# Small Banks and Local Economic Development[*]

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**Abstract**

This paper discusses the effects of small banks on economic growth. We first theoretically show that small banks operating at a regional level can spur local economic growth. As compared with big interregional banks, small regional banks are more effective in promoting local economic growth, especially in regions with lower initial endowments and severe credit rationing. We then test the model predictions using a sample of German banks and corresponding regional statistics. We find that small regional banks are more important funding providers in regions with low access to finance. The empirical results support the theoretical hypotheses.

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## 1. INTRODUCTION

Banking systems have experienced a trend toward greater market concentration and a decline in the number of banks in recent decades. Driven by market power (Claessens and Laeven, 2004, 2005; Carbó-Valverde et al., 2009; Koetter et al., 2012), scale economy (Berger, 1995; DeYoung et al., 2009; DeYoung, 2012; Wheelock and Wilson, 2012) and too-big-to-fail motives (Mishkin, 2006; Kane, 2000; Stolz and Wedow, 2010; Laeven and Valencia, 2010; Carow et al. 2011) banks have become larger.[1] However, these big, complex, and increasingly opaque banks exploited financial safety nets and took risks that endangered economies (Blinder, 2010; Feldman and Stern, 2010; Liikanen, 2012; IMF, 2013). The widespread bailout of big banks during the recent financial crisis introduced the possibility of break-ups post-crisis, and this has turned analysts' attentions to the role of small banks in local economies (Buiter, 2009; Rosenblum, 2011). Ring-fencing proposals in Europe and a de facto fence around foreign banks in the U.S. have addressed some policy concerns regarding big banks. In contrast, small local and regional banks often have limited access to government safety nets and mainly focus on financing individuals/households, as well as small to medium-sized enterprises (SMEs).[2] A major concern regarding small local and

[1] Higher credit ratings and lower funding costs may also be related to access to government safety nets (Brewer and Jagtiani, 2013). The rapid growth in investment banking and the "originate-to-distribute" securitization model also encouraged banking sector consolidation as well as moral hazard, thereby resulting in excessive risk-taking (Blinder, 2010; Feldman and Stern, 2010). There is some evidence also that big banks have more volatile returns (Goddard et al., 2004).

[2] In Germany, however, some small banks are protected by insurance funds run by the Bundesverband der Volks- und Raiffeisenbanken (cooperative banks) and the Savings Bank Association (DSGV) (savings banks). These offer institution protection schemes to their members. Also, the German savings bank sector had a

regional banks is that they are believed to be weak at loan diversification, as highlighted in the 1980s S&L crisis in the U.S., when more than 700 primarily small S&Ls failed. In Europe, however, certain small banks, such as savings banks and co-operative banks, can diversify their loan portfolios as they are organized under central entities that pool risk management and risk-sharing strategies. Multi-bank loan pools are applied as an instrument that allows participating banks to share regional credit risk. Loan pools exploit the diversification benefits available to large banks by spreading risk over regional investments, while remaining independent and benefiting from local knowledge (Gintschel and Hackethal, 2004). These pooling arrangements, coupled with local knowledge and lower loan screening and debtor monitoring costs, can result in small banks being effective at promoting local and regional economic growth (Petersen and Rajan, 2002; Bofondi and Gobbi, 2003).

There is no clear empirical evidence of the differing effects between small local and regional banks and big interregional banks on local economic growth. Some empirical studies suggest that small banks with limited market power reduce SME financing constraints (Carbó-Valverde et al., 2009; Degryse and Ongena, 2007). Based on data from Italy, Guiso et al. (2004) find that local financial development is positively associated with entry of new firms, increased competition, and economic growth. Berger et al. (2004) also argue that healthy community banks improve SME financing. In a recent paper, DeYoung et al. (2012) find that SMEs are especially reliant on community bank finance. However, they also argue that small banks can exacerbate economic downturns during recessions due to low diversification. An alternative empirical finding is by Beck et al. (2010), who show that an increase in intra-state bank M&As mitigated regional income inequality by affecting labor market conditions.

government guarantee until 2001 (Gropp et al., 2013; Fischer et al., 2012).

These conflicting views raise questions about the role of bank size on firm-financing and economic development.

Since previous studies have not addressed the question whether small banks or big banks are more efficient at promoting local economic growth, our work aims at providing evidence on this issue. In particular, we try to answer the question whether small regional banks are more efficient in promoting local economic growth as compared to big interregional banks. To the best of our knowledge, our work is the first to explicitly account for the different roles of regional versus interregional banks in assessing the effectiveness of financial development on economic growth. Our results are in line with Guiso et al. (2004), in that local financial development matters for economic growth. We further demonstrate that regional financial development is especially important for relatively poor regions in an integrated economy, mainly due to problems associated with attracting interregional financing.

In our paper, we first develop an overlapping generations model that builds on the work by Bernanke and Gertler (1989) and includes small regional banks in a setting of financial development and economic growth. There is some theoretical literature on the impact of financial development on regional growth. In Greenwood and Jovanovic (1990), for instance, banks produce information, which improves the allocation of resources and fosters growth. As a larger number of firms use bank services, banks become more efficient, which feeds into development. Levine (1991) has a growth model based on Diamond and Dybvig (1983) that focuses on liquidity shocks, which also shows that financial development entails higher growth. Morales (2003) develops a Schumpeterian model that focuses on creative destruction and the role of banks. The paper shows that a policy that incentivizes financial intermediary

monitoring activity can improve economic growth due to reduced moral hazard. The literature on the role of regional financial institutions on growth is, however, relatively sparse. The paper closest to ours is probably Boyd and Smith (1997). In their model, entrepreneurs from two regions suffer from a state verification problem. In the absence of interregional capital flows, both regions converge to the same output level. With capital flows, the richer region finds it easier to attract new capital, and there is no convergence. Hakenes and Schnabel (2010) theoretically examine the role of bank size on real economic development, arguing that small regional institutions can give local entrepreneurs a competitive edge and promote local economic growth in underdeveloped regions. However, their model is static. Our theoretical model extends the aforementioned literature in three main ways. First, we explicitly combine elements of both regional financial development and economic growth in a comparative static equilibrium model. Second, we show that the effect of regional bank development on economic growth is conditional on the state of economy, with small bank development becoming more important for regions with lower initial endowments and severe credit rationing. Finally, unlike the earlier literature, we differentiate between the roles of small regional banks and big interregional banks on local economic growth. We find that small regional banks are more effective in promoting local economic growth, especially in underdeveloped regions.

We then empirically test these predictions on a sample of 457 German savings banks and corresponding regional statistics over 1995 to 2004. We use German data for two reasons. First, focusing on a single country limits the unobserved heterogeneity in the sample. Second, Germany has a strong local banking sector. German savings banks (*Sparkasse*) follow a regional principle; they operate predominantly within their own region and typically do not

compete with other regions' savings banks. The regions in which the savings banks operate are easily identifiable and are closely linked to German administrative districts, called counties (*Kreise*). Counties are the second smallest administrative units that provide macroeconomic data on a regular basis. Therefore, a focus on Germany yields financial and macroeconomic data on a disaggregated level. Our empirical results reveal that small regional institutions, namely savings banks, play a prominent role in enhancing local economic development in under-developed regions. The results remain robust if we control for a variety of bank and region-specific effects, as well as alternative economic development measures. Based on these findings we argue that small local and regional banks can spur local economic growth.

Our paper is organized as follows. Section 2 develops the model and derives various predictions. In section 3 we outline the empirical methodology and the sample and then present the results, including robustness tests. Section 4 concludes.

## 2. THE THEORETICAL MODEL

### 2.1. THE MODEL ENVIRONMENT

In this section, we construct a growth model that stresses the role of small regional banks. The growth model is based on Bernanke and Gertler (1989) and Kiyotaki and Moore (1997) and hence we use an overlapping generations framework. In addition, we allow capital to flow out of the region. Our economy is small and open so the interest rate is fixed. As a deviation from perfect financial markets, we assume that entrepreneurs suffer from a moral

hazard problem and that the scope of moral hazard can be reduced by bank monitoring.

