Regional Banks and Economic Development[*]
— Evidence from German Savings Banks —

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Abstract

Localized banks may be desirable from a regional perspective in a financially integrated economy because they can prevent a capital drain from poor to rich regions. Consequently, they improve regional economic development. In this context, our paper discusses the effect of small regional banks on local economic growth. We first theoretically show that a more efficient regional banking system in both quantity and quality can spur local economic growth. Furthermore, in less developed regions, the impact of an expansion in loan volume of regional banks is higher, and the impact of a local bank efficiency improvement is larger. We then test the model predictions based on a data set of 457 local savings banks and the corresponding regional statistics in Germany for a time period from 1995 to 2004. Our empirical results suggest that efficient savings banks can spur regional growth; the effect is stronger in relatively poor regions.

JEL Classification: G21, H54, R11.

Keywords: banking structure, regional banks, regional economic growth.

1   Introduction

According to standard neoclassical theory, capital should flow from rich to poor regions due to higher marginal capital productivity. By connecting to international capital markets, capital-poor countries should be able to free themselves from local capital constraints. The positive impact of financial integration on economic growth has also been empirically demonstrated. On a global level, Levine (2001) shows that international financial integration can accelerate economic growth through enhanced stock market liquidity. On a domestic level, Beck, Levine, and Levkov (2007) find that liberalizing restrictions on intra-state branching in the United States lowers income inequality by affecting labor market conditions. These studies confirm the positive relationship between finance and growth (King and Levine, 1993), however they do not observe a capital flow from rich to poor regions as theoretically predicted. This missing capital flow from rich to poor regions is famously discussed in a paper by Lucas (1990); the phenomenon is often referred to as the "Lucas Paradox." The main theoretical explanations are capital market failures and information asymmetries.

Another strand of literature focusses on negative aspects of capital flows, discussing the danger of capital drain from the poor to rich regions. Under the assumption of credit rationing, Boyd and Smith (1997) show that countries with relatively high capital stocks will be attractive places to invest, and such countries will be net recipients of external capital investment. With international capital markets, currently poor countries will be net lenders to richer countries; hence they will permanently remain poor. In a comparable theoretical framework, Hakenes and Schnabel (2006) argue that regional public bank can prevent capital drain from poor to rich regions and thus promote local economic growth in less developed regions. From an empirical perspective, Guiso, Sapienza, and Zingales (2004) investigate the relationship between regional access to finance and economic development. They find that local financial development is an important determinant for economic success, even in a financially integrated market. They further argue that regional financial development especially benefits small and medium-sized enterprizes. Applying a cross country data from 1993 to 2000 on 43 nations, Berger, Hasan, and Klapper (2004) argue that the relative health of community banks are positively associated with economic growth through improved financing for small and medium enterprizes or greater overall bank credit flows. From the perspective of financial quality, Hasan, Koetter, and Wedow (2007) further demonstrate that efficient regional banks can spur economic growth. However, this empirical literature does not answer the question whether regional banks are effective in preventing a capital drain from poor to rich regions.

Our work attempts to fill this gap, shedding more light onto the relationship between regional banking development and economic growth. We ask whether regional banking development can spur local economic growth in differently developed regions, and investigate whether regional banks are efficient in preventing a capital drain from poor to rich regions. If capital flows from rich to poor regions as predicted by the neoclassical theory, interregional banks should be more important funding providers than regional banks in poor regions. On the other hand, if rich regions are more attractive for external investment, a highly developed regional banking system can maintain local deposits in a certain region to meet home capital demands; while interregional banks would invest the deposits they have collected from the poor regions into the more attractive rich regions. In this situation, regional banks should play a prominent role in enhancing local economic development in less developed regions.

In our paper, we first put forward an overlapping generation model with elements of both financial development and economic growth, building on Diamond (1965). The theoretical results show that regional financial development in both quantity and quality spur local economic growth. We further demonstrate that, under the assumption of credit rationing, the impact of an improvement in local financial development on regional economic growth is higher in less developed regions, and regional financial development will especially benefit the poor regions with danger of capital drain.

We then test these predictions on a data set including 457 regional savings banks and the corresponding regional statistics in the observation period 1995-2004. We focus on Germany because the German Banking system is characterized by a strong regional banking sector. Furthermore, the clear boarder of regional and interregional banking sectors in Germany provides us with a neat sample of regional banks for an investigation of their effects on local economic development.

The relationship between finance and growth has been first advocated by Schumpeter (1934). Starting with the seminal paper from King and Levine (1993), the research question between finance and growth has experienced a renaissance. Using a cross country data of 80 countries from 1960 to 1989, King and Levine (1993) argue that a sound financial system is strongly associated with current and future economic efficiencies. In a more recent paper, Levine, Loayza, and Beck (2000) confirm that better functioning financial intermediaries could ameliorate capital market failures and enhance economic development. In both of the papers, financial development is proxied from the quantity preperceptive, that is the size of financial systems, for example, the total private credit relative to GDP. Further empirical analysis argue that the quality of financial intermediations should be a better measure for financial development. In an empirical

study from Koetter and Wedow (2005), financial development is approximated by the cost efficiency estimates derived from stochastic frontier analysis. The results show that the efficiency of financial intermediation has a significant and positive influence on economic growth.

Following the earlier literature, we approach financial development both from a quantitative and a qualitative perspectives. On the quantitative side, we apply non-bank loans and total corporate loans relative to regional gross products (GRP) as measures for regional bank lending volumes. On the qualitative side, to avoid potential opaqueness, we use the traditional performance measurements, return on equity and return on asset, as approximations for regional bank operating performance. We first regress regional growth on both quantity and quality variables. As predicted by our model, we find a significantly positive relationship between regional savings bank development and local economic growth. Both kinds of determinants are highly significant and positive, and the explanatory power of the quantity of intermediation is much higher than that of the quality. Furthermore, we want to test whether the effect of regional intermediation differs in more versus less developed regions by running interactive regressions to distinguish the effect in rich and poor regions. We find that regional banks are more important in less developed regions. The results remain robust if we control for savings bank and regional specific effects. They are also robust to the use of alternative economic development measures. Based on these findings, we argue that regional bank could spur local economic growth by preventing capital drain from the poor to rich regions.

The paper is organized as follows. Section 2 develops the model and derives the predictions, which are subsequently empirically tested. In Section 3 we describe the data used in the empirical analysis, presents and discusses the empirical results and provides some robustness tests. Section 4 concludes.

2   A Theoretical Model

General Environment.   Consider an overlapping generations model.[1] There is an infinite sequence of two period lived, overlapping generations. At each date $t = 0, 1, \ldots$, a continuum of mass $\mathcal{L} = 1$ of young agents is born. All agents are risk-neutral, they care only about old-age consumption.

