + \varepsilon_{i,t} \quad (2)$$

In this equation, *ShareSavingsbanks* is the number of savings bank branches relative to the total number of banks in each region, which instruments for the savings bank ratio. We lose some observations because bank branch data are only available to us up to 2004. Furthermore, we replicate our results employing Almeida et al.'s (2010) OLS-IV estimator that uses lagged versions of CF/K and CF/K*SB as instruments.

In our second set of results, we distinguish explicitly between firms that are more and less financially constrained. The sorting of firms into these two groups is usually done according to several ex-ante constraint selection criteria.[7] Most of these criteria are not applicable in our case. For instance, we cannot make use of the availability of a bond or a commercial paper rating or the dividend payout ratio (as in, e.g., Almeida et. al, 2004; Almeida and Campello, 2007) because such information is not available for the firms in our sample. We distinguish between financially more and less constrained firms using the following three schemes:

- Scheme #1: We rank firms based on their asset size over the 1995 to 2007 period, and assign to the financially constrained (unconstrained) group those firms in the bottom (top) tercile of the size distribution. This is done for every year of the sample period. The argument for size as a good observable measure of financial constraints is that small firms are typically young, more opaque and thus less likely to obtain external funding or to obtain it more costly. This approach was used in numerous papers (e.g., Gilchrist and Himmelberg, 1995; Lamont et al., 2001; Almeida et al., 2004; Almeida and Campello, 2007 and 2010; Hadlock and Pierce, 2010).
- Scheme #2: We sort firms into groups of more and less financially constraints firms according to the tangibility of their assets. This idea is based on Almeida and Campello (2007) who argue that firms with more tangible assets should be less financially constrained because they have more collateral (assets) to pledge.

[7] One notable exception is Almeida and Campello (2007) who use endogenously determined constraints based on a switching regression model further to several ex-ante constraint selection criteria.

Specifically, we rank firms based on their tangible assets over the 1995 to 2007 period, and assign to the financially constrained (unconstrained) group those firms in the bottom (top) tercile of the tangible asset size distribution. This is done for every year of the sample period.

- Scheme #3: We rank firms according to the Whited and Wu (2006) index. In our ranking, higher index values indicate firms that are more financially constrained. We assign to the financially constrained (unconstrained) group those firms in the top (bottom) tercile of the WW-index. This is done for every year of the sample period.

After assigning firms to these categories, we estimate two regression models. First, we estimate the baseline regression equation (1). Second, we replicate the cash flow sensitivity of cash regression proposed by Almeida et al. (2004) using the following model:

$$\Delta CashHoldings_{i,t} = \alpha + \beta_1 * \Delta SA_{i,t-1} + \beta_2 * CashFlow_{i,t} + \beta_3 * SB_{i,t} + \beta_4 * (CashFlow_{i,t} * SB_{i,t}) \quad (3)$$
$$+ \beta_5 * Size_{i,t} + \sum_j industry_j + \sum_t year_t + \varepsilon_{i,t}$$

CashHoldings is the ratio of holdings of cash to total assets, *CashFlow* is scaled by total assets, and *Size* is the natural log of assets. In both cases we compare the results for CF/K and CF/K*SB between the two groups. We expect CF/K*SB to be bigger in size and more significant in the group of financially constrained firms. Note that the results of these first tests are largely driven by the cross-sectional variation rather than the variation over time because we have on average approximately three yearly observations per firm.

In our third set of results, we investigate the variation of borrowings from public sector banks over time. To do so, we conduct an event study-like analysis. We identify firms that increase their percentage share of borrowings from public sector banks by 10 (5) percentage points and examine their investment-cash flow sensitivities before and after such a change by estimating equation (1) in the year prior to the change and the year after the change. The key

advantage of this test is that we compare exactly the same firms before and after they have changed their mix of bank debt. As we require three consecutive yearly observations for each firm, one year prior to the change, the year in which SB changes by 10 (5) percentage points, and the following year, the sample size is substantially reduced in these analyses. Together with the first two sets of results, this third analysis complements our findings on the impact of public ownership in banks on corporate financial constraints.

4. Results

We first present a graphical illustration of the main findings of this paper. Figure 1 displays the reduction of corporate financial constraints when firms increase their borrowings from savings banks relative to total bank debt by 10 percentage points for different samples and tests.

(Insert Figure 1 here)

We find a statistically significant and economically meaningful reduction of firms' investment-cash flow sensitivity when firms increase their relative borrowings from savings banks. For example, financial constraints decline on average by 2.8 percent in the full sample when firms increase their relative borrowings from savings banks by 10 percentage points. We obtain stronger effects for firms that are more likely to be constrained based on a split according to firm size, asset tangibility and the Whited and Wu (2006) index but no significant or only marginally significant effects for firms that are not likely to be constrained. The two rightmost bars indicate the event study-like results for increases of the savings banks-debt share by 10 and 5 percentage points. It turns out that financial constraints decline by 5-6 percent when firms rely relatively more on borrowings from savings banks. Subsequently, we explain the respective empirical models and estimation results in more detail.

4.1. Cross-sectional time-series pooled results

Table 3 contains the baseline regression results using equations (1) and (2). In column one we use industry- and in column two, for robustness, we use firm-fixed effects. In both columns, we see a positive and highly significant coefficient of CF/K indicating that the firms in our sample are cash flow-sensitive, i.e., financially constrained. This result is in line with the related literature that suggests that small firms highly depend on their cash flows to fund investments. However, our result represents an out-of-sample confirmation of findings from earlier studies based on data for large listed U.S. firms. We therefore believe that our dataset and methods are well-suited to measure corporate financial constraints despite of the institutional differences.

Most important, our main result is the sign and the significance of the coefficient of the interaction term CF/K*SB. In both cases, this coefficient is negative and highly significant. We interpret this as evidence that firms that rely more on savings banks debt face lower financial constraints. Savings banks seem to provide services that help to alleviate these firms' financial constraints.