Consider an economy with an infinite sequence of two-period overlapping generations. At each date $t = 0, 1, 2, \ldots$, a continuum of mass $L = 1$ of young agents is born. All agents live for two periods. They are risk-neutral, and care only about old-age consumption. In his first period, an agent works to earn money, which he invests. In the second period, an agent disinvests and consumes. There is a single final good that can either be consumed or used to build capital for the following period. Capital is produced by entrepreneurs using an indivisible capital production technology. This technology is modelled exactly as in Tirole (2006, chapter 9.2, based on Holmstrom and Tirole, 1997): each project requires $I$ units of the final good and produces an expected return of $R$ units of capital with probability $p$. The entrepreneur can decide whether to work or shirk. If he works, the probability of success is $p_H$. If he shirks, the probability is $p_L$, and the entrepreneur gets a private benefit $B$. The successes or failures of different entrepreneurs are stochastically independent, so there is no aggregate risk. The private benefit can be reduced to $b < B$ if the entrepreneur is monitored by a bank. Bank monitoring costs are $c$ per entrepreneur. The net present value of the project is positive if the entrepreneur behaves, and negative if he shirks. Assume that parameters are such that the entrepreneur can attract funds only if he is monitored (for example because $B$ is large). The bank monitoring cost $c$ is also a measure for regional bank efficiency in our model, with a higher $c$ indicating lower bank efficiency. For now, this $c$ is assumed to be exogenous. We will discuss endogenous bank efficiency below.

If the entrepreneur is promised a sum $R_e$ from the return $R$, he will work if and only if $p_H R_e \geq p_L R_e + b$, which is equivalent to

$$R_e \geq b/\Delta p \qquad \text{(IC)}$$

with $\Delta p = p_H - p_L$. Consequently, the bank and investor cannot demand more than $R - R_e = R - b/\Delta p$ from the entrepreneur, otherwise they would induce him to shirk. Thus the entrepreneur cannot credibly promise to pay back more than an expected $R_p = p_H (R - b/\Delta p)$, namely, the pledgeable part of the entrepreneur's income.

Capital is used to produce consumption goods for the next period. Let $K_t$ be the capital stock at date $t$. Then the quantity of the final good output is $Y_t = F(K_t, L)$, following a neoclassical production function. For concreteness, assume that $Y_t = \beta K_t^{\alpha} L^{1-\alpha} = \beta K_t^{\alpha}$. Hence, the complete production process takes two steps. First, final goods must be turned into capital by entrepreneurs. Second, capital in combination with labor is used to produce new final goods for consumption.

In summary, the economy works as follows. A generation of agents earns wages while young. Agents need this income to save for future consumption. There are two different ways to save. An agent can either invest (that is, deposit) money at a bank, which then hands out the money to entrepreneurs in the form of loans and monitors these entrepreneurs. Otherwise, an agent can take out a loan, become an entrepreneur, and apply the capital production technology. Capital can then be used in the future to produce new final consumption goods. These consumption goods are used to repay the loan to the bank; the rest can be consumed by the now-old entrepreneur. However, production requires not only capital but also labor. Hence, entrepreneurs must pay out wages to the next generation; these wages will then be

saved for the next period production process. At this point, the model starts over again.

For a bank, there are two alternative classes of investment. It can either hand out loans, as described above, or it can invest in an interregional financial market. For exposition, we assume that the region is considered to be a small open economy, and hence the interest rate $r$ is exogenous. Investment in the financial market works as follows. One unit of final consumption goods from one period turns into $1 + r$ units of the final good in the following period. Alternatively, the region can also borrow from financial markets instead of investing. Of course, interest rates are endogenous and volatile in reality. Adding volatility would not change the model, because all agents in the model are risk-neutral. Having an exogenous interest rate is equivalent to assuming a small open economy, where the other regions are not modelled explicitly. In a larger model, one could have heterogeneous regions, some that borrow on the market, and some that lend. The aggregate interest rate r would be the same, and would be determined by the aggregate market clearing condition. In terms of German counties, the assumption of small open economies seems fair, as no single county can likely influence the world interest rate, or even the German interest rate level.

Both capital and labor are assumed to be immobile between regions. As a consequence of capital immobility, interregional investment and borrowing is possible only with respect to the final consumption good. The assumptions that the final consumption good (money) is perfectly mobile and that labor is perfectly immobile are not crucial. However, labor needs to be less mobile than money; this assumption seems innocuous. Let us also assume that small regional banks invest only within their respective region, and call interregional banks those banks that also invest outside their respective region. Without loss of generality, one can

assume that interregional banks only invest outside their respective region.

The structure of the regional economy, therefore, can be summarized as follows. Entrepreneurs use their capital to produce consumption goods. For capital production, they require financing, which they obtain from the regional banking system. Regional banks, in turn, refinance from regional investors (that is, depositors). Any remaining regional savings are invested at interregional banks, which then invest outside their region[3].

Importantly, there are two kinds of equilibrium. If the incentive constraint (IC) is binding, then entrepreneurs can earn a higher return than investors. In this case, there is credit rationing: investors would prefer to become entrepreneurs, but they cannot get a loan. To attract a loan, they would have to offer a higher interest rate, which would violate the incentive constraint. In the second kind of equilibrium, the incentive constraint is not binding, hence entrepreneurs and investors must earn the same expected return. Otherwise, some investors would prefer to start their own firms. We first discuss the equilibrium with a binding constraint (section 2.2). In section 2.3, we provide sufficient and necessary conditions for a binding constraint, and then discuss the second case.

## 2.2. EQUILIBRIUM WITH BINDING INCENTIVE CONSTRAINT

[3] Regional banks are likely to be under-diversified. In our model, there is no aggregate risk, so diversification plays no role. However, in a model with regional risk factors, diversification would matter. There are two issues. Regional banks exposed to regional risk may suffer from regional shocks. This would dampen their growth path. Furthermore, undiversified banks may hold more equity (which is not in the current model). This would raise the financing costs of regional banks, indirectly leading to higher costs of lending *c*.

Consider a region in which agents are initially endowed with consumption goods $A_t$. Agents can now try to borrow more from a bank to generate capital to produce more consumption goods. Assume for now that pledgeable income is small such that the incentive constraint (IC) is binding. Consequently, to obtain a loan, entrepreneurs must invest their own complete endowment $A_t$, and thus, they borrow the difference $I - A_t$ from a regional bank.

If banks grant $n_t$ loans altogether, the aggregate loan volume in the region is $F_t = n_t (I - A_t)$. The lending volume from regional banks $F_t$ depends on regional bank efficiency, $F_t = f(c)$. More efficient banks lead to better capital allocation and thus decreasing $c$ has a positive effect on bank lending. From each loan, a bank receives the pledgeable portion $R_p = p_H (R - b/\Delta p)$ and the zero-profit condition implies that it repays $R_p - c$ to investors (that is, depositors). The entrepreneur retains the non-pledgeable part $p_H R - R_p$. After repayment, investors and entrepreneurs have an aggregate capital of

$$K_i = n_t(R_p - c) \quad \text{and} \quad K_e = n_t(p_H R - R_p). \tag{1}$$

Aggregate capital in the region is thus

$$K_t = K_i + K_e = n_t(p_H R - c). \tag{2}$$

This aggregate capital is now used to produce consumption goods by employing next period's labor force. The labor market is competitive within each region, thus the equilibrium wage is

$$W_t = \beta(1-\alpha){K_t}^{\alpha}. \tag{3}$$

The net output of final consumption goods is

$$Y_t - W_t = \beta {K_t}^{\alpha} - \beta(1-\alpha){K_t}^{\alpha} = \beta\alpha {K_t}^{\alpha} = \beta\alpha {n_t}^{\alpha}(p_H R - c)^{\alpha}. \tag{4}$$

Of this aggregate output, a fraction $K_i/(K_i + K_e)$ belongs to investors, and a fraction $K_e/(K_i + K_e)$ to entrepreneurs. Now recall that as an alternative, banks could have invested abroad, in which case they may have offered an interest rate of $r$. Given that the financial system is competitive, an investment abroad must earn the same rate as an investment in the bank's home region. Because investors have invested an aggregate $F_t = n_t (I - A_t)$ in the region,

$$n_t(1+r)(I-A_t) = \frac{R_p - c}{p_H R - c}\beta\alpha n_t (p_H R - c)^{\alpha}. \tag{5}$$

Solving for $n_t$,

$$n_t = \frac{1}{p_H R - c}\sqrt[1-\alpha]{\frac{\beta\alpha(R_p - c)}{(1 \mp r)(I - A_t)}}. \tag{6}$$

Now if $n_t$ projects are financed, the aggregate amount of capital is given by (2), and the wage $W_t$ is given by (3), thus

$$W_t = \beta(1-\alpha){K_t}^{\alpha} = \beta(1-\alpha){n_t}^{\alpha}(p_H R - c)^{\alpha}$$

$$= \beta(1-\alpha)\left(\frac{\beta\alpha\left(R_p - c\right)}{(1+r)(I-A_t)}\right)^{\frac{\alpha}{1-\alpha}}. \qquad (7)$$

This wage $W_t$ serves as assets for new projects for the young generation, with $A_{t+1} = W_t$. Then a new period starts and the cycle begins anew. If $W_t > A_t$, the economy is growing; if $W_t < A_t$, the economy is shrinking.

