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Geographic and demographic Bank outreach: Evidence from Germany's three-pillar banking system

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Working Paper No. 98

Geographic and Demographic Bank Outreach:
Evidence from Germany's Three-Pillar Banking
System

by

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2008

Geographic and Demographic Bank Outreach: Evidence from Germany's Three-Pillar Banking System

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Summary

This paper investigates the performance of Germany's three-pillar banking system in providing financial services nationwide, regarding different outreach indicators. At the federal state level, bank outreach shows South-North and West-East gaps. Combining regional and bank data at the district level for 2005, we examine the determinants of geographic and demographic branch penetration of the regional savings and cooperative banks. Both banking groups provide a larger branch penetration in more wealthy regions, but maintain a larger number of branches per inhabitant in less densely populated regions, easing access to retail banking services. With their comparatively large branch penetration in less wealthy regions, public savings banks help to reduce regional economic disparities. The branch penetration of both banking groups increases with the share of elder people and bank size in a region. Because of their public mission to serve all regions, public savings banks foster competition.

Zusammenfassung

Geographische und demographische Reichweite von Banken: Empirische Evidenz für Deutschlands Dreisäulen-Bankensystem

Der Beitrag untersucht die flächendeckende Bereitstellung von Finanzdienstleistungen durch das deutsche Dreisäulen-Bankensystem, wobei unterschiedliche Indikatoren der Reichweite betrachtet werden. Auf der Ebene der Bundesländer zeigen sich Süd-Nord und West-Ost-Gefälle. Durch Verknüpfung von Regional- und Bankdaten auf Kreisebene für das Jahr 2005 werden die Determinanten der geographischen und demographischen Bankstellenpenetration der regional tätigen Sparkassen und Genossenschaftsbanken untersucht. Beide Bankengruppen zeigen eine höhere Bankstellenversorgung in wirtschaftsstärkeren Regionen, unterhalten aber mehr Bankstellen pro Einwohner in dünner besiedelten Regionen, womit sie den Zugang zu Finanzdienstleistungen erleichtern. Mit ihrer relativ großen Bankstellenpenetration in wirtschaftsschwächeren Regionen tragen die Sparkassen zur Überwindung regionaler ökonomischer Disparitäten bei. Die Bankstellenversorgung beider Regionalbankgruppen steigt mit dem Anteil älterer Menschen und der Bankgröße in einer Region. Durch ihren öffentlichen Auftrag, alle Regionen zu versorgen, tragen die Sparkassen zur Sicherung des Wettbewerbs bei.

JEL classification/keywords: G21 – Banks; L1 - Market Structure, Firm Strategy, and Market Performance; L2 - Firm Objectives, Organization, and Behavior

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Geographic and Demographic Bank Outreach: Evidence from Germany's Three-Pillar Banking System

I. Introduction

The performance of financial systems has been usually measured by variables of financial sector depth and banking sector structure and performance, which are expected to determine the efficiency of capital allocation and thus economic development and growth. While most of the literature has focused on financial sector depth, measured by the ratio of private sector debt to GDP, and its economic impact in developing economies (Levine 2005), the quality of financial systems in industrialized economies has not been investigated comprehensively so far. Research on indicators to measure the quality with which financial systems perform their main functions (Hartmann et al. 2006) focuses on efficiency measures, neglecting aspects of access or distribution. Financial sector breadth or outreach, measured by access of the population to banking services, or geographic and demographic distribution, has only recently been put on the research agenda by the World Bank (Beck et al. 2006, Claessens 2006).

Concerns about unbanking or unequal access to banking services in developed countries have grown recently, because an ever more sophisticated and efficient financial system seems to go along with the risk of excluding an increasing number of people from financial services (Anderloni et al. 2007). This is driven by growing competitive pressure in the banking market due to globalization and technological change. It has led to profound structural changes through mergers, consolidation of branch networks and privatization of state-owned banks in most industrialized countries. These changes are likely to impair the provision of financial services to less profitable and poorly populated areas and to less profitable retail customer segments such as poor households and SMEs (small and medium-sized enterprises). Banking consolidation may reduce access of SMEs to finance, if large banks are less prone to lend to SMEs or soft information of relationship lending is lost in mergers and acquisitions.

The effects of technological change on access to finance are ambiguous: on the one hand, electronic distribution channels and progress in credit scoring technology have reduced prices and increased the geographical extent of retail banking markets.¹ On the

¹ To the changing role of distance in small business lending see *Petersen/Rajan (2002); Hannan (2003); Agarwal/Hauswald (2006)*.

other hand, replacing bank branches by direct banking channels excludes customers who need personal contact.² Since branches are still the most preferred distribution channel of retail banking services, many banks in the EU increasingly rely on them to target their customers' needs for personal advice. Retail banking constitutes over half of the total banking activity and generates 2% of EU GDP annually in gross income (ECB 2007, p. 39). Therefore, providing access to retail banking services is of great importance.

The German financial system is unique for two reasons: it is the prototype of a bank-based system, and still relies on the three-pillar commercial banking system composed of private banks, public savings banks and cooperative banks. This system has been abandoned by many European countries through privatizing their savings banks.

Even if the state guarantees of the German savings banks were abolished in 2005 because they constituted state aid incompatible with the EC Treaty, these banks are still in public hand and play a major role in the banking sector. In March 2008, savings banks accounted for 34%, private banks for 30% and cooperative banks for 12% of total banking assets (Deutsche Bundesbank 2008a, p. 24).³ In the retail banking segment, the savings banks play an even larger role (Bresler et al. 2007, Mullineux/Terberger 2006). In contrast to the nationwide operating big private banks, savings and cooperative banks are regional banks. Cooperative banks follow the non-profit mission to support the business of their members. Savings banks have the public mission to provide safe and interest-bearing investment opportunities and access to loans to the local population and SMEs. Their public mandate and ownership are economically justified, if there is a market failure through under-provision of financial services by private and cooperative banks. The often raised claim that because of the public pillar, the German banking sector is overbanked and unprofitable (Koetter et al. 2006), is premature. The lower profitability of German banks compared to their UK and US counterparts may signal a higher intensity of competition and economic welfare (Neumann/Reichel 2006, KfW 2005, Sachverständigenrat 2008). The comparatively low concentration and high branch density of the German banking market may imply broader access to financial services.

² Internet banking usage declines with age and increases with education and wealth (ECB 2007, p. 44; Neuberger 2007; Neuberger/Lehmann 1998).

³ The savings banks pillar comprises 444 municipal savings banks and 12 Landesbanken, the private bank pillar comprises five big banks (Deutsche Bank AG, Dresdner Bank AG, Hypovereinsbank AG, Commerzbank AG, Deutsche Postbank AG), branches of foreign banks, regional and other banks, and the cooperative bank pillar comprises 1232 local cooperative banks and two central institutions. The remaining banks are special commercial banks.

While cross-country evidence shows a large outreach of the German banking sector at the national level, a comprehensive study at the regional level is missing so far. Economic wealth is unevenly distributed in Germany, with prosperous, economically growing regions concentrated in the south, and poor, economically declining regions in the north and east. Demographic change through population aging and migration of young people to prosperous regions enhances regional disparities. This has caused political concern, given that the German population has a legal entitlement to equal living standards. To achieve this goal, a nationwide provision of bank services may play an important role.

Most of the literature on bank sector outreach is empirical with focus on cross-country evidence (Peachey/Roe 2006, Beck et al. 2006, Claessens 2006, Anderloni et al. 2007). Recent research examines the welfare effects of Germany's three-pillar banking system theoretically (Neumann/Reichel 2006, Hakenes/Schnabel 2006). The outreach of savings banks in East Germany has been investigated empirically (Wengler 2006). The present paper provides an overview of the literature, presents hypotheses on determinants of bank outreach and tests them using recent banking and regional data for Germany. We provide descriptive statistics for the outreach of German banks at the federal, federal state, and district level, and use multivariate analyses to examine determinants of branch penetration of savings and cooperative banks at the district level.