There is a single final good which can either be consumed or used to build up

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[1]Our model is closest to Bernanke and Gertler (1989) or Boyd and Smith (1997), building of course on Diamond (1965). See also Kiyotaki and Moore (1997).

capital for the following period. Capital is produced by entrepreneurs, using an indivisible capital production technology. Each project requires I units of final goods and produces an expected return or R units of capital, of which a part $R_p < R$ is pledgeable. Furthermore, projects need to be monitored, for example by banks. Monitoring costs are γ per project.[2]

Capital, again, is used to produce consumption goods. Be K_t the capital stock at date t. Then the final good output is $Y_t = F(K_t, \mathcal{L}_t)$, following a neoclassical production function. For concreteness, assume that $Y_t = c \, K_t^\alpha \, \mathcal{L}_t^{1-\alpha} = c \, K_t^\alpha$. Hence, the complete production process takes two steps. First, final goods need to be turned into capital (by entrepreneurs). Second, capital is used to produce new final goods for consumption.

Summing up, the economy works as follows. A generation earns wages while it is young. It needs this income to save for future consumption. There are two different ways to save. One can either invest (deposit) money at a bank, which then hands out the money to entrepreneurs in the form of loans, and monitors these entrepreneurs. Otherwise, one can take out a loan, become an entrepreneur and invest in 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 (then old) entrepreneur. However, production requires not only capital but also labor. Hence entrepreneurs need to pay out wages to the next generation, these wages will then again be saved for the next period; the model starts over again.

For a bank, there are two alternative classes of investment. It can either hand out loans, as described above. It can also invest in an interregional financial market. For exposition, we assume that the interest rate r is exogenous,[3] hence the region is considered to be a small open economy. Investment at 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, instead of investing, the region could also borrow from financial markets. Both capital and labor are assumed to be immobile. As a consequence, interregional investment and borrowing is possible only with respect to the final consumption good. Let us assume that *regional banks* invest only within the region, and let us call *interregional banks* those banks that also invest outside the region. Without loss of generality, one can assume that interregional banks *only* invest outside.

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[2]These assumptions can be micro-founded following (Tirole, 2006, chapter 9.2). Our R_p is equivalent to $p_H (R - B/\Delta p)$ in the book, our γ is called c in the book. In our model, if the bank monitors many uncorrelated entrepreneurs, delegation costs converge to zero as in the model of Diamond (1984).

[3]Boyd and Smith (1997) present a model with two regions and endogenous rates.

Figure 1: The Structure of the Regional Economy
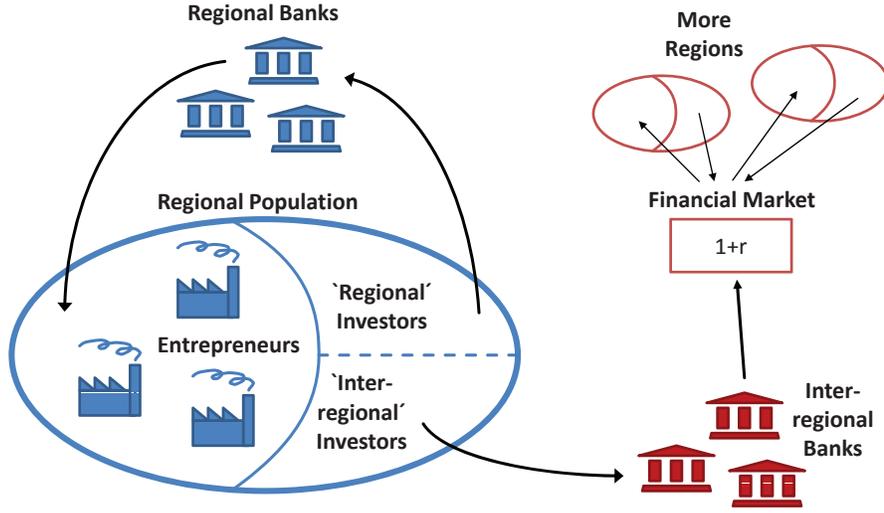
The structure of the regional economy is depicted in Figure 1. Entrepreneurs use their capital to produce consumption goods. For the capital production, they need finance, which they get from the regional banking system. The regional banks, in turn, refinance from regional investors (depositors). The rest of regional savings is invested at interregional banks, which then invest outside the region.

Markets. Consider a region in which agents are initially endowed with consumption goods A_t.[4] Agents can now try and borrow more from a bank, in order to generate capital to produce more consumption goods. Assume for the moment that pledgeable income is small, such that there is *credit rationing* in the economy.[5] Consequently, in order to obtain a loan, entrepreneurs need to invest their complete own endowment A, thus they borrow the difference $I - A$ from a regional bank. If banks grant n loans altogether, the aggregate loan volume in the region is $L = n(I - A)$. From each loan, a bank receives the pledgeable part R_p, hence the zero-profit condition implies that it repays $R_p - \gamma$ to investors (depositors). The entrepreneur himself remains with the non-pledgeable part $R - R_p$. After repayment, investors and entrepreneurs have capital

$$K_i = n(R_p - \gamma) \quad \text{and} \quad K_e = n(R - R_p). \tag{1}$$

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[4] In the following, we concentrate on one period and hence omit the time index t.

[5] We give according conditions and discuss the case without credit rationing in the appendix.

Aggregate capital in the region is thus

$$K = K_i + K_e = n\,(R - \gamma). \tag{2}$$

This aggregate capital K is now used to produce the consumption good, employing the next period's labor force. The labor market is competitive, thus the equilibrium wage is

$$W = c\,(1 - \alpha)\,K^\alpha, \tag{3}$$

and the net output of final consumption goods is

$$Y - W = c\,K^\alpha - c\,(1 - \alpha)\,K^\alpha = c\,\alpha\,K^\alpha = c\,\alpha\,n^\alpha\,(R - \gamma)^\alpha. \tag{4}$$

Of this aggregate output, a fraction $K_i/(K_i + K_e)$ belongs to the investors, and a fraction $K_e/(K_i + K_e)$ belongs to the entrepreneurs. Now remember that as an alternative, banks could have invested abroad, in which case they could 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 home region. Because investors have invested an aggregate $L = n\,(I - A)$ in the region,

$$n\,(1 + r)\,(I - A) = \frac{R_p - \gamma}{R - \gamma}\,c\,\alpha\,n^\alpha\,(R - \gamma)^\alpha \tag{5}$$

must hold. Solving for n,

$$n = \frac{1}{(R - \gamma)}\,\sqrt[1-\alpha]{\frac{c\,\alpha\,(R_p - \gamma)}{(1 + r)\,(I - A)}}. \tag{6}$$

Now if n projects are financed, the aggregate amount of capital is given by (2), and the wage W is given by (3), hence

$$W = c\,(1 - \alpha)\,K^\alpha = c\,(1 - \alpha)\,n^\alpha\,(R - \gamma)^\alpha$$
$$= c\,(1 - \alpha)\left(\frac{c\,\alpha\,(R_p - \gamma)}{(1 + r)\,(I - A)}\right)^{\frac{\alpha}{1-\alpha}}. \tag{7}$$

This wage W serves as assets for new projects for the young generation. The cycle can begin anew. If $W > A$, the economy is growing; if $W < A$, it is shrinking.

