Growing Like Germany: Local Public Debt, Local Banks, Low Private Investment[*]

Mathias Hoffmann
University of Zurich

Iryna Stewen
JGU Mainz

Michael Stiefel[†]
University of Zurich

This version: January 2020

Abstract

Low private investment contributes to Germany's persistent current account surplus. We argue that two structural factors—the local fragmentation of Germany's banking system and the role of local public banks in local public finance— interacted with fiscal austerity are driving down the country's private investment rate. Local banks dominate lending to small and medium firms in Germany and local public banks also have an explicit mandate to lend to the local public sector. Over the last decade, fiscal consolidation at the state and federal levels put pressure on the budgets of local governments which increasingly turned to local public banks for loans. With spreads on local government debt at all-time lows, local banks tried to break even by using their market power in geographically segmented lending markets to charge higher rates on their small-and-medium sized enterprise (SME) customers. Using a unique data set of more than 1m German firms over 2010-2016, we show that firms which depend on local banks face higher interest rates and have considerably lower investment if the local bank lends a lot to the local public sector. Aggregate private investment is around 1 percent of GDP lower due this crowding-out effect.

Keywords: local public banks, regional banking integration, firm-level investment, crowding out, current account, global and European imbalances
JEL-codes: E62, F21, F32, H32

[*]We are grateful to Ippei Fujiwara, Takeo Hoshi, Pia Jankowski and her colleagues at DSGV, Isabel Schnabel, and seminar participants at the KIT Karlsuhe, the DIW Berlin, the AlpMacro Workshop, the University of Tokyo, the Bank of Japan, Osaka University and Keio University for discussions and comments.

[†]Mathias Hoffmann is Professor at the Department of Economics, University of Zurich. He is also affiliated with University of Zurich's Research Priority Program in Financial Market Regulation (URPP FinReg), the CESifo Munich and the Centre for Applied Macroeconomic Analysis (CAMA).
E-mail: mathias.hoffmann@uzh.ch.
Iryna Stewen is Assistant Professor at Gutenberg School of Management and Economics, Johannes Gutenberg University Mainz, Jakob-Welder-Weg 4, D-55128 Mainz, Germany. She is also an affiliate researcher at the URPP FinReg. E-mail: iryna.stewen@uni-mainz.de
Michael Stiefel is PhD student at the Zurich Graduate School of Economics, University of Zurich. He is grateful for a scholarship by the UBS Center of Economics in Society during his graduate studies. E-mail: michaelstiefel@outlook.com

1 Introduction

Germany's exceptional growth over the last decade was accompanied by declining private investment and high net corporate savings. This trend has contributed to the country's high current account surplus that is increasingly perceived as an important source of intra-european and even global imbalances. It is therefore no surprise that this issue has moved into the focus of international policy-makers.

In spite of the recent prominence of Germany's current account surplus in policy discussions, little is known to date about its structural determinants. In this paper, we focus on low private investment as an important source of Germany's high current account surpluses. We draw attention to two important explanatory factors that, so far, have not been explored as drivers of external surpluses in the context of advanced economies: the fragmentation of domestic banking markets and the role that these local banks play for local government finance. We argue that these structural features of Germany's banking sector interacted with fiscal austerity at the federal and state-levels, driving down the country's private investment rate and increasing corporate savings.

Germany's local banks, the Sparkassen (savings banks) and Volksbanken (cooperative banks), dominate local banking markets in large parts of the country. They have designated geographical areas of business in which other banks of the same type (savings or cooperative) are not allowed to compete. This institutional backdrop suggests that German banking markets are segmented along regional or municipal boundaries. Their dense branch network gives local banks a very strong presence in retail and SME lending markets that the big nationwide banks (mainly Deutsche Bank with its Postbank subsidiary and Commerzbank) cannot match. Many small German firms have long-standing relations with their local banks. This relationship-based model is widely praised and the local banks pride themselves of it in their own publicity. Relationship banking allows the bank to screen borrowers much more closely and to continue lending to distressed firms even when arm's length lenders would long have stopped to provide credit. On the other hand, relationship lending also leads to a well-known hold-up problem: over the course of the relationship, the lender acquires private information about the borrower—and often holds the best collateral—which makes it hard for the borrowing firm to switch lender if the lender tightens loan terms. We show empirically that this hold-up mechanism is quantitatively important for firm-level investment in Germany.

Germany's local banks also play an important role in local public finance, including direct lending to municipalities and lending to local public enterprises. This is true, in particular, of the savings banks, which as non-profit public banks have a statuatory mandate to lend to the public sector. The savings banks are also under direct control of the municipalities in their respective district, with local mayors and other high-ranked officials being ex-officio members of their supervisory boards.

We document that the share of local banks' balance sheets invested in public debt is particularly high in municipalities with high public debt levels. We also show that local banks in highly indebted communities increased their exposure to public debt as fiscal consolidation pressure coming from the federal and state levels increased following the introduction of debt brakes in the federal and state constitutions after 2010. The latter finding allows us to rule out that the cross-sectional correlation between local banks public-sector lending and local government debt could just reflect a lack of private investment opportunities for local banks in economically weak areas with high public debt.

In locally segmented banking markets, increased lending to politically connected borrowers—be it local municipalities directly or enterprises linked to them—would either have to be financed by raising additional deposits locally or by reducing lending to other borrowers. Following the financial crisis, savings banks did actually see a net inflow of short-term deposits. Even though explicit public guarantees for the savings banks were gradually phased out over the first decade of the 2000s, the public still widely perceived the public savings banks as safer than the big country-wide private banks and shifted funds from bigger banks to the savings banks during the financial crisis. This glut of deposits, however, created problems of its own. By law, the savings banks are confined to the traditional margin business of maturity transformation. As lending rates declined after 2010, their net interest margins shrank considerably. At the same time, savings banks, unlike the big private banks, have no other lines of business to turn to and considerably less leeway to cut costs. Being viewed as the banks for the common citizen, it is difficult for them to pass on negative monetary policy rates into retail deposit rates. At the same time, their ability to cut costs is limited by political resistance to branch closures.

We argue that these general threats to the business model of the local banks are compounded for those local banks that are under particularly strong political pressure to lend to local governments because of the dire state of local public finances. Under the Basel framework, loans to municipalities have a risk weight of zero because local governments cannot declare bankruptcy under German law (their debt is legally guaranteed by the federal state). Municipal loans will therefore have very low rates even if municipalities have high debt levels. Given their high costs, savings banks that lend more to local governments at very low rates have to raise their margins elsewhere in order to break even. We show that they did so by increasing lending rates for their least elastic customers, tied to them by long-standing lending relationships—small and medium-sized firms. This led to lower investment for these firms.

Our empirical analysis is based on a unique German firm-level panel that covers more than 1m German firms over the period from 2010 until 2016, including many small ones not covered by other data sets. Our data also contains rich information on firms' bank relations that we use to construct a measure of the extent to which a firm depends on local banks for credit. We call this measure the firm's local bank spread.

To construct a firm's local bank spread, we proceed as follows. For each local bank we calculate the interest return that the bank would need to generate on its average private-sector loan in order to break even, taking account of the fraction of its balance sheet invested in low-yielding local government debt. Ceteris paribus, the more a local bank lends to local government, the higher will be the break-even interest rate that it will have to charge its other customers, including SMEs.

We then compute the firm-level local bank spread by averaging the spread between the local bank-specific break-even rate over the average German corporate borrowing rate across all banks with which the firm has a lending relationship. In doing so, we weight each bank relation with the inverse of the nearest distance of the firm to a branch of each of these local banks.

A firm's local bank spread is exogenous to firm-specific characteristics because the individual break-even rates that enter it are computed using bank-level information only, in particular the share of the bank's balance sheet going to public loans. Furthermore, because the firm-specific local bank spread exploits variation between firms and over time in firms' bank relations it is orthogonal to virtually all conceivable confounding factors such as time-varying local- or sector-specific demand spillovers or unobserved firm or bank heterogeneity.

We show that the local bank spread has a quantitatively important and significantly negative effect on firm level investment controlling for a host of firm-level variables and a rich set of controls for potential confounding factors: firm effects, district-time and sector-time effects as well as region-specific, time-varying effects that vary by firm size, sector or exporter status. This latter set of controls effectively controls for compositional differences in the customer base of local banks. Hence, we can rule out that the effect of the local bank spread on investment arises because local banks in some areas lend to particularly small or risky firms or to some specifically risky sectors which would justify charging an interest rate spread even in the absence of our conjectured mechanism.

We further buttress the causal interpretation of our findings by inspecting the transmission mechanism.

First, we document that the local bank spread has indeed a significantly positive effect on the average interest rate paid by the firms in our sample. Since the local bank spread is constructed using interest rates that are imputed at the bank level using only bank-level information about public sector lending, this is a very strong independent vindication of one of our central conjectures: local banks' public sector lending leads to higher borrowing costs for their SME customers.

Secondly, our results suggest that local banks have considerable price setting power because firms that depend on them are very inelastic in their credit demand. We find only a relatively weak and generally insignificant negative impact of the local bank spread on bank credit growth at the firm level.

Having established that the local bank spread affects firms mainly through its impact on borrowing costs, we use it as an instrument for interest rates in firm-level investment regressions. Again, we find strong and significant effects that are quantitatively comparable to our previous reduced-form regressions.

Our findings therefore suggest that local bank lending to the public sector crowds out private sector investment. The effect is economically important: according to our estimates, the local banking spread lowers investment for the average firm in our sample by about 6 percent. While many of the firms in our sample are small, the effect on Germany's aggregate investment—and therefore on the current account balance—is still considerable. We find that from 2012-2015, aggregate investment would on average have been 30 billion Euro per year higher in the absence of crowding out. This amounts to roughly 1 percent of German GDP.

Simple theory would suggest that crowding out is possible only if local public demand for borrowing can impact interest rates for other borrowers in the local economy. This requires local banking markets to be geographically segmented because otherwise borrowers could easily substitute local bank credit for alternative sources of finance. Consistent with this view, we document that our findings are particularly strong in areas with strong geographical segmentation in which local banks account for a high share of bank-firm relations. Conversely, we find crowding out to be considerably weaker in areas where firms find it easier to turn to non-local lenders.

Over the last decade, Germany's federal states and the federal government have tightened their spending under the influence of the so-called debt brake. Introduced into the federal constitution and most individual state constitutions in 2010, the debt brake stipulates that the federal government should not run a structural deficit of more than 0.35% of GDP from 2016, whereas the federal states should not incur any structural deficit at all beginning in 2020.

Against this backdrop of fiscal austerity, it may appear surprising that we find any evidence of crowding out in Germany at all. We argue that fiscal austerity at the state- and federal levels and the financial distress of many municipalities are actually two sides of the same coin. In the process of fiscal consolidation stipulated by the debt brake, the federal and state governments have shifted a lot of expensive government tasks to the municipalities, whose debt is exempted from the debt brake. We show empirically that local banks' public lending share has increased under the influence of the consolidation requirements imposed by state-level debt brakes, in particular in municipalities with high initial public debt levels. This suggests that local municipalities have indeed used their political influence over local banks, and in particular the savings banks, to plug budget gaps through bank loans.

To illustrate the link between fiscal austerity at the the federal and state levels and crowding out at the local level, we repeat our firm-level analysis using an alternative measure of the local banking spread. We fit the share of local banks' lending going to government from a regression, on local government debt interacted with state-level measures of fiscal adjustment pressure. Using this fitted value for constructing the local banking spread, we then re-run our firm-level analysis. Again our results stand: firms in highly indebted municipalities in states with high fiscal austerity pay higher interest rates and have lower investment rates. Indeed, the increase in public loan shares in local banks' balance sheets induced by fiscal austerity in this way explains around three quarters of the total crowding out effect on investment that we identfiy in this paper.

Hence, our results suggest that two structural features of Germany's banking market—local segmentation and the role of local public banks in local public finance—interacted in a peculiar way with fiscal austerity at higher layers of government to crowd-out private investment. While the discussion about fiscal austerity in Germany has generally focused on its implications for public investment (notably infrastructure), our results highlight a mechanism through which fiscal austerity can do unforeseen collateral damage by crowding out *private* investment. Our results suggest that this indirect effect is of the same order of magnitude as the direct effect of fiscal consolidation on Germany's external balance.