(Insert Table 3 here)

In column 3 of Table 3 we account for the potential endogeneity of the savings bank ratio and estimate an OLS-IV regression using equation (2). We instrument SB with the share of savings bank branches relative to all bank branches in a specific region. This variable is exogenous to the firm, but we expect it to have an impact on SB because, for instance, if a firm is headquartered in a region in which no (only) savings banks exist, SB should be zero (one). The sample size in this regression is reduced because we have bank branch data only up to 2004. We again find a positive and highly significant coefficient of CF/K and a negative and highly significant coefficient of CF/K*SB. The table further reports the p-value of the

instrument from the first stage regression, the p-value of the F-Test of the first stage regression and the p-value of a test of underidentification. All test statistics indicate that the model is properly identified and that the instrument is relevant. The results in column 3 have two important implications. First, endogeneity does not hamper our analyses. Second, the combined effect of CF/K and CF/K*SB is stronger in the instrumental regression setup suggesting that the alleviating effect of SB on firms' financial constraints is likely to be underestimated when OLS is used. Both implications are in favor of our main results.

In column 4 of Table 3 we follow Almeida et al. (2010) and estimate an OLS-IV regression using lags of CF/K and CF/K*SB as instruments. We use third and fourth lags of these two variables as instruments. This considerably reduces the sample size. However, we continue to find an alleviating effect of SB on firms' financial constraints. In fact, while we slightly lose significance, the economic magnitude of the effect is even stronger in this last regression.

Figure 2 is a graphical illustration of the combined effect of CF/K and CF/K*SB resulting from the estimation of the baseline equation (1). The solid line in Figure 2 is the combined effect of CF/K and CF/K*SB and the two dotted lines indicate the 95 percent confidence interval.

(Insert Figure 2 here)

Three interesting observations can be made. The effect is significant over the whole range of possible values of SB. It is negative, indicating that a higher reliance on savings bank debt helps to alleviate firms' financial constraints. The combined effect is always positive suggesting that, while savings banks help to alleviate financial constraints, these constraints do not completely disappear.

Summarizing, the results in Table 3 provide clear evidence that there are real effects of bank governance. These effects are not only significant from a statistical point of view but also economically meaningful. Specifically, the size of the coefficient of CF/K*SB in column 1 indicates a reduction of financial constraints by 2.8 percent if SB is increased by 10 percentage points. The effect rises to 3.1 percent in column 2, to 5.7 percent in column 3, and nearly 7.2 percent in column 4.

We next present our second set of results using three different sorting schemes to assign the samples into groups of more or less financially constrained firms. After sorting firms in either of the two groups, we first estimate equation (1) and then equation (3), each time separately for both groups using OLS. We continue to use OLS because the instrumental variable regressions have shown that these regressions are not plagued by endogeneity problems associated with the savings bank ratio. Table 4, Panel A contains the results using equation (1) with I/K as the dependent variable. Column 1a and column 1b contain the results for more respectively less constrained firms based on scheme #1, the asset size criterion. This criterion has been widely used in the financial constraints literature (e.g. Gilchrist and Himmelberg, 1995; Almeida et al., 2004; Almeida and Campello, 2007 and 2010).

(Insert Table 4 here)

As shown in columns 1a and 1b of Table 4, we again find a positive and highly significant coefficient of CF/K. However, only for more financially constrained firms we find that a higher reliance on savings bank debt alleviates financial constraints. This supports our finding from the baseline regressions. In column 2a and 2b we sort firms into the two groups using scheme #2, the size of firms' tangible assets. Using tangible assets as a criterion for financial constraints goes back to Almeida and Campello (2007) who argue that firms with more tangible assets should be less financially constrained because they have more collateral to

pledge and should therefore have an easier access to external financing. We find the same pattern. In both cases, CF/K is positively significant, but CF/K*SB is only significant in the group of financially more constrained firms.

Finally, in columns 3a and 3b we use scheme #3, the WW-index to sort firms into the two groups. The results are very similar. This time, CF/K*SB is also significant in the group of less financially constrained firms, however, significance is weaker and the coefficient size is only about one third of the coefficient in the group of more financially constrained firms.

Panel B of Table 4 shows the results on the cash flow sensitivity of cash regression setup proposed by Almeida et al. (2004) using the same sorting schemes. The results are very similar to before. Using asset size as the sorting criterion yields a significant coefficient of CF/K*SB for constrained but not significant coefficient for unconstrained firms. Using tangible assets as the sorting criterion yields a highly significant coefficient in the group of constrained and a weakly significant coefficient in the group of less constrained firms. Moreover, relative to the size of CF/K, the alleviating effect of SB on firms' financial constraints is much bigger in the group of more constrained firms (-0.01 to 0.02 vs. 0.01 to 0.05). Only in the case of sorting scheme #3, the WW-index, are the results not fully clear.

In unreported results we did two additional tests. We also sorted firms into groups of more and less financial constraints according to the KZ index (Kaplan and Zingales, 1997) and the ratio of trade credit relative to total liabilities. With regard to the latter, the argument is that firms that have access to more trade credit should be less financially constrained. For instance, firms may rely more on trade credit when credit from financial institutions is not available and/or more expensive (Petersen and Rajan, 1997). The results are less clear when we use these two sorting criteria. One potential explanation is that both the KZ index and the ratio of trade credit are highly asymmetrically distributed in our sample. If we sorted by terciles, we would mix the few non constrained firms with firms very similar to the most constrained firms. In fact, if we use a more asymmetric sorting, i.e., the 75 percent of firms

with the highest versus the 5 percent of firms with the lowest KZ index, we get identical results compared with using any of the other three sorting criteria. Financial constraints of firms in the group of more constrained firms are alleviated when SB rises, while they are not alleviated for the firms from the less financially constrained group.[8]

The results reported in Tables 3 and 4 suggest that public bank ownership matters for corporate financial constraints. The more firms borrow from public sector banks the more their financial constraints are alleviated. If we subscribe to the view that financial constraints are unfavorable for firms, then borrowing from public sector banks helps to reduce these disadvantages and public sector bank ownership yields positive real effect.

4.2. Results on the within-firm variation of financial constraints over time

The findings from the previous section are largely (but not entirely) driven by the cross-sectional variation of firms' borrowings from public sector banks. In order to account for variation between firms with different levels of borrowings from public sector banks, we included several control variables that capture between-firm differences such as sales growth, industry effects, and size. However, firms may differ along a variety of other factors not captured in the above regressions, which might (at least partially) drive our results. In our third set of results, we therefore conduct a test in which we analyze the time series variation of financial constraints within firms.