The rest of the paper is structured as follows. Section II provides an overview of the conceptual framework and measurement of bank outreach. Section III reviews the theoretical literature and hypotheses to be tested, and section IV reviews previous evidence. Section V presents univariate analyses, and section VI multivariate analyses of outreach in the German banking market. Section VII concludes.

II. Conceptual framework and measurement of bank outreach

The term banking sector outreach refers to the access to banking services and their use by households and firms (Beck et al. 2006). There are various dimensions to access: availability of financial services, cost of access, and range, type and quality of financial services offered (Claessens 2006). Access is not synonymous to use. Economic agents might decide not to use accessible financial services, either for socio-cultural reasons, or because opportunity costs are too high (Beck et al. 2006). The counterpart of access is exclusion. Financial exclusion may be caused by (1) 'geographic limitations' due to under-provision of banking services in remote and scarcely populated areas, (2) 'socio-

economic limitations’ when financial services appear inaccessible to specific income, social or ethnic groups, or (3) ‘limitations of opportunity’, when new or small firms with profitable projects are credit rationed because of lack of information and collateral (Beck/de la Torre 2006, Anderloni/Carluccio 2007, p. 9).

A broad banking sector outreach is important for economic and social development. Financial market imperfections cause credit constraints particularly for poor households and small or young entrepreneurs, which are opaque and lack collateral. Broadening their access to banks would ease the financing of high-return investment projects, alleviating poverty and spurring economic growth. Access of talented newcomers to financial services is crucial for Schumpeterian competition and development through the entry of new and innovative firms. Access to finance may even be considered as a basic need such as clean water, health services and education (Peachy/Roe 2006).⁴ However, it is unclear whether there is a public goods argument for extending access more broadly. Some households or firms may not demand financial services at the prevailing costs or may not be credit-worthy, and some banks may not wish to provide financial services to all customers, because it is not profitable or too risky (Claessens 2006, Beck/de la Torre 2006). Voluntary self-exclusion does not constitute a problem of access, unless it results from unduly low levels of financial literacy or financial market discrimination.

Evidence on financial exclusion is scarce, because it is hard to measure, and data on the use of financial services by households and firms is limited (Claessens 2006). As an analytical tool to measure financial sector outreach, Beck and de la Torre (2006) suggested the access possibilities frontier as the intersection of potential supply and demand. Potential supply denotes the maximum outreach that can be provided given the institutional framework, macroeconomic environment, or technology. Potential demand is the demand predicted by economic factors. Starting from this frontier, there are three access problems: a lack of demand due to voluntary self-exclusion, a gap between actual and potential supply due to incomplete competition or other supply-side constraints, and a frontier that is too low in international comparisons because of the state variables (Beck/de la Torre 2006, p. 47). This framework can be used for the debate on how to expand bank outreach by private solutions or public policies.

⁴ For reviews see *Beck et al.* (2006) and *Beck/de la Torre* (2006).

To measure bank outreach, several proxy indicators have been used in the literature (see Table 1). Proxy (1) measures access to and use of bank accounts. Full access may be reached, if the number of accounts per adult is above 0.5 (Peachy/Roe 2006, p.16). The penetration of banks' physical outlets (branches, ATMs) is measured by (2)-(5). While higher geographic branch and ATM penetration indicate smaller distance and thus easier geographic access, higher demographic branch and ATM penetration indicate easier access because of fewer potential clients per outlet. The use of loans and deposits is measured by (6)-(9). A higher demographic loan or deposit penetration indicates larger use, and higher loan- or deposit-income-ratios signal that these services may only be affordable to larger enterprises or wealthier individuals. The loan-income-ratio is about 2 in rich countries, but above 8 in poor countries (Beck et al. 2006, pp. 8). Alternative measures of deposit penetration are the deposit-GDP-ratio and the cash-deposit-ratio. According to Peachy and Roe (2006, p. 15), an economy has reached full access, if the deposit-GDP-ratio is 100% or the cash-deposit-ratio is below 20%. This measures the development of the financial system rather than deposit penetration. For the indicators (2)-(9), a country may be considered approaching full access, if its outreach indicator lies above the mean value in developed countries (Beck and de la Torre 2006).

Table 1 :
Indicators of banking sector outreach

Indicator	Measurement
(1) Bank accounts per adult	Number of bank accounts per adult
(2) Geographic branch penetration	Number of branches per 1,000 km ²
(3) Demographic branch penetration	Number of branches per 100,000 people
(4) Geographic ATM penetration	Number of bank ATMs per 1,000 km ²
(5) Demographic ATM penetration	Number of bank ATMs per 100,000 people
(6) Demographic loan penetration	Number of loans per 100,000 people
(7) Loan-income-ratio	Average size of loans to GDP per capita
(8) Demographic deposit penetration	Number of deposits per 100,000 people
(9) Deposit-income-ratio (or deposit-GDP-ratio)	Average size of deposits to GDP per capita (or total bank deposits to GDP)
(10) Cash-deposit-ratio	Cash in circulation to total bank deposits

Source: own composition, Beck et al. (2006), Peachy/Roe (2006).

Even if these outreach indicators are easy to measure, they have shortcomings: they are crude quantity-based indicators that ignore new delivery channels of financial services and costs of accessing and using banking services. When applied to a country, they assume a uniform distribution of bank outlets, loans and deposits, as well as of the

population and GDP per capita. In most countries, however, bank branches and ATMs are concentrated in urban or prosperous regions, and the size of loans and deposits may be unevenly distributed (Beck et al. 2006). Therefore, it is necessary to measure banking outreach also on the regional level.

III. Theory and hypotheses

Hypotheses about determinants of bank outreach can be derived from the concept of the access possibilities frontier and microeconomics of supply and demand. On the supply side, access to banking services depends on the bank's strategy and cost management as well as on state variables such as market size, macroeconomic fundamentals, available technology, per capita income, intensity of competition and the legal and institutional environment. On the demand side, price and income level are the main economic determinants of the use of financial services. For a given price and income level, actual demand may be lower than potential demand because of self-exclusion arising from non economic reasons as financial illiteracy, ethnic or religious factors (Beck/de la Torre 2006). Since supply-side theories play the major role in explaining banking sector outreach in developed countries, we will focus on them.

For the supply of banking services, fixed production costs play a large role. At the level of the firm, fixed costs arise from the brick-and-mortar branch network, computer and accounting systems, legal services, and security arrangements. Fixed costs also arise at the level of individual transactions and clients: the costs of an individual payments or savings transaction are independent of the value of the transaction, and the costs of maintaining an account for a client are independent on the number and size of that client's transactions (Beck/de la Torre 2006, p. 7).

The higher are the fixed costs at the firm or branch level, the higher are the economies of scale that can be reaped by an expansion of output and the lower will be the number of banks or bank branches in the long-run market equilibrium. This has been shown within a spatial competition model of banks that compete on deposit and loan markets (Chiappori et al. 1995). Hence, fixed costs constitute an important limitation to geographic outreach in the provision of retail banking services. At the level of the client, economies of scale can be seized by raising the number or volume of transactions. This implies that low-income clients that need small and few payment and savings transactions may not be profitable customers for profit-maximizing banks (Beck/de la Torre 2006, p. 8). Financial

exclusion of these customers implies smaller demographic outreach.