2 A first look at the data

2.1 Germany's current account surplus and low private investment

Figure 1 plots Germany's current account balance and its composition in terms of sectoral net lending of households, non-financial and financial corporations and of government. As is apparent, Germany has been running increasing current account surpluses since the late 1990s.

Turning to the composition of the current account surplus we see that see that in the years before the financial crisis it is predominantly the shrinking deficit of the public sector that drives Germany's surplus. However, net non-financial corporate lending soars during the global financial crisis and remains high thereafter. Interestingly, this is also the period when the net lending of the government sector turns positive. This post-crisis period is the focus of our analysis in this paper. We argue that the balanced budget of the public sector and the increase in net lending by non-financial corporates are linked. A balanced budget for the government sector as a whole actually disguises deteriorating municipal finances. Specifically, we argue that the consolidation of federal and state budgets largely came at the expense of municipalities which in turn turned to the local public banks to plug budget gaps. In Germany's locally segmented credit markets, this lending of local public banks to local governments crowded out private investment for SMEs. While our main analysis uses matched firm-bank-level data to make this point, the next two subsections illustrate some key aspects of this mechanism in aggregated data.

2.2 Local banks in the German banking system

Local banks play a key role in Germany's banking system. There are only two big commercial banks with a country-wide branch network, Deutsche Bank (with its Postbank subsidiary) and Commerzbank. In most regions, local banks dominate deposit markets and the market for SME lending. Local banks come in two forms: savings banks (Sparkassen) and cooperative banks (Volks- und Raiffeisenbanken). As public banks, savings banks are non-profit organizations owned by one or several municipalities or by the administrative district which forms their geographical area of activity. In most cases, the mayor or the head of the local district chairs the board and other mayors and local officials join the board as ordinary members.

Cooperative banks, by contrast, are local cooperative banks that raise deposits from and lend to their members. They also face no competition from other cooperative banks in their designated geographical area. While cooperative banks are not under the same direct political influence of the local municipalities as savings banks, holders of local public offices are nonetheless often represented on their boards. Cooperative banks are also generally much smaller than savings banks and generally lend to smaller firms. In our baseline specifications, we generally do not differentiate between savings banks and cooperative banks but define local bank dependence of a firm irrespective of whether a firm is associated with a cooperative bank or a savings bank. Generally, however, most of our results are stronger if we focus on the savings banks alone, consistent with our conjecture that savings banks are under more direct political influence to lend to the local government.

One hallmark of local banks in Germany is the tight relationship they maintain with local SMEs. The map in Figure 2 shows the county-level variation in the share of firms with a local bank relationship in our sample. While the figure reveals considerable regional variation, its predominantly dark colour suggest that in many areas local banks are the main—and often only—provider of credit to SMEs. This dominance of local banks in their respective markets is one of the key elements of the mechanism we highlight in this paper. Not only are many SMEs probably too small and too opaque to borrow from the bigger banks which are arms' length lenders. The map suggest that in many areas local banks are actually the "only game in town". This leaves SMEs highly exposed to changes in funding conditions imposed by the local banks.

2.3 Local banks and local public finance

The other element of our mechanism is the role of local banks—and in particular of the savings banks — in local public finance. As public banks, the savings banks have an explicit statutory and legal mandate to provide credit to the local public sector. Local mayors from the municipalities in a given savings bank's district form the supervisory board of these banks so that municipalities effectively control the local public banks. Clearly, this makes it difficult for the savings banks to decline financing requests from municipalities or connected enterprises. The role of the local banks in local government finance is illustrated in Figure 3 which shows the ratio of local public debt to GDP for Germany's districts and big municipalities plotted against the share of loans to government from the balance sheet of their respective local banks. The correlation is clearly positive, suggesting that, on the margin, savings banks lending to government mainly means lending to local municipalities.

While the link between local public debt and local bank lending to government is still present for the Volksbanken, it is considerably weaker. This is in line with institutional setup in which the savings banks are actually under the direct control of locally elected politicians and are therefore likely to have to accept the financing requests by their respective districts or municipalities. By contrast, political influence on the cooperative banks is much less direct and only informal.

One question our results may raise is why local banks may be under pressure to provide more credit to local government in a period during which Germany saw a secular consolidation of its public finances.

We argue that fiscal consolidation—and notably the implementation of 'debt brakes' in the federal and most state constitutions during that period—and the increased role of local banks for municipal finance are two sides of the same coin.

Germany's parliamentary system puts considerable emphasis on finding a balance of power and compromise between the states and the federal government. However, while the federal and state-levels of government have direct parliamentary representation in the Bundestag (the lower chamber) and the Bundesrat (the upper chamber) respectively, municipalities as the lowest levels of government, have no such representation. Indeed, we are not the first to argue that fiscal consolidation at the state and federal levels over the last decade essentially went at the expense of local municipalities. Fratzscher, Kriwolutzky and Michelsen argue in Fuest et al. (2019) that higher levels of government increasingly passed legislation that shifted considerable financial burdens onto the municipalities. They cite social security payments, notably the cost of accommodation of households on social benefits or payments to asylum seekers as examples. In return municipalities obtain a share of the tax revenue that federal states and the federal government raise, but these funds were generally insufficient to cover the additional expense imposed on municipalities by new legislation. Over the last decade, the financial situations of many municipalities have therefore deteriorated dramatically. At the same time, municipalities have very limited direct taxation powers themselves. Under German law, municipalities cannot declare bankruptcy and the federal state to which they belong is ultimately liable for their debt. But making recourse to the state would require the municipality to put itself under state administratorship which would considerably curtail its political independence. Hence, municipalities have a strong incentive to avoid this situation at all costs.

This is where we argue the savings banks come into play. As non-profit organizations by law they are not able to make systematic profits and to disburse them to local municipalities. However, the political control of the savings banks boards allows local municipalities to borrow from 'their' savings bank at preferential conditions. The cross-sectional correlation in Figure 3 could just reflect a lack of investment opportunities which forces local banks to invest a higher share of their lending in government debt in depressed areas with low growth prospects and high municipal debt. However, this interpretation cannot explain the fact that we document in the last part of the paper: the share of public lending in the balance sheets of local banks increases directly with the need of fiscal consolidation (as stipulated by the debt brake), in particular in municipalities with high initial public debt levels. This effect is particularly strong for the local public banks, the savings banks. Hence, our results strongly suggest that local municipalities have tried to dampen the negative impact of the fiscal consolidation at the state and federal levels on their own budgets by borrowing from local banks.

3 Related literature

Our paper integrates and builds on several strands of literature.

The first strand is a by now classic literature on emerging economies that identifies domestic financial frictions as the source of current account surpluses in these countries. Specifically, our analysis and the title of the paper are inspired by Song et al. (2011) who argue that China's persistent current account surpluses are ultimately the result of a domestic misallocation of capital: since only politically connected (state-owned) firms can borrow from the banking sector, domestic private firms are required to finance investment from internal funds. This keeps private sector investment lower than it would otherwise be. Since domestic private enterprises are the ultimate drivers of growth in their model, the share of state-owned enterprises in the economy declines and banks increasingly invest savings of workers into foreign bonds. This drives the current account surplus. While the details of our mechanism are clearly different, we believe it is a fruitful analogy to apply some fundamental insights from this literature to understand the sources of global imbalances in the context of advanced economies. In our setting it is the pressure on local banks to lend to politically connected borrowers (in our case municipalities and districts) that forces local banks to impose tighter funding conditions on non-connected borrowers. This tightening of terms can only affect borrower's overall ability to borrow (and thus investment), if these borrowers are sufficiently inelastic. This, we argue is the case because credit markets are geographically segmented and because it is therefore difficult for SMEs to turn to other banks for credit.

The idea that government borrowing can crowd out private investment in geographically segmented credit markets has also first been explored in the Chinese context. Huang et al. (2019) show that local government borrowing in China drains local private firms of credit. Our results are similar to theirs but the mechanisms are different due to the very different institutional settings. As we show below, German local banks do not appear to ration credit. Being flooded by deposits, they actually had a strong desire to lend in the period after 2010. However, lending to local government at low rates forced German local banks to increase interest rates on other borrowers in order to break even. Different from Huang et al. (2019), we can also match the our entire sample of firms with their banks, which allows us to considerably sharpen the identification.

Our paper also builds on a number of recent studies that have identified a secular rise in corporate net savings since the 1980s. Chen et al. (2017) identify the decline in the price of capital goods as an important factor behind this increase. Dao and Maggi (2018) argue that this increase is indeed a global phenomenon that affects all industrialized economies. These studies generally focus on large, listed firms, however. Local banks predominantly lend to SMEs and our results are therefore driven by Germany's, small non-listed firms, the "Mittelstand". To our knowledge, ours is one of the first papers to document the low investment rates of German "Mittelstand" firms.

In the banking literature, recent studies have investigated the impact on low and negative interest rates on bank behaviour, for example Heider et al. (2019) and Basten and Mariathasan (2018). Related to us, Heider et al. (2019) show that high deposit banks are particularly hit by the introduction of negative interest rates in the euro area in June 2014. High deposit banks cannot pass on negative rates to customers which implies comparatively higher cost of funding. As a consequence, high deposit banks increase their interest rates and reduce lending. In our setting, local banks are typically high deposit banks as well and our mechanism also works through higher interest rates to private firms. Different to their paper, our mechanism is present through the whole period after the great recession and works through the asset side of the bank balance sheet. The low interest rates imply less revenue for local banks that lend to the public which decreases their interest income on the asset side. To achieve a sufficient high interest margin, local banks then increase rates to private firms. Possibly, the comparatively higher cost of funding due to negative rates is an additional source of pressure for local banks towards the end of our sample.

Our analysis is also informed by a number of recent papers that have shown that lending decisions of Germany's savings banks are subject to political influence. Englmaier and Stowasser (2017) document an electoral cycle in the lending of Germany's savings banks. Markgraf and Rosas (2019) show that mayors who sit on the boards of German savings banks are more likely to get re-elected than their peers who are not board members. Koetter and Popov (2018) show that savings banks tend to increase their holding of state-level bonds if an election brings different parties to power at the county- and the state-levels. The authors interpret this as a way by the local government to curry favor with the state-level government.

None of these papers, however, identifies the exact mechanisms through which political lending affects the real economy. By contrast, our analysis benefits from having access to matched bank-firm data to identify the specific channel through which real-sector (firm-level) outcomes are affected. Our setup also allows us to draw conclusions about the importance of this mechanism for aggregate investment.

In its focus on how public banks affects investment, our paper also relates to Bian et al. (2017) who examine the impact of main bank choice on corporate innovation. Exploiting distress events of public banks as an instrument for the choice of main bank, they show that firms with a government-owned bank as their main bank have lower innovation rates. The focus of this study, however, is on the ability of banks to identify innovative projects. By contrast, we study how the role of local banks in municipal finance affects credit conditions for other lenders in locally segmented credit markets.

In its use of matched bank-firm data, our analysis builds on the seminal work by Khwaja and Mian (2008) and the literature spawned by this paper. Huber (2018) applies the approach by Khwaja and Mian (2008) to German firms which are dependent on one of Germany's biggest banks, the Commerzbank. Huber shows how this shock affected firm-level outcomes across the country during the financial crisis of 2008. Popov and Rocholl (2018) show that external financing shocks to savings banks lead to a decline in labor demand of firms which are connected to savings banks. While our paper is related to both, our focus here is quite different from most of this literature. Specifically, most earlier contributions have focused on credit supply shocks that adversely affect the length of the balance sheet of banks and therefore force them to reduce the quantity of credit supply. Our focus here is on prices. We do not argue that German savings banks ration the quantity of credit to firms after an adverse shock to their balance sheets. Rather, we show that the necessity to break even forces local banks to charge higher rates if they hold a lot of low-yielding government debt on their balance sheet. To the best of our knowledge, this channel—and its potential impact on real outcomes such as firm-level investment — has not been explored in the literature.

4 Data and empirical framework

4.1 Data Sources

We build a data set of firm outcomes and firm-bank relationships matched with lending statistics for the banks. To this end, we rely on two data sources, *Dafne* and *FitchConnect*.