For this purpose, we identify firms that change the ratio of borrowings from savings banks relative to total bank debt over time and compare the magnitude of financial constraints before and after this change. This test focuses on the dynamics of public sector bank debt reliance rather than cross-sectional differences. We consider firms that appear in the dataset in

[8] We further employed the Hadlock and Pierce (2010) index as a sorting criterion. This index measures financial constraints as function of firm age and size. Unfortunately, firm age data is only available for a very small subset of the firms in our sample. For the reduced sample we obtain qualitatively similar results.

three consecutive years.[9] We require these firms to have a change in the public sector bank debt ratio of at least ten (five) percentage points and compare the effect of the public sector bank debt reliance on the cash-flow sensitivity before and after the change occurred. These firms changed the mix of their bank debt by either obtaining new loans from public sector banks or paying back loans from private sector banks. We further require these firms to have an unchanged public sector bank debt ratio in the year before the change occurred and in the year after. This approach is similar to an event study in which the change of the public sector bank debt ratio in year t=0 is the event. We conduct this test for two cases, the case in which firms increase the public sector bank debt ratio by at least ten and the case in which firms increase the public sector bank debt ratio by at least five percentage points. Table 5 reports the results of these tests.

(Insert Table 5 here)

Columns 1a and 1b are based on the estimation of equation (1), using exactly the same regression setup as above, for the year before (1a) and the year after the ratio change (1b). In both columns we see the significant dependence of firms' investment behavior on their cash flows. However, only in the period after SB was increased, we see a highly significant effect of CF/K*SB. Not only the statistical, but also the economic significance is very strong because the point estimate of CF/K*SB indicates that an increase of SB by 10 percentage points reduces financial constraints by roughly 6 percent. We interpret this finding as supporting evidence for our prior finding that a higher reliance on public sector bank debt indeed alleviates financial constraints.

[9] Results remain unchanged if we use five years instead, but the sample sizes become very small.

In columns 2a and 2b we run the same regressions controlling for the start level of SB. The results remain almost identical in this robustness test. In columns 3a and 3b we consider a five percentage points change of SB. It turns out that the results remain largely the same.

These findings provide further support for the financial constraints-reducing effect of borrowing from public sector banks. We note that the test reported in this section is stricter than the one reported for the full sample because we consider financial constraints of exactly the same firms over time.

4.3. Mechanisms

Based on our cross-sectional and time series results, the question arises why increased borrowing from public sector banks helps to reduce corporate financial constraints. Therefore, we now explore potential mechanisms that drive the effect we have identified previously.

First, it might be possible that the constraints-reducing effect is not unique to borrowing from public sector banks but that it is a general effect of increasing bank debt. It might be that financial constraints are alleviated if firms take on more bank debt (regardless from which type of bank) in absolute or relative terms. We conduct a series of tests to investigate whether this can explain our findings. Again, we use the event study-like setup from the previous analysis and identify firms that increase their savings bank loans by at least 50 percent in absolute terms. However, contrary to before, we now allow the firms to also increase their absolute loan volume from private banks. The only restriction we make is that the increase in private bank loans has to be smaller than the increase in savings bank loans.[10] In this analysis we view private and public bank loans as complements rather than substitutes in order to analyze whether the effect we identified is unique to public sector banks. The threshold of 50 percent is not arbitrarily chosen but corresponds roughly to an increase of the savings bank

[10] A further advantage compared to Table 5 is, that we now also include firms that increase their absolute borrowings from savings banks but already display a SB ratio of 100 percent.

ratio of 10 percentage points. All results reported in this section hold when we use other thresholds like 40, 30 or 20 percent. Similar to Table 4 we conduct a before and after analysis. Table 6 shows the results.

(Insert Table 6 here)

Columns 1a and 1b of Table 6 show that there is no significant effect when borrowings from savings banks and private banks are increased simultaneously. In column 2a and 2b we conduct a related analysis with the only difference that this time we identify firms that increase their private bank loan volume by at least 50 percent and at the same time increase their savings bank loan volume but by a lesser extent. Again, there is no significant difference between the situation before and after the increase. This suggests that a higher reliance on savings bank loans does not alleviate firms' financial constraints if at the same time they also increase their borrowing from private banks, i.e., if private and public sector bank loans are used as complements.

In columns 3a and 3b of Table 6 we investigate whether the effect can be found if firms use public and private bank debt as substitutes rather than complements. We now identify firms that increase their public bank loan volume by at least 50 percent while holding the volume of private bank loans constant or even reducing it. This analysis is similar to the analyses of Table 5, columns 1a and 1b. It is therefore not surprising that we find that an increase in reliance on savings bank loans alleviates firms' financial constraints.

In columns 4a and 4b of Table 6 we identify firms that increase the volume of private bank loans by at least 50 percent while holding the volume of public bank loans constant or even decreasing it. Strikingly, we do not find the alleviating effect on financial constraints for increases in borrowings from private banks.

While the sample sizes in these tests are reduced considerably due to the restrictive inclusion criteria and the results should be interpreted with some caution, we argue that the findings in Table 6 provide strong support that the effect we identified so far is unique to public sector banks. By increasing borrowings from private banks, firms cannot alleviate their financial constraints, whereas borrowing from public sector banks is beneficial for firms insofar that it helps them to be less dependent of their cash flows.

In order to better understand the mechanisms that drive our findings, we now zoom in on changes in firms' balance sheet structures, their investment behavior and the availability of cash flows prior to an increase of savings banks loans of at least 50 percent, in the year of the increase and one year after the increase. This analysis yields a sample that is identical to the sample of firms from Table 6, columns 3a and 3b. As a control group, we analyze the same variables for those firms that increase their loan volume from private banks by 50 percent (similar to Table 5, columns 4a and 4b). Such a descriptive analysis of changes in firms' financing and investment behavior before, around, and after the increase of borrowings from savings banks may help to shed light on the underlying mechanisms. Table 7 reports the findings.