Let us discuss the financial system in some more detail. Given that n projects are financed within the region, there is an aggregate amount $n\,A$ of inside finance that is not channeled through the financial system. Each entrepreneur needs an additional $I - A$, hence the aggregate amount of regional lending is $L = n\,(I - A)$.

Given that the region is inhabited by $\mathcal{L} = 1$ agents, each endowed with A, the difference $A - nA - n(I - A) = A - nI$ is invested abroad by interregional banks.

Importantly, there can be a *capital drain* from less developed regions: Consider a poor region, with low A. Then an entrepreneur needs 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 it must be scarce. Hence in equilibrium, the number of firms n must be small. Hence only few firms receive finance, and the bulk of the region's savings are drained away from outside the region.

Results. Let us derive some relations between some variables. The first proposition looks at partial derivatives. To avoid confusion, we add time-indices to the variables.

Intuitively, if the loan volume L_t is larger, more loans n_t can be granted. The additional entrepreneurs add their own assets as inside finance. Consequently, the amount of capital K_t will increase. This leads to an increase in Y_t, even taking into account the increasing wages W_t. Consequently, $Y_t - Y_{t-1}$ increases. Given that L_t is determined endogenously in the previous period of the model, we can only take partial derivatives.

Along the same line, let us discuss the effect of regional bank efficiency on regional growth. Quite naturally, efficiency spurs growth: More efficient banks leave more capital to the investors. More regional finance can be attracted. Consequently, Y_t rises for two reasons: a decreasing γ has a positive effect on the remaining capital, and in addition, more investment can be kept in the region. Again we consider the partial derivative (short-term effects) with respect to γ.

Proposition 1 *A higher volume in the regional banking system increases regional GRP growth, $\partial(Y_t - Y_{t-1})/\partial L \geq 0$. Also, a more efficient regional banking system spurs regional GRP growth, $\partial(Y_t - Y_{t-1})/\partial\gamma < 0$.*

Proofs are in the appendix. The following proposition states that in a region with more initial assets A, the number of projects n will be higher. The intuition going as follows: If A is rather high, inside finance within each firm is relatively high, and entrepreneurs need to attract relatively little outside finance $I - A$ from banks. Consequently, the repayment R_p that they can pledge is relatively

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high in proportion to the loan volume $I - A$. Given that (due to the second step in the production function) there are decreasing returns to scale, more projects can be carried out in the region, and still the interest rate of r can be matched.

The second part of the proposition is slightly more subtle. If initial assets A are high, a shock in the regional loan volume L has a higher impact on growth, because each dollar in loans is matched by more additional dollars in inside finance by entrepreneurs. On the other hand, L has a lower impact on growth because the natural number of projects is already relatively high, hence due to decreasing returns, additional investment increases output by only little. The following proposition shows that the second effect dominates the first one, hence that the effect of regional finance decreases if the region is relatively developed. Furthermore, it makes an analogous point with respect to bank efficiency.

Proposition 2 *A richer region attracts more investment, $dn/dA \geq 0$. Richer regions are still richer after one period, $dW/dA \geq 0$. In a less developed region with lower A, the impact of an expansion in loan volume is higher, and the impact of an efficiency improvement is larger.*

Remember that W, being one period's labor income, also measures the following period's assets, $A_{t+1} = W_t$, and A measures previous period's wages, $A_t = W_{t-1}$, the difference $W - A$ actually measures GRP (gross regional product) growth, $W_t - A_t = W_t - W_{t-1}$. Hence the above proposition states that a region that starts of poorer than another will also be poorer in future periods. This fact is due to the pledgeable income problem, it would not hold if finance were frictionless.

3 Empirical Analysis

In the empirical analysis, we test the two propositions derived from the theoretical model, using a data set of 457 local savings banks and the corresponding regional statistics in Germany. Germany, with its strong regional banking sector, lends itself especially well for an empirical study of regional banks. Concentrating on regions within one country, one largely avoids comparability issues between regions. Let us start with a short overview over the German banking landscape.

3.1 Overview over the German Banking System

There are three main banking groups in the regional banking market: the branches from big commercial banks, the savings banking group and the co-operative banking group (Schmidt and Tyrell, 2004; Hackethal, 2004). The big four commercial banks represent the interregional financial institutions in our sample; while the local savings banks and the credit cooperative are typical regional banks that only operate in the regions they are based in. The clear boarder of regional and interregional banking sectors in Germany provides a neat sample of regional banks for an investigation of their effects on regional economic development.

In the local retail banking market, the branches from large interregional banks compete with the savings banks and the credit cooperatives. Unlike local branches of big commercial banks, savings banks and local credit cooperatives are independent financial institutions. The WGZ bank, DZ bank, Deka bank, and the Landesbanks basically act as the clearing institutions for interbank transfers and support the much smaller local banks in providing complex, non-standard products and services to their customers. The small size and independency of savings banks and credit cooperatives entail a competitive advantage with respect to customer proximity and quick decision making in local retail banking market. Furthermore, because of the regional evolvements as shareholders or memberships, they are more important funding providers to individuals and small and medium-size enterprizes in the regions they are based on to support the local financing demand, especially in the relatively poor regions with less presence of the interregional banks. Although both the savings banks and credit cooperatives in Germany adopt the regional operating principle, we choose to focus on savings banks in this study: with almost twice the market share in total corporate loans, saving banks are more important market players in the market for local corporate finance.

Table 1, panel A presents the market shares of these three main banking groups according to the bank total assets and total corporate loans. At the end of 2007, the savings banks have a market share of total bank assets for about 13.70 percent, compared with the big commercial banks and credit cooperatives of 18.41 percent and 8.29 percent, respectively. Although the four big commercial banks enjoy a higher market share in total bank assets, the savings banks are the most important corporate loan providers with a market share 22.51 percent, about 8 percent higher than the four big commercial banks and more than 10 percent higher than the local credit cooperatives. From the year 1999 to 2007, the proportion of total bank assets for the big commercial bank raised slightly

from 14.37 percent to 18.41 percent, however the share of total corporate loans declined from 18.14 percent in 1999 to 14.62 percent in 2007. The market share from the savings banks and credit cooperatives in total corporate loans remain stable during that period. The results support that savings banks and credit cooperatives strongly focus on retail banking business, which is confirmed by the variable COM, the share of commission income in total bank income according the consolidated balance sheet, in panel B. At the end of 2007, the proportion of non-interest income account for 29.04 percent in bank total income for the savings banks, and 31.31 percent for the credit cooperatives, differentiated from the big commercial banks with 45.46 percent. Consequently, the savings banks and credit cooperatives enjoy a higher interest margin, as shown by the variable of Intmar in panel B. Due to the focus on capital market oriented business with large corporations, institutions, and wealthy individuals, the profitability of the big commercial banks are more volatile than the saving banks and credit cooperatives. As shown by the variable of ROE in panel B, Table 1, the return on equity of the big banks, from the year 1999 to 2007, are contingent on the economic situation; while the profitability of the savings banks and credit cooperatives are steady and not strongly influenced by the business cycle. Although, theoretically, the big commercial banks should enjoy the advantages of economy of scale and easy diversification, according to the cost income ratio represented by CIR in panel B of Table 1, the savings banks and credit cooperatives maintain a relatively higher efficiency during the year 1999 to 2007 than the big commercial banks. The cost income ratio of savings banks is on average 11.4 percent lower than big commercial banks and 6.5 percent lower than the credit cooperatives for the period 1999 to 2007. Generally, we detect that the regional banks in Germany have stronger focus on retail banking market, and with it enjoy a higher interest margin and stable return on equity. The big commercial banks address more on the capital market oriented investment banking business and slightly lose their market shares during the competition with regional banks on corporate lending from 1999 to 2007.