Generally, the higher are the fixed costs relative to market size or individual demand, the lower is the efficient number of banks, bank branches or clients served. Thus, outreach depends negatively on fixed costs, but positively on the size of the market or bank. Moreover, the outreach of an individual bank decreases as the number of competitors rises, reducing residual demand. Banking consolidation to reap economies of scale may increase monopolistic market power, restricting output and outreach. On the other hand, gains from monopoly power may ease the financing of a larger branch network.

These production cost arguments neglect the role of banks to reduce problems of incomplete information by advising and monitoring customers. A reduction of the branch network involves opportunity costs through losses of customers or profits from providing personal contact and advice, and higher risk costs through less monitoring of borrowers. Although the use of electronic banking channels and transaction lending technologies has increased for standardized banking products and wholesale customers, the branch network with provision of informational and advisory services is still the most preferred distribution channel in retail banking markets (ECB 2007). It is crucial for providing relationship banking services by maintaining proximity to clients. This applies above all to market segments with high information asymmetry like SMEs and households, where banks perform a monitoring function (Diamond 1994). Under relationship lending, the bank relies on soft information gathered through direct contact of the loan officer with the borrower and its local community over time (Berger/Udell 2006). This lending technology addresses the problem of information opacity, in contrast to transaction lending based on “hard” quantitative data. Theoretically, the optimal geographic outreach would be given at the point where the marginal costs of increasing the branch network and information services are equal to the marginal gains from a reduction of transaction costs and information asymmetry.

Small, regional banks are likely to have a comparative advantage in gathering and verifying soft information, because they are closer to their customers in local markets (Agarwal/Hauswald 2007, Hauswald/Marquez 2006). Soft information is difficult to quantify and transmit through the communication channels of large organizations (Berger/Udell 2002, 2003), which in turn may have an advantage in transaction lending. A centralized hierarchical bank offers greater incentives to employ hard information (Stein 2002, Degryse et al. 2007). This implies that outreach to retail banking customers is larger

for small, decentralized banks compared to large, hierarchical banks, which specialize on wholesale customers. Employing a model of banking competition with different organizational structures, Degryse et al. (2006) predict that a bank's geographic outreach decreases when rival banks are more hierarchically organized and lending decisions are communicated more swiftly at rival banks. Banking consolidation may impair access of SMEs to finance, because large banks are less prone to lend to SMEs or soft information of relationship lending is lost in mergers and acquisitions.

Regarding social welfare, the supply of profit maximizing banks involves an under-provision of financial services in a region, if positive externalities drive a wedge between the social and private marginal benefits from broadening outreach. A positive intra-regional externality is likely to result from investment finance within the region, which fosters regional entrepreneurial activity (Hakenes/Schnabel 2006, p. 2). Employing a model with credit rationing and heterogeneous regions, Hakenes and Schnabel (2006) show that in a financially integrated economy without public banks, there is a capital drain from poor to rich regions, because lenders will transfer their funds to the regions with the highest endowments, where they obtain the highest interest rates. While private banks cannot improve upon this allocation, a public bank can prevent the capital drain if it is sufficiently subsidized to offer a competitive deposit rate. Obeying a regional principle, it internalizes the intra-regional externality from investing within the region. To some extent, the same result can be achieved by a cooperative bank that endogenously establishes a regional principle by lending only to its members. In contrast to public banks, cooperative banks cannot internalize positive externalities of production on the non-entrepreneurs and mobilize funds from them. However, they are better than public banks in ensuring access to capital for the poor and moral-hazard-prone industries within a region.

Using a Cournot oligopoly model, Neumann and Reichel (2006) show that the presence of a non profit maximizing public or cooperative bank has positive welfare effects by increasing equilibrium output to the competitive level, compared to the Cournot equilibrium level of competition between private banks. An equilibrium with both banking groups is only viable, if the average cost of the private bank is lower than that of the public or cooperative bank. The private bank's cost advantage is likely to result from its smaller branch network and economies of scale due to larger firm size and centralized organization. The model predicts that the output of a private bank reacts more strongly to

a change in demand, because average costs rise (fall) less rapidly as output expands (decreases), compared to the case of a public or cooperative bank. This implies that private, profit maximizing banks retreat more rapidly from regions with declining demand than non profit maximizing banks.

Thus, Germany's three-pillar banking system with state-owned banks may be justified by the failure of private banks and to some extent also of cooperative banks (Hakenes/Schnabel 2006) to supply a socially optimal outreach. Because German savings banks have a public mission to serve all regions and customers beyond the goal of economic efficiency, we expect that their outreach is broader and less dependent on the external factors affecting the outreach of a pure profit maximizing bank (Wengler 2006). However, because of the regional principle, they are more dependent on the situation of their business district, with which they form a 'common destiny'. Therefore, economic wealth and population density may have a large impact on the outreach of public savings banks, as long as they strive for economic efficiency.

Summarizing, we derive the following hypotheses:

- H1: Bank outreach increases with economic wealth in a region (profit or efficiency goal).
- H2: Bank outreach increases with population density in a region (profit or efficiency goal).
- H3: Bank outreach decreases with the number of competitors in a region (profit goal).
- H4: Bank outreach increases with the size of the bank in a region (profit or efficiency goal).
- H5: The outreach of small, decentralized banks (large, centralized banks) increases (decreases) with the demand for retail banking services in a region (profit or efficiency goal).
- H6: Public savings banks provide a broader outreach than private and cooperative banks (public mission).

IV. Previous evidence

Most of the previous studies investigate bank outreach on the national level for cross-sections of countries. They show large differences between poor and rich economies, consistent with H1. In a nutshell, the percentage rate of access in poorer developing countries (some 10%) is about equal to the percentage rate of exclusion in richer advanced

industrial economies (Peachey/Roe 2006, p. 14). There are large variations of outreach both within the group of developing and transition economies and the group of advanced industrial countries. Among the latter, the relatively urbanized social market economies of Europe (the Scandinavian countries, France, Germany, the Netherlands, Spain) and Japan have the largest bank outreach with access above 95%. The Anglo-Saxon market economies of the UK, US and Australia rank behind. The lowest outreach is found in Ireland and the more southerly EU states except Spain, where average access seems to be reduced by a larger share of rural regions and greater regional income inequality. However, the problem of geographic exclusion is not restricted to these countries. Across the developed world there is growing concern that commercial banks are concentrating their outreach on more profitable customers and regions, because the private benefits of reaching the last 10% of customers are limited. In line with H6, savings banks and other socially committed retail banks are by far the largest suppliers of accessible accounts in developing and transition economies, where they provide some three-quarters of all such accounts. Even in advanced economies, they are often the only banking institutions left in areas of geographic exclusion, and which provide services accessible to the socially and economically excluded (Peachey/Roe 2006).

The first attempt at directly investigating the determinants of different indicators of bank outreach and their influence on the use of banking services has been made by Beck et al. (2006) for a sample of 99 developed and developing countries. They find that countries with greater bank outreach experience a significantly larger share of households with bank accounts and small firms with bank loans, and significantly less severe firm financing obstacles. Outreach is positively related to the overall level of economic development, supporting H1. The degree of government ownership of banks exerts a negative influence on the branch and ATM penetration, inconsistent with H6. However, this result may be biased, because the dataset excludes most of the savings banks in developing and transition economies, which account for half of all accessible accounts (Peachey/Roe 2006, p. 30).

Studies investigating regional variations of bank outreach in developed countries confirm the hypotheses that private banks retreat from rural and under-populated regions and urban areas with economic difficulties (H1 and H2). This is due to increasing cost-pressure on banks driven by rising competition and the progress of e-banking technologies (Peachey/Roe 2006, pp.30). Especially the market-oriented financial systems of the UK

and US have experienced a process of ‘flight to quality’ and financial infrastructure withdrawal from socially and economically disadvantaged areas. The emerged spaces of financial exclusion are associated with economic decline and social problems, contributing to uneven development (Leyshon/Thrift 1995, Mullineux/Terberger 2006, Anderloni/Carluccio 2007).