(Insert Table 7 here)

Firms that increased their savings banks loans by at least 50 percent (and thereby substitute private bank loans) are shown in Panel A, firms that increased their private bank loans by at least 50 percent are shown in Panel B. In both cases, only one category of bank loans is increased while the other is held constant or even reduced. First, we note that savings banks provide considerable more long-term loans than private banks because long-term liabilities for the firms in Panel A increase by 50 percent, while the increase for the firms in Panel B is only moderate. Second, we see that the firms that rely more on savings banks debt

display a bigger growth in assets. Third, we see that firms in both groups expand their investments in absolute terms as well as relative to their capital stock. Fourth, and most important, we see that firms in the first group experience a decrease in the absolute level of cash flows as well as in the ratio of cash flows relative to their capital stock. This may indicate that managers or owners of firms that experience or anticipate cash flow problems rely more on public sector bank debt. Specifically, public sector banks seem to provide financing sources when the firms really need them, i.e. when they face a critical situation with cash flow problems. The higher reliance on public sector bank debt reduces their dependence on internal funds. This is exactly the effect we have established in the previous sections of this paper.

There are three explanations why public sector banks provide these services to firms in certain situations. First, public sector banks effectively follow their legal mandate, namely to support the local economy by providing credit, in particular to SMEs. Our results provide clear evidence in favor of this view. We argue that such bank behavior is beneficial for SMEs because it alleviates their financial constraints. Second, it is not unlikely that German public sector banks are better able to provide credit to SMEs because of informational advantages. SMEs are frequent clients of savings banks but also the owners of the SMEs often have a retail relationship with the same savings bank. An informational synergy across the boundaries of the firm might arise from the owner's checking account, mortgage or overall credit history at the bank. Recent studies provide clear evidence that there are cross-product and intertemporal information spillover effects in bank-firm relationships (Mester et al., 2007; Sufi, 2009; Norden and Weber, 2010b). This enables public sector banks to provide firms with access to financial services especially in situations in which private banks would not provide these services. Third, savings banks have the largest market share in the German banking system, the largest branch network, and are therefore most likely to be the main bank

(and/or the only bank) for the majority of SMEs. We note that these three lines of reasoning are not mutually exclusive.

We can, however, not make statements about whether private banks could provide the same services as savings banks. Our findings suggest that savings banks are both capable and willing to serve SMEs and that this alleviates firms' financial constraints. It may well be that private banks have the same capability, however, based on our findings it seems that they are not willing to provide the same services as savings banks. Clearly, it would be interesting to test whether private banks could fulfill the same role as savings banks. However, this is beyond the scope of this paper and is left for future research.

4.4. Implications for financial system stability

In the remainder we study potential implications of public ownership in banks on financial system stability. We consider macroeconomic and microeconomic implications. We first examine the effect in times of economic downturns and booms. We refer to this channel as the macro effect. Second, we examine if our previous results vary with different degrees of firm-specific default risk. We refer to this channel as the micro effect. These two tests also contribute to the discussion about whether and how financial constraints and financial distress of firms are related (e.g. Kaplan and Zingales, 1997).

To study the macro effect we map macroeconomic activity to our dataset of German SMEs. From the German federal statistical office we obtain quarterly data for the regional real GDP growth which we map to the 54 regions where the SMEs of our sample are located. This makes it possible for us to exploit cross-sectional variation in GDP growth and analyze how this impacts the effect of bank ownership on firms' financial constraints. We conduct three different tests. First, we calculate the median quarterly GDP growth over all regions and split the sample into firm-year observations from periods in which the quarterly GDP growth was below the median (economic downturn) and those in which it was above the median (boom

phase). Second, we calculate GDP growth terciles and split the sample according to these. Third, we compare the 10 percent worst with the 10 percent best GDP growth quarters. After each sample split, we separately estimate equation (1) using the same regression setup as above for the economic downturn and the boom phase. Table 8 contains the results of these regressions.

(Insert Table 8 here)

We obtain two main results. First, CF/K*SB is always higher in the samples that we define as phases of economic downturns. Second, the difference between the coefficients of CF/K*SB in downturns and boom phases becomes larger the thinner we slice the samples. Furthermore, the last comparison in columns 3a and 3b shows that CF/K*SB is only significant in times of very low GDP growth.

These results indicate that the alleviating effect of public sector bank debt on firms' financial constraints is particularly pronounced when the economic activity slows down. One way to interpret this finding is that public sector banks do not act as pro-cyclical as private banks because they are of particular value to their clients when economic conditions deteriorate. The pro-cyclical behavior of private sector banks has been documented in a number of studies and is generally seen to be negative because it intensifies economic developments, which may especially be harmful in times of economic downturns (e.g., Engel and Middendorf, 2010; Foos, 2010). Our results provide evidence that public sector banks may (at least to some extent) counter this pro-cyclicality in banking.

The micro effect is analyzed in Table 9. We investigate how the effect of public sector bank debt on firms' financial constraints behaves with regard to differing levels of individual firm risk. We proxy individual firm risk by calculating each firm's abnormal Altman Z-Score. The abnormal Z-Score is defined as the difference between a firm's regular Z-Score and the

average Z-Score of all firms in the same region. Calculating the Z-Score in this way has the advantage that we can explicitly consider geographic heterogeneity. All results reported in Table 9 remain if we use the regular version of the Z-Score instead. The variable is defined in such a way that lower Z-Scores imply a higher risk of default. We then again split the sample according to the median abnormal Z-Score, according to the highest and lowest abnormal Z-Score tercile and according to the 10 and 90 percent abnormal Z-Score quantile. Then we estimate our baseline equation (1) separately for the resulting subsamples. In these analyses we take financial distress risk explicitly into account. This is potentially important because it may be argued that the effects on financial constraints are influenced by different degrees of firms' financial distress (e.g., Kaplan and Zingales, 1997). The results are shown in Table 9.

(Insert Table 9 here)

Our first result is that the coefficient of CF/K is always bigger when risk of financial distress is higher. This is what we would expect because riskier firms should be more financially constraint. However, the findings reported in Table 9 show that the alleviating effect of public sector bank debt on financial constraints seems to be independent of a firm's risk of financial distress. Most important, we do not detect differences in the effect in any of the comparisons, CF/K*SB is always negative and highly significant. While the coefficient of CF/K*SB is higher in two of the three cases of high distress risk, these differences are not significant according to a Wald-test of differences of coefficients. These results suggest that the unique effect of public sector bank debt on firms' financial constraints is independent of the firms' risk of financial distress. In other words, savings banks do not pick cherries (i.e., they do not only reduce financial constraints of low-risk firms). Hence, firms with a higher risk of distress are not cut off from bank lending.