Dafne is a database provided by Bureau van Dijk which contains the balance sheets and income statements for up to 1.4 million German firms based on annual reports of the companies. *Dafne* also contains bank relationships for the majority of firms. Since bank relationships are overwritten in each year, we make use of historical vintages of the database to obtain a panel of firm-level data. This panel also provides us with time-varying bank-firm connections. To proxy investment behaviour of the firm, we compute investment rate as the difference in fixed assets from t to t+1 divided by fixed assets in t. We measure the effective interest rate paid by the firm by dividing interest payments with liabilities. We compute bank liabilities growth as the t to t+1 change in bank liabilities divided by bank liabilities in t. As control variables, we use firm size - defined as the natural logarithm of total assets - and the cash flow to total assets ratio.

We merge our firm-level data set with bank-level information from *FitchConnect*, a database provided by Fitch which contains historical bank balance sheets. We extract information on the net interest margin, net loans, and on public sector loans. Public sector loans in the bank balance sheet data comprise all lending to public borrowers, including the lending to public owner-operated enterprises and municipal enterprises without legal capacity ('Eigenbetriebe') which are legally part of their respective municipality but whose financial budgets are formally separate. Data on public sector loans in *FitchConnect* are available from 2009. For this reason and because our interest is in the recent, post-crisis period of Germany's high current-account surpluses, our empirical analysis in this paper generally focuses on the period 2010-2016.

4.2 Public sector lending and private-sector interest rates: Bank-level break-even lending rates

Our aim is to construct a measure of the exposure of each firm to local banks. A key input into this indicator of local bank exposure is the average interest rate that a local bank has to charge its private customers if it wants to break even.

While Germany's local banks (and in particular the savings banks) are not profit oriented, they need to earn a sufficiently high interest margin in order to maintain their dense local branch networks and pay what are comparatively many employees (as compared to the big, country-wide banks). A key assumption of our analysis is that local government debt yields lower returns for the bank than other forms of lending. This is because local municipalities cannot technically declare bankruptcy and because local government debt has a risk weight of zero. Figure 4 plots the yield on German municipal bonds against the average deposit rate of all German banks. The two lines track each other closely, suggesting that it its indeed not very profitable for banks to lend to local governments.

For a given required net interest margin, the higher the lending share to local governments, the higher will have to be the effective interest rate that local banks charge on other forms of lending. Specifically, let λ_t^b be the public debt share of a banks' total lending. Then we can write the bank's net interest margin as

$$\text{NetInterestMargin}_t^b = \lambda_t^b \left(r_t^{\text{public}} - r_t^{\text{deposit}} \right) + (1 - \lambda_t^b) \left(\tilde{r}_t^b - r_t^{\text{deposit}} \right) \tag{1}$$

where r_t^{deposit} and r_t^{public} denote the bank's average deposit rate, and the average rate on public sector lending respectively and $\tilde{r}_t^b$ denotes the average rate charged on loans to the private sector, our object of interest here. We call $\tilde{r}_t^b$ the break-even rate of the bank.

In our bank data set, we directly observe the bank's net interest margin as well as the share of of public sector loans, λ_t^b. However, we do not have direct bank-level information on $\tilde{r}_t^b$ or about the average lending rates that individual local banks charge for government loans or for mortgages.

For public sector loans we assume that this rate is the same for all banks and that it is given by the benchmark rate of return on municipal bonds. As regards the deposit rate, we use the the average deposit rate for all banks published by the Deutsche Bundesbank. Based on these assumptions, for each bank in our sample, we can then easily obtain a time-series of the average (across all customers) private-sector lending rate $\tilde{r}_t^b$ from equation (1).

The assumption that government borrowing rates as well as deposit rates are the same across all banks ensures that the heterogeneity in the break-even rates is ultimately determined by cross-bank heterogeneity in λ_t^b. We view this as an advantage of our identification procedure, but these assumptions are also likely to be justified on empirical grounds. While direct evidence on the borrowing conditions municipalities face is scarce, we note again that loans to municipalities carry a risk weight of zero and that the federal states are ultimately liable for these loans. This suggests that spreads of individual loans to local governments over, say, German treasury bills are likely to be small and that the common component is likely to be dominant. Some indicative evidence can be gleaned from the risk premia on municipal bonds of major German cities that are around 25-30 basis points on average and appear rather uniform across cities (Friedrich et al. (2014)). The assumption that all banks pay the same deposits rates appears as a stronger simplification. However, we believe it to be justified on the grounds that the German market for deposits is much less segmented along geographical lines than the market for SME lending.

Our simple decomposition (1) does not distinguish between mortgage lending and other (unsecured or secured) forms of private-sector lending. The reason is that the recent literature has emphasized the importance of collateralized (mortgage) borrowing for corporate finance (see Chaney et al. (2012) for the United States and Bednarek et al. (2019) for Germany). Also, for many smaller firms for which the private finances of their owner and those of the firm are closely intertwined, a mortgage taken out on a private home may well be used for business purposes and vice versa.

The break-even rate $\tilde{r}_t^b$ can therefore best be interpreted as the average borrowing rate of all private-sector customers of a given bank. To what extent $\tilde{r}_t^b$ reflects the borrowing conditions that the bank offers to its SME customers, is an empirical question. As we show below, actual interest rates paid by SMEs computed from our entirely independent firm-level data set are actually highly correlated with firm-level exposures constructed from $\tilde{r}_t^b$.

Figure 5 provides an impression of the average break-even rates for the savings and cooperative banks respectively and plots them against the average German corporate borrowing rate (across all banks) as published by the Deutsche Bundesbank. The average break-even rate for the savings and the cooperative banks track each other very closely and are also highly correlated with the average corporate borrowing rate. However, local banks' break even rates are markedly higher than the average corporate borrowing rate. While the spread between the break-even and the corporate borrowing rate is around 50 basis points in the earlier part of the sample, it gradually declines in the second half of the sample, in line with the general decline of interest rates over the period.

4.3 Firm-level exposures: the local bank spread

We now construct firm-level exposures to the funding conditions set by local banks. Specifically, we are interested in the spread that a firm would pay over the average German corporate borrowing rate as a consequence of being dependent on local banks. The idea behind this approach is that local segmentation of banking markets leads to differences between the interest rates that comparable firms would pay in different local markets. Our key conjecture is that these differences are driven by differences in the extent to which local banks engage in lending to the public. We therefore use the bank-level break-even rates obtained in the previous subsection and information on firms' bank relations at a given point in time to construct the local bank spread, LBS_t^f, for firm f in year t as follows:

$$\text{LBS}_t^f = \sum_{b \in \mathcal{L}} \omega_t^{f,b} \times \left(\tilde{r}_t^b - \bar{r}_t \right) \tag{2}$$

where $\bar{r}_t$ is the German corporate borrowing rate as published by the Deutsche Bundesbank, $\mathcal{L}$ is the set of all local banks , $\omega_t^{f,b}$ is the weight of the relation with bank b for the firm and $\tilde{r}_t^b$ is the bank's break-even rate from above.

Our data set does not contain direct information about the amount of loans that a firm borrows from each bank. Also, even if this information was available, the actual extent to which each firm borrows from a bank could be endogenous to firm- or bank-level characteristics. Petersen and Rajan (1995) and Degryse and Ongena (2005) have shown that distance to the lending bank and the competitors is a key determinant of the lending conditions faced by SMEs. We therefore impute the weights $\omega_t^{f,b}$ based on the inverse of the geographical distance, $\text{DIST}^{f,b}$, between firm f and the closest branch of bank b:

$$\omega_t^{f,b} = \frac{\frac{1}{1+\text{dist}^{f,b}}}{\sum_{j \in \mathcal{B}_t(f)} \frac{1}{1+\text{dist}^{f,j}}} \tag{3}$$

where $\mathcal{B}_t(f)$ is the set of all bank relations of the firm at time t. This weighting reflects the notion that distance is a key determinant of the intensity of a bank relation, in particular when lending is relationship based, as is the case for Germany's SMEs.

4.4 Main specification: estimation and identification

Our main conjecture is that firms that are particularly exposed to the local bank spread invest less. We test this proposition using our main reduced-form specification

$$I_t^f = \alpha \times \text{LBS}_t^f + \boldsymbol{\beta}' \boldsymbol{X}_t^f + \delta_t^f + u_t^f \tag{4}$$

where the dependent variable I_t^f is the investment rate of firm f in year t and our main parameter of interest is α, the coefficient on the local bank spread LBS_t^f. The vector $\boldsymbol{X}_t^f$ contains time-varying firm-specific controls and the vector $\boldsymbol{\delta}_t^f$ collects a range of fixed effects, including firm fixed effects, municipality-time and sector-time effects.

We estimate specification (4) by OLS and cluster standard errors at the county level.

There are at least three reasons that allow us to interpret our estimate of α as the causal effect of local banks' public sector lending on firm-level investment.

First, the break-even interest rates used to compute LBS are constructed using bank's balance sheet info only. Hence, LBS is clearly uncorrelated with omitted time-varying firm-specific factors such as variation in the firm's demand for loans or a firm's riskiness.

Second, LBS exploits variation across firms in the same location in terms of their banking relations. This makes LBS uncorrelated with common, region-specific influences that affect all firms in the same location. Furthermore, since firms in the same region differ in the exogenous weight that each bank has in firms' bank-relationships, our approach also alleviates the concern that unobserved heterogeneity in bank-firm matches could be correlated with LBS.

Third, we note that LBS_t^f is equal to the weighted average of $\tilde{r}_t^b - \bar{r}_t$ across *all* banks with which the firm has connections, assuming that the break-even rate on all non-local banks equals $\bar{r}_t$. Hence, LBS_t^f implicitly assumes that all firms borrow from non-local banks at the average corporate borrowing rate.

5 Results

5.1 Descriptive statistics

Table 1 provides summary statistics for the main variables in our data set. The average of the local bank spread across all firm-year observations in our sample is relatively small with just 8 basis points. However, there is considerable variation across firms. The standard deviation of LBS is just below 30 basis points. The average investment rate (as a fraction of assets) for the firm in our sample is around 15 percent, while the average interest rate firms pay on their liabilities is around 3 percent. Interest rates vary widely across firms, the standard deviation of interest rates paid by firms is of the same magnitude as the mean. Average bank liability growth across our sample of firms is around 1 percent per year, again with wide variation. The average firm has around $416000 = 1000 * \exp(6.032)$ EUR in assets and has a cashflow of 9 percent of total assets.

5.2 OLS results

Table 2 presents the results from the estimation of our baseline regression (4). Column (1) shows a simple panel-regression with time and firm fixed effects. Our estimate of α, -4.6, is negative and significant. Adding firm-specific controls lowers the absolute magnitude of the coefficient, but the estimate remains negative and significant. Consistent with the bulk of the literature, firms with higher cashflow have higher investment rates. Interestingly, firms with higher total assets have lower investment rates. Some regions or sectors may be in relative decline, leading firms to have low investment and forcing local banks to charge relatively high risk premia. To rule out that our results are driven by such common factors, in column (3) we include locality- and sector-specific time effects. At -3.2, our estimate of α remains stable and significant.

We have argued that the way in which LBS is constructed ensures that it is exogenous to most firm- and local-specific confounders as well as to unobserved heterogeneity in bank-firm level matches.

However, there could be a challenge to identification if the following conditions are fulfilled: i) banks' break even rates are correlated with local- or sector-specific shocks. ii) firms differ in the way they load on these local- or sector-specific shocks and iii) these loadings correlate across firms with the weight that local banks have in these firms' bank relations. If all of these conditions are met, then our estimate of α would be biased. For example, small firms are generally more exposed to local economic conditions since they are more likely to depend on local demand than bigger firms. Smaller firms are also disproportionately dependent on local banks. Hence, conditions ii) and iii) would be fulfilled here. If local economic conditions also affect local banks' break-even rate, then condition i) would also be met, and α would be biased.

In Table 3, we account for this possibility and allow for an interaction of local-time-specific factors with firm-size (column (1)). In column (2), we also allow for local-time-specific factors to load differentially on investment depending on the sector in which the firm is active. This allows for the possibility that certain sectors in certain localities could be particularly dependent on particular bank types. Finally, we also interact the local-specific factor with a firm's exporter status. This allows for the possibility that banks in some areas have particular exposure to exporting or non-exporting firms. Our results are robust to all of these exercises. Our estimate of α remains stable at around -3.