3.2   Data Description and Variables

Our unique data set combines information from three main data resources. The savings bank operating and financial data is provided by the German Savings Bank Association (DSGV), the regional macroeconomic statistic is collected by the German Federal Statistic Ministry, and the information about local banking market competition is provided by German Bundesbank. In total, the data covers 457 savings banks and 440 administrative districts for a time period from 1995 to 2004. The matching of all the data sets on savings banks financial

performance and regional economic situation is not straightforward. Because in some of the administrative districts operate two savings banks or more; while it could also be that one savings bank is responsible for two administrative regions. For the first case, we take all the savings banks in this region into consideration. This means that we assign all these savings banks into one region. In the second case, we only consider the region where the headquarter of this savings bank is located. In this context, we have a many to one match, which means that a region with more than one savings bank is allowed. Finally, we have 395 groups for a time series of 10 years.

Regional Economic Development and Regional Macroeconomic Control Variables. Following the classical literature on finance and growth (King and Levine, 1993), regional economic growth is approximated by the growth rate of regional GRP per capita. Naturally, the GRP growth rate could be influenced by the general macroeconomic conditions besides financial development in a certain region. To control for these macroeconomic effects, we include the inflation rate, savings rate, and the absolute value of GRP per capita in a certain administrative region in all the regression models. As robustness test, we use the growth rate of new business registrations in a certain region instead of Economic growth rate as dependent variable to approximate the regional economic preposterousness.

Regional Banking Market. To compare the role of interregional and regional banks on local economic development, we need to present the market shares of the three main banking groups in the respective local market. As described in the above subsection, the big commercial banks with branches all over the country belong to the interregional banking group in our sample, and the savings banks and credit cooperatives are the regional banks that only operate in the region they are based on. The local market shares of the big commercial banks, the savings banks and the credit cooperatives are estimated on the basis of the number of branches of any one bank institution in each administrative district over the total number of bank branches. The data is provided by the German Bundesbank. Based on the local market shares of total branches for both regional and interregional banks , we further estimate the Herfindahl-Hirschman-Index as approximation of regional banking market competition. The variables of different market shares of regional and interregional banks and Herfindahl-Hirschman-Index are applied later in the subsections of correlation analysis and robustness test. In the correlation analysis, we first examine the different characteristics of bank presences for both interregional and regional banks. In the robustness test part, we further analyze and com-

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pare the different roles of interregional and regional banks in local economic development.

Savings-Bank Specific Variables.   In order to investigate the role of a savings bank on a region's economic development, we need to approximate the savings bank's operating quality and lending volume. An efficient bank should be profitable in most of the case. In our analysis we take the traditional profitability measurements of return on equity and return on total assets to proxy the financial health of a savings bank. From the quantity perspective, we take the volume of total non-bank loans and total corporate loans relative to regional GRP as measurements for the relative financing volume of a savings bank. In this sense, both the quality and quantity of a regional public financial intermediation are taken into account. All the variables on bank quality and lending volume are lagged one period in order to avoid the potential endogeneity problem. As robustness check, we also apply the market share of a savings bank in a certain region to examine whether regions with higher savings bank coverage are associated with higher economic growth.

Furthermore, we include bank size, bank capitalization ratio and the percentage of non-interest income as bank-specific control variables. Bank size is defined as the natural logarithm of total assets and is used to control different characteristics between relatively large and small savings banks, as well as the economies of scale. Banks with lower capitalization ratio might enjoy a relatively higher return on equity ratio and this could generate biased information. Besides, the capitalization ratio reflects the management's risk aversion and a control of this variable could adjust the possible bias of the final results we estimate. Finally, some of the savings banks might focus on potentially higher margin commission business, which could have a positive influence on the bank profitability and efficiency measure. Consequently, we control the bank non-interest income to isolate this effect. Table 2 defines the variables and summarize descriptive statistics for all the variables applied in the regression analysis.

3.3   Correlation Analysis

Table 3 shows the contemporaneous correlations between local market conditions and savings bank presence. The competitive structure in the respective local markets are approximated by the Herfindahl-Hirschman-Index, on the basis of the number of branches of any one banking institution in each administrative district over the total number of bank branches. Comparing the presence between savings banks and big national commercial banks, we find that the

market share of savings bank is negatively correlated with a region's GRP and GRP per capita, which means that the regional bank enjoy a higher market share in the less developed regions. Another regional banking group, the cooperative banks, share the same characteristic as the savings banks for presence more intensively in the less developed regions. On the opposite side, the big interregional commercial banks operate mostly in the relatively rich regions. This result suggest that the savings banks and cooperative banks are more important market players in the less developed regions to provide SME financing and other financial services to support the regional economic development. The big national banks would prefer set branches in the more developed regions, where more profitable projects could be invested. As a consequence, in such regions the bank competition is relatively high. Due to the regional principle, savings banks con only operate within a ceratin region. They are set for the purpose to promote local economic growth. Since the less developed regions are not very attractive for the other banks, they could enjoy a higher market share in those regions.

Table 4 focusses on the contemporaneous correlations between regional bank competition and savings bank profitability. Here we only deal with the savings bank, which is the mainly investigated banking group in our study. We take here return on equity and net interest margin as approximations for a savings bank profitability. The net interest margin is defined as the net interest income relative to a bank's total assets. The results show that savings banks' profitability are negatively correlated with the regional GRP per capita and regional bank competition, indicating that savings banks are more profitable in less developed regions and regions with less bank competitions, measured by GRP per capita and Herfindahl-Hirschman-Index, respectively. In addition, competition is negatively correlated with GRP per capita. Not surprisingly, bank competition is fiercer in the relatively rich regions than in the poor ones. These results also explain the reason why savings banks are more profitable in less developed regions. Because in less developed regions, the savings bank have local knowhow, close customer relationship, and consequently enjoy a comparative advantage on the banking competition. On the other hand, the big national commercial banks following the central decision making process are not as flexible as the regional small banks; besides most of them are concentrated on the "big deal" businesses rather than SME finance. Due to the less banking sector competitions, savings banks enjoy a higher interest margin in less developed regions. Consequently, they are more profitable than in the relatively highly developed regions with high competitive banking markets.