Summarizing, the previous two tests indicate that borrowing from public sector banks is particularly beneficial for SMEs when economic times are bad. This finding is consistent with studies that document that public sector banks' lending behavior is less pro-cyclical than that of private sector banks. Furthermore, public sector banks do not distinguish between low and high risk firms when providing access to bank debt that helps alleviating firms' financial constraints. While we do not have comprehensive measures of financial system stability and the impact of public sector bank ownership on these, we view our results as new and supporting evidence for the hypothesis that public sector ownership in banks enhances the stability and resilience of financial systems.

5. Conclusion

We investigate whether bank governance, especially private vs. public bank ownership, affects financial constraints of small and medium-sized enterprises (SMEs). This issue is important because it has implications for individual firms, aggregate economic activity, financial stability, and financial system architecture (e.g., Fazzari et al., 1988; Kaplan and Zingales, 1997). Our empirical analysis is based on a rich dataset from Germany because its economy is dominated by SMEs and its banking system is characterized by a long-run coexistence of private and non-private banks (public sector banks or savings banks). These two institutional characteristics can be found in many other countries as well.

The principal result of our study is that larger borrowings from savings banks reduce financial constraints of SMEs by 2.5 to 3.5 percent if borrowings from savings banks relative to total bank borrowings are increased by 10 percentage points. This result is highly significant and based on a cross-sectional time-series pooled analysis, an event study-like analysis, and it is robust to different model specifications and estimation techniques. There is no such effect for borrowings from private banks. The reduction in financial constraints becomes stronger in periods of low regional economic growth, and for the smallest and

relatively risky firms. Our main result is consistent with the business objectives of savings banks, their strong position as housebanks of SMEs, and potential benefits from informational synergies between SMEs and their owners and local proximity. Consistent with the conceptual framework for SME finance proposed by Berger and Udell (2006) we show that institutional characteristics of a country's financial system, such as bank ownership, have significant real effects. We are, however, not able to make statements about whether private banks could not fulfill the same role as savings banks. They may be capable, but based on our results, they do not seem to be willing to provide the special services that savings banks seem to provide.

Our study challenges the view that state-owned banks per se exert negative influence on economic activity, as suggested by La Porta et al. (2002). We document significant and economically meaningful positive effects from public banks in a country with a high degree of financial, legal and political development. Our findings offer several avenues for follow-up research. For example, more evidence is needed on how differences in the pro-cyclicality of lending between private and non-private banks affect corporate financing and investments. Furthermore, a comprehensive examination of the implications for allocative efficiency is beyond the scope of this study and therefore left to future research.

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Table 1: Descriptive statistics of main variables

This table shows the mean, standard deviation (SD), 1 percent, 25 percent quantile, the median, the 75 percent and the 99 percent quantile for 166,300 firm-year observations over the period 1995-2007 for a sample of German SMEs. Variables are defined as follows: I/K is the ratio of investments relative to beginning of the period capital stock, CF/K is cash flow relative to capital stock, SB is the ratio of public sector bank debt relative to total bank debt, TA is total assets, ΔSA is sales growth, WW-index is the Whited and Wu index (2006), Z-score is Altman's (1968) Z-Score, and GDP is the real regional GDP growth in percent. TA and Tangible Assets are expressed in millions of Euros, and WW-index and Z-score in absolute values.

	Mean	SD	p1	p25	p50	p75	p99
I/K	0.4788	1.0664	0.0000	0.0385	0.1538	0.4627	6.4000
CF/K	1.7759	3.8649	-0.3692	0.2593	0.6081	1.5652	24.1806
SB	0.7033	0.3561	0.0000	0.4408	0.8874	1.0000	1.0000
TA	1.1177	1.4094	0.0490	0.2910	0.5970	1.3251	7.7099
ΔSA	0.0659	0.5034	-0.4731	-0.0651	0.0197	0.1281	1.1291
Tangible Assets	0.4580	0.6603	0.0034	0.0693	0.1996	0.5480	3.2618
WW-index	-0.6048	0.0518	-0.7393	-0.6381	-0.6009	-0.5685	-0.5006
Z-score	3.4742	2.1981	0.1501	1.9693	3.0390	4.4350	11.8606
GDP	0.0092	0.0191	-0.0381	-0.0036	0.0082	0.0223	0.0506
Observations	166,300						

Table 2: Industry distribution

The first column of Table 2 shows the industry distribution for 166,300 firm-year observations over the period 1995-2007 for a sample of German SMEs. Industry classes are defined according to the Compustat definition. The other columns show the industry-specific medians for all main variables included and defined in Table 1, except for the GDP.

	Share	I/K	CF/K	SB	TA	ΔSA	Tangible Assets	WW-index	Z-Score
Agriculture	0.05	0.06	0.17	0.87	0.69	0.02	0.24	-0.60	2.22
Mining	0.00	0.11	0.28	0.76	1.42	-0.01	0.42	-0.65	2.16
Manufacturing	0.22	0.16	0.57	0.89	0.80	0.03	0.29	-0.62	2.98
Construction	0.18	0.18	0.81	0.85	0.49	0.02	0.19	-0.60	2.90
Wholesale Retail	0.29	0.15	0.67	0.89	0.62	0.01	0.24	-0.60	3.50
Services	0.17	0.13	0.67	0.95	0.44	0.01	0.09	-0.58	2.75
Transportation & Utility	0.05	0.32	0.50	0.60	0.75	0.05	0.19	-0.62	2.96
Public administration	0.03	0.14	0.55	0.95	0.60	0.02	0.13	-0.61	2.85
Observations	166,300								

Table 3: Baseline regression results

This table shows baseline regression results with investment relative to beginning of the year capital stock (I/K) as dependent variable. Control variables are defined as follows: CF/K is the ratio of cash flows to capital stock, CF/K*SB interacts this ratio with the share of public sector bank debt as share of total bank debt, ΔSA is last year's sales growth. In regression model (1) we include industry fixed effects, in model (2) we include firm fixed effects instead. Regression model (3) is an OLS-IV regression using the share of savings bank branches as instrument for SB. Regression model (4) is an OLS-IV regression using lags of three and four periods for SB and CF/K*SB as instruments according to Almeida et al. (2010). All regressions further include time fixed effects. Standard errors that account for clustering at the firm level are shown in parentheses. The table further includes the p-values of the instruments from the first-stage regression, the p-value of the F-Test of the first-stage regression, the p-value of the test of under identification as well as the p-value of the Hansen-test of over identification. *, **, and *** denote significance at the 10, 5, and 1 percent level, respectively.