Let us discuss the financial system in more detail. Given that $n_t$ projects are financed within the region, there is an aggregate amount $n_t A_t$ of inside finance that is not channelled through the financial system. Each entrepreneur needs an additional $I-A_t$, and hence the aggregate amount of regional lending is $F_t = n_t (I - A_t)$. Now the region is inhabited by $L = 1$ agents each endowed with $A_t$, thus the difference $A_t - n_t A_t - n_t (I - A_t) = A_t - n_t I$ is invested outside the region by interregional banks. Importantly, there can be a capital outflow from less developed regions. Consider a poor region with low $A_t$. Then an entrepreneur requires a large amount of outside finance. The amount of pledgeable capital in relation to the amount of finance is then rather low. This low amount of pledgeable capital can only be compensated by high marginal productivity, which implies that it must be scarce. Hence, in equilibrium, the number of firms $n_t$ must be small. Thus, only a few firms receive financing, while part of the region's savings is drained away from the bank's respective region.

### 2.3. EQUILIBRIUM WITH NON-BINDING INCENTIVE CONSTRAINT

Before discussing the equilibrium, let us derive a condition for when the incentive constraint binds. If it does, returns are higher for an entrepreneur. An entrepreneur then invests $A_t$ and

receives $p_H R - R_p$; investors pay $I - A_t$ to obtain $R_p - c$ in return. Consequently, the incentive constraint binds if and only if

$$\frac{p_H R - R_p}{A_t} > \frac{R_p - c}{I - A_t}, \qquad \text{or equivalently}$$

$$A_t < I \frac{p_H R - R_p}{p_H R - c} \tag{8}$$

Now consider an economy with larger endowments, such that the incentive constraint is not binding. If there are $n_t$ firm in the region, the according investment is $n_t I$. The return is an amount of capital $K_t = n_t (p_H R - c)$, already taking into account the monitoring costs $c$. Because of the production function $Y_t = \beta K_t^{\alpha} L_t^{1-\alpha}$, the wage equals marginal productivity, $W_t = \beta (1-\alpha) K_t^{\alpha} L_t^{-\alpha} = \beta (1-\alpha) K_t^{\alpha}$, which implies a return of $Y_t - L_t W_t = \beta \alpha K_t^{\alpha}$. Now in equilibrium, the return must equal that from a risk-free investment, $n_t (1+r) I$. As a consequence,

$$n_t(1+r)I = \beta\alpha {n_t}^{\alpha}(p_H R - c)^{\alpha}, \text{ or equivalently,}$$

$$n_t = \sqrt[1-\alpha]{\frac{\beta\alpha(p_H R - c)^{\alpha}}{(1+r)I}}. \tag{9}$$

Because the incentive constraint does not bind, it becomes irrelevant. The friction on the capital market vanishes, and consequently, investment in the region is independent from its initial endowment $A_t$. Finally, calculate the wage level as

$$W_t = \frac{1-\alpha}{\alpha}(1+r)\, n_t = \frac{1-\alpha}{\alpha} \sqrt[1-\alpha]{\frac{\beta\alpha(R-c)^{\alpha}}{(1+r)^{\alpha} I}}. \tag{10}$$

## 2.4. COMPARATIVE STATIC RESULTS AND HYPOTHESES

When the incentive Constraint (8) is not binding, Equation (9) implies that bank efficiency has a positive impact on the number of firms, and thus also on output (GDP), and (10) implies that bank efficiency increases the wage level. However, all these are level effects: more bank efficiency leads to a higher GDP, but not to higher GDP growth. Because the incentive constraint does not bind, the financial market works without friction, and output is only influenced by current bank efficiency.

When the incentive constraint is binding, an increase in bank efficiency has three effects. First, less capital is consumed by the bank and more is left for the production of final goods. Second, more capital can be attracted from the global financial market. And third, the wage level increases. Consequently, in the next period, wealth in this region will be higher and entrepreneurs will find it easier to attract more funds. Hence, bank efficiency has a positive growth effect. Potentially, the region can grow until the incentive constraint ceases to bind. Putting both cases together, bank efficiency weakly increases growth.

**Proposition 1**: *A more efficient regional banking system spurs regional GDP growth,* $\partial(Y_t - Y_{t-1})/\partial c \leq 0$.

Proofs are in the appendix. Now the second proposition follows the first one. If the initial endowment $A_t$ is large, entrepreneurs are rich enough that the incentive constraint does not bind. In that case, bank efficiency has a positive effect on the level of output, but not on

growth. The smaller $A_t$, the higher the shadow price of the binding constraint. As a result, bank efficiency then has a larger effect on growth. Putting both cases together, the positive effect of bank efficiency on growth is smaller for richer regions (large $A_t$).

If the incentive constraint were non-binding for all firms in all regions, then no firm would be credit constrained. Consequently, as argued above, there would be no relation between bank efficiency and growth. Realistically, some firms within each region suffer from borrowing constraints. The poorer the region, the more severe these constraints will be. This is exactly the precondition to test Proposition 2, which states that in a region with more initial assets $A_t$, an improvement of bank efficiency has a smaller impact on growth due to decreasing returns.

**Proposition 2**: *In a less developed region with lower $A_t$, the impact of an improvement in bank efficiency on economic growth is larger, $\partial/\partial A_t \, \partial(Y_t - Y_{t-1})/\partial c \leq 0$.*

In our model, we have treated bank efficiency as exogenous. The parameter *c* is a measure for the cost of banks, and hence implicitly also a measure of their comparative (dis)advantage. In reality, bank costs consist of many components, like screening costs and cost of capital.[4] In our model, as in many others, *c* is treated as exogenous. Let us thus discuss what factors influence *c*. In principle, the past decisions of banks may have influenced *c*. For example, there may be "learning by doing": larger banks may have learned more about how to monitor their borrowers, and thus have a lower *c*. Consequently, they will increase lending, fostering growth. There may be further consequences. Some banks, taking into account future cost

[4] In Germany, a country in which there is an implicit government guarantee, the cost of capital is lower for small regional savings banks.

reductions, will offer lower loan rates in order to attract volume. Both of these effects would be beneficial for growth in the region. As a result, the relaxation of the assumption of exogeneity of *c* does not adversely influence our results.

## 3. EMPIRICAL EVIDENCE

### 3.1. DATA AND VARIABLES

In order to test the findings of our model, we focus on the German regional banking market, in which three bank types operate, namely, branches of big commercial banks, savings banks, and cooperative banks (Altunbas, et al. 2001; Schmidt and Tyrell, 2004; Hackethal, 2004). Major commercial banks operate nationally, whereas local savings banks and credit cooperatives operate in regions where they are headquartered. The small size and independence of savings and credit cooperatives can give rise to a competitive advantage, specifically because of customer proximity and the capacity for quick decision-making in the local retail banking market (Slotty, 2009). Furthermore, because of the regional footing of shareholders or members, they are more important funding providers to individuals and SMEs, especially in relatively poor regions with less of a big bank presence.