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3.4 Regression Analysis

In this subsection, we assess the direct link between savings banks and regional economic development by applying the fixed effect panel data analysis.[6] This way, we control for unobserved but constant variations across the cross-sectional units. It is, to some extent, equivalent to including a dummy for each region in our regressions.

General Effects of Regional Savings Banks on Economic Growth. We first test Proposition 1 from our theoretical part by estimating the following equation:

$$\Delta GRP_{jt} = \alpha_{it} + \beta_{it} X_{it-1} + \gamma_{it} B_{jt} + \delta_{it} C_{it} + \nu_{it} + \varepsilon_{it} \tag{8}$$

where ΔGRP_{jt} is the dependent variable measured as the growth rate of GRP per capita in region j at time t; X_{it-1} is the proxy of savings bank efficiency and lending behavior for bank i at time $t-1$; B_{jt} are the regional control variables for region j at time t; C_{it} are the bank specific control variable for bank i at time t. Further, α_{it} is a constant, and β_{it}, γ_{it}, δ_{it} are coefficients, while ε_{it} and ν_{it} are the usual and unit specific residual, respectively. All regressions include region and macroeconomic time shocks (as proxied by the annual inflation rate fixed effects. The estimations use ordinary least squares. We avoid using current financial performance of the savings banks, since contemporaneous financial and environmental performance are most likely jointly determined. Instead, we use lagged financial performance, which is considered as predetermined. Thus, lagging financial performance avoids the potential endogeneity problem.

The fixed-effect methodology allows for a different intercept term $\alpha_{it} + \nu_{it}$ for each cross-section in the pooled analysis. That is, the term of ν_{it} in the regressions vary across the different regions thus enabling the model to accommodate regional specific differences. The X_{it-1} and ΔGRP_{jt} are converted for each observation into a deviation from the mean in that unit and this sweeps out the unit effects. So the model regresses $\Delta GRP_{jt} - mean(\Delta GRP_{jt})$ on $X_{it-1} - mean(X_{it-1})$. This is often called "within" estimator because it looks at how changes in the explanatory variables cause dependent variable to vary around a mean within the unit.

The estimation results, Table 5, indicate that savings bank operating performance and lending behavior are positively and significantly associated with the

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[6]The results of the F-test performed indicate that the fixed effects model is more appropriate than the pooled effects model. On the other hand, The Hausman-test also indicates that fixed effects model dominates the the random effects model in our case.

GRP per capita growth rate using fixed effect OLS regressions. The dependent variable is per capita GRP growth rate over the 1995-2004 period (GRP), and the four indicators of savings bank lending behavior and operating performance are the total non-bank loans relative to regional GRP, total corporate loans divided by regional GRP, return on equity, and return on total assets. The first two columns show that the volume of savings bank total non-bank loans and corporate loans relative to GRP are positively associated with the regions' economic development, which means that a relatively higher ratio of local credit provided by the savings bank could spur the region's economic development in the next period. The last two columns contain the results with independent variables of ROE and ROA. The coefficients of these two profitability proxies of the savings banks are positive with 5 percent significance. The results confirm that savings bank quality is associated with an increase in a regions economic growth in the next period. As shown, all of these four indicators are highly correlated with economic growth in the fixed effect panel specifications. The data generally support the hypothesis that the level of savings bank development is a good predictor of subsequent economic growth. The results further show reasonable values for the adjusted R-square from 10 to 29 percent, indicating that the specified model is appropriate to explain regional economic growth. The results confirm our theoretical prediction in proposition 1.

Turning to control variables, we see that inflation is negatively related to the regional economic growth. This result is consistent with the notion that higher inflation rate leads to uncertainty about the future profitability of investment projects and as a result suspend economic development. The per capita income is associated with increased economic growth; while savings rate are not significantly associated with the dependent variable. Bank size and the percentage of non-interest income are negatively correlated with regional economic growth; while a savings bank's equity ratio is not associated with the dependent variable in most of our specifications.

The Effect in Less Developed vs. More Developed Regions. We further want to test Proposition 2 in the theoretical part by estimating a modified version of (8). We create an additional variable $Inter_{it}$ which interacts performance of the savings bank and the regional development, approximated by GRP per capita. The introduction of this interaction term enables us to differentiate the relationship between savings bank performance and lending volume and regional economic growth in less vs. more developed regions. The estimation model is of the form

$$\Delta GRP_{jt} = \alpha_{it} + \beta_{it} X_{it-1} + \lambda_{it} Inter_{it} + \gamma_{it} B_{jt} + \delta_{it} C_{it} + \nu_{it} + \varepsilon_{it} \qquad (9)$$

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where $Inter_{it}$ is the product of the savings bank independent variables and the regional GRP per capita. The other variables are as before in (8).

The results, which are presented in Table 6, illustrate that the savings bank quantity and quality improvements are effective in promoting regional economic growth. The interaction term, however, is negative and highly significant, indicating that the effect is stronger in the less developed regions than in the high developed regions. The results confirm our theoretical prediction in proposition 2.

Overall, the results in the regression analysis suggest that savings bank as regional funding provider is positively associated with local economic growth in the next period, and the effect is even stronger in the relatively poor regions. The stronger of role of savings banks in less developed regions demonstrate that regional banks are more important funding providers in poor regions and they are efficient in prevent capital drain from the poor to rich regions. The results are consistent with our theoretical model.

3.5   Robustness Tests

This subsection presents a number of tests to demonstrate the robustness of our results to changes of the underlying assumptions. We first control other potential influence factors on regional economic growth by including the absolute value of total labor force, the growth rate of total labor force. We further exclude the potential concerns on associations of savings bank specific characteristics and regional economic growth by introducing another measure for local economic development.

Controlling for Local Labor Supply.   In the classical production function, the economic production depend on two inputs, capital and labor. Consequently, one concern with our analysis is that the results may be driven by the regional labor supply that not captured by a region's GRP per capita, total area, savings rate, and inflation rate. We therefore include several test to verify that indeed our results are not driven by other characteristics, like the local lobar supply. We first test whether the regional economic growth is associated with savings bank lending volume and operating performance after controlling for regional labor force. In a similar spirit, we further examine our results by controlling the growth rate of local labor force. The results indicate that savings bank quantity and quality are positively and significantly associated with regional economic

growth rate.[7] The significance level for all the regressions with interaction terms are above 1 percent level. For the basic regressions without interaction terms, the significance level are more than 10 percent for the variables of ROE and ROA and above 1 percent for the variables of CIR, Loan1 and Loan2. Overall, our results after controlling the local labor supply is not different from our initial regressions and effect of savings bank quantity and quality does not diminish after taking the regional labor supply into consideration.