The effects of banking competition on outreach are ambiguous. On the one hand, studies for developed and developing countries find positive effects of banking competition (e.g. measured by foreign bank entry) on outreach, especially regarding access of SMEs to loans and other services (Beck et al. 2004, p. 640, Claessens 2006, p. 227, Peachey/Roe 2006, p. 36). On the other hand, the growing intensity of competition in the EU banking markets has made cross-subsidization impossible, which was used to finance the majority of loss-making current accounts by profitable ones (Peachey/Roe 2006, p. 36). It has caused consolidations of banks and branch networks, with negative effects on small business finance. Even if the empirical evidence for advanced countries is mixed, it confirms that larger banks hold relatively fewer small business loans than small banks and that banks reassess their portfolios after mergers, inducing termination of lending relationships. At least mergers between large banks seem to have negative effects on small firm finance (for reviews see Bonaccorsi di Patti/Gobbi 2007, 2003, Sachverständigenrat 2005).

Germany belongs to the countries with the highest access to banking services, measured by different outreach indicators (Peachey/Roe 2006, pp. 30, Koetter et al. 2006, Bresler et al. 2007, Sachverständigenrat 2008). However, there are large regional variations and differences between the three banking groups, with the state-owned savings banks providing the most even regional distribution of branches (Bresler et al. 2007, Wengler 2005, p. 276). The first attempt to investigate the determinants of bank outreach on the regional level has been made by Wengler (2006) for banks in East Germany. For the year 1998, he regressed geographic branch penetration of savings banks and big private banks as well as demographic deposit and loan penetration of savings banks on a number of explanatory variables. He found that economic wealth and population density had a significant positive influence on geographic branch penetration of private banks, in line with H1 and H2. In the case of savings banks, economic wealth had a negative effect on geographic branch penetration, and population density had a positive, but smaller effect than in the case of the big private banks. This indicates that public savings banks provide

larger financial access to poorer and less densely populated regions due to their public mandate. The branch density of savings banks is positively affected by bank size (supporting H4). The intensity of competition, measured by the branch density of other banking groups in the region did not influence geographic outreach. A positive effect of the branch density of cooperative banks on the outreach of savings banks indicates that both banking groups are following similar branch strategies (Wengler 2006, p. 286). Demographic deposit and loan penetration of savings banks decrease with population density and increase with economic wealth and geographic branch penetration. Thus, public savings banks contribute to higher savings and loans by a dense branch network. Moreover, demographic deposit penetration increases with the share of elder people in the population, indicating that savings banks are serving elder customers with a high demand for deposit services. The reverse result is found for demographic loan penetration, because elder people have a lower demand for bank loans. This supports the hypothesis that the outreach of small, decentralized banks increases with the demand for retail banking services (H5). The size of the bank relative to the population has a positive effect on demographic loan penetration, consistent with H4.

V. Univariate analysis

1. Bank outreach at the federal and federal state level

The 16 federal states of Germany differ with respect to population density and economic wealth (measured by GDP per capita, disposable income and employment rates). Both tend to be higher in the South and the old federal states of West Germany than in the North and the new federal states of East Germany (Eurostat Regionaldaten 2008, Bundesagentur für Arbeit 2008). Thus, there is a gap between the South/West and North/East of Germany.

With a total number of 75,188 million current accounts in Germany (2005)⁵, the outreach indicator (1) ‘bank accounts per adult’ lies above one, indicating full access at the federal level. Within Europe, such high penetration rates with more than 90% of the population using a current account are only found in Germany, France, Belgium and the Netherlands (European Commission 2004, p.21). However, there are regional variations.

⁵ Deutsche Bundesbank (2008b, table 4); Statistisches Bundesamt (2008).

While in most of the federal states, less than 10% of the adults have no current account, the share of the excluded is higher in Northern than in Southern Germany (Media Spiegel 2007). Bank outreach seems to increase with economic wealth, consistent with H1. Public savings banks are the leading provider of bank accounts, with a market share of 48%.⁶ This supports H6.

To examine branch penetration (indicators (2) and (3)), we use 2003 data of the Deutsche Bundesbank (2007). Since 2004, data on the regional distribution of bank branches are no longer available. In 2003, the total number of bank branches in Germany was 47,244,⁷ serving an area of 357,083 km² and a population of 82.5 million. Thus, the geographic branch penetration was 132 and the demographic branch penetration 57.2 at the federal level.⁸ While this is high compared to other countries,⁹ there are large differences in branch penetration among the federal states (see Table 2). The city states (Berlin, Hamburg, Bremen) show the lowest demographic, but highest geographic branch penetration, because of their comparatively high population density and small size. Among the larger federal states with low population density, the East German states Mecklenburg-Western Pomerania and Brandenburg have the lowest branch penetration. Table 2 shows a South-North and West-East gap. In the South, geographic branch penetration is almost twice as large as in the North (160 vs. 89 branches per 1,000 km²), and in the West, it is more than twice as large as in the East (159 vs. 63 branches per 1,000 km²). Given the economic wealth gap between the South/West and North/East, these observations support H1.

Table 2 also shows differences in branch penetration rates among the three banking pillars. For whole Germany, savings banks have the highest demographic and geographic branch outreach. The geographic branch penetration of the five big private banks is highest in the agglomerated regions of the city states (Berlin, Bremen, Hamburg) and lowest in the least densely populated states (Brandenburg, Mecklenburg-Western Pomerania). There are West-East and South-North gaps, following the economic wealth gaps. Because private banks hold a larger number of branches in more densely populated areas, their demographic branch penetration does not vary much across federal states. The geographic branch penetration of the decentralized savings and cooperative banks also

⁶ Deutsche Bundesbank (2006d); *DSGV* (2006); own calculations.

⁷ Including the Postbank AG (Deutsche Bundesbank 2007, p. 104).

⁸ Own calculations, *Statistisches Bundesamt* (2008); Deutsche Bundesbank (2004).

⁹ In 2005, demographic branch penetration was 53.4 in Germany, but only 29.6 in the EU-25 average (ECB 2006, own calculations).

tends to be higher in more densely populated states and in the West/South compared to the East/North, with cooperative banks being least concentrated on the city states. In East Germany, private banks show a higher branch penetration than the other groups. This may be due to the fact that the “Staatsbank” of the former German Democratic Republic with its large branch network was taken over by two big private banks in 1990. In all other regions (West, North, Middle South), branch penetration of savings banks exceeds that of private and cooperative banks, except in Southern Germany, where the cooperative banks show the highest outreach.