Our unique data set combines information from three main resources. Financial and other information on savings banks are obtained from the German Savings Bank Association;[5] regional macroeconomic statistics are provided by the German Federal Statistical Office and information on local banking market share of big banks and savings banks is provided by the

[5] We exclude Landesbanken from our sample, given their national/interregional role.

German Bundesbank. In total, the bank-specific data covers 457 savings banks and the regional and bank market share information of 440 administrative districts from 1995 to 2004.[6] Matching of the data sets is not always one-to-one. In some administrative districts, there is more than one savings bank, and some can also operate in more than one district. In the first case, we simply aggregate data from the balance sheets of savings banks within the given district. In the second case, we only consider the region where the headquarters of the savings bank is located. After this procedure, we are left with 395 regions over a time span of 10 years. Table I reports the definitions and main characteristics of the sample.

[Insert Table I here]

In-line with the classic literature on finance and growth (King and Levine, 1993), regional economic growth $Y_{it}$ is measured by the growth rate of regional GDP per capita (GDP_Capita_Growth). As a robustness test, following Guiso (2004) and Hasan, Shaffer, and Zhou (2009), we also use the growth rate of new business registrations (Business_Reg_Growth) to approximate regional industrial growth. The two measures are not significantly related, the correlation ratio between the two being -5.29%.

In the theoretical model we employ bank monitoring costs as an indicator of the level of local financial development. In the empirical analysis, we use three savings bank performance indicators to proxy for efficiency. First, we use two indirect indicators, ROA and ROE, which

[6] The timeframe is mainly due to data availability issues and a ten year period we believe sufficient to test our model. Also in recent years, savings banks have started to offer direct banking to their customers, leading to some softening in the regional principle, so this also supports the use of an earlier time frame.

indicate that efficient banks should be more profitable. Then, from Koetter and Wedow (2010), who find that bank quality (proxied by cost efficiency) explains economic growth, we use a direct cost efficiency measure derived from stochastic cost frontier estimation. Cost efficiency measures show how close bank *i* is to the estimated industry-wide best-practice cost frontier in year *t*. As shown in Table I, the average cost efficiency for regional savings bank is 82.8% over the sample period (similar to earlier findings of Altunbas et al., 2001).[7] Details on our cost efficiency estimation methodology are provided in Appendix A2. As a robustness check, we employ bank Z-score as further bank efficiency proxy so as to take bank risk taking into consideration. Banks with higher risk-taking are less efficient in capital allocation and project financing. We use the bank Z-score to measure bank insolvency risk. The Z-Score is estimated as the ratio between the sum of a bank's average return on assets and capitalization (equity/total assets) and the standard deviation of the return on assets. The Z-score indicates the number of standard deviations that a bank's return on assets has to drop below its expected value before equity is depleted and the bank becomes insolvent. Banks with a low Z-Score indicate that the institution is exposed to higher risk.

To compare the role of big versus small banks on local economic development, we present the market shares of two banking groups in the respective local market. Large commercial banks with branches all over the country belong to the big bank group (Market_Share_Big) in

[7] Over the study period from 1995 to 2004 there was consolidation in the savings bank sector with the number of banks falling from 607 to 457 (Bloch, 2008). Simple correlation of our direct cost efficiency measure with M&A activity per year (the latter from Table 4, p37 in Bloch, 2008) reveals an inverse relationship (- 0.4138). Similar relationships are found for our direct measures of efficiency. The level of M&A activity in the savings bank sector appears to be inversely linked to bank cost efficiency (however measured).

our sample, whereas savings banks are small banks that only operate in the region in which they are based (MS_Savings_Bank). The local market shares of the large commercial banks and the savings banks are calculated on the basis of the number of branches of any one bank in each administrative district over the total number of bank branches in the same district.

GDP growth can be influenced by factors other than financial sector development, and as such, these need to be controlled for. First we take account of competition faced by the savings bank sector using the Lerner index (Fernandez de Guevara et al., 2005; Carbó-Valverde et al., 2009). The Lerner index is a non-structural measure of competition defined as:

$$L = \frac{P-MC}{P} \tag{11}$$

where *P* denotes the output price of savings bank *i*, and *MC* is their marginal cost obtained by differentiation of the total cost function shown in Appendix A3. The index ranges from a high of 1 to a low of 0, with higher values indicating greater market power. As shown in Table 1, the average value for the Lerner index is 0.236 over the entire sample period.[8]

We also control for a variety of other macro indicators including: inflation, the local labor

[8] We do not have cooperative bank data for our individual localities, so the Lerner index is calculated just for our sample of savings banks. We do not believe that competition between these two types of banks affects heterogeneity in terms of composition of the regional competition indicators, as the Lerner index of 0.236 is similar to that found in previous studies on German banking (see Koetter and Poghosyan, 2009; Buch et al. 2010).

supply, and the absolute value of GDP per capita in a given administrative region. High inflation rates can result in a loss of confidence for future investments and suspend economic growth. We apply the annual CPI index in Germany to control for this macroeconomic shock. In the classical production function, output depends on two inputs, namely, capital and labor. Consequently, one concern of our analysis is that the results may be driven by features of the local labor supply not captured by a region's financial development. We therefore include local labor supply (Labor_Supply) measured by the size of the regional labor force to isolate this effect. Rich or poor regions might have different growth patterns. We first include regional GDP per capita (GDP_Capita) to control for the effect of a region's initial endowments. We also include a dummy variable (Group Dummy (west)) to determine whether a region belongs to the former West Germany before the reunification of 1990 to control for any potential regional bias.

Furthermore, we include bank size, the equity ratio, and the percentage of non-interest income as bank-specific controls. Bank size (ln_Totalasset) is defined as the natural logarithm of total assets and is used to control for different characteristics across relatively large and small savings banks, as well as economies of scale. Banks with a lower equity ratio (Equity_Ratio) might enjoy a relatively higher return on equity, and this could generate biased results. Besides, this ratio reflects management's attitude to risk, and a control for this variable may also adjust for this possible bias. Finally, some savings banks might focus on potentially higher marginal commission business, which could have a positive influence on bank profitability and efficiency measures. Consequently, we control for bank non-interest income (Share_of_Fee_Inc) to isolate this effect. Table 1 reports the summary statistics.

### 3.2. METHODOLOGY

The following empirical analysis seeks to test the two propositions derived from our theoretical model. Namely, does a more efficient local banking system promote regional GDP growth and is this effect larger in less developed regions? The link between finance and growth as first advocated by Schumpeter (1934) has spawned a significant empirical literature (King and Levine, 1993; Arestis and Demetriades, 1997; Levine and Zervos, 1998; Rajan and Zingales, 1998; Claessens and Laeven. 2003; Bekaert et al., 2005; Beck et al., 2008). Following on from this, we test the propositions presented above using the following model, which examines the effect of local financial development on economic growth:

$$Y_{it} = a + \delta Y_{it-1} + \beta_m Local\_Fin_{it} + \sum_{j=1}^{J} \beta_j X_{it}^{j} + \beta_l Year\_Dummy + \varepsilon_{it} \tag{12}$$

where subscript *i* indicates regions and *t* indicates years. In line with the theoretical model, $Y_{it}$ stands for local economic growth. We use two proxies for $Y_{it}$: the growth rate of regional GDP per capita and the growth rate of business registration in a certain region. $Local\_Fin_{it}$ is an indicator of local financial development proxied by one of three variables: savings bank cost efficiency, return on total assets, and return on total equity. As a robustness check, we employ bank Z-score as a further bank efficiency proxy. We also control for a variety of other variables, $X_{it}$, covering indicators of: local banking market competition; inflation; regional labor supply; bank size; share of fee income; capital strength (proxied using an equity ratio); and a binary variable indicating whether a region belongs to the former West Germany. $\varepsilon_{it}$ is the disturbance, with $v_i$ the unobserved regional specific effect and $u_{it}$ the idiosyncratic error.

A major technical challenge in the empirical finance and growth literature is how to address

potential endogeneity problems, as the use of endogenous regressors will lead to inconsistent and biased estimations. Following Levine et al. (2000), Beck et al. (2000), and Beck and Levine (2004), we employ dynamic panel estimators to address potential endogeneity concerns relating to the direction of causality between financial development and economic growth. Specifically, we use the dynamic system GMM panel estimators proposed by Arellano and Bover (1995) and Blundell and Bond (1998) with Windmeijer (2005) robust errors. The dynamic system GMM panel estimators use lagged first-differences of the variables as additional instruments for equations in levels, which is more efficient than difference GMM estimators.