	(1)	(2)	(3)	(4)
CF/K	0.1455***	0.2374***	0.1995***	0.2648***
	(0.0051)	(0.0090)	(0.0176)	(0.0665)
CF/K*SB	-0.0418***	-0.0723***	-0.1131***	-0.1905**
	(0.0059)	(0.0104)	(0.0239)	(0.0804)
ΔSA	0.0978***	0.0199***	0.1178***	0.1347***
	(0.0155)	(0.0073)	(0.0231)	(0.0287)
SB	-0.0758***	-0.0518**	1.5820***	0.1385
	(0.0089)	(0.0262)	(0.4397)	(0.1080)
Constant	0.2425***	0.3349***	-0.9341***	0.1379
	(0.0283)	(0.0310)	(0.3203)	(0.0950)
Industry FE	Yes	No	Yes	Yes
Firm FE	No	Yes	No	No
p Instrument first			0.0000	0.0000
pFfirst			0.0000	0.0000
Under(p)			0.0000	0.0000
Hansen(p)				0.2832
Adjusted R^2	0.1791	0.1924	n.a.	n.a.
Observations	166,300	166,300	115,919	18,268

Table 4: Regression results for constraint groups

This table shows regression results with I/K (ΔCashHoldings) as dependent variable in Panel A (B). Control variables are defined as in Table 3. Additionally, TA is total assets. In the first two columns, firms are sorted into groups of more and less financially constraint firms according to total asset size (scheme #1), in columns three and four they are sorted according to their tangible assets (scheme #2), and in column five and six according to the WW-index (scheme #3). Standard errors that account for clustering at the firm level are shown in parentheses. *, **, and *** denote significance at the 10, 5, and 1 percent level, respectively.

	Scheme #1		Scheme #2		Scheme #3	
	(Size-con)	(Size-unc)	(Tang-con)	(Tang-unc)	(WW-con)	(WW-unc)
Panel A: Investment-cash flow sensitivities						
CF/K	0.1533***	0.1378***	0.1654***	0.1198***	0.1522***	0.1418***
	(0.0075)	(0.0096)	(0.0093)	(0.0086)	(0.0101)	(0.0084)
CF/K*SB	-0.0550***	-0.0159	-0.0644***	-0.0118	-0.0548***	-0.0197*
	(0.0084)	(0.0127)	(0.0103)	(0.0110)	(0.0111)	(0.0106)
SB	-0.0357*	-0.0794***	-0.0545***	-0.0851***	-0.0710***	-0.0556***
	(0.0190)	(0.0133)	(0.0190)	(0.0140)	(0.0180)	(0.0150)
ΔSA	0.1555***	0.0635***	0.1551***	0.0566***	0.0821*	0.0742***
	(0.0292)	(0.0144)	(0.0311)	(0.0149)	(0.0485)	(0.0151)
Constant	0.2632***	0.2948***	0.0878	0.2915***	0.4293***	0.2807***
	(0.0550)	(0.0315)	(0.0554)	(0.0403)	(0.0522)	(0.0363)
Observations	55,457	55,419	54,892	54,891	52,305	52,306
Adjusted R^2	0.2080	0.1391	0.1946	0.1557	0.1736	0.1787
Panel B: Cash flow sensitivity of cash						
CF/TA	0.0272***	0.0506***	0.0255***	0.0500***	0.0121***	0.0455***
	(0.0034)	(0.0057)	(0.0037)	(0.0055)	(0.0046)	(0.0049)
CF/TA*SB	-0.0108***	-0.0081	-0.0097**	-0.0133*	-0.0052	-0.0114*
	(0.0040)	(0.0078)	(0.0042)	(0.0074)	(0.0054)	(0.0059)
SB	0.0041***	0.0003	0.0019	0.0010	0.0009	0.0010
	(0.0016)	(0.0011)	(0.0014)	(0.0011)	(0.0014)	(0.0012)
ΔSA	0.0137***	0.0030***	0.0136***	0.0033***	0.0226***	0.0034***
	(0.0017)	(0.0009)	(0.0018)	(0.0011)	(0.0019)	(0.0009)
Log TA	0.0066***	0.0008**	0.0047***	0.0037***	0.0029***	0.0004
	(0.0007)	(0.0004)	(0.0004)	(0.0004)	(0.0006)	(0.0005)
Constant	-0.0566***	-0.0127***	-0.0300***	-0.0362***	-0.0181***	-0.0126**
	(0.0057)	(0.0038)	(0.0114)	(0.0051)	(0.0045)	(0.0054)
Observations	55,457	55,419	54,892	54,891	52,305	52,306
Adjusted R^2	0.0102	0.0088	0.0113	0.0080	0.0067	0.0133

Table 5: Time series variation of financial constraints

This table shows results from an event study-type analysis in which SB changes by 10 respectively 5 percentage points. Columns 1a and 1b show OLS estimates using equation (1) with I/K as dependent variable for the situation before (1a) and after (1b) a 10 percent change in SB. In columns 2a and 2b we additionally control for the start level of SB (Start SB). Finally, columns 3a and 3b show results for a 5 percentage points change of SB. All control variables are as defined in Table 3. All regressions further include industry and time fixed effects. Standard errors that account for clustering at the firm level are shown in parentheses. *, **, and *** denote significance at the 10, 5, and 1 percent level, respectively.