It is instructive to gauge the economic significance of our estimate of α. A value of α of, e.g., -3.2 implies that a one-standard deviation increase in the local banking spread of 28 basis points will tend to lower the investment rate by around 0.9 percentage points. With an average investment rate of 15 percent of total assets, this amounts to an almost 6 percent (0.009/0.15) decrease in firm-level investment. Hence, the results in Table 3 show that firms invest considerably less in response to relative small increases in their local banking spread. Since the local banking spread ultimately reflects the variation in public holdings across banks, our results suggest that the local public debt crowd out private investment in Germany's locally segmented credit markets.

We emphasize that the spreads that firms face are relatively small. While the spread for the average firm in our sample is only 8 bps, the standard deviation of LBS is 28 bps. For firms that only bank with local banks, Figure 5 would suggest that LBS should on average be around 50 bps.

To appreciate the magnitude of the sensitivity of investment to these spreads, we relate our estimates to earlier studies in the literature. Gilchrist and Zakrajsek (2007) and Guiso et al. (2002) find that investment is highly sensitive to truly exogenous measures of firm interest rates, which is consistent with our results here.[1] Gilchrist and Zakrajsek (2007) estimate that a 100 bps increase in interest rates lowers investment (as a fraction of the installed capital stock) by around 75 basis points and that it decreases the capital stock by 1 percentage point in the long run. While of the same order or magnitude, our estimates here are still 2-3 times bigger. To understand this discrepancy, note that Gilchrist and Zakrajsek (2007)'s estimates are based on a a sample of big, listed and bond-issuing firms from the period before the financial crisis. We would expect that the smaller and more opaque firms that dominate in our sample are considerably more sensitive to changes in financing conditions. Furthermore, as recently highlighted by Lin et al. (2018), the secular drop in interest rates since the financial crisis and the commitment of monetary policy to keep rates low for long will considerably increase the sensitivity of investment to small changes in interest rates.

We illustrate this last point using a textbook model of investment behavior with a constant interest rate that we detail in the Appendix. In this model, the sensitivity of Tobin's q to a permanent change in the interest rate can be written as

$$\frac{\partial q_t}{\partial r_t^f} = -\frac{\Pi_{K,t+1}}{\left(r_t^f + \delta\right)^2} \tag{5}$$

where δ denotes the depreciation rate and $\Pi_{K,t+1}$ the expected marginal profit (net of adjustment costs) from an increase in the capital stock.

The key insight here is that Tobin's q, as sufficient statistic for investment, is much more sensitive to small changes in the cost of capital $r_t^f + \delta$ when interest rates are near zero (and expected to stay so) than when they are at higher positive levels. The reason is that if interest rates are expected to be low in the future, then a small permanent increase will have an outsize effect on the present value of future discounted marginal profits. By way of example, consider a depreciation rate of 10 percent and assume that before the crisis, the average interest rate paid by a firm would be four percent, while after the crisis this would have dropped to zero. The sensitivity $\partial q_t / \partial r_t^f$ (for given $\Pi_{K,t+1}$) will be almost twice as a high when $r_t^f = 0$ than when $r_t^f = 0.04$. If we allow a slightly lower depreciation rate of $\delta = 0.07$, Tobin's q is even 2.5 times more sensitive when interest rates are zero than when they are

[1] The early literature in this area was based on macro or sectoral time series evidence generally found it difficult to establish a significant link between interest rates and investment. As discussed by Guiso et al. (2002), studies based on firm-level evidence that use truly exogenous shifters in firm's cost of capital (such as e.g. tax reforms or indicators of firm-level interest rates constructed using bank-level information, as we do here) tend to find much larger effects.

at four percent. Now consider two otherwise identical firms of which one has to pay a slightly higher interest rate than the other (e.g. because one banks with a local bank and faces a spread and the other not). Then the simple model here suggests that the sensitivity of the firms' investment could easily be 2-2.5 times higher in the post-crisis (where average interest rates are near zero) than in the pre-crisis period when interest rates might have been nearer to 4 percent. Therefore, if we take the estimates by Gilchrist and Zakrajsek (2007) as a pre-crisis baseline for the interest sensitivity of investment, then the magnitude of the estimates of α obtained in the low-for-long interest rate environment of the post-crisis period can be quantitatively reconciled with the previous literature.

The finding that small spreads have a relatively big impact on SME investment in a low-for-long environment clearly also has potential implications for the transmission of monetary policy. If average borrowing rates are low, then relatively small frictions in the financial system may have a disproportionate effect on firm-level investment. This can frustrate attempts by the monetary authority to stimulate the economy with low or negative interest rates.

In Table 4 we examine the impact of the local banking spread on other outcome variables: sales growth, employment growth and the equity ratio. The results suggest that the impact of the local bank spread is pervasive: higher spreads are associated with lower revenue growth and lower employment.

5.3 Transmission mechanism

Crowding out of private investment should only be possible in segmented credit markets. If firms can easily switch away from local banks, then variation in the local banking spread should have not bearing on real outcomes. Table 5 illustrates that the local segmentation of Germany's credit market is indeed an important ingredient of our mechanism. The table report results for our baseline regression (4) on two sub-samples: one for firms headquartered in districts where local banks account for a high (above-median) share of all bank-firm relation (high segmentation) and one for firms headquartered in districts with a low share of local banks. In the high-segmentation districts (column (1)), our estimate of α is significant and much higher than when estimated with the same controls on the whole sample (compare column (3) of Table 2). Conversely, the coefficient is much lower and insignificant when estimated on the low-segmentation sample.

Tables 6 and 7 shed further light on the channel through which the local banking spread affects firm-level investment.

The *Dafne* data base contains firm-level information about interest payments. This allows us to calculate the effective interest rate that the firm pays on all its liabilities. Table 7 shows regressions of these firm-level effective rates on the local banking spread. The coefficient is large, positive and highly significant. Hence, the results in Table 7 provide independent firm-level evidence that the break-even rates that were calculated using bank-level information on the composition of bank's balance sheets in terms of public and private-sector lending actually bear (via LBS) a strong relation with the interest rates that firms actually pay.

Table 6 looks at the response of firms' balance sheets. Columns (1)-(3) show firm-level regressions of bank liability growth, columns (4)-(6) show regressions of the change in the firm's equity share on LBS. The coefficient in the bank-liabilities regressions are negative throughout, though they seem imprecisely estimated. The equity-share regressions by contrast display positive and highly significant coefficient on LBS throughout. These results suggest that a higher local bank spread leads firms to borrow less from banks and to increase their equity ratio. This could be mechanic, simply because borrowing less from banks will lead to a shorter balance sheet and a higher equity ratio ceteris paribus. The pattern could, however, also reflect a more general turn away from banks towards internal funds. For example, to finance investment in the future, firms could increase their equity ratio by accumulating retained earnings.

The pattern of responses in Table 6 is consistent with a hold-up problem that would typically arise if lending is relationship-based, where the lender has acquired private information about the firm over the course of the relationship (Sharpe (1990)). If firms could easily switch to other lenders following an increase in the local banking spread, there should not be any effect on the firm's total amount of bank liabilities, on its equity share, and, ultimately, on investment. Firms would simply substitute one lender with another. The fact that they do not generally seem able to do so suggests that credit markets are indeed locally segmented, consistent with the findings reported in Table 5.

We emphasize that our results do not support the view that German firms over the last decade could have been facing a credit-crunch. The traditional credit-crunch mechanism has been shown to have mattered for Germany during the financial crisis (see Huber (2018)), but it appears implausible that German firms faced serious constraints on the amount they could borrow during our sample period, which covers Germany's exceptional boom of the last decade. Rather, our results suggest that firms faced higher interest rates because of their exposure to local banks. This is the pattern we would expect to see if these banks wield considerable price-setting power in locally segmented markets (see also Degryse and Ongena (2005)).

5.4 IV results

Having identified the cost of credit as the main vector of transmission to firm-level outcomes, we therefore now use the local banking spread as an instrument for firm's effective borrowing costs in firm-level investment regressions. Specifically, we estimate

$$I_t^f = \alpha \times r_t^f + \boldsymbol{\beta' X_t^f} + \delta_t^f + u_t^f, \tag{6}$$

where r_t^f is the firm-level effective interest rate which we instrument using LBS. The results are shown in Table 8. Column (1) presents the first stage which is essentially identical to the regression presented in Table 7.[2] As before, our local bank shock is associated with a strong increase in the firm interest rate. Testing for a weak instrument results in an F-statistic larger than 60, suggesting that LBS is a very strong instrument. As we noted in the discussion this first stage also vindicates our construction of the break-even rates for individual local banks. While we do not directly observe average SME lending rates charged by the local banks, we see that firms connected with these banks do indeed pay higher interest rates on their stock of liabilities. This suggests that our imputation of break-even rates captures the pricing behavior of local banks very well.

In the second stage regression, a 1 percent change in the interest rate is associated with a 25 percent reduction in the investment rate. Taking the first and second stages together, this effect is quantitatively very similar to the effect we estimated based on our reduced form in Table 2. A one-standard deviation of local bank shock is again roughly associated with a 0.8 percentage points reduction in the investment rate. Given that the average investment rate in our sample is around 15 percent, this suggests a 5-6 percent reduction in investment for the average firm in our sample.

[2]Note that the number of observations in the first column of Table 8 differs from the third column in Table 7 since the investment rate is not always observed for some of those firms. The estimates are numerically almost unaffected, however.

6 Implications for aggregate investment

Some first evidence on the importance of our mechanism for aggregate outcomes can be gleaned from Figure 6. Here, we plot the county-level investment rate calculated from our data set against public loan shares for the local banks in the respective county. Investment rates in counties where local banks have high public loan shares tend to be lower. Clearly, this effect could be driven by low local investment opportunities. But if this was the case, in low-investment counties we should see high public loan shares for all local banks. However, the negative relationship between λ_t^b and investment rates is driven in particular by the public savings banks (red dots) whereas the cooperative banks (blue dots) generally have much lower public loan shares, even in counties with low investment rates.

To get a quantitative impression of how much investment Germany as a whole looses as a consequence of our mechanism, we conducted a counterfactual exercise by aggregating the fitted value $\alpha \times \text{LBS}_t^f$ across all firms for each year in our sample, using the firm's share in country-wide assets as a weight in the aggregation. This aggregation suggests that the segmentation of Germany's banking markets (i.e. the fact that generally $\text{LBS}_t^f > 0$) could have reduced private investment by up to 30 billion Euro per year, equivalent to around 1 percent of GDP.

7 The role of fiscal austerity

Our results show that banks with higher public debt shares charge higher interest rates to their private borrowers and that this crowds out private investment in Germany's locally segmented banking markets. Against the background of Germany's recent fiscal consolidation over the last decade, this finding may at first appear surprising. In this section, we provide evidence that fiscal austerity at the state and federal levels and the financing of public debt by the local banks are two sides of the same coin.

Starting in 2009, the federal government and most federal states incorporated so-called debt brakes into the federal and state constitutions. These debt brakes stipulate that the federal government and the states may not incur new debt by 2016 and 2020, respectively. While some allowances are made for recessionary periods, the debt brakes limit the federal government to 0.35 percent of GDP and that of the states to zero in normal times.

Several authors have argued that the debt brake has encouraged state- and federal governments (which directly control the legislative process in Germany's two-chamber system) to shift expensive government tasks to the municipalities. Importantly, the constitutional debt brakes do not generally cover the debt of the municipalities. However, already prior to the introduction of the debt brake, the debt levels of many municipalities were so high that their ability to take on new expensive government tasks, let alone to generate new public investment, was severely impaired. We argue that in this situation, the local banks, and in particular the savings banks which are under direct control of the municipalities have played an important role in local government finance. Specifically, we show that fiscal consolidation pressure at the state level directly led to increased public debt shares on local bank balance sheets, in particular in municipalities where there was high public debt to begin with. To illustrate this point, we run the following bank-level regressions for the period 2010-2016:

$$\lambda_t^b = \gamma \times \lambda_{2009}^b \times \text{FiscalPressure}_t^{s(b)} + \mathbf{d}_t^b + \nu_t^b \tag{7}$$

where λ_t^b is again the public debt share on local bank b's balance sheet, $\text{FiscalPressure}_t^{s(b)}$ denotes the pressure for fiscal consolidation in federal state $s(b)$ in which bank b is located and λ_{2009}^b is the debt share of the bank prior to the sample period, i.e. in 2009, the first year for which we have data. The term $\mathbf{d}_t^b$ collects bank- and time fixed effects as well as state-time-effects. This full set of fixed effects makes sure that we do not have to include the stand-alone terms of λ_{2009}^b and $\text{FiscalPressure}_t^{s(b)}$ separately, since these will be absorbed by the bank- and state-time effects respectively. As our indicator of fiscal pressure, we use the difference between state-level expenditure and state-level revenue so that higher values imply bigger consolidation pressure.