Table 2

Branch penetration at the federal state level for the three pillars of the banking system (2003)

Federal State	Dem. branch penetration				Geo. branch penetration			
	All	I ¹	II ²	III ³	All	I ¹	II ²	III ³
West Germany ⁴	60.2	19.6	17.9	15.6	159.1	51.7	47.3	41.1
B.-Württemberg	72.0	24.0	24.3	16.4	215.4	71.8	72.6	49.1
Bavaria	73.4	22.2	25.7	18.9	129.2	39.1	45.3	33.3
Bremen	37.9	14.9	3.8	10.1	620.9	244.9	61.8	165.7
Hamburg	34.0	10.8	3.3	9.5	781.2	247.6	75.5	217.2
Hesse	67.0	22.7	20.1	17.3	193.2	65.5	57.8	49.9
N.R.-Westphalia	43.5	14.5	9.9	11.8	230.7	77.1	52.7	62.7
R.-Palatinate	73.9	26.3	23.6	18.6	151.2	53.7	48.3	38.1
Saarland	72.0	25.5	23.9	17.1	297.4	105.5	98.9	70.5
S.-Holstein	53.2	14.4	12.8	15.9	95.1	25.8	22.9	28.4
East Germany ⁴	50.6	16.6	9.6	17.5	63.5	20.9	12.0	22.0
Brandenburg	45.6	13.8	7.7	18.2	39.9	12.1	6.7	15.9
M.-W. Pomerania	47.1	12.8	10.2	15.7	35.2	9.6	7.6	11.7
Lower Saxony	58.4	18.5	16.2	16.4	98.0	31.1	27.1	27.4
Saxony	49.2	17.5	7.7	17.0	115.6	41.1	18.0	39.8
Saxony-Anhalt	53.7	19.3	10.2	17.7	66.2	23.8	12.6	21.9
Thuringia	57.5	18.0	14.0	18.8	84.4	26.3	20.5	27.6
Berlin	25.9	6.9	2.7	8.2	984.5	263.5	102.0	312.8
Northern Germany ⁵	52.4	16.0	12.8	15.1	89.2	27.3	21.8	25.7
Middle Germany ⁶	47.9	15.9	10.7	14.1	134.0	44.6	30.1	39.6
Southern Germany ⁷	72.9	23.6	24.8	17.9	159.9	51.7	54.4	39.2
Whole Germany	57.2	18.6	15.9	15.6	132.3	42.9	36.8	36.0

¹savings banks, including Landesbanken; ²cooperative bank; ³big private banks: Deutsche Bank AG, Commerzbank AG, Dresdner Bank AG, Hypovereinsbank AG, Postbank AG; ⁴without Berlin; ⁵Bremen, Hamburg, Mecklenburg-Western Pomerania, Lower Saxony, Schleswig-Holstein; ⁶Berlin, Brandenburg, Hesse, North Rhine-Westphalia, Saxony, Saxony-Anhalt, Thuringia; ⁷Baden-Württemberg, Bavaria, Rhineland-Palatinate, Saarland; Source: Deutsche Bundesbank (2004), Statistisches Bundesamt (2008), own calculations.

Bank ATM data to calculate indicators (4) and (5) are only available at the federal level. In 2006, German banks served 82.3 million people on 357,083 km² with 53,887 ATMs. This yields a large demographic ATM penetration of 65.5, and geographic ATM penetration of 150.9.¹⁰ Also debit card penetration is high: with a total number of 90.4 million in 2006, the number of debit cards owned per person exceeds one. 48.7% of the debit cards are provided by savings banks, 27.1% by cooperative banks and 21.6% by private banks (Bundesverband deutscher Banken 2008). This supports H6.

Data about the outreach of bank loans, measured by indicators (6) and (7), are not available for the German banking sector, except some survey data about the number of loans. According to a 2007 survey, only two loans were used by 11 inhabitants, which yields a demographic loan penetration of 18,182 (number of loans per 100,000 people).¹¹ This is below the average of 50,000 in the richest countries, where every other uses a bank loan (Beck et al. 2006). Also here, there are regional variations at the federal state level, with the lowest demographic loan penetration in Saarland (12,500) and the highest in Saxony-Anhalt (28,571).¹² There seems to be a West-East and a South-North gap, with higher demographic loan penetration in the East/North than in the West/South of Germany. This does not indicate better loan access, but higher loan use in the East/North, as loan demand tends to be higher because of lower per capita incomes there.

Since the loan-income-ratio cannot be calculated because of missing data about individual loan sizes, we calculate instead the ratio of the total loan volume to GDP at the federal state level. While a higher value of the loan-income-ratio defined in Table 1 indicates worse access to smaller loans, a higher value of our loan-GDP-ratio indicates higher loan access or use. Table 3 shows this ratio for the 16 federal states in 2005. Again, there are large regional variations, with the highest loan-GDP-ratios in the West German states Hamburg and Hesse and the lowest ones in the East German states Brandenburg and Saxony-Anhalt. In contrast to the demographic loan penetration ratios above, there is a West-East gap, with the average loan-GDP-ratio in West Germany being more than twice as high as in East Germany (1.040 vs. 0.451). This may be due to lower loan sizes or higher credit rationing of East German firms, indicating worse access there (consistent

¹⁰ Own calculations, *Bundesverband deutscher Banken* (2008); *Statistisches Bundesamt* (2008). For a comparison of demographic ATM penetration within the EU, see *ECB* (2007), p. 41.

¹¹ own calculations, *Media Spiegel* (2007).

¹² own calculations, *Media Spiegel* (2007)

with H1).¹³ However, loan-GDP-ratios are higher in the North than in the South, consistent with the findings for demographic loan penetration.

Table 3
Loan-GDP-ratio and deposit-GDP-ratio at the federal state level (2005)

Federal state	Loan volume ⁹ to GDP	Deposit volume ¹⁰ to GDP			
		All	I ¹	II ²	III ³
West Germany ⁴	1.04	0.99	0.28	0.20	0.15
B.-Württemberg	1.04	0.99	0.26	0.25	0.07
Bavaria	1.01	0.94	0.26	0.22	0.22
Bremen	0.89	0.99	0.31	0.07	0.10
Hamburg	1.49	0.89	0.24	0.06	0.18
Hesse	1.51	1.72	0.26	0.20	0.36
N.R.-Westphalia	0.81	0.80	0.31	0.17	0.10
R.-Palatinate	0.99	0.92	0.35	0.28	0.06
Saarland	0.73	0.76	0.33	0.22	0.06
Schleswig-Holstein	1.11	0.96	0.26	0.15	0.11
East Germany ⁴	0.45	0.59	0.33	0.10	0.08
Brandenburg	0.38	0.59	0.32	0.09	0.07
M.-W. Pomerania	0.52	0.50	0.28	0.12	0.07
Lower Saxony	1.08	0.92	0.27	0.18	0.07
Saxony	0.50	0.67	0.37	0.09	0.10
Saxony-Anhalt	0.40	0.52	0.32	0.10	0.07
Thuringia	0.43	0.55	0.32	0.11	0.08
Berlin ⁵	1.02	1.05	0.29	0.13	0.19
Northern Germany ⁶	1.11	0.89	0.27	0.14	0.10
Middle Germany ⁷	0.89	0.96	0.31	0.16	0.16
Southern Germany ⁸	1.01	0.95	0.27	0.24	0.14

¹savings banks; ²cooperative banks; ³big private banks: Deutsche Bank AG, Commerzbank AG, Dresdner Bank AG, Hypovereinsbank AG, Postbank AG; ⁴without Berlin; ⁵Data of the Berliner Landesbank, the only bank belonging to the savings banks sector in Berlin; ⁶Bremen, Hamburg, Mecklenburg-Western Pomerania, Lower Saxony, Schleswig-Holstein; ⁷Berlin, Brandenburg, Hesse, North Rhine-Westphalia, Saxony, Saxony-Anhalt, Thuringia; ⁸Baden-Württemberg, Bavaria, Rhineland-Palatinate, Saarland; ⁹without loans to domestic public authorities; ¹⁰ demand, time, and savings deposits, and savings certificates of domestic non-banks (without domestic public authorities); Source: Deutsche Bundesbank (2006e), Statistisches Bundesamt (2008), own calculations

Access to loans is of particular importance to SMEs, which comprise 99.7% of all enterprises and 70.9% of all employees in Germany (IMF 2007). On the federal level, the share of savings banks in the SME loan market exceeds that of the other two banking groups: in 2005, savings banks provided 43.1%, private banks 16.2% and cooperative banks 14.5% of all SME loans. In the trade sector with mainly small firms, the market

¹³ For previous evidence showing an East-West gap in lending to small and medium-sized firms in Germany see *Lehmann et al.* (2004).

share of the savings banks reaches even 69.8% (DSGV 2006a, p. 9).¹⁴ These observations are consistent with H6 and indicate that state-owned savings banks help to increase outreach in markets which are likely to fail due to asymmetric information.¹⁵

Also demographic deposit penetration (outreach indicator (8)) is high in Germany, with more than 75% of private households using a savings deposit in 2004. At the federal state level, we observe again a gap between the West/South and East/North of Germany. With 84%, the share of households using a savings deposit is 6 percentage points higher in Western than in Eastern German states. It is highest in the Southern state of Bavaria (90%) and lowest in the Northern state of Schleswig-Holstein (74%) (Media Spiegel 2007), consistent with H1.