## 3.3. EMPIRICAL RESULTS

### BASELINE RESULTS

We first test proposition 1 presented above by estimating the direct link between regional bank performance and local economic growth. We estimate the baseline model in Equation (12) using the two-step system GMM estimator with Windmeijer (2005) small sample robust correction (Carbó-Valverde et al., 2009). The dependent variable is the growth rate of GDP per capita in a certain region. Savings bank efficiency is proxied by return on equity, return on total assets, and cost efficiency. All regressions include macroeconomic and bank specific controls. The GMM estimation results, shown in Table II, indicate a significantly positive coefficient for the bank performance variables. In all the three regression models, we treat the lagged dependent variable (L.GDP_Capita_Growth) and lagged bank efficiency (L.ROA, L.ROE, L.Cost Efficiency) as endogenous GMM style variables. The result remains robust if

we only apply the lagged dependent variable (L.GDP_Capita_Growth) as an endogenous variable. Two tests support our model specification: the null of second-order autocorrelation (AR(2)) is rejected, and heteroscedasticity-consistent Hansen J-tests do not reject the validity of our instrument set at least at the 5% level. This illustrates that small bank performance improvements are effective in promoting regional economic growth. The first two regression models that use indirect bank efficiency indicators—ROA and ROE—indicate that efficiency is positively associated with regional economic development: namely, a higher level of bank profitability spurs region's economic development in the following period. The final regression model contains the results with respect to the direct cost efficiency indicator derived from frontier estimation. Here the results again confirm that savings bank cost efficiency is associated with an increase in regional economic growth, consistent with the findings of Koetter and Wedow (2010). All three indicators are highly correlated with economic growth. As a robustness check, we employ the bank Z-score to proxy for the degree of bank risk taking. The results show a significantly negative relationship between bank risk and regional economic growth. Savings banks with higher Z_Score are positively correlated with regional economic growth. The results illustrate that regional savings banks with a lower degree of risk taking are associated with higher local economic growth rates.[9] Overall, these results confirm our theoretical findings and show that small regional banks are important fund providers in promoting local economic development.[10] In addition, in regression models (4) to (6), we employ clustered standard errors to control for potential unobserved factors that may cause correlation of error-terms across regions. The results remain robust.

[9] The results for robustness checks are not reported here. However, they are available upon request.

[10] Our estimations suggest divergence of growth across regions due to different initial conditions.

Turning to the various control variables, we see that inflation is negatively related to regional economic growth. This result is consistent with the notion that a higher inflation rate leads to uncertainty about the future profitability of investment projects and, as a result, suspends economic development. The Lerner index and local labor supply are not significantly associated with regional economic growth. Bank size, the amount of non-interest income, and capital strength (equity ratio) do not appear to be linked to regional economic growth in most model specifications.

[Insert Table II here]

## INITIAL ENDOWMENTS AND REGIONAL ECONOMIC DEVELOPMENT

We further want to test proposition 2 from the theoretical model. We assess whether the impact of financial development varies in regions with different initial endowments. If small regional banks can prevent financial resources flowing from poor to rich regions, then such banks will help cover local capital demand and the impact of regional bank efficiency should be stronger in regions with low initial endowments. We create an interaction term and add this variable to all the regression models. The interaction term is the product of bank efficiency and the initial regional GDP per capita in 1995. The introduction of this interaction term enables us to differentiate the relationship between savings bank efficiency and regional economic growth in less versus more developed regions.

The results presented in Table III show a significantly positive coefficient for the bank efficiency variables. This illustrates that savings bank efficiency improvements are effective in promoting regional economic growth. The coefficients of the interaction term are negative and highly significant, indicating that the effect is stronger in less developed regions, rather than in highly developed regions. This confirms our theoretical findings and shows that regional banks are important in promoting local economic development in poor regions. The results also support the theoretical findings of Lucas (1990) and Boyd and Smith (1997), who discuss the danger of capital flows from the poor to rich regions.

Overall, our findings suggest that the presence of savings banks as regional funding providers is positively associated with local economic growth and that this effect is stronger in relatively poor regions. Small banks appear to be important funding providers in such regions and as such they may limit capital flows from poor to rich regions. The results are consistent with our theoretical model.

[Insert Table III here]

## THE ROLE OF ACCESS TO FINANCE

Without access to external finance, firms cannot get enough funding for their projects, which results in slower economic growth for a region. In our theory, we have shown that financing constraints are negatively correlated with regional economic growth, especially in regions with weak financial development. In this subsection, we assess whether the impact of regional saving banks on economic development varies in regions with different credit

market conditions. We employ two measures for regional access to finance: commercial bank branches per 100,000 residents (Branch) and private lending per capita in a certain region (Private_credit). We subdivide the sample according to the medians of the variable Branch. Regions with average commercial bank branches per 100,000 residents greater than the sample median are classified as markets with high access to finance. The regions with average commercial bank branches per 100,000 residents lower than the sample median are classified as markets with low access to finance. As a robustness check we also subdivide the sample according to the median of the variable Private_credit.

Table IV contains the results. Regression models (1), (3), and (5) report results in regions with relatively high access to finance. Regression models (2), (4), and (6) report results in regions with relatively low access to finance. The significantly positive coefficients for the bank efficiency variables, especially in regions with low access to finance, indicate that regional savings banks are more important external finance providers in regions with higher financing constraints. This confirms our theoretical findings and shows that regional banks are important in promoting local economic development in regions with binding incentive constraint.

[Insert Table IV here]

**SMALL BANKS vs. BIG BANKS**

We have shown that local financial development is essential for regional economic growth, especially in poor regions. A further interesting question is: do small banks or big banks have a differential impact on a region's economic development? In order to answer this question

we proxy for small and big bank presence using branch market shares of regional savings banks, regional cooperative banks, and big commercial banks based on the number of branches in the region. The regional savings banks and regional cooperative banks represent small banks, while big interregional commercial banks are big banks. So far we have used the growth rate of GDP per capita as a dependent variable. In the following analysis, we approximate regional economic development using the growth rate of new business registrations (Business_Reg_Growth) in a certain region as a robustness check. A further advantage of this approach is that we can mitigate concerns over causality between regional economic growth and bank performance. Again, we use the interactive variable to differentiate the effect of financial development in poor versus rich regions. The interaction term is defined as the product of market share of big or small banks and regional GDP per capita. A negative sign on the interaction term will indicate that the effect is stronger in poor regions.

[Insert Table V here]

Estimates in Table V reveal that regions in which there is a larger market share of regional savings banks have higher growth in new business registrations, suggesting more prosperous economic conditions. As the growth rate of regional business registration mainly represents regional SME growth, these results confirm the findings of Carbó-Valverde et al. (2009) and Degryse and Ongena (2007), who show that savings banks are more effective at promoting SME development. We therefore find that savings banks have a positive and significant effect on regional development proxied by the growth rate of business registrations, and the highly significant negative coefficient on the interaction term indicates that the effect is particularly strong in relatively poor regions. The cooperative banks, another representative from the

regional banking group, exhibit similar effect on promoting regional economic development. The coefficient is positive but insignificant for the market share of cooperative banks, and the coefficient of the interaction term is negative and insignificant, indicating a higher market share of credit cooperatives is weakly associated with higher growth rates of new business registration.

Our findings for large commercial banks, however, are in the opposite direction; the coefficients for the market share of large banks have a negative and insignificant sign and the coefficient for the interaction term is positive and insignificant. The results suggests that a higher proportion of large commercial bank branches in a given region might not improve regional development. A possible reason is that the presence of large commercial banks may crowd out small banks that have a stronger focus on local SME finance. Also, our results using the growth rate of new business registrations demonstrates that the effect of regional banks on local economic development diverges between poor and prosperous regions. This confirms the findings of our theoretical model, which shows that more developed regions are attractive for big banks due to higher initial endowments. However, in less developed regions with lower initial endowments, big banks only have a limited presence. In this context, big banks have a more positive role on local economic development for rich regions, as compared to poor regions. In contrast, small banks that do not have the opportunity for mobility are engines for local growth, especially in poor regions that face potential capital outflows from interregional banks. Our findings, therefore, remain robust to alternative measures of regional economic development (growth in GDP per capita and new business registrations).