Our conjecture is that the coefficient γ in regression (7) is positive: state-level consolidation pressure increased the public debt share more for banks that already had a high share of public debt to begin with. Table 9 presents the results. Column (1) shows that the the estimate of γ is positive and significant when all local banks are included in the sample. Column (2) shows results for the savings banks only. The point estimate of the coefficient virtually triples even though it is somewhat less precisely estimated than before. Column (3) reports the results for the cooperative banks. The coefficient is smaller than for the savings banks, but still significant.

Clearly, these results could just reflect that certain local banks have certain business models that make them particularly prone to lend to public instead of private borrowers. Also, there may be a lack of private investment opportunities in some rural areas which lead local banks to invest relatively more into public debt. Local banks may also lend directly to the state government, responding to state-level demand for finance and / or to curry favor with state governments, as recently suggested by Koetter and Popov (2018). Such increases in banks' public debt share may be unrelated to the financial health (or distress) of the local municipality, the channel of interests here. To address this point, we exploit the cross-sectional link between local government debt and banks' public debt share illustrated in Figure 3. We re-run regression (7) instrumenting the interaction $\lambda^b_{2009} \times \text{FiscalPressure}^{s(b)}_t$ with the interaction of fiscal pressure with the ratio of local government debt to GDP in 2009. The results are in Table 10.

The first stage, reported in the first column, confirms the strong link between local public debt and the public debt share on local bank's balance sheets that is visually apparent from Figure 3. The coefficient is highly significant and the F-statistics on the excluded instrument is around 15. Turning to the second stage, the estimate of γ is considerably lower than the OLS-estimates in the previous Table. In view of the discussion in the previous paragraph, this is what we would expect: some local banks may lend to the public sector for reasons that are ultimately unrelated to the state of local public finances and this would lead us to overestimate the impact of fiscal consolidation on banks' public lending shares. Still the second-stage coefficient is very significant and actually more precisely estimated than the OLS coefficients in the previous table. This strongly supports our initial conjecture that state-level fiscal consolidation forced highly indebted local governments to turn to local banks for finance.

As a last exercise, we ask to what extent fiscal austerity can explain the crowding out of private investment that we documented in our firm-level data. To this end, we construct bank-level break-even rates using fitted values of λ^b_t from the second stage of the IV-estimate of equation (7), i.e. as

$$\widehat{\lambda^t_b} = \gamma \times \lambda^b_{2009} \times \widehat{\text{FiscalPressure}}^{s(b)}$$

where $\gamma = 1.143$ from the second column of Table 10. We then reconstruct the local banking shock, using these imputed values $\widehat{\lambda^t_b}$ and re-run our firm-level regressions, specifically, the IV regression of investment on the firm's effective interest rate, using this alternative local banking shock as instrument. Results are presented in Table 11. The first stage remains very strong as in Table 8. The first-stage point estimate even doubles to 0.198. The second stage estimate of our main coefficient of interest α is somewhat lower (in absolute value) than before (-19 vs. -25 in Table 8). But again it remains highly significant. The standard deviation in LBS that we obtain from computing the break-even rates using the fitted and imputed public loan shares is around 0.2, i.e. around 10 bps lower than when we construct the spread using the values of λ from the data. Together with the estimates reported in 11, this implies that a one-standard deviation increase in the firm-specific local bank spread lowers investment by $0.002 \times 0.198 \times -18.74 = -0.0074$ or 74 basis points. Comparing this to our baseline estimate of around 90 basis points from above, these results imply that the fallout on municipal finances from fiscal consolidation at the state and federal levels accounts for around 80 percent of the crowding out of private investment that we have identified in this paper.

8 Extensions and Robustness

We consider a range of robustness checks and extensions which we report in appendix B.

Our results critically depend on the heterogeneity in break-even rates charged by the local banks. In our calculations, these depend on the public debt share λ, but also on banks' net interest margins. We want to make sure that our results are not driven by heterogeneity in banks' margins that is unrelated to the heterogeneity in public debt shares. We therefore calculate the break-even rates by assuming that all banks realize the same net interest margin, equal to the bank-type specific average in each year. We then re-run our baseline reduced-form regressions using LBS calculated from these alternative break-even rates. Our results, shown in Table B.1, are robust to this change in specification.

We also construct bank-type specific local bank shocks to see if our results are driven by one of the two types of local banks, (public) savings banks or cooperative banks. To this end, we set $\omega_{t-1}^{f,b} = 0$ for the respective other bank type, when constructing LBS_t^f. Tables B.2 and B.3 show that our results are driven by the public savings banks, not by the cooperative banks. This finding is in line with the special statutory role of the public savings banks in local government finance that is a key ingredient of our conjectured mechanism.

Local banks have a different history in the western and eastern parts of Germany. In the 19th century, local banks were founded mainly in the west and the south of the country. During the communist era, only big, state-run banks existed that were eventually dissolved following reunification. While the big West German banks started to enter the market in the east by opening new branches, local banks in East Germany essentially had to be founded anew in the years after reunification. To make sure that our results are not driven by some East-West divide, we also run our baseline regressions on a West-German sample of firms alone. Again, our results hold (see Table B.4).

9 Conclusion

In this paper, we have argued that two key characteristics of Germany's banking system—local segmentation and the role of local banks in local government finance–go a long way in explaining low investment rates of small and medium-sized enterprises in Germany. Local banks dominate the market for SME lending in most of the country. At the same time, local banks –in particular the publicly owned savings banks–are important as lenders to local government. Local government debt yields very low returns, but because lending markets are geographically segmented, local banks can charge higher rates on their small and medium-sized enterprise (SME) customers to break even. This has economically important adverse effects on the investment of these firms and seems to have contributed significantly to the run-up in Germany's current account surplus.

While it may appear surprising that local government debt should crowd out private investment in a country where public finances have seen a secular consolidation over the last decade, we argue that budget consolidation and high local government debt are two sides of the same coin. As the federal government and federal states have steadily improved their budgetary situation, they have also shifted a lot of financial responsibilities to the lower levels of government, i.e. the municipalities. These seem to have used their political influence over local banks, in particular over the savings banks, to finance their deficits. The irony of this situation is that government financing in this way is shifted to the local level where, due to the geographical segmentation of credit markets, it has the largest possible crowding-out effect on private investment.

Our results highlight that fiscal consolidation does not only have direct consequences in terms of lower public investment. They show that in imperfect financial and banking markets, the unintended impact on private investment can be of a similar order or magnitude as the effect on public investment.

References

Basten, C. and Mariathasan, M. (2018). How banks respond to negative interest rates: Evidence from the swiss exemption threshold.

Bednarek, P., te Kaat, D., Ma, C., and Rebucci, A. (2019). Capital flows, real estate, and city business cycles: Micro evidence from the german boom. Unpublished manuscript, John Hopkins University.

Bian, B., Haselmann, R., Vig, V., and di Mauro, B. W. (2017). Government ownership of banks and corporate innovation. Unpublished manuscript.

Chaney, T., Sraer, D., and Thesmar, D. (2012). The collateral channel: How real estate shocks affect corporate investment. *American Economic Review*, 102(6):2381–2409.

Chen, P., Karabarbounis, L., and Neiman, B. (2017). The Global Rise of Corporate Saving. *Journal of Monetary Economics*, 89:1–19.

Dao, M. C. and Maggi, C. (2018). The Rise in Corporate Saving and Cash Holding in Advanced Economies: Aggregate and Firm Level Trends. Technical report, International Monetary Fund.

Degryse, H. and Ongena, S. (2005). Distance, lending relationships, and competition. *The Journal of Finance*, 60(1):231–266.

Englmaier, F. and Stowasser, T. (2017). Electoral Cycles in Savings Bank Lending. *Journal of the European Economic Association*, 15(2):296–354.

Friedrich, S., Walkshaeusl, C., and Lesser, C. (2014). The Pricing of German Municipal Bonds. Technical report, Kandler Gruppe.

Fuest, C., Gründler, K., Potrafke, N., Fratzscher, M., Kriwoluzky, A., Michelsen, C., Hüther, M., Bofinger, P., Feld, L. P., and Reuter, W. H. (2019). Schuldenbremse — Investitionshemmnis oder Vorbild für Europa? [Debt Brake — Investment Barrier or Role Model for Europe?]. *Wirtschaftsdienst*, 99(5):307–329.

Gilchrist, S. and Zakrajsek, E. (2007). Investment and the cost of capital: New evidence from the corporate bond market. Working Paper 13174, National Bureau of Economic Research.

Guiso, L., Kashyap, A. K., Panetta, F., and Terlizzese, D. (2002). How interest sensitive is investment? very (when the data are well measured). Unpublished manuscript (draft dated July 29).

Heider, F., Saidi, F., and Schepens, G. (2019). Life below zero: Bank lending under negative policy rates. *The Review of Financial Studies*, 32(10):3728–3761.

Huang, Y., Pagano, M., and Panizza, U. (2019). Local Crowding Out in China. *Available at SSRN 2820682.*

Huber, K. (2018). Disentangling the Effects of a Banking Crisis: Evidence from German Firms and Counties. *American Economic Review*, 108(3):868–98.

Khwaja, A. I. and Mian, A. (2008). Tracing the Impact of Bank Liquidity Shocks: Evidence from an Emerging Market. *American Economic Review*, 98(4):1413–1442.

Koetter, M. and Popov, A. A. (2018). Politics, banks, and sub-sovereign debt: Unholy trinity or divine coincidence. Technical Report 2146.

Lin, X., Wang, C., Wang, N., and Yang, J. (2018). Investment, tobin's q, and interest rates. *Journal of Financial Economics*, 130(3):620 – 640.

Markgraf, J. and Rosas, G. (2019). On Board with Banks: Do Banking Connections Help Politicians Win Elections? *The Journal of Politics*.

Petersen, M. A. and Rajan, R. (1995). The effect of credit market competition on lending relationships. *The Quarterly Journal of Economics*, 110(2):407–443.

Popov, A. and Rocholl, J. (2018). Do credit shocks affect labor demand? Evidence for employment and wages during the financial crisis. *Journal of Financial Intermediation*, 36:16–27.

Sharpe, S. A. (1990). Asymmetric information, bank lending and implicit contracts: A stylized model of customer relationships. *The Journal of Finance*, 45(4):pp. 1069–1087.

Song, Z., Storesletten, K., and Zilibotti, F. (2011). Growing like China. *American Economic Review*, 101:202–241.