Similar regional variations apply to the deposit-GDP-ratio (outreach indicator (9)) shown in Table 3. With 0.99, the deposit-GDP-ratio in the West exceeds that in the East by 67%. It is lowest in the North with 0.89, followed by 0.95 in the South and 0.96 in Middle Germany.¹⁶ Table 3 also shows the dominance of the savings banks in the deposit market. Only in Hesse, the location of the financial center Frankfurt/Main, the big private banks have a larger market share.¹⁷ The credit cooperatives have large market shares in Southern Germany. The dominant positions of the savings banks are highest in the less wealthy states of the East (56.1%) and North (30%).¹⁸

Summing up, we find that although banking sector outreach is high in Germany, there are regional disparities showing both a West-East and a South-North gap regarding access to bank branches, ATMs and loans as well as use of bank accounts and deposits. Even if these descriptive statistics on the federal state level are crude, they tend to support the hypothesis that bank outreach increases with regional economic wealth. Comparing the three pillars of the German banking system, we find that public savings banks provide a larger loan and deposit penetration, and in most federal states also branch penetration, compared to private and cooperative banks. With their larger deposit penetration in the less wealthy Eastern and Northern regions, they tend to reduce regional disparities.

¹⁴ Savings banks are also leading the market of loans to private households, with a market share of 29.4% (own calculations, Deutsche Bundesbank 2006e).

¹⁵ See also the KfW survey results (*KfW* 2006, p. 16 and 27).

¹⁶ Own calculations, *Deutsche Bundesbank* (2006e), *Statistisches Bundesamt* (2007).

¹⁷ Calculated by the ratio of savings banks deposit-GDP-ratio to all banks deposit-GDP-ratio.

¹⁸ This is supported by bank customer surveys. In 2005, 39% of German bank depositors declared that savings banks were their first partner in asset formation, followed by cooperative banks with 19% and big private banks with 12% (*DSGV* 2005, pp. 27).

2. Bank outreach at the district level

Looking at smaller regions or districts, we observe an uneven distribution of the population. In the OECD average, about a third of a country's population is concentrated on only 10% of its regions. With 32%, Germany lies slightly below the average (OECD 2005, p.21). To examine the distribution of the population in the 439 German districts, we use the classification of regions according to population density and size into agglomerated, urbanized and rural regions (BBR 2005).

87% of the German population lives in agglomerated and urbanized regions, and 13% in rural regions. Compared to other OECD countries, the settlement in rural regions is relatively high, because they are close to the centers (OECD 2007, pp. 56). The regional distribution of GDP and economic wealth, however, is highly concentrated. In 2001, about 67% of the German GDP was produced in urban regions, and only 16-17% in rural or intermediate regions (OECD 2005, pp. 26.) There are large variations in GDP per capita, disposable income and unemployment rates per district type. The highest GDP per capita and disposable income are obtained in cities and districts with high population density, the lowest ones in rural districts. Rural districts with low density have the highest average unemployment rate, especially in East Germany, where these districts are more highly concentrated and farer away from the centers (BBR 2005). To examine whether these regional gaps in economic wealth influence the regional distribution of bank branches, we calculate branch penetration rates at the district level.

Table 4 shows geographic and demographic branch penetration for the three region types and pillars of the German banking system in 2001 and 2003, and the changes between both years. Regarding all banks, geographic branch penetration is highest in agglomerated regions (1) and lowest in rural regions (3). This is consistent with the hypotheses that bank outreach increases with economic wealth (H1) and population density (H2). The reverse holds for demographic branch penetration, which shows smaller regional differences. This can be explained by lower branch densities in districts with lower population density. From 2001 to 2003, both branch penetration rates declined by 9-10%, with the largest declines in urbanized regions (2). Comparing the three pillars, savings banks have the highest, and private banks the lowest branch penetration rates in all regions. This supports H6. Only in rural regions, cooperative banks have a slightly higher demographic (but still lower geographic) branch penetration than savings banks.

Compared to savings and cooperative banks, private banks are more highly concentrated on agglomerated regions, where their geographic branch penetration is more than twice as high as in urban regions. From 2001 to 2003, branch penetration rates declined by 8% in the savings banks pillar, by 8-9% in the cooperative bank pillar and by 17-20% in the private bank pillar. The reduction rates in the first two pillars are below average in all three region types. Only in rural regions, cooperative banks reduced their branch penetration rates less than the other banking groups.

Table 4

Branch penetration at the district level for the three region types and bank pillars (2001, 2003)

		Geographic branch penetration			Demographic branch penetration		
		2001	2003	01/03 ¹⁰	2001	2003	01/03 ¹⁰
All ⁶	Region type 1 ¹	385.6	350.9	-8.9	59.0	53.8	-8.8
	Region type 2 ²	238.8	214.6	-10.1	80.8	72.0	-10.9
	Region type 3 ³	190.3	174.7	-8.2	83.2	76.1	-8.5
	All ⁴	276.6	250.9	-9.3	74.1	66.9	-9.7
	Whole Germany ⁵	147.8	133.6	-9.6	68.1	61.4	-9.7
I ⁷	Region type 1 ¹	128.7	119.5	-7.1	20.5	18.9	-7.9
	Region type 2 ²	81.8	74.3	-9.1	26.9	24.1	-10.2
	Region type 3 ³	62.3	57.6	-7.5	25.7	23.3	-9.3
	All ⁴	92.3	84.9	-7.9	24,0	22,0	-8.3
II ⁸	Region type 1 ¹	87.4	80.1	-8.3	16.2	14.8	-8.8
	Region type 2 ²	66.1	60.1	-9.1	26.7	23.9	-10.7
	Region type 3 ³	51.3	48.4	-5.8	27.7	25.5	-8.1
	All ⁴	69.8	64.1	-8.2	23.5	21.2	-9.5
III ⁹	Region type 1 ¹	41.0	32.3	-21.2	3.8	3.2	-17.4
	Region type 2 ²	16.2	13.0	-19.7	3.0	2.4	-19.2
	Region type 3 ³	23.0	19.5	-15.4	4.8	4.2	-13.9
	All ⁴	26.1	21.0	-19.6	3.7	3.1	-17.0

¹agglomerated region (n=146); ²urbanized region (n=188); ³rural region (n=102); ⁴without Berlin, Hamburg and Landkreis Ludwigshafen (included in the district Ludwigshafen am Rhein) (n=436); ⁵(n=439); ⁶private banks, savings banks, cooperative banks, Postbank, regional und other credit banks; ⁷savings banks; ⁸cooperative banks; ⁹big private banks: Deutsche Bank AG, Dresdner Bank AG, Hypovereinsbank AG, Commerzbank AG; ¹⁰percent change from 2001 to 2003; source: Deutsche Bundesbank (2001-2003), BBR (2005), own calculations.