## 4. CONCLUSION

The potential role of small banks in a financially-integrated market is not obvious. Earlier empirical studies suggest that local financial development remains important and that there is a causal link between local financial development and real economic growth. In this paper, we investigate the influence of small banks and big banks on real economic development. We propose a theoretical model of financial development and economic growth. The model suggests that under credit rationing, rich regions are more attractive for external investments because of higher initial endowments and because poor regions tend to have fewer projects that need financing. Thus, in a financially-integrated market, capital will flow from poor to rich regions. Accordingly, due to the lower level of economic activity, an expansion in investment will have a rather high marginal productivity in poor regions. Thus, small banks can improve local economic development and will have a higher impact on economic growth in such regions. We then empirically test the roles of small banks and big banks on economic growth. The GMM estimations show that small bank development improves local economic growth, with the effect being stronger in less developed regions. Overall, both the theoretical and empirical parts of our analysis suggest that small banks may be effective in preventing capital outflows from poor to rich regions.

Our analysis illustrates the important role of small regional banks in a financially-integrated market. Interregional bank consolidation may destroy the regional rootedness of these banks, turning small regional banks into big banks and thus losing the potential benefits. Small and regional banks play a role in many financial systems, not only Germany. For example, local and regional cooperative and savings banks play an important role in many European banking

systems, particularly in Austria, Belgium, France, Italy, Norway, Portugal, Spain and Sweden. In the US, banks that fall under the community reinvestment act (CRA) from 1977 also have a regional development focus. Also in both US and UK, governments have created Community Development Financial Institutions. In this context, the findings have relevance beyond the German setting as many other European countries as well as the U.S. (community banks) host a variety of banks with important local or/and regional focus.

Overall, our paper discusses the optimal architecture of a regional and interregional banking system. Financial policies that supports regional granularity may prevent a capital drain and thus foster development, especially in less developed regions.

Table I: Variable definitions and summary statistics

| Variable | Definition | N | Mean | Std.Dev. | Min. | Max. |
|---|---|---|---|---|---|---|
| Panel A: Key variables of interest | | | | | | |
| Regional Economic Development | | | | | | |
| GDP_Capita_Growth (%) | Annual growth rate of regional gross domestic product per capita. | 3554 | 1.995 | 3.142 | -15.983 | 25.484 |
| Business_Reg_Growth (%) | Annual growth rate of regional new business registrations. | 2765 | 1.957 | 11.913 | -30.120 | 83.260 |
| Bank Efficiency and Risk Taking | | | | | | |
| ROA (%) | Return on total assets of savings banks. | 3575 | 0.234 | 0.170 | -3.967 | 2.038 |
| ROE (%) | Return on total equity of savings banks. | 3575 | 5.556 | 4.330 | -4.045 | 69.300 |
| Cost Efficiency | Cost efficiencies of savings banks estimated using stochastic frontier analysis. It represents a relative performance measure of savings banks. | 2776 | 0.828 | 0.039 | 0.519 | 0.919 |
| Z_Score | Z-score is estimated as ROA+(equity/assets))/Sd(ROA). | 2870 | 3.839 | 21.095 | 0.210 | 37.503 |
| Panel B: Control variables | | | | | | |
| Regional Specific Controls | | | | | | |
| Lerner | Lerner index measure of regional bank competition. | 2776 | 0.236 | 0.057 | 0.049 | 0.520 |
| Branch | Bank branches per 100,000 residents. | 3935 | 49.076 | 20.271 | 12.918 | 116.788 |

| | | | | | | |
|---|---|---|---|---|---|---|
| Private_Credit (Tds. Euro) | Private credit per capita in thousand Euro. | 3935 | 27.603 | 35.558 | 2.393 | 361.177 |
| GDP_Capita (Tds. Euro) | Absolute value of regional gross domestic product per capita in thousand Euro. | 3949 | 23.226 | 7.782 | 10.118 | 74.118 |
| Inflation (%) | Annual German Consumer Price Index (CPI). | 3950 | 0.619 | 0.673 | -0.678 | 1.874 |
| Labor_Supply (Mio.) | Total population in a region in Million. | 3950 | 0.233 | 0.188 | 0.040 | 1.736 |
| Savings_rate (%) | Regional annual savings rate in percentage. | 3950 | 10.193 | 1.005 | 6.800 | 12.300 |
| MS_Savings_Bank(%) | Market share of regional savings bank branches in a region as a proportion of total bank branches. | 3555 | 34.822 | 6.164 | 8.475 | 61.333 |
| MS_Coop_Bank (%) | Market share of regional cooperative bank branches in a region as a proportion of total bank branches. | 3555 | 27.881 | 9,696 | 4.950 | 58.879 |
| MS_Big_Commercial (%) | Market share of large commercial bank branches divided by the total number of bank branches in a region. | 3555 | 37.297 | 9.179 | 12.500 | 74.510 |
| Group Dummy (West) | A dummy variable equals to one if a region belongs to the former West Germany. | 3950 | 0.833 | 0.373 | 0.000 | 1.000 |
| Bank Specific Controls | | | | | | |
| In_Totalasset | Natural logarithm of savings bank total assets. | 3575 | 6.081 | 0.400 | 4.993 | 7.529 |
| Share_of_Fee_Inc. (%) | Percentage of non-interest income relative to interest income. | 3575 | 21.311 | 5.000 | 6.227 | 53.042 |
| Equity_Ratio (%) | Equity to total assets ratios for savings banks. | 3575 | 4.338 | 0.923 | 2.032 | 8.720 |

Table II: Impact of regional savings bank efficiency on local economic growth

This table reports results from GMM estimations of the effects of small savings banks on regional economic development. The dependent variable is the growth rate of regional GDP per capita. The measures of savings bank efficiency include two indirect indicators—(1) ROA and (2) ROE—and a direct measure derived from stochastic frontier estimation, namely (3) Cost Efficiency. Regression models (1) to (3) contain results with Windmeijer (2005) small-sample two-step standard errors. Regression models (4) to (6) contain results with clustered standard errors. The period covers the years 1995 to 2004. *** denotes significance at the 1%-level; ** denotes significance at the 5%-level; * denotes significance at the 10%-level.

| Dependent Variable: | GDP_Capita_Growth | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | (1) | | (2) | | (3) | | (4) | | (5) | | (6) | |
| | Coeff. | p-Val. | Coeff. | p-Val. | Coeff. | p-Val. | Coeff. | p-Val. | Coeff. | p-Val. | Coeff. | p-Val. |
| L. GDP_Capita_Growth | -0.034 | 0.755 | -0.047 | 0.667 | -0.055 | 0.470 | -0.034 | 0.851 | 0.010 | 0.951 | -0.263* | 0.077 |
| L.ROA | 2.850* | 0.055 | | | | | 2.850 | 0.105 | | | | |
| L.ROE | | | 0.116* | 0.068 | | | | | 0.042* | 0.098 | | |
| L.Cost_Eff. | | | | | 3.883* | 0.100 | | | | | -19.289** | 0.013 |
| Lerner | -4.614 | 0.717 | -7.142 | 0.524 | 1.913 | 0.738 | -4.614 | 0.767 | -0.892 | 0.941 | -16.609* | 0.071 |
| Inflation | -10.453*** | 0.000 | -10.323*** | 0.000 | -10.389*** | 0.000 | -10.453*** | 0.000 | -10.268*** | 0.000 | -10.176*** | 0.000 |
| Labor_Supply | -0.363 | 0.543 | -0.302 | 0.586 | -0.596 | 0.148 | -0.363 | 0.674 | -0.390 | 0.608 | -0.183 | 0.804 |
| In_Totalasset | 0.129 | 0.862 | 0.337 | 0.656 | -0.252 | 0.571 | 0.129 | 0.894 | 0.569 | 0.539 | 0.689 | 0.525 |
| Share_of_Fee_Inc. | -0.009 | 0.907 | -0.015 | 0.834 | 0.074 | 0.236 | -0.009 | 0.927 | -0.021 | 0.813 | 0.157 | 0.176 |
| Equity_Ratio | -0.111 | 0.757 | 0.187 | 0.676 | 0.124 | 0.371 | -0.111 | 0.797 | 0.058 | 0.898 | -1.356*** | 0.008 |
| Group Dummy (west) | -0.552 | 0.316 | -0.868 | 0.162 | 0.134 | 0.750 | -0.552 | 0.468 | -0.616 | 0.404 | -0.152 | 0.855 |
| _cons | 12.610 | 0.150 | 10.838 | 0.148 | 7.155 | 0.128 | 12.610 | 0.238 | 8.740 | 0.291 | 29.576*** | 0.001 |
| Year_Dummies | Yes | | Yes | | Yes | | Yes | | Yes | | Yes | |
| Number of Obs. | 2873 | | 2873 | | 2862 | | 2873 | | 2873 | | 2862 | |
| Number of Banks | 367 | | 367 | | 366 | | 367 | | 367 | | 366 | |
| Hansen test (p-value) | 0.159 | | 0.244 | | 0.093 | | 0.159 | | 0.220 | | 0.089 | |
| AB test AR(1) (p-value) | 0.000 | | 0.000 | | 0.000 | | 0.005 | | 0.001 | | 0.019 | |
| AB test AR(2) (p-value) | 0.766 | | 0.844 | | 0.906 | | 0.839 | | 0.690 | | 0.224 | |
| Clustered SE | No | | No | | No | | Yes | | Yes | | Yes | |