Figure 1: Sectoral Decomposition of Germany's Net Lending

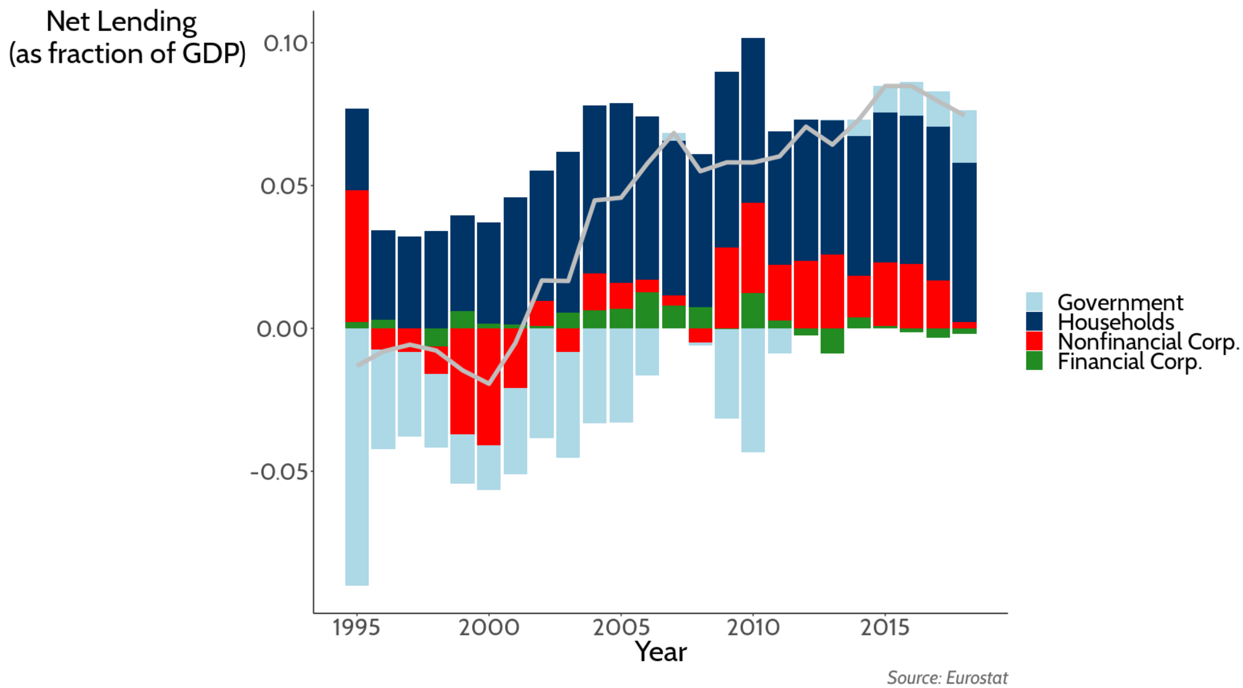
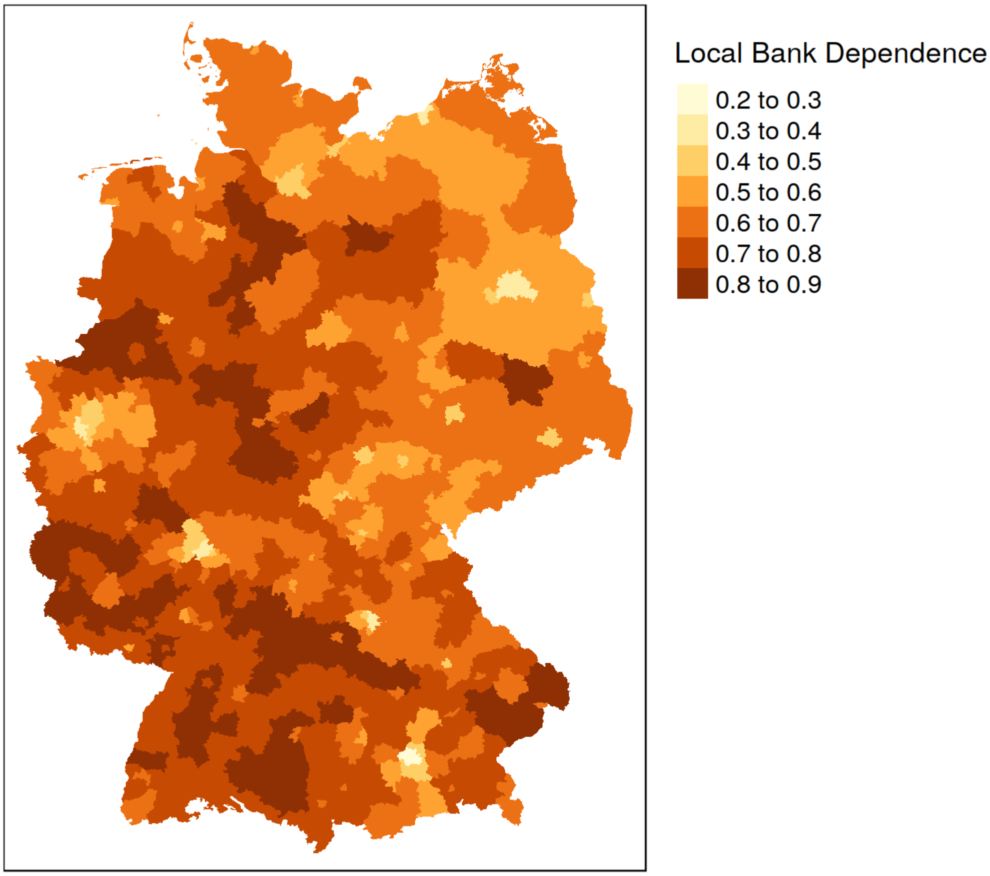


Figure 2: Map of local bank dependence



Note: This figure shows the dependence of firms on local banks in German counties in 2009. The dependence is computed as the share of savings and cooperative bank connections in the total number of bank connections in a county.

Figure 3: Correlation between county-level public debt and local banks' public loans share