An Alternative Measure of Regional Economic Development. So far in the analysis we use the growth rate of GRP per capita as dependent variable. Although all the savings bank independent variables are lagged one period, there might still be concerns on the certain causality between the regional economic growth and savings bank profitability and lending behavior. We therefore approximate the regional economic development by the growth rate of new business registrations in a certain region and further examine their relationship with the market shares of saving banks as well as the cooperative banks and big commercial banks. A further advantage of this analysis is that we can compare different roles of interregional and regional banks on local economic growth. Again, we run the regression both with and without interaction terms.

Our results in Table 7 suggest that savings bank have a positive and significant effect on regional development, and the highly significant negative coefficient of the interaction term indicates that the effect is stronger especially in relatively poor regions. Regions with higher market shares of savings banks are associated with higher growth rate of new business registrations, which means more prosper economic conditions and the effect of a higher market share of savings bank in less developed regions is even stronger. This result confirms that savings banks are more important financial intermediations in less developed regions. In those non-attractive regions, savings banks are more important to promote economic growth and prevent capital outflows. The cooperative banks, another representative from the regional banking group, exhibit the same effect on promoting regional economic development. A higher market share of the credit cooperatives are associated with higher growth rate of new business registration. Similarly, in the interactive regression, the coefficient is positive and significant for the the market share of cooperative banks, and the coefficient of the interaction term is negative and highly significant, indicating that effect is stronger in the relatively poor regions. However, the results for the big commercial banks are on the opposite. The coefficient for the market share of big commercial bank is negative and significant, and the coefficient for the interaction term is positive and highly significant. The negative sign of the coefficient

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[7]The results are not reported here, however are available on demand.

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of local market shares for big commercial banks suggests that a higher proportion of big commercial bank branches in a certain region might not improve the regional development. The reason is that the presence of big commercial banks might crowd out the regional banks, which have stronger focus on local corporate finance.

If we compare the absolute value of the coefficients in the basic regressions and the interactive regressions, we find that the coefficients for the market shares of the three banking groups are significantly different between these two regression models. When the wealth of the region, approximated by the GRP per capita in a certain region, is controlled by the interaction terms, the measure effects of savings bank on regional economic development is significantly increased. This is true for both the interregional and regional banks. The results demonstrate that the effects of regional bank on local economic development is discriminative in less vs. more developed regions. In the more developed regions, as explained by the theoretical model, because of higher initial endowments it is more attractive for the interregional banks. However, in the less developed regions with lower initial endowments, the interregional banks only have limited presence there. In this context, the interregional banks have more positive role on the local economic development for the rich regions than the poor, as shown by the interactive regression. On the contrary, the regional banks, which don't have the mobile opportunity, are engines for the local growth, especially for the poor regions with a danger of capital drain by the interregional banks.

4   Conclusion

The role of regional banks in a financial integrated market is discussible. Earlier empirical studies suggest that local financial development remain important in a financially integrated world and there exist a causal link between local financial development and real economic growth. However, these studies have mainly proved the relationship between finance and growth, rather than investigating the different roles of interregional and regional bank in preventing capital drain from poor regions.

In this paper, we investigate the potential role of regional banks on preventing capital drains from poor regions by interacting the effect of regional banking development on local economic development with regional wealth. If there is a positive capital flow from rich to poor regions, interregional banks should be more important in poor regions as external funding providers. On the contrary, if there is a danger of capital drain in less developed regions, regional banks

should be prominent to fulfill the local capital demand in poor regions.

We first set forth a model of regional financial development and economic growth. The model suggests that under credit rationing, rich regions are more attractive for external investment because of higher initial endowments and poor regions would have less projects to be financed. Thus, in a financial integrated market, capital will flow from poor to rich regions when no intervention exerted. Accordingly, due to the small amount of projects financed in less developed regions, an expansion of investment could enjoy an increasing return to capital productivity in poor regions. Thus, an improvement of local financial development in poor regions will have a higher impact on economic growth. We then test the role of regional bank on economic growth from an empirical perspective. First, our correlation analysis exhibits that regional banks are prominent market players in less developed regions. They also enjoy a higher profitability in poor regions than in the rich ones. On the contrary, big interregional banks concentrate on the rich regions and profit more in rich than poor regions. Our following regression results have further confirmed the earlier theoretical results. The basic and interactive regression estimations show that regional banking development improve local economic growth and effect is stronger in less developed regions. Overall, both our theoretical and empirical demonstrate that rich regions are more attractive places for investments and regional banks are efficient in preventing a capital drain from poor to rich regions.

Our analysis provides a framework of the role of regional banks in a financial integrated market. Moreover, this analysis may help contribute to discussions of public policies toward bank consolidations, and optimal banking structures of regional and interregional banks. The extant research is consistent with favorable economic consequences from policies that support local financial development in relatively poor regions to prevent potential capital drains. In general, we also see two avenues for future research. First, our results capture only the relative benefits of regional banks on promoting local economic growth in poor regions. We do not identify the optimal banking structure of regional and interregional banks in a certain region, as well as the interaction between regional and interregional banks. Second, our study also does not capture the role of regional and interregional banks in boom and recession times. Analyzing the different reactions and lending behaviors from regional and interregional banks during financial crises is an important topic for future research.

Table 1: This table presents the market shares and performance of savings banks, the big coomercial banks and the cooperative banks, MS SB is the market share of savings banks, MS CB is the market share of the coopeartive banks, MS BB is the market share of the big commercial banks, CIR is the cost income ratio in percentage, ROE is the ratio of return on equity in percentage, Intmar is the interest margin in percentage measured by total interest income relative total bank assets, COM is the proportion of commission income on total bank income in percentage.

Panel A: Banking Group Market Share

	Bank	1999	2000	2001	2002	2003	2004	2005	2006	2007
Total Bank Assets										
	MS SB	16.12	15.52	15.43	15.47	15.45	15.04	14.69	14.29	13.70
	MS CB	9.31	8.68	8.64	8.67	8.75	8.65	8.57	8.46	8.29
	MS BB	14.37	15.77	16.08	16.37	16.15	18.27	17.77	18.04	18.41
Total Corporate Loans										
	MS SB	21.58	21.67	21.99	22.40	22.54	22.89	22.94	22.96	22.51
	MS CB	12.69	12.37	12.20	12.33	12.35	12.49	12.62	12.58	12.34
	MS BB	18.14	17.55	16.67	15.33	14.46	15.38	15.35	14.52	14.62