Table III: Initial Endowments and Regional Economic Development

This table reports the impact of small savings banks on regional economic development with different initial conditions. The dependent variable is the growth rate of regional GDP per capita. The measures of savings bank efficiency include two indirect indicators—(1) ROA and (2) ROE—and a direct measure derived from stochastic frontier estimation, namely (3) Cost Efficiency. The proxy for regional initial condition is regional GDP per Capita in 1995. The period covers the years 1995 to 2004. *** denotes significance at the 1%-level; ** denotes significance at the 5%-level; * denotes significance at the 10%-level.

| Dependent Variable: | GDP_Capita_Growth | | | | | |
|---|---|---|---|---|---|---|
| | (1) | | (2) | | (3) | |
| | Coeff. | p-Val. | Coeff. | p-Val. | Coeff. | p-Val. |
| L. GDP_Capita_Growth | -0.229** | 0.021 | -0.215** | 0.031 | -0.318** | 0.010 |
| L.ROA | 15.923*** | 0.000 | | | | |
| L.ROE | | | 0.493*** | 0.000 | | |
| L.Cost_Eff. | | | | | 18.024*** | 0.003 |
| ROA×(Initial GDP_Capita) | -0.683*** | 0.000 | | | | |
| ROE×(Initial GDP_Capita) | | | -0.022*** | 0.001 | | |
| Cost_Eff.×(Initial GDP_Capita) | | | | | -1.108*** | 0.000 |
| Lerner | -9.150 | 0.492 | -3.002 | 0.806 | -23.589 | 0.159 |
| GDP_Capita | 0.182*** | 0.002 | 0.161*** | 0.007 | 0.812*** | 0.000 |
| Inflation | -9.010*** | 0.000 | -8.682*** | 0.000 | -3.566** | 0.040 |
| Labor_Supply | -0.687 | 0.280 | -0.878 | 0.165 | 0.360 | 0.709 |
| In_Totalasset | 0.223 | 0.764 | 0.543 | 0.488 | -1.721** | 0.048 |
| Share_of_Fee_Inc. | -0.016 | 0.854 | -0.002 | 0.976 | 0.410*** | 0.002 |
| Equity_Ratio | -0.205 | 0.627 | 0.180 | 0.726 | -0.314 | 0.610 |
| Group Dummy (west) | -1.195 | 0.116 | -1.193 | 0.137 | 1.311 | 0.324 |
| _cons | 8.895 | 0.311 | 3.869 | 0.629 | -3.788 | 0.748 |
| Year_Dummies | yes | | yes | | yes | |
| Number of Obs. | 2866 | | 2866 | | 2855 | |
| Number of Banks | 366 | | 366 | | 365 | |
| Hansen test (p-value) | 0.330 | | 0.299 | | 0.946 | |
| AB test AR(1) (p-value) | 0.000 | | 0.000 | | 0.023 | |
| AB test AR(2) (p-value) | 0.256 | | 0.309 | | 0.087 | |

Table IV: The Role of Access to Finance

This table reports results from GMM estimations of the effects of small savings banks on regional economic development under low or high access to finance. The dependent variable is the growth rate of regional GDP per capita. The measures of savings bank efficiency include two indirect indicators—(1) ROA and (2) ROE—and a direct measure derived from stochastic frontier estimation, namely (3) Cost Efficiency. Regression models (1), (3), and (5) with H contain results in regions of relative high access to finance. Regression models (2), (4), and (6) with L contain results in regions of relative low access to finance. The period covers the years 1995 to 2004. *** denotes significance at the 1%-level; ** denotes significance at the 5%-level; * denotes significance at the 10%-level.

| Dependent Variable: | GDP_Capita_Growth | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | (1) | | (2) | | (3) | | (4) | | (5) | | (6) | |
| | H | | L | | H | | L | | H | | L | |
| | Coeff. | p-Val. | Coeff. | p-Val. | Coeff. | p-Val. | Coeff. | p-Val. | Coeff. | p-Val. | Coeff. | p-Val. |
| L. GDP_Capita_Growth | -0.083 | 0.495 | 0.071 | 0.621 | -0.243** | 0.033 | 0.016 | 0.917 | -0.184** | 0.032 | -0.140** | 0.046 |
| L.ROA | -0.612 | 0.866 | 1.542* | 0.075 | | | | | | | | |
| L.ROE | | | | | 0.034 | 0.780 | 0.053 | 0.280 | | | | |
| L.Cost_Eff. | | | | | | | | | -3.535 | 0.489 | -13.230*** | 0.007 |
| Lerner | 23.051 | 0.230 | -27.635* | 0.063 | 14.296 | 0.481 | -24.171* | 0.069 | 9.503 | 0.199 | -15.411*** | 0.002 |
| Inflation | -8.700*** | 0.000 | -12.737*** | 0.000 | -7.488*** | 0.000 | -12.344*** | 0.000 | -9.344*** | 0.000 | -12.722*** | 0.000 |
| Labor_Supply | -2.777 | 0.154 | -0.158 | 0.859 | -1.319 | 0.412 | -0.408 | 0.637 | 8.026** | 0.022 | -1.902* | 0.086 |
| In_Totalasset | -1.390 | 0.334 | 0.530 | 0.619 | -1.017 | 0.506 | 0.907 | 0.386 | 2.088** | 0.046 | -0.016 | 0.973 |
| Share_of_Fee_Inc. | -0.014 | 0.910 | -0.170 | 0.164 | 0.087 | 0.456 | -0.126 | 0.284 | -0.128 | 0.183 | -0.016 | 0.796 |
| Equity_Ratio | -0.527 | 0.420 | 0.039 | 0.953 | -0.685 | 0.323 | -0.152 | 0.828 | 0.817*** | 0.000 | -0.103 | 0.704 |
| Group Dummy (west) | 1.916* | 0.061 | -1.504* | 0.090 | 1.462 | 0.121 | -1.047 | 0.287 | -3.912*** | 0.000 | -1.075** | 0.011 |
| _cons | 15.124 | 0.317 | 21.358* | 0.085 | 12.058 | 0.386 | 17.534* | 0.099 | 0.131 | 0.991 | 30.498*** | 0.000 |
| Year_Dummies | Yes | | Yes | | Yes | | Yes | | | Yes | | Yes |
| Number of Obs. | 1249 | | 1624 | | 1249 | | 1624 | | | 1249 | | 1623 |
| Number of Banks | 157 | | 210 | | 157 | | 210 | | | 157 | | 367 |
| Hansen test (p-value) | 0.763 | | 0.850 | | 0.505 | | 0.820 | | | 0.267 | | 0.129 |
| AB test AR(1) (p-value) | 0.002 | | 0.000 | | 0.006 | | 0.000 | | | 0.000 | | 0.000 |
| AB test AR(2) (p-value) | 0.548 | | 0.290 | | 0.073 | | 0.433 | | | 0.150 | | 0.791 |