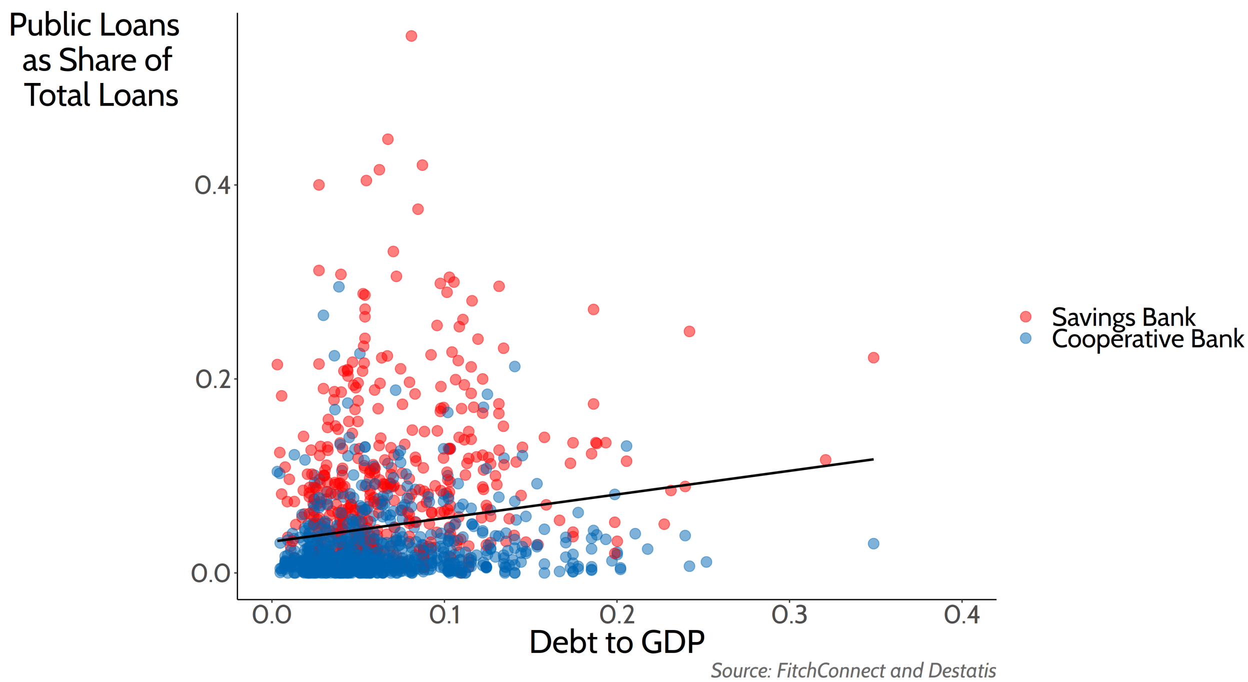


Figure 4: Average bank deposit rate and municipal bond rate

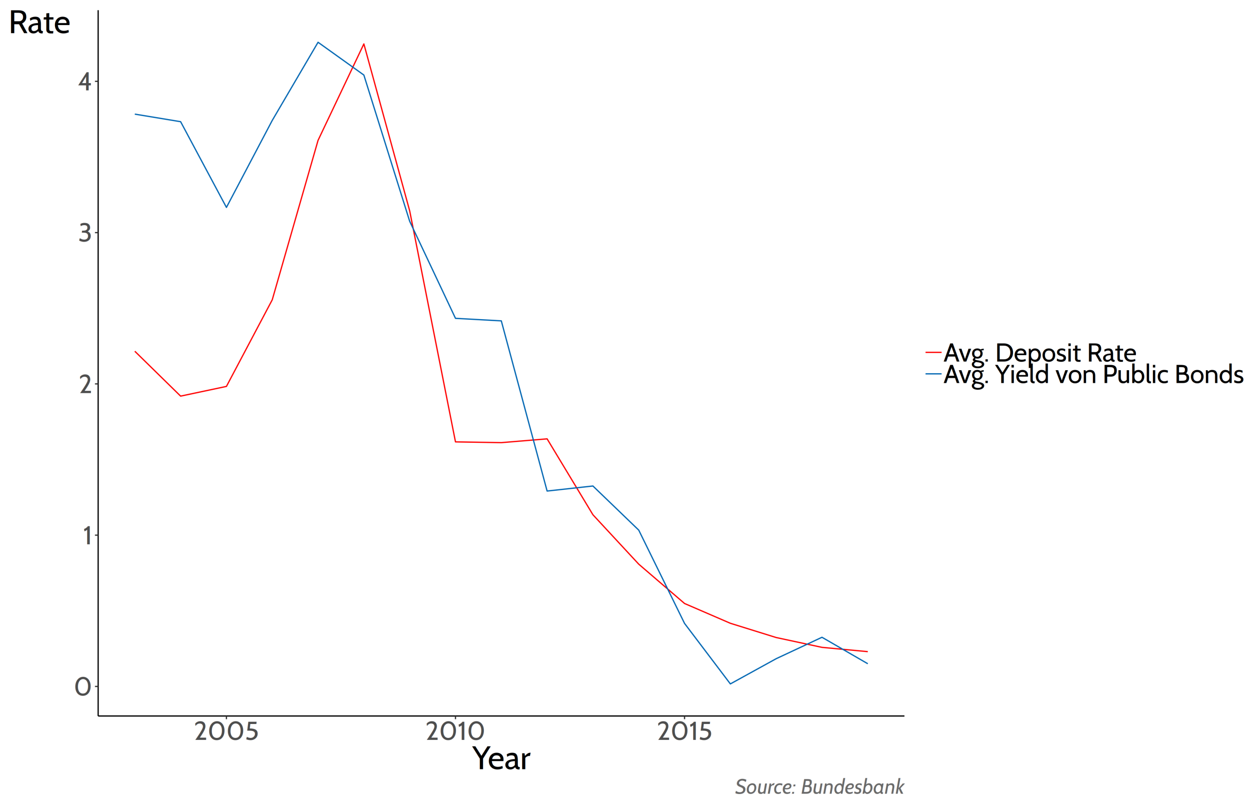
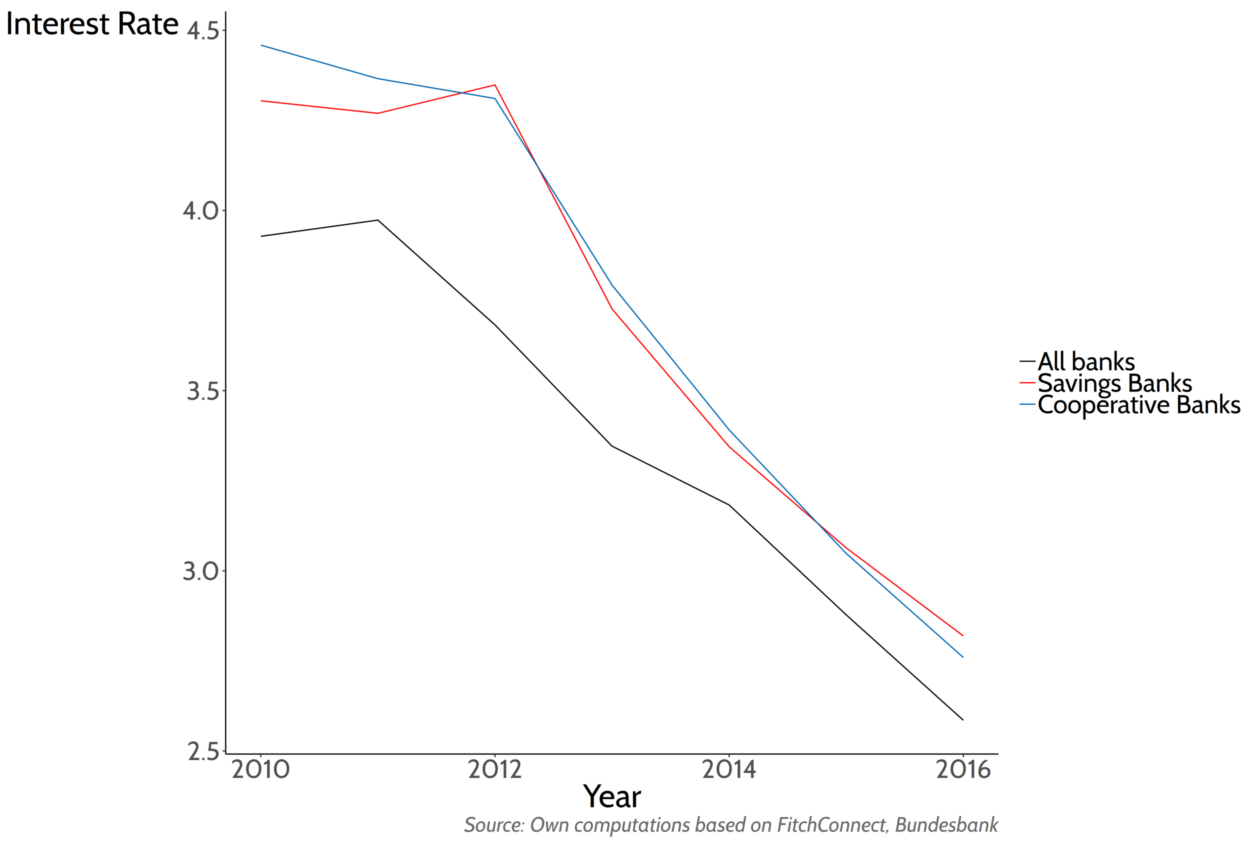
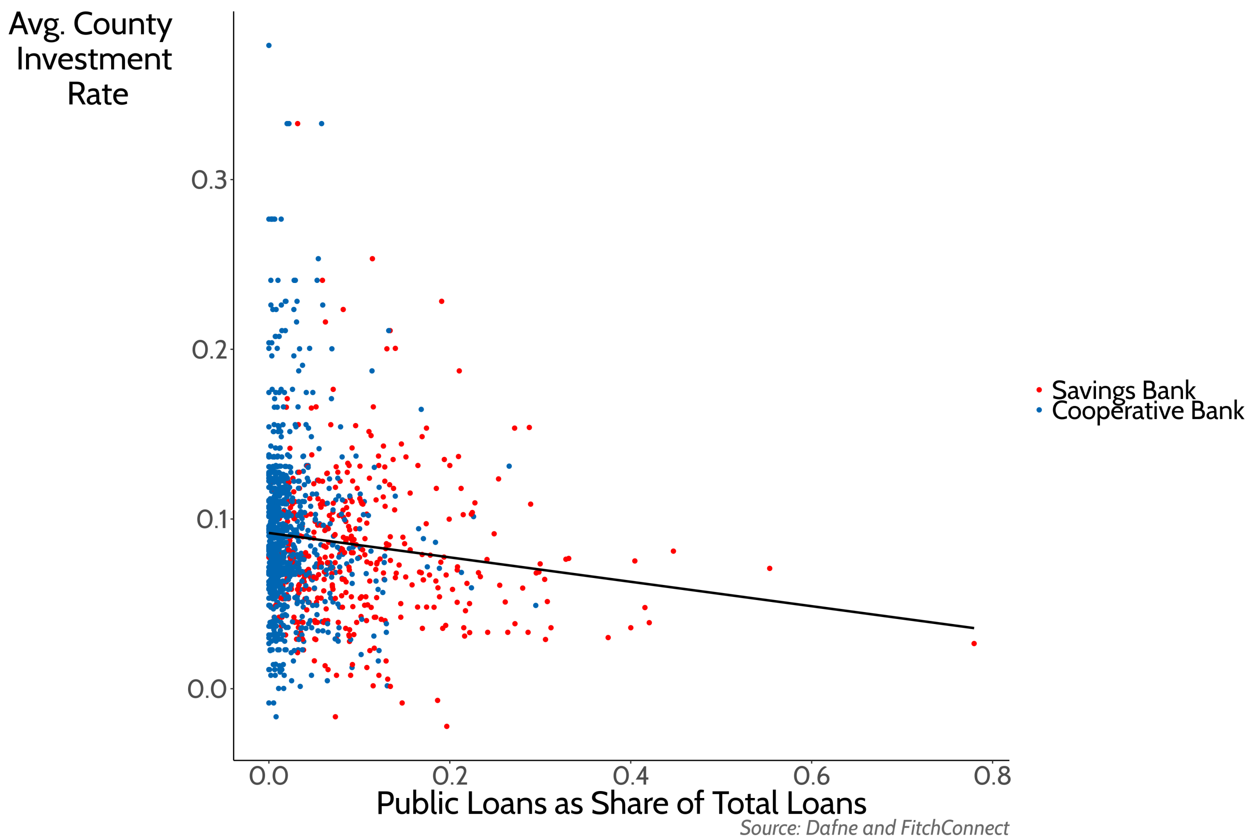


Figure 5: Comparison of local banks' break-even rates with the average (across all banks) corporate borrowing rate



Note:

Figure 6: County-level investment rates vs public-sector loans issued by local banks in 2009



Note: The average investment rate per county is computed using the firm-level data set Dafne. For each firm, we compute the period to period change in fixed assets and divide it by the previous period's value of fixed assets. We then take the weighted average of all firms in a county, where the weight reflects the share of the balance sheet that this firm has in this particular county. The share of public loans in total loans for each bank is computed based on the reported balance sheets in FitchConnect.

Table 1: Summary Statistics of Main Variables

Statistic	N	Mean	St. Dev.
Local Bank Spread	9,793,658	0.0008	0.0028
Investment Rate	2,550,918	0.1525	0.8492
Interest Rate	458,812	0.0346	0.0307
Bank Liabilities Growth	282,504	0.0126	0.1993
Cashflow Share	571,244	0.0942	0.1513
Firm Size	4,337,681	6.0325	1.9694

The Table shows numbers of observations, means and standard deviations of main variables and controls. Data are annual, sample period is 2010-2016.

Table 2: Reduced Form Baseline Results

	Investment Rate		
	(1)	(2)	(3)
Local Bank Spread	-4.882^{***}	-2.600^{**}	-3.278^{**}
	(0.347)	(1.168)	(1.316)
Cashflow Share		0.252^{***}	0.246^{***}
		(0.028)	(0.028)
Firm Size		-0.481^{***}	-0.487^{***}
		(0.013)	(0.014)
Firm FE	Yes	Yes	Yes
Time FE	Yes	Yes	No
County-Time FE	No	No	Yes
Sector-Time FE	No	No	Yes
Clustered SE	No	No	County
Observations	2,550,918	408,182	408,182
R^2	0.400	0.490	0.494

The Table shows the results from the panel regression

$$I_t^f = \alpha \times \text{LBS}_t^f + \boldsymbol{\beta}' \boldsymbol{X}_t^f + \delta_t^f + u_t^f,$$

where I_t^f and LBS_t^f are the investment rate and the local bank spread of firm f in year t respectively. The vector $\boldsymbol{X}_t^f$ contains cashflow share and firm size as time-varying firm-specific controls. The vector δ_t^f collects a range of fixed effects, including firm fixed effects, county-time and sector-time effects. Data are annual, sample period is 2010-2016. Standard errors are in parentheses. *p<0.1; **p<0.05; ***p<0.01

Table 3: Reduced Form Robustness Checks

	Investment Rate		
	(1)	(2)	(3)
Local Bank Spread	-3.028^{**}	-3.221^{**}	-3.254^{**}
	(1.460)	(1.384)	(1.312)
Cashflow Share	0.253^{***}	0.239^{***}	0.244^{***}
	(0.030)	(0.029)	(0.028)
Firm Size	-0.491^{***}	-0.500^{***}	-0.488^{***}
	(0.015)	(0.014)	(0.014)
Firm FE	Yes	Yes	Yes
Sector-Time FE	No	Yes	Yes
County-Sector-Time FE	Yes	No	No
County-Time-SizeClass FE	No	Yes	No
County-Time-Exporter FE	No	No	Yes
Clustered SE	County	County	County
Observations	408,182	392,189	408,182
R^2	0.533	0.486	0.497

The Table shows the results from the panel regression

$$I_t^f = \alpha \times \text{LBS}_t^f + \boldsymbol{\beta}' \boldsymbol{X}_t^f + \delta_t^f + u_t^f,$$

where I_t^f and LBS_t^f are the investment rate and the local bank spread of firm f in year t respectively. The vector $\boldsymbol{X}_t^f$ contains cashflow share and firm size as time-varying firm-specific controls. The vector δ_t^f collects a range of fixed effects, including firm fixed effects, county-time and sector-time effects. Size Class distinguishes 6 different groups: The first group goes from 1 to 20 employees, the second group from 21 to 50, the third group from 51 to 100, the fourth group from 101 to 200, the fifth group from 201 to 500 and the sixth group all larger firms. Exporter is a dummy which takes the value of 1 if the export share > 0 (NAs counted as zero). Data are annual, sample period is 2010-2016. Clustered by county standard errors are in parentheses. *p$<$0.1; **p$<$0.05; ***p$<$0.01

Table 4: Reduced Form with different Outcome Variables

	Sales Growth	Employment Growth
	(1)	(2)
Local Bank Spread	-2.493^{***}	-0.910^{**}
	(0.735)	(0.382)
Cashflow Share	0.597^{***}	0.020^{**}
	(0.026)	(0.009)
Firm Size	0.092^{***}	0.042^{***}
	(0.006)	(0.003)
Firm FE	Yes	Yes
Sector-Time FE	Yes	Yes
County-Time FE	Yes	Yes
Clustered SE	County	County
Observations	295,175	340,865
R^2	0.574	0.485

The Table shows the results from the panel regression

$$Y_t^f = \alpha \times \text{LBS}_t^f + \boldsymbol{\beta}' \boldsymbol{X_t^f} + \delta_t^f + u_t^f,$$

where dependent variable $Y_t^f = [SalesGrowth, EmploymentGrowth]$ is defined in the upper line of each column. LBS_t^f is the local bank spread of firm f in year t respectively. The vector $\boldsymbol{X}_t^f$ contains cashflow share and firm size as time-varying firm-specific controls. The vector δ_t^f collects firm fixed effects, county-time and sector-time effects. Data are annual, sample period is 2010-2016. Clustered by county standard errors are in parentheses. *p$<$0.1; **p$<$0.05; ***p$<$0.01

Table 5: Reduced Form with in Counties with high and low Fragmentation

	Investment Rate	
	(1)	(2)
Local Bank Spread	-4.783^{**}	-2.503
	(1.956)	(1.666)
Cashflow Share	0.289^{***}	0.222^{***}
	(0.051)	(0.033)
Firm Size	-0.504^{***}	-0.479^{***}
	(0.021)	(0.017)
Firm FE	Yes	Yes
Fragmentation	High	Low
County-Time FE	Yes	Yes
Sector-Time FE	Yes	Yes
Clustered SE	County	County
Observations	153,446	254,736
R^2	0.487	0.497

The Table shows the results from the panel regression

$$I_t^f = \alpha \times \text{LBS}_t^f + \boldsymbol{\beta}' \boldsymbol{X}_t^f + \delta_t^f + u_t^f,$$

where I_t^f and LBS_t^f are the investment rate and the local bank spread of firm f in year t respectively. The vector $\boldsymbol{X}_t^f$ contains cashflow share and firm size as time-varying firm-specific controls. The vector δ_t^f collects a range of fixed effects, including firm fixed effects, county-time and sector-time effects. Counties are split into "High" and "Low" fragmentation group. Highly fragmented counties are counties in which the local bank share (SPK + VBK connections as a share of all bank connections) is higher than the median local bank share across all counties (0.68). Data are annual, sample period is 2010-2016. Clustered by county standard errors are in parentheses. *p$<$0.1; **p$<$0.05; ***p$<$0.01