Panel B: Banking Group Performance

	Commercial Bank				Savings Bank				Cooperative Bank			
	CIR	ROE	Intmar	COM	CIR	ROE	Intmar	COM	CIR	ROE	Intmar	COM
1999	80.40	7.01	1.43	48.96	67.00	6.12	2.48	22.18	70.40	4.74	2.49	24.85
2000	86.50	7.31	1.59	65.38	69.00	6.02	2.33	23.47	76.10	4.09	2.45	27.94
2001	91.60	4.24	1.15	55.92	70.90	5.06	2.28	21.95	78.90	4.41	2.41	24.17
2002	80.20	0.04	1.34	45.04	67.90	4.65	2.38	20.59	75.20	6.60	2.49	22.89
2003	87.00	-6.57	1.17	50.32	67.50	4.00	2.40	22.04	74.30	5.24	2.51	24.32
2004	77.80	-1.42	1.25	45.57	65.80	5.03	2.35	23.98	72.30	5.26	2.51	25.86
2005	73.50	15.52	1.27	47.17	67.10	5.60	2.30	24.52	73.60	9.00	2.46	27.31
2006	72.30	9.12	1.33	47.72	67.20	4.95	2.23	26.06	76.60	8.51	2.30	28.78
2007	67.40	15.60	1.30	45.46	71.70	4.20	2.06	29.04	75.20	5.12	2.15	31.31

Table 2: This table shows the descriptive statistics of all the variables applied in the regression. ROE is the return on equity lagged one period, ROA is the return on total assets lagged one period, Loan1 is the percentage of total non-banks loans relative to regional GRP lagged one period, Loan2 is the percentage of total corporate loans relative to regional GRP lagged one period, COM is the percentage of non-interest income relative to both interest income, Equity Ratio is the ratio of equity relative to total assets in percentage, Total Assets is the total bank assets of a savings bank in Mio. Euro, RMS SB is the market share of the saving banks in a certain region based on number of branches, RMS CB is the market share of the cooperative banks in a certain region based on number of branches, RMS BB is the market share of the big commercial banks in a certain region based on number of branches, HHI is the Hirschmann-Herfindahl-Index of market shares approximated with the share of branches, GRP Capita Growth is the annual growth rate regional gross products in percentage, GRP is the gross regional product in Bn. Euro, GRP Capita is the absolute value of gross regional product per capita in tsd. Euro, Total Area is the natural logarithm of a regions total area measured in Kilometer, Inflation is the annual GDP deflator in percentage, Savings Rate is the annual savings rate in a certain region in percentage, Business Registration is the regional growth rate of new business registration.

Variables	Mean	Std.Dev	Min	Max	Obs.
Panel I: Regional Bank Specific Variables					
ROE (%)	5.556	4.33	-87.275	69.301	5127
ROA (%)	0.234	0.17	-3.967	2.038	5127
Loan1 (%)	12.417	10.733	0.225	65.691	3160
Loan2 (%)	26.846	21.878	0.499	133.995	3160
Com (%)	21.312	5.000	6.227	53.042	5135
Equity ratio (%)	4.3	0.9	2	8.7	5135
Total Assets (Mio. Euro)	1913.413	2648.776	98.364	33799.417	5135
Panel II: Regional Banking Market Structure					
RMS SB	34.822	6.164	8.475	61.333	3555
RMS CB	27.881	9.696	4.95	58.879	3555
RMS BB	37.297	9.179	12.5	74.510	3555
HHI	0.196	0.063	0.09	0.532	3555
Panel III: Regional Economic Development					
GRP capita growth (%)	1.995	3.142	-15.983	25.484	3554
GRP (Mio. Euro)	5697.462	6763.153	741.820	78493.563	3949
GRP capita (tsd. Euro)	23.226	7.782	10.118	74.118	3949
Total area (tsd.sq.km.)	896.228	599.242	37.22	3058.25	3902
Inflation (%)	0.619	0.673	-0.678	1.874	4740
Savings rate (%)	10.193	1.005	6.8	12.3	4345
Business registration (%)	1.957	11.913	-30.12	83.260	2765

Table 3: This table shows contemporaneous correlations between regional macroeconomic conditions and market shares of savings banks. ** denotes significance on the 1%-level, * on the 5%-level.

	Savings Bank Presence				
	GRP	GRP Capita	MS SB	MS CB	MS PB
GRP	1.000				
GRP Capita	0.434**	1.000			
RMS SB	-0.042*	-0.066**	1.000		
RMS CB	-0.182*	-0.056**	-0.400**	1.000	
RMS BB	0.221**	0.103**	-0.250**	-0.788**	1.000

Table 4: This table shows contemporaneous correlations between savings bank profitability and other bank level as well as regional level conditions. ** denotes significance on the 1%-level, * on the 5%-level.

	Regional Bank Competition and Bank Profitability				
	ROE	Intmar	GRP	GRP Capita	HHI
ROE	1.000				
Intmar	0.317**	1.000			
GRP	-0.017	-0.118	1.000		
GRP Capita	-0.125**	-0.352**	0.434**	1.000	
HHI	0.049**	0.117**	-0.340**	-0.308**	1.000

Table 5: This table shows the impact of local savings bank on regional economic growth. The dependent variable is the annual growth rate of GRP per capita . The results are estimated from fixed effect panel regressions. The bank-specific and regional specific effects are controlled in all the regressions. *** denotes significance on the 0.1%-level, ** on the 1%-level, * on the 5%-level.

	Growth Rate of GRP per capita			
	Quantity		Quality	
Loan1	0.549***			
	(0.045)			
Loan2		0.771***		
		(0.066)		
ROE			0.037*	
			(0.017)	
ROA				0.981*
				(0.467)
Log (area)	-14.436	-10.279	-9.844	-9.817
	(10.397)	(11.204)	(6.060)	(6.040)
GDP Capita	1.632***	1.531***	0.875***	0.876***
	(0.103)	(0.107)	(0.082)	(0.082)
Inflation	-0.751***	-0.852***	-0.843***	-0.846***
	(0.110)	(0.114)	(0.113)	(0.113)
Savings Rate	-0.412**	-0.237	-0.057	-0.050
	(0.132)	(0.138)	(0.107)	(0.107)
Size	-49.018***	-41.297***	-11.290***	-11.259***
	(3.925)	(3.644)	(2.033)	(2.033)
Non Interest	-0.129***	-0.119***	-0.077**	-0.077**
	(0.028)	(0.029)	(0.026)	(0.026)
Equity Ratio	-0.663***	-0.456**	-0.321*	-0.354**
	(0.153)	(0.153)	(0.126)	(0.125)
Constant	298.404***	244.357***	81.715***	81.492***
	(38.192)	(38.721)	(21.747)	(21.673)
R-squared	0.285	0.244	0.103	0.103
N	2737	2737	3519	3519
Group(bank)	395	395	395	395

Table 6: This table shows the impact of local savings bank on regional economic growth. The dependent variable is the annual growth rate of GRP per capita . The results are estimated from fixed effect panel regressions. The bank-specific and regional specific effects are controlled in all the regressions. *** denotes significance on the 0.1%-level, ** on the 1%-level, * on the 5%-level.

	Growth rate of GRP per capita			
	Quantity		Quality	
Loan1	1.123***			
	(0.070)			
loan1inter	-0.032***			
	(0.002)			
Loan2		2.049***		
		(0.127)		
loan2inter		-0.063***		
		(0.004)		
ROE			0.264***	
			(0.057)	
ROEinter			-0.011***	
			(0.003)	
ROA				8.524***
				(1.538)
ROAinter				-0.354***
				(0.068)
Log(area)	-9.968	-8.012	-10.401	-10.557
	(8.708)	(8.860)	(5.916)	(5.947)
GRP Capita	2.146***	2.031***	0.876***	0.886***
	(0.100)	(0.102)	(0.081)	(0.081)
Inflation	-0.596***	-0.668***	-0.817***	-0.821***
	(0.094)	(0.098)	(0.113)	(0.113)
Savings Rate	-0.409***	-0.280*	-0.102	-0.076
	(0.119)	(0.124)	(0.107)	(0.107)
Size	-36.557***	-32.635***	-10.763***	-10.505***
	(3.099)	(2.854)	(2.024)	(2.020)
Non interest	-0.128***	-0.121***	-0.074**	-0.072**
	(0.025)	(0.026)	(0.026)	(0.026)
Equity Ratio	-0.319*	-0.195	-0.278*	-0.281*
	(0.136)	(0.137)	(0.127)	(0.126)
Constant	201.879***	176.066***	80.354***	78.666***
	(30.919)	(30.016)	(21.312)	(21.364)
R-squared	0.443	0.405	0.110	0.114
N	2737	2737	3519	3519
Group(bank)	395	395	395	395

Table 7: This table compares the impact of regional and interregional bank on local economic development. The dependent variable is the annual growth rate of new business registragion. The results are estimated from fixed effect panel regressions. The regional specific effects are controlled in all the regressions. *** denotes significance on the 0.1%-level, ** on the 1%-level, * on the 5%-level.

	Growth rate of business registration					
RMS SB	0.342**			1.093**		
	(0.132)			(0.369)		
RMS CB		0.468**			1.770***	
		(0.151)			(0.367)	
RMS BB			-0.627***			-2.011***
			(0.104)			(0.260)
SBinter				-0.035*		
				(0.015)		
CBinter					-0.056***	
					(0.013)	
PBinter						0.062***
						(0.011)
Log(area)	37.638	41.805	36.895	39.801	31.908	29.263
	(22.759)	(22.598)	(23.494)	(22.541)	(22.675)	(22.983)
GRP Capita	0.507*	0.486*	0.400	1.744**	2.028***	-1.849***
	(0.226)	(0.223)	(0.224)	(0.584)	(0.438)	(0.419)
Inflation	-3.953***	-3.845***	-3.891***	-3.941***	-3.863***	-3.904***
	(0.284)	(0.282)	(0.281)	(0.283)	(0.282)	(0.281)
Savings Rate	19.162***	19.013***	18.499***	19.160***	19.173***	18.692***
	(0.509)	(0.491)	(0.499)	(0.510)	(0.491)	(0.497)
Constant	-310.909***	-321.811***	-264.917***	-344.097***	-331.998***	-195.738**
	(63.422)	(63.177)	(66.037)	(64.497)	(63.132)	(65.386)
R-squared	0.545	0.546	0.551	0.546	0.551	0.560
N	2342	2342	2342	2342	2342	2342
group(bank)	395	395	395	395	395	395

A Appendix

A.1 Absence of Credit Rationing

The number of entrepreneurs n is endogenous in the model. Hence every agent has the choice whether to use his assets A as inside finance in his own firm as an entrepreneur, or just deposit the assets at a bank as an investor. If the returns are higher for an entrepreneur, there is credit rationing. Under credit rationing, an entrepreneur invests A and receives $R - R_p$; investors pay $I - A$ in order to get $R_p - \gamma$ in return. Consequently, credit is rationed if

$$\frac{R - R_p}{A} > \frac{R_p - \gamma}{I - A},$$
$$A < I\,\frac{R - R_p}{R - \gamma}. \tag{10}$$

Let us now shortly discuss a rather developed economy (in the absence of credit rationing). Because credit is not rationed, (1) becomes $R_i = n\,(R - \gamma)$. Consequently, (5) becomes

$$n\,(1 + r)\,I = c\,\alpha\,n^\alpha\,(R - \gamma)^\alpha,$$
$$n = \sqrt[1-\alpha]{\frac{c\,\alpha\,(R - \gamma)^\alpha}{(1 + r)\,I}}. \tag{11}$$

The equilibrium wage is $W = c\,(1 - \alpha)\,n^\alpha\,(R - \gamma)^\alpha$, in analogy to (7). Clearly, the wage does not depend on initial assets A. Furthermore, $L = n\,I$ and thus $n = L/I$ (instead of $L = n\,(I - A)$ as before). Investment by regional banks are no longer multiplied by entrepreneurs' inside finance.

A.2 Proofs

Proof of Proposition 1:   First, the previous period's output Y_{t-1} is independent of today's loan volume L_t, hence we only need to consider $\partial Y_t / \partial L_t$ instead of $\partial(Y_t - Y_{t-1})/\partial L_t$. Now an increase in L_t directly increases the number of projects in the region. $L_t = n_t\,(I - A_t)$, hence $n_t = L_t/(I - A_t)$. More project produce more capital, $K_t = n_t\,(R - \gamma)$. Hence the output Y_t increases. This completes the first part of the proof. This proposition holds true in the absence of credit rationing, hence if (10) does not hold. Only the multiplier is smaller because outside finance crowds out inside finance, hence $n_t = L_t/I$. ∎

Proof of Proposition 2: According to (6), n is an increasing function in A. According to (7), W increases in n, hence it also increases in A. If (10) fails to hold, there is no credit rationing, hence W does not depend on A.

Take the derivative dW/dL, which is positive. Then consider this derivative at different levels of A. If the derivative is smaller for higher levels of A, the (first part of the) proof is complete. The argument for $dW/d\gamma$ then proceeds along the same line. Using (2), (3), and $n = L/(I - A)$ yields

$$W = c(1 - \alpha)\left(\frac{L(R - \gamma)}{I - A}\right)^{\alpha}. \tag{12}$$

The derivative with respect to L is

$$\frac{\partial W}{\partial L} = \frac{c(1 - \alpha)\alpha(R - \gamma)}{I - A}\left(\frac{L(R - \gamma)}{I - A}\right)^{\alpha - 1}. \tag{13}$$

According to this term, $\partial W/\partial L$ is *larger* for larger A. However, one needs to take into account that the natural (equilibrium) number of projects (and, thus, the amount of regional finance) also depends on A. Considering (5) yields

$$\frac{\partial W}{\partial L} = (1 + r)(1 - \alpha)\frac{R - \gamma}{R_p - \gamma}. \tag{14}$$

Hence the two effects cancel out exactly. However, this result holds true only if (10) holds and there is credit rationing. In more developed regions, $n = L/I$, hence the first channel is weaker. In this case, thus, $\partial W/\partial L$ is *smaller* for larger A, which completes the proof. ∎

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