These results are not directly comparable to those for the federal state level above (Table 2), because they are based on a narrower classification of private banks. Here, the group of private banks includes only the four biggest banks, without the Deutsche Postbank AG.¹⁹ The Deutsche Postbank holds a larger branch network than the four big banks,

¹⁹ The Deutsche Postbank AG is classified by the Deutsche Bundesbank within the group of the big private banks since 01/01/2005.

because it cooperates with the Deutsche Post AG, which has a public mandate to provide nationwide services. Therefore, Table 2 shows a larger branch penetration for the private banking pillar than Table 4.

VI. Multivariate analysis

1. Data set, measurements and method

We employ multivariate analyses to test the hypotheses about branch penetration for savings and cooperative banks at the district level, using regional and bank-specific data. The regional data were taken from the data bases ‘Statistik regional’ (Statistische Ämter 2006) and ‘INKAR’ (BBR 2005). Bank-specific data were obtained from DSGV (2006b) and BVR (2005). Comparable data for private banks are not available.

To combine regional and bank-specific data, a region should correspond to a bank’s business district. In the case of savings banks, this applies to most districts and independent cities, which incurred the guarantor liability of ‘their’ savings bank until 2005.²⁰ In those cases, in which the business district of a savings bank comprises more than one region (district or independent city), we aggregated these regions. In those cases, in which a region comprises the business districts of several savings banks, we aggregated these banks. The resulting data set covers almost 95% of all savings banks (463 in 2005) and almost 90% of all districts and independent cities of Germany for the period 2001-2005.

For the cooperative banks (1,262 in 2005), geographic market delineation is less clear. Because of the mission to promote their members, cooperative banks are also regionally bounded, however less strictly than public savings banks. Data about the business areas of German cooperative banks are missing. We define the business district of a cooperative bank as the region (district or independent city), in which the bank’s headquarter is located. In those cases, in which more than one bank is assigned to a region, these banks are aggregated. The resulting data set comprises 97% of all cooperative banks and 87% of all districts and independent cities of Germany in 2005. Data about the number of branches per cooperative bank are not available. We used the bank branch statistics of the Deutsche Bundesbank (2001-2003), which contain the number of branches per banking

²⁰ Therefore, spatial autocorrelations can be excluded (Wengler 2006, p. 253).

group at the district level until 2003. These data were extrapolated until 2005 by using the available rates of changes at the federal level.

Table 5
Definition, measurements and descriptive statistics of variables (2005)

Dependent variables		Mean (median)	SD ³	n ⁴
Geographic branch penetration (I) ¹	Number of savings bank branches per 1.000 km ²	64 (39)	70	283
Geographic branch penetration (II) ²	Number of cooperative bank branches per 1.000 km ²	59 (48)	44	362
Demographic branch penetration (I) ¹	Number of savings bank branches per 100.000 inhabitants	21 (19)	9	283
Demographic branch penetration (II) ²	Number of cooperative bank branches per 100.000 inhabitants	21 (18)	13	362
Branch market share (I) ¹	Number of savings bank branches per competitor branches (DSGV 2006b)	0.85 (0.77)	0.47	283
Branch market share (II) ²	Number of cooperative bank branches per competitor branches (Deutsche Bundesbank 2005, extrapolated from 2003 with federal trend)	0.49 (0.48)	0.23	362
Independent variables				
Population density (I) ¹	Number of inhabitants per km ²	400 (175)	606	283
Population density (II) ²	Number of inhabitants per km ²	450 (200)	559	362
Economic wealth (I) ¹	Purchasing power per capita (DSGV 2006b) ²¹	17,731 (16,929)	7,866	283
Economic wealth (II) ²	available household income per capita (Statistische Ämter 2006)	19,368 (19,691)	3,896	362
Share 75+ (I) ¹	Percent of inhabitants aged 75 or more	8.3 (8.2)	1	283
Share 75+ (II) ²	Percent of inhabitants aged 75 or more	8.3 (8.2)	1	362
Competition (I) ¹	Number of competitor branches per savings bank branches (DSGV 2006b)	1.4 (1.3)	0.6	283
Competition (II) ²	Number of competitor branches per cooperative bank branches (Deutsche Bundesbank 2005, extrapolated from 2003 with federal trend)	2.6 (2)	1.6	362
Bank size (I) ¹	Average volume of savings bank assets per capita	12.2 (11.7)	4.5	283
Bank size (II) ²	Average volume of cooperative bank assets per capita	7.2 (6.2)	6	362

¹Savings banks; ² cooperative banks; ³ standard deviation; ⁴ number of observations; source: own calculations.

²¹ Purchasing power or disposable household income are better proxies for potential demand than GDP per capita (used by *Wengler* 2006), if people do not live in the region where they work, commuting to neighboring regions. The correlation coefficient between regional GDP and purchasing power is 0.869.

Our main dependent variables in multivariate regressions are geographic and demographic branch penetration. Additionally, we use branch market shares to examine group differences in branching strategies. As independent variables we use economic wealth, population density, share of elder people, competition, and bank size. The variable definitions and descriptive statistics are listed in Table 5. All variables are taken in logarithmic form within linear OLS estimations. Thus, the regression coefficients are elasticities indicating the percentage change of the dependent variable if the independent variable changes by one percent, *ceteris paribus*.

2. Regression results

The regression results for geographic branch penetration of savings banks (2001, 2005) and cooperative banks (2005) are reported in Table 6. Economic wealth shows a highly significant positive influence on branch penetration of both groups, indicating that they are profit- or efficiency-oriented (H1). The difference in the magnitude of the influence cannot be interpreted because of different measurements. The results remain robust to replacing the independent variable purchasing power per capita by GDP per capita and splitting the sample into East and West Germany. They contrast to those of Wengler (2006), who found that GDP per capita had a significant negative effect on the branch penetration of savings banks in East Germany in 1998.

Population density exerts a highly significant positive influence on geographic branch penetration of savings and cooperative banks, with elasticities of 0.73 and 0.78 (2005). Thus, both kinds of regional banks provide less branches per km² in less densely populated regions, according to the efficiency goal (H2). Since this reaction is less than proportional, the number of branches per inhabitant is higher in less densely populated regions. Comparable regressions for demographic branch penetration yield the same results for all independent variables, except a negative influence of population density.²² Hence, small, decentralized banks provide a larger number of branches per inhabitant in less densely populated regions, serving the inhabitants' demand for retail banking services. Wengler (2006) also found an elasticity of geographic branch penetration with respect to population density smaller than one for the case of savings banks, but larger than one for the case of big private banks in East Germany in 1998.

²² The elasticities of geographic and demographic branch penetration with respect to population density sum up to about 1.

Table 6

Regression results (OLS): dependent variable ln(geographic branch penetration)

	Savings Banks		Cooperative Banks
Independent variables	2001 n=283	2005 n=283	2005 n=362
Ln(economic wealth)	0.72***	0.50***	0,32***
Ln(population density)	0.68***	0.73***	0.78***
Ln(share 75+)	0.55***	0.42***	0.72***
Ln(competition)	-0.42***	-0.28***	-0.94***
Ln(bank size)	0.37***	0.52***	0.08***
Constant	-12.77***	-12.22***	-3.73***
R ²	0.92	0.91	0.93

*** $p \leq 1\%$; ** $p \leq 5\%$; * $p \leq 10\%$; (White) heteroscedasticity-robust standard errors; tested for normal distribution of error terms and multicollinearity; source: own calculations.

Branch penetration of savings and cooperative banks is significantly higher in regions with a larger share of elder people. The share of the elderly may be a proxy for the demand for retail banking services. In Germany, today's seniors are the most wealthy age group with a high demand for bank deposits (Grabka/Krause 2005). They are less likely to use direct banking, preferring personal contact and advice at a local bank branch. Thus, we find support for H5. On the other hand, elder people have lower demand for loans than younger people. The age structure may also be a proxy for a region's economic activity or attractiveness, which influence migration flows. In rural or regions with a declining population, the share of elder people is higher than in industrial or dynamic regions attracting young people. The large impact of the share of the elderly on the branch penetration of cooperative banks may partly reflect their concentration on rural regions.