Table 6: Impact of local bank spread on firm balance sheets

	Bank Liabilities Growth			Change in Equity Ratio		
	(1)	(2)	(3)	(4)	(5)	(6)
Local Bank Spread	-0.543^{**}	-0.266	-0.601	0.359^{***}	0.269^{**}	0.284^{**}
	(0.247)	(0.435)	(0.465)	(0.037)	(0.108)	(0.123)
Cashflow Share		0.259^{***}	0.255^{***}		0.376^{***}	0.377^{***}
		(0.013)	(0.013)		(0.004)	(0.004)
Firm Size		-0.188^{***}	-0.197^{***}		-0.034^{***}	-0.035^{***}
		(0.005)	(0.005)		(0.002)	(0.002)
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes
Time FE	Yes	Yes	No	Yes	Yes	No
County-Time FE	No	No	Yes	No	No	Yes
Sector-Time FE	No	No	Yes	No	No	Yes
Clustered SE	No	No	County	No	No	County
Observations	282,504	208,169	208,169	3,901,733	510,641	510,641
R^2	0.453	0.462	0.472	0.282	0.441	0.445

Note: $^{*}p<0.1$; $^{**}p<0.05$; $^{***}p<0.01$

Table 7: Interest Rate Regressions

	Interest Rate		
	(1)	(2)	(3)
Local Bank Spread	0.128***	0.162***	0.126***
	(0.019)	(0.023)	(0.026)
Cashflow Share		0.016***	0.016***
		(0.001)	(0.001)
Firm Size		−0.014***	−0.014***
		(0.0003)	(0.0003)
Firm FE	Yes	Yes	Yes
Time FE	Yes	Yes	No
County-Time FE	No	No	Yes
Sector-Time FE	No	No	Yes
Clustered SE	No	No	County
Observations	458,812	457,340	457,340
R^2	0.764	0.777	0.779

The Table shows the results from the panel regression

$$r_t^f = \alpha \times \text{LBS}_t^f + \boldsymbol{\beta}' \boldsymbol{X}_t^f + \delta_t^f + u_t^f,$$

where r_t^f and LBS_t^f are the effective firm interest rate and the local bank spread of firm f in year t respectively. The vector $\boldsymbol{X}_t^f$ contains cashflow share and firm size as time-varying firm-specific controls. The vector δ_t^f collects a range of fixed effects, including firm fixed effects, county-time and sector-time effects. Data are annual, sample period is 2010-2016. Standard errors are in parentheses. *p<0.1; **p<0.05; ***p<0.01

Table 8: IV Regressions

	Interest Rate	Investment Rate
	(1)	(2)
Local Bank Spread	0.119^{***}	
	(0.028)	
Interest Rate		-25.867^{**}
		(11.242)
Cashflow Share	0.016^{***}	0.672^{***}
	(0.001)	(0.176)
Firm Size	-0.014^{***}	-0.808^{***}
	(0.0003)	(0.163)
Firm FE	Yes	Yes
County-Time FE	Yes	Yes
Sector-Time FE	Yes	Yes
Clustered SE	County	County
F (excl. instr).	17.66	-
Observations	353,781	353,781
R^2	0.804	0.242

The Table shows the results from the panel regression with instrumental variable. Column (1) instruments effective firm interest rate by the local bank spread, LBS_t^f in the investment regression of the form

$$I_t^f = \alpha \times \widehat{r_t^f} + \boldsymbol{\beta' X_t^f} + \delta_t^f + u_t^f.$$

where the hat denotes the fitted value from the first stage. I_t^f is the investment rate of firm f in year t. The vector $\boldsymbol{X}_t^f$ contains cashflow share and firm size as time-varying firm-specific controls. The vector δ_t^f collects firm fixed effects, county-time and sector-time effects. Data are annual, sample period is 2010-2016. County clustered standard errors are in parentheses. *p<0.1; **p<0.05; ***p<0.01

Table 9: Bank Level OLS Regressions with Public Loans Share as dependent variable

	Share of Public Loans		
	(1)	(2)	(3)
Initial Share of Public Loans * $\textsc{FiscalPressure}_t^{s(b)}$	7.949***	25.283*	15.132**
	(2.725)	(13.607)	(7.102)
BankType	SPK+VBK	SPK	VBK
Bank FE	Yes	Yes	Yes
County Year FE	Yes	Yes	Yes
Clustered SE	State	State	State
Observations	8,950	2,811	6,139
R^2	0.977	0.991	0.953

The Table shows the results from the panel regression

$$\lambda_t^b = \gamma \times \lambda_{2009}^b \times \textsc{FiscalPressure}_t^{s(b)} + \mathbf{d}_t^b + \nu_t^b,$$

where λ_t^b is the public debt share on local bank b's balance sheet, $\textsc{FiscalPressure}_t^{s(b)}$ denotes the pressure for fiscal consolidation in federal state $s(b)$ in which bank b is located and λ_{2009}^b is the debt share of the bank prior to the sample period, i.e. in 2009. The vector $\mathbf{d}_t^b$ collects bank- and county-fixed effects. The regressions are run for different bank types (Sparkassen, Volksbanken and the both) which are indicated in the line "BankType". Data are annual, sample period is 2010-2016. State clustered standard errors are in parentheses. *p$<$0.1; **p$<$0.05; ***p$<$0.01

Table 10: Bank Level IV Regressions

	Initial Share of Public Loans * $\textsc{FiscalPressure}_t^{s(b)}$ (1)	Share of Public Loans (2)
$LocalCountyDebt_{2009}^b \times \textsc{FiscalPressure}_t^{s(b)}$	1.330***	
	(0.337)	
Initial Share of Public Loans * $\textsc{FiscalPressure}_t^{s(b)}$		1.143***
		(0.388)
Bank FE	Yes	Yes
County-Year FE	Yes	Yes
Clustered SE	State	State
F (excl. instr).	15.58	-
Observations	8,950	8,950
R^2	0.877	0.976

The Table shows the results from the panel regression with instrumental variable. Column (1) instruments the interaction $\lambda_{2009}^b \times \textsc{FiscalPressure}_t^{s(b)}$ with the interaction of Fiscal pressure with the ratio of local government debt to GDP in 2009, $LocalCountyDebt_{2009}^b \times \textsc{FiscalPressure}_t^{s(b)}$, in the regression of the form

$$\lambda_t^b = \gamma \times [\widehat{\lambda_{2009}^b \times \textsc{FiscalPressure}_t^{s(b)}}] + \mathbf{d}_t^b + \nu_t^b,$$

where the hat denotes the fitted value from the first stage. λ_t^b is the public debt share on local bank b's balance sheet, $\textsc{FiscalPressure}_t^{s(b)}$ denotes the pressure for fiscal consolidation in federal state $s(b)$ in which bank b is located and λ_{2009}^b is the debt share of the bank prior to the sample period, i.e. in 2009. The vector $\mathbf{d}_t^b$ collects bank- and county-fixed effects. Data are annual, sample period is 2010-2016. State clustered standard errors are in parentheses. *p$<$0.1; **p$<$0.05; ***p$<$0.01

Table 11: IV Regression with imputed+instrumented Public Loans Share

	Interest Rate	Investment Rate
	(1)	(2)
LBS using imputed+instrumented Public Loans Share	0.198^{***}	
	(0.042)	
Interest Rate		-18.742^{**}
		(8.312)
Cashflow Share	0.016^{***}	0.561^{***}
	(0.001)	(0.133)
Firm Size	-0.014^{***}	-0.707^{***}
	(0.0003)	(0.120)
Firm FE	Yes	Yes
County-Time FE	Yes	Yes
Sector-Time FE	Yes	Yes
Clustered SE	County	County
F (excl. instr).	22.47	-
Observations	353,781	353,781
R^2	0.804	0.359

The Table shows the results from the panel regression with instrumental variable. Column (1) instruments effective firm interest rate by the local bank spread, $\widetilde{\text{LBS}}_t^f$ in the investment regression of the form

$$I_t^f = \alpha \times \widehat{r_t^f} + \boldsymbol{\beta}' \boldsymbol{X}_t^f + \delta_t^f + u_t^f.$$

where the hat denotes the fitted value from the first stage. I_t^f is the investment rate of firm f in year t. The vector $\boldsymbol{X}_t^f$ contains cashflow share and firm size as time-varying firm-specific controls. The vector δ_t^f collects firm fixed effects, county-time and sector-time effects. $\widetilde{\text{LBS}}_t^f$ is constructed using fitted values of $\widehat{\lambda_t^b}$ from the second stage of the IV-estimate of equation (7)

$$\widehat{\lambda_b^t} = \gamma \times \lambda_{2009}^b \times \widehat{\text{FiscalPressure}}^{s(b)}$$

where $\gamma = 1.143$ from the second column of Table 10. Data are annual, sample period is 2010-2016. County clustered standard errors are in parentheses. *p<0.1; **p<0.05; ***p<0.01

Appendix B. Additional tables and results

Table B.1: Reduced Form Results under the assumption of a common Net Interest Margin for each type of local bank

	Investment Rate		
	(1)	(2)	(3)
Local Bank Spread (common NIM assumed)	-5.608^{***}	-3.818^{**}	-4.094^{**}
	(0.643)	(1.873)	(2.039)
Cashflow Share		0.252^{***}	0.246^{***}
		(0.028)	(0.028)
Firm Size		-0.481^{***}	-0.487^{***}
		(0.013)	(0.014)
Firm FE	Yes	Yes	Yes
Time FE	Yes	Yes	No
County-Time FE	No	No	Yes
Sector-Time FE	No	No	Yes
Clustered SE	No	No	County
Observations	2,550,918	408,182	408,182
R^2	0.400	0.490	0.494

Note: $^{*}p<0.1$; $^{**}p<0.05$; $^{***}p<0.01$

Table B.2: Reduced Form with spread computed only for savings banks

	Investment Rate		
	(1)	(2)	(3)
Savings Bank Spread	-3.584^{***}	-3.348^{**}	-4.020^{**}
	(0.422)	(1.422)	(1.633)
Cashflow Share		0.252^{***}	0.246^{***}
		(0.028)	(0.028)
Firm Size		-0.481^{***}	-0.487^{***}
		(0.013)	(0.014)
Firm FE	Yes	Yes	Yes
Time FE	Yes	Yes	No
County-Time FE	No	No	Yes
Sector-Time FE	No	No	Yes
Clustered SE	No	No	County
Observations	2,550,918	408,182	408,182
R^2	0.400	0.490	0.494

Note: $^{*}p<0.1$; $^{**}p<0.05$; $^{***}p<0.01$

Table B.3: Reduced Form with spread computed only for cooperative banks

	Investment Rate		
	(1)	(2)	(3)
Cooperative Bank Spread	-6.117^{***}	-0.640	-1.141
	(0.548)	(1.656)	(1.760)
Cashflow Share		0.251^{***}	0.246^{***}
		(0.028)	(0.028)
Firm Size		-0.481^{***}	-0.487^{***}
		(0.013)	(0.014)
Firm FE	Yes	Yes	Yes
Time FE	Yes	Yes	No
County-Time FE	No	No	Yes
Sector-Time FE	No	No	Yes
Clustered SE	No	No	County
Observations	2,550,918	408,182	408,182
R^2	0.400	0.490	0.493

Note: $^{*}p<0.1$; $^{**}p<0.05$; $^{***}p<0.01$

Table B.4: Reduced Form Baseline Results for firms in West Germany only

	Investment Rate		
	(1)	(2)	(3)
Local Bank Spread	-5.171^{***}	-3.909^{***}	-5.117^{***}
	(0.431)	(1.383)	(1.496)
Cashflow Share		0.257^{***}	0.252^{***}
		(0.034)	(0.034)
Firm Size		-0.463^{***}	-0.467^{***}
		(0.015)	(0.015)
Firm FE	Yes	Yes	Yes
Time FE	Yes	Yes	No
County-Time FE	No	No	Yes
Sector-Time FE	No	No	Yes
Clustered SE	No	No	County
Observations	2,114,310	325,839	325,839
R^2	0.396	0.480	0.483

Note: $^{*}p<0.1$; $^{**}p<0.05$; $^{***}p<0.01$