	(1a)	(1b)	(2a)	(2b)	(3a)	(3b)
CF/K	0.1414***	0.2313***	0.1388***	0.2280***	0.1372***	0.1871***
	(0.0297)	(0.0467)	(0.0303)	(0.0465)	(0.0297)	(0.0423)
CF/K*SB	0.0135	-0.1397**	0.0171	-0.1359**	0.0166	-0.0998*
	(0.0534)	(0.0561)	(0.0540)	(0.0559)	(0.0497)	(0.0510)
SB	-0.1119	0.0127	-0.9683***	-0.1299	-0.1694***	0.0066
	(0.0754)	(0.0738)	(0.3002)	(0.0936)	(0.0656)	(0.0672)
ΔSA	0.2583***	0.0686	0.2566***	0.0767	0.0166*	0.0762
	(0.0743)	(0.0570)	(0.0745)	(0.0573)	(0.0091)	(0.0590)
Start SB			0.8901***	0.2448***		
			(0.2934)	(0.0811)		
Constant	0.4744**	0.3931**	0.4603**	0.3870**	0.1958	0.1872*
	(0.2047)	(0.1876)	(0.2016)	(0.1862)	(0.1197)	(0.1080)
Observations	3,138	3,138	3,138	3,138	3,782	3,782
Adjusted R^2	0.2254	0.2045	0.2300	0.2079	0.1984	0.1676

Table 6: Changes in borrowings from public sector vs. private sector banks

This table shows results from an event study-type analysis in which the total volume of savings respectively private bank loans changes by 50 percent. Columns 1a and 1b show OLS estimates using equation (1) with I/K as dependent variable for the situation before (1a) and after (1b) a change in the total volume of savings bank loans of at least 50 percent for firms that changed the volume of private bank loans at the same time by less than 50 percent. Columns 2a and 2b contain firms that changed the total volume of private bank loans by at least 50 percent while at the same time changing the volume of savings bank loans by less than 50 percent. Columns 3a and 3b contain firms that changed the volume of savings bank loans by at least 50 percent while holding private bank loans constant or even reducing them. Finally, in columns 4a and 4b we identify firms that changed the volume of private bank loans by at least 50 percent while holding the volume of savings bank loans constant or even reducing them. All control variables are as defined in Table 3. All regressions further include industry and time fixed effects. Standard errors that account for clustering at the firm level are shown in parentheses. *, **, and *** denote significance at the 10, 5, and 1 percent level, respectively.

	(1a)	(1b)	(2a)	(2b)	(3a)	(3b)	(4a)	(4b)
CF/K	0.1559**	0.1877**	0.1312	0.0246	0.1689***	0.2382***	0.1467**	0.1055**
	(0.0615)	(0.0831)	(0.1045)	(0.0355)	(0.0385)	(0.0458)	(0.0622)	(0.0529)
CF/K*SB	-0.1356	-0.1170	0.0432	0.0687	0.0108	-0.1562**	0.0415	-0.0314
	(0.1175)	(0.1084)	(0.1324)	(0.0443)	(0.0682)	(0.0626)	(0.0774)	(0.0824)
SB	0.2209	0.0886	-0.2000	-0.2828***	-0.0882	0.0399	-0.1212	-0.0993
	(0.1507)	(0.1114)	(0.1978)	(0.0744)	(0.0962)	(0.0707)	(0.0994)	(0.0836)
ΔSA	0.1706	-0.0388	0.4845**	0.1423	0.3141***	0.1257*	0.2198***	0.1919**
	(0.1373)	(0.0984)	(0.2252)	(0.1219)	(0.0716)	(0.0659)	(0.0794)	(0.0766)
Constant	0.2015	0.0942	0.3927	0.5028***	0.4886*	0.4490**	0.4292*	0.4092***
	(0.2652)	(0.1448)	(0.3348)	(0.1404)	(0.2622)	(0.1922)	(0.2355)	(0.1409)
Observations	736	736	1,107	1,107	1,913	1,913	2,158	2,158
Adjusted R^2	0.1257	0.1838	0.2036	0.0778	0.2933	0.2446	0.2357	0.1150

Table 7: Firms' balance sheet structures before and after changes in bank debt

This table contains an analysis of the balance sheet, investment and cash flows of the firms that increased SB by at least 10 percent (Panel A), respectively that increased the ratio of private bank loans to total bank debt by at least 10 percent. The firms in Panel A, hence, correspond to the firms from Table 5, columns 1a and 1b. In each column median values are reported. Variables are defined as follows: Short-term liabilities are firms' liabilities due within one year; Long-term liabilities are firms' liabilities due in more than one year; Total assets are firms' total assets; Investment is firms' yearly investment; Investment/Capital is firms' yearly investment relative to beginning-of-period capital stock; Cash flow is firms' operative cash flow per year; Cash flow/Capital is firms' cash flow per beginning-of-period capital stock. Total assets, Investment, and Cash flow are denoted in million Euros.

	t-1	t=0	t+1	t-1	t=0	t+1
Panel A: Increase of savings banks loans of at least 10 percent				Panel B: Increase of private bank loans of at least 10 percent		
Short-term liabilities	0.2560	0.2766	0.2770	0.2328	0.2460	0.2460
Long-term liabilities	0.0820	0.1258	0.1421	0.1431	0.1610	0.1660
Total assets	0.6860	0.7680	0.7920	0.6596	0.7076	0.7125
Investment	0.0400	0.0570	0.0360	0.0321	0.0460	0.0290
Investment / Capital	0.2505	0.3043	0.1784	0.1836	0.2632	0.1440
Cash flow	0.1248	0.1230	0.1330	0.1130	0.1140	0.1180
Cash flow / Capital	0.6887	0.6295	0.5711	0.5689	0.5781	0.5104

Table 8: Financial constraints and macroeconomic activity

This table shows baseline regression results with investment relative to capital (I/K) as dependent variable, but further differentiating between regional economic conditions. In columns 1a and 1b, firms are sorted according to the median GDP growth. Column 1a (1b) displays GDP growth below (above) the median. In columns 2a (below) and 2b (above) we use GDP growth terciles for the sorting. In columns 3a and 3b sorting is according to the 10 and 90 percent quantiles of GDP growth. All regressions further include industry and time fixed effects. Standard errors that account for clustering at the firm level are shown in parentheses. *, **, and *** denote significance at the 10, 5, and 1 percent level, respectively.