Banking competition has a significant negative effect on the branch penetration of both groups, in line with H3. The elasticity is much lower for savings banks (-0.28) than for cooperative banks (-0.94). This indicates that savings banks fulfill their public mission to serve all regions, fostering competition.

Branch penetration of both groups increases significantly with bank size, in line with H4. This corresponds to the results of Wengler (2006) and indicates again that public savings banks pursue the goal of economic efficiency beyond their public mission. The smaller elasticity in the case of cooperative banks may be due to their smaller size, which restrains the possibility to reap economies of scale by establishing additional branches.

To examine the explanatory power of the single variables, we performed univariate regressions. Tables 8 and 9 (appendix) show that the share of the elderly and competition

play a very minor role. The signs and significance levels of the regression coefficients are the same as in Table 6, except for the variable competition losing its influence in the case of savings banks. This is another hint to their public mission.

Table 7
Regression results (OLS): dependent variable ln (branch market share)

	Savings Banks		Cooperative Banks
Independent variables	2001 n=283	2005 n=283	2005 n=362
Ln(economic wealth)	-0.42***	-0.60***	0.88***
Ln(population density)	0.028	-0.035	-0.32***
Ln(share 75+)	0.170	0.67***	-0.12***
Ln(bank size)	0.25***	0.29***	0.19***
Constant	3.01***	6.78***	3.86***
R ²	0.08	0.17	0.58

*** p ≤ 1 %; ** p ≤ 5 % * p ≤ 10 %; (White) heteroscedasticity-robust standard errors; tested for normal distribution of error terms and multicollinearity; source: own calculations

To investigate whether the branching strategy differs between savings and cooperative banks, we regressed the branch market shares on regional economic variables and bank size. The results are presented in Table 7. An increase in economic wealth has a significant negative influence on the branch market share of savings banks, while the reverse holds for cooperative banks. This indicates that due to their public mission, savings banks maintain a higher branch penetration in less wealthy regions, compared to all other banks. Population density has no significant effect on the market share of savings banks, but a significant negative effect on that of cooperative banks. This may reflect that cooperative banks concentrate on less densely populated rural regions, while savings bank branches are most evenly distributed. The share of elder people has a positive influence on the branch market share of savings banks, indicating that they specialize on retail deposit customers (consistent with H5). This does not hold for cooperative banks. The branch market shares of both groups increase with bank size, as expected. All together, the independent variables explain 58% of the variation in the market shares of cooperative banks, but only 17% of those of savings banks. Thus, the branching policy of savings banks is less dependent on regional economic factors, due to their public mission. The univariate regression results are shown in Tables 10 and 11 (appendix).

VII. Conclusions

The present paper tried to explain geographic and demographic outreach of the German banking system. After a review on the conceptual framework and theoretical literature we derived hypotheses on the determinants of bank outreach for profit- or efficiency-oriented banks and savings banks with a public mission. These were confronted with evidence for German banks. A review of the empirical literature revealed a research gap with respect to studies on the regional level. While in international comparisons the German banking sector shows a high outreach performance, the distribution of banking services over smaller regions and the three pillars of the banking sector has not been thoroughly investigated so far. The present paper yields two contributions to close this gap: first, it examines different outreach measures at the federal state and district levels for the three banking pillars by univariate analyses. Secondly, it seeks to explain the branch penetration of the regional savings and cooperative banks in all German districts by multivariate analyses.

Our main results are as follows. First, all three banking groups – private, public savings and cooperative banks – show a broader outreach in economically wealthy and more densely populated regions. This is economically efficient and the result of higher demand for banking services when household income and the number of customers are higher. However, due to their public mission, savings banks maintain a higher branch penetration in less wealthy regions, compared to all other banks. With their comparatively large branch, deposit and loan penetration in less wealthy and less densely populated regions, public savings banks help to reduce regional disparities in access to and use of banking services within Germany.

Secondly, public savings banks provide a broader outreach to retail banking customers than private banks, holding dominant positions in deposit and SME loan markets. Due to their decentralized organization and regional principle, they help to reduce information and transaction costs by relationship banking close to the customers. In regions with a larger share of elder people, savings and cooperative banks provide more branches than in “younger regions”, serving customers who need personal contact and advice. Savings banks show a higher specialization on ‘elder regions’ than cooperative banks.

Third, because of their public mission to serve all regions, savings banks foster competition. The lower competitive pressure in those regions, which are unattractive for

private or cooperative banks may help them to cover the costs of fulfilling their public mandate.

In sum, our results show that the German three-pillar banking system performs well in providing nationwide banking services. They support microeconomic theories of banking, which explain welfare benefits of a division of labor between large, centrally organized private banks and small, de-central savings and cooperative banks. The regional principle and public mandate of savings banks seem to contribute to the goal of equal living standards across German regions, which show large disparities in economic wealth and population density. Thus, we support the recent recommendation of the German Council of Economic Advisors to maintain the regional principle and public mandate of the German savings banks (Sachverständigenrat 2008).²³ However, the present study is only a first step to explain differences among the three banking pillars in providing access to banking services. The analysis will be extended in future work.

²³ Moreover, the *Sachverständigenrat* (2008) recommends to transform the state-owned savings banks into stock corporations in the majority ownership of foundations. The question whether this would improve the performance of the German banking system is beyond the scope of the present paper. While gains in economic efficiency are likely, positive effects on bank outreach are unlikely.

Appendix

Table 8

Univariate regression results (OLS): dependent variable ln(geographic branch penetration) of savings banks 2005

Independent variables	N = 283				
Ln(economic wealth)	1.32***				
Ln(population density)		0.82***			
Ln(share 75+)			1.52***		
Ln(competition)				0.007	
Ln(bank size)					1.39***
R ²	0.23	0.77	0.04	0.001	0.32

*** p ≤ 1 %; ** p ≤ 5 % * p ≤ 10 %; (White) heteroscedasticity-robust standard errors; source: own calculations

Table 9

Univariate regression results (OLS): dependent variable ln(geographic branch penetration) of cooperative banks 2005

Independent variables	N = 362				
Ln(economic wealth)	2.08***				
Ln(population density)		0.56***			
Ln(share 75+)			0.51***		
Ln(competition)				-0.18***	
Ln(bank size)					0.47***
R ²	0.30	0.54	0.007	0.01	0.23

*** p ≤ 1 %; ** p ≤ 5 % * p ≤ 10 %; (White) heteroscedasticity-robust standard errors; source: own calculations

Table 10

Univariate regression results (OLS): dependent variable ln(branch market share) of savings banks 2005

Independent variables	n=283			
Ln(economic wealth)	-0.39***			
Ln(population density)		-0.04		
Ln(share 75+)			0.82***	
Ln(bank size)				-0.11***
R ²	0.09	0.008	0.05	0.009

*** p ≤ 1 %; ** p ≤ 5 % * p ≤ 10 %; (White) heteroscedasticity-robust standard errors; source: own calculations

Table 11

**Univariate regression results (OLS): dependent variable ln(branch market share) of cooperative banks
2005**

Independent variables	n=362			
Ln(economic wealth)	0.84***			
Ln(population density)		-0.26***		
Ln(share 75+)			-0.90***	
Ln(bank size)				0,25***
R ²	0.11	0.27	0.05	0.14

*** $p \leq 1\%$; ** $p \leq 5\%$; * $p \leq 10\%$; (White) heteroscedasticity-robust standard errors; source: own calculations

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