Funding modes of German banks: structural changes and its implications

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Abstract

This paper examines funding modes of German banks and its implications for lending and

profitability over the period 1992-2002. Analyzing individual-bank data from the Deutsche

Bundesbank, we first find that deposits from customers lose ground in relative terms while

interbank liabilities increase as a source of funding. Second, we cannot detect a negative

impact of the relative decline in deposits on the lending business. In contrast, loans to

customers become even slightly more important. Third, the decreasing ability of banks to

mobilize deposits from customers and the substitution of deposits by interbank liabilities

unfavorably affects the net interest results of savings banks.

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1.   Introduction

In theory, banks are considered as financial intermediaries in a narrow sense because they provide qualitative asset transformation (QAT) which comprises lot size, maturity, and risk transformation (see, for example, Bhattacharya and Thakor (1993), Allen and Santomero (1998)). Banks typically take deposits from surplus units (households) and lend money to deficit units (firms) which is known as commercial banking. In this paper, we take a new look at the evolution of bank funding modes over time, in particular at deposit taking being mutually with lending the core of commercial banking. Additionally, the implications of potential changes within the liability structure of banks for lending and profitability are analyzed.

Traditional approaches of banking theory argue that the above quoted transformation functions can serve as a rationale for the existence of banks because intermediation helps to lower transaction costs (see Gurley and Shaw (1960), Benston and Smith (1976)). Modern theory of financial intermediation explains the existence of intermediaries as an improvement of welfare due to a reduction in costs of asymmetric information. Some of these models focus on lending (see, for example, Diamond (1984)) while others derive the existence of banks from deposit taking (see, for example, Diamond and Dybvig (1983)). More recent empirical work establishes a link between relationship lending and a special form of deposits (see Berlin and Mester (1999)): *„banks' access to core deposits has been one of the foundations of relationship lending."* Other studies offer explanations that are based on synergies between lending and deposit taking.

In practice, financial intermediaries have been subject to considerable changes during the past two decades and there has been discussion about the future of banks (see Boyd and Gertler (1995), Allen and Santomero (2001), Bossone (2001)). In addition to globalization, liberalization and consolidation phenomena like securitization and disintermediation have appeared. In general, securitization refers to the creation of financial contracts that assume the

form of securities. Particularly in recent years, securitization describes a new financial engineering technique: the transformation of illiquid assets into marketable securities (asset backed securities). Disintermediation generally stands for a decrease in contracting with intermediaries, thus may affect both the lending and deposit taking of banks. Edwards and Mishkin (1995) see a global trend: *„As a source of funds for financial intermediaries, deposits have steadily diminished in importance. [...] we can expect a diminished role for traditional banking in these [other] countries as well.“* These developments indicate that financial intermediation services seem to be subject to substantial changes. Surprisingly, besides general tendency statements there is relatively little empirical evidence for the extent and shape of these developments (see, for example, Schmidt, Hackethal, and Tyrell (1999)). Recently, Hackethal (2004) concludes that the structurally declining role of deposits represents a future critical issue as deposits were the most important funding source of German banks in the past and contributed significantly to their net interest income: one *„issue relates directly to the core deposits [...]. Should the trend of disintermediation on the banks liability sides continue, savings banks will probably lose a competitive advantage ...”* Interestingly, an examination of aggregate bank data from the 30 OECD countries over the past 25 years reveals that in some countries deposits (relative to total bank assets) have steadily lost ground (Germany, Greece, Italy, Portugal, Spain, Switzerland) while they have been stable (Australia, Japan, Netherlands, United States of America) or even slightly gaining in importance (France, Belgium, Poland, Hungary) in others. The evolution of deposits is more or less ambiguous in the remaining countries.

These developments raise several questions that relate to the nature of deposit taking. First, given that deposits constitute the major funding mode of banks in many countries, what happens if banks are no longer able to mobilize a sufficient volume of deposits? Can they close the funding gap by alternative refinancing instruments or should we expect a negative impact on the lending business? Note that this problem is still relevant if disintermediation in

absolute terms (i.e. a decline in deposits) does not occur because it is sufficient that deposits grow at a smaller rate than the lending volume. Second, if banks cannot