	(1a)	(1b)	(2a)	(2b)	(3a)	(3b)
CF/K	0.1494***	0.1419***	0.1489***	0.1393***	0.1541***	0.1514***
	(0.0073)	(0.0068)	(0.0089)	(0.0081)	(0.0166)	(0.0157)
CF/K*SB	-0.0444***	-0.0392***	-0.0420***	-0.0323***	-0.0476**	-0.0254
	(0.0083)	(0.0079)	(0.0102)	(0.0095)	(0.0189)	(0.0182)
SB	-0.0741***	-0.0777***	-0.0759***	-0.0805***	-0.0881***	-0.1074***
	(0.0122)	(0.0123)	(0.0147)	(0.0149)	(0.0277)	(0.0270)
ΔSA	0.1067***	0.0891***	0.1134***	0.0809***	0.0975***	0.0593
	(0.0155)	(0.0252)	(0.0256)	(0.0305)	(0.0378)	(0.0378)
Constant	0.2525***	0.3593***	0.4474***	0.4904***	0.0877	0.5018***
	(0.0517)	(0.0466)	(0.1096)	(0.0496)	(0.0787)	(0.0657)
Observations	83,249	82,962	55,812	55,321	16,783	16,612
Adjusted R^2	0.1785	0.1794	0.1792	0.1798	0.1820	0.2059

Table 9: Financial constraints and firm-specific default risk

This table shows baseline regression results with investment relative to capital (I/K) as dependent variable, but further differentiating between firm-specific default risk. Default risk is measured as the abnormal Altman Z-Score. This variable is defined as the firm-specific Altman Z-Score adjusted by the average Z-Score of all firms in the same region to control for regional heterogeneity. In columns 1a (below) and 1b (above), firms are sorted according to the median abnormal Altman Z-Score. In columns 2a (below) and 2b (above) we use abnormal Altman Z-Score terciles for the sorting. In columns 3a and 3b sorting is according to the 10 and 90 percent quantiles of the abnormal Altman Z-Score. All regressions further include industry and time fixed effects. Standard errors that account for clustering at the firm level are shown in parentheses. *, **, and *** denote significance at the 10, 5, and 1 percent level, respectively.

	(1a)	(1b)	(2a)	(2b)	(2a)	(2b)
CF/K	0.1665***	0.1376***	0.1654***	0.1350***	0.1767***	0.1201***
	(0.0107)	(0.0060)	(0.0137)	(0.0065)	(0.0226)	(0.0088)
CF/K*SB	-0.0442***	-0.0401***	-0.0371**	-0.0419***	-0.0578**	-0.0343***
	(0.0126)	(0.0069)	(0.0162)	(0.0073)	(0.0273)	(0.0100)
SB	-0.0795***	-0.0749***	-0.0765***	-0.0600***	-0.0579**	-0.0496*
	(0.0124)	(0.0128)	(0.0153)	(0.0158)	(0.0278)	(0.0289)
ΔSA	0.0992***	0.1026***	0.0851***	0.0957***	0.0514*	0.0729***
	(0.0286)	(0.0157)	(0.0300)	(0.0159)	(0.0292)	(0.0154)
Constant	0.1675***	0.4066***	0.3054***	0.3333***	0.6662***	0.2083**
	(0.0292)	(0.0632)	(0.0463)	(0.0410)	(0.0944)	(0.0987)
Observations	83,165	83,135	55,434	55,433	16,630	16,630
Adjusted R^2	0.1439	0.2135	0.1314	0.2266	0.1079	0.2364

Figure 1: Reduction of financial constraints due to borrowings from savings banks

This figure displays the reduction of corporate financial constraints due to borrowings from savings banks for different samples and tests. The numbers indicate the percentage change of firms' investment-cash flow sensitivity when firms increase their borrowings from savings banks relative to total bank debt by 10 percentage points (e.g., from 20 to 30 percent). The two rightmost bars indicate the event study-like results for the change in financial constraints due to increases of borrowings from savings banks by 10 or 5 percentage points for exactly the same firms. *, **, and *** denote significance at the 10, 5, and 1 percent level, respectively.

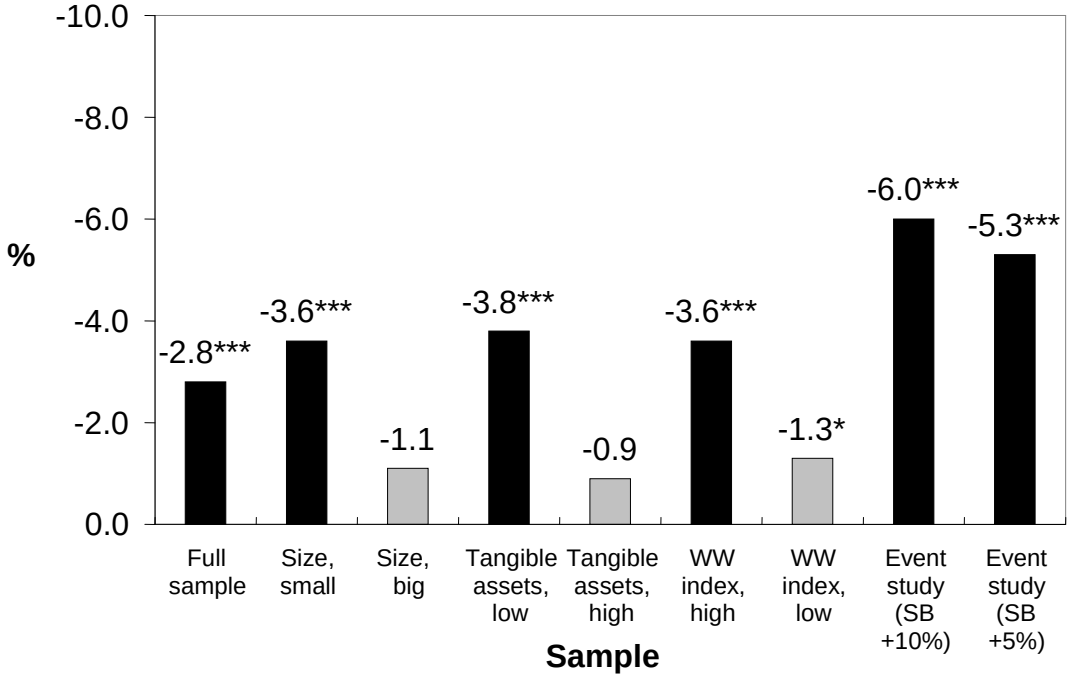

Figure 2: Marginal effect of cash flow on investment when SB changes

This figure shows the marginal effect of cash flow on investment, i.e. the combined effect of the variables CF/K and CF/K*SB from Table 3, column 1, as the ratio of public sector bank debt (SB) increases. The solid line represents this marginal effect, the dotted lines represent the 95 percent confidence level.