Table V: Small vs. Big Banks

This table compares the impact of small vs. big bank presence on local economic development. The dependent variable is growth rate of regional business registration. The proxies for small and big bank presence in a certain region are the market shares of the regional savings banks and big commercial banks based on the number of branches. The period covers the years 1995 to 2004. *** denotes significance at the 1%-level; ** denotes significance at the 5%-level; * denotes significance at the 10%-level.

| Dependent Variable: | Growth Rate of Business Registration | | | | | |
|---|---|---|---|---|---|---|
| | Coeff. | p-Val. | Coeff. | p-Val. | Coeff. | p-Val. |
| | (1) | | (2) | | (3) | |
| L.Business_Registration | 0.235 | 0.171 | -0.270 | 0.125 | -0.040 | 0.820 |
| MS_Savings_Bank | 1.289** | 0.024 | | | | |
| MS_Saving × GDP_Capita | -0.041** | 0.029 | | | | |
| MS_Coop_Bank | | | 0.065 | 0.799 | | |
| MS_Coop × GDP_Capita | | | 0.001 | 0.916 | | |
| MS_Big_Commercial | | | | | -0.263 | 0.367 |
| MS_Big × GDP_Capita | | | | | 0.005 | 0.588 |
| GDP_Capita | 1.421** | 0.029 | 0.030 | 0.894 | -0.131 | 0.715 |
| Inflation | -3.969 | 0.787 | -47.318*** | 0.001 | -26.565* | 0.072 |
| Labor_supply | -2.452 | 0.142 | 2.821 | 0.170 | 2.364 | 0.228 |
| Savings_rate | 0.364 | 0.548 | 0.827 | 0.137 | 0.788 | 0.106 |
| Group Dummy (west) | 0.458 | 0.850 | -6.617** | 0.044 | -6.894** | 0.024 |
| Year_Dummies | yes | | yes | | yes | |
| Constant | -29.914 | 0.315 | 56.043*** | 0.001 | 47.143*** | 0.004 |
| Number of observations | 1975 | | 1975 | | 1975 | |
| Hansen test (p-value) | | 0.234 | | 0.352 | | 0.297 |
| AB test AR(1) (p-value) | | 0.000 | | 0.009 | | 0.001 |
| AB test AR(2) (p-value) | | 0.154 | | 0.469 | | 0.681 |

## A. Appendix

### A.1. Proofs

**Proof of Proposition 1**: We need to differentiate between the two cases, with and without binding incentive constraint (IC). If the constraint does not bind, Equation (9) applies. In each period, the number of firms is independent from last period's level. As a consequence, output is identical, thus there is no growth. If (IC) does bind, Equation (6) applies, and $n_t$ depends on last period's wage level $W_{t-1}$, and hence from the initial endowment $A_t = W_{t-1}$. Output at date $t$ is $Y_t = \beta K_t^{\alpha} = \beta \; n_t^{\alpha} (p_H R - c)^{\alpha}$. Now the previous period's output $Y_{t-1}$ is independent of today's cost $c$, and hence, we only need to consider $\partial Y_t/\partial c$ instead of $\partial(Y_t - Y_{t-1})/\partial c$.

An increase in regional lending $F_t$ now directly increases the number of projects in the region. $F_t = n_t (I - A_t)$, and hence, $n_t = F_t/(I - A_t)$. More projects produce more capital such that $K_t = n_t (p_H R - c)$. Hence, output $Y_t$ increases. Because $c$ is negatively associated with $F_t$, the partial derivative with respect to $c$ is negative, $\partial(Y_t - Y_{t-1})/\partial c < 0$. This proposition also holds true in the absence of credit rationing. Only the multiplier is smaller because outside finance crowds out inside finance, and hence, $n_t = F_t/I$.

**Proof of Proposition 2**: According to (6), $n_t$ is an increasing function in $A_t$. According to (7), $W_t$ increases in $n_t$, and hence, it also increases in $A_t$. If (8) fails to hold, there is no credit rationing. In that case, $W_t$ does not depend on $A_t$.

Take the derivative $dW_t/dF_t$, which is positive. Then consider this derivative at different values of $A_t$. If the derivative is smaller for higher values of $A_t$, the first part of the proof is

complete. Noting that (2), (3), and $n_t = F_t/(I - A_t)$ yields

$$W_t = \beta(1-\alpha)\left(\frac{F_t(p_H R - c)}{I - A_t}\right)^{\alpha}. \quad (13)$$

The derivative with respect to $F_t$ is

$$\frac{\partial W_t}{\partial F_t} = \frac{\beta(1-\alpha)\alpha(p_H R - c)}{I - A_t}\left(\frac{F_t(p_H R - c)}{I - A_t}\right)^{\alpha-1} \quad (14)$$

According to this term, $\partial W_t/\partial F_t$ is larger for larger $A_t$. However, one needs to take into account that the natural (or equilibrium) number of projects (and thus the amount of regional finance) also depends on $A_t$. Considering $F_t = n_t\,(I - A_t)$ and (5) yields

$$\frac{\partial W_t}{\partial F_t} = (1+r)(1-\alpha)\frac{p_H R - c}{R_p - c}. \quad (15)$$

Hence, the two effects cancel out exactly. However, this result holds true only if (8) holds and the incentive constraint thus binds. In more developed regions, $n_t = F_t/I$, and hence, the first effect is weaker. In this case $\partial W_t/\partial F_t$ is smaller for larger $A_t$. Since $F$ depends on bank efficiency $c$ $\partial W_t/\partial($–c) is smaller for larger $A_t$, which completes the proof.

### A.2. Bank Cost Efficiency

Following Berger and Mester (1997), the cost frontier is specified as a Fourier-flexible functional form for each year *t* in our analysis:

$$\ln TC = a_0 + \sum_{i=1}^{3} \alpha_i \ln Q_i + \sum_{l=1}^{3} \beta_l \ln P_l + t_1 T$$
$$+ \frac{1}{2}\left(\sum_{i=1}^{3}\sum_{j=1}^{3} \delta_{ij} \ln Q_i \ln Q_j + \sum_{l=1}^{3}\sum_{m=1}^{3} \gamma_{lm} \ln P_l \ln P_m + t_{11} T^2\right)$$
$$+ \sum_{i=1}^{3}\sum_{m=1}^{3} \rho_{im} \ln Q_i \ln P_m + \sum_{i=1}^{3} \varphi_i T \ln Q_i + \sum_{l=1}^{3} \theta_l T \ln P_l$$
$$+ \sum_{i=1}^{3} \left[a_i \cos(Z_i) + b_i \sin(Z_i)\right]$$
$$+ \sum_{i=1}^{3}\sum_{j=1}^{3} \left[a_{ij} \cos\left(Z_i + Z_j\right) + b_{ij} \sin(Z_i + Z_j)\right]$$
$$+ \sum_{i=1}^{3}\sum_{j=1}^{3}\sum_{k\geq j, k\neq i}^{3} \left[a_{ijk} \cos(Z_i + Z_j + Z_k) + b_{ijk} \sin(Z_i + Z_j + Z_k)\right] + \varepsilon \qquad (16)$$

where

ln $TC$ = the natural logarithm of total costs (operating plus financial cost);

ln $Q_i$ = the natural logarithm of bank outputs including bank loans, securities, and off-balance sheet items;

ln $P_l$ = the natural logarithm of input prices including wage rate, interest rate and physical capital price;

$T$ = time trend;

$Z_i$= the adjusted values of the log output ln $Q_i$ such that they span the interval [0, 2π];

$a$, $\beta$, $\delta_i$, $\gamma$, φ, θ, $\rho$, $a$, $b$ and $t$ are coefficients to be estimated.

We use the stochastic cost frontier approach to generate annual estimate of cost efficiency for each bank. The sample covers 457 regional savings banks from 1994 to 2005. As shown in Table 1, the average cost efficiency for regional savings bank in Germany is 82.8% over the entire sample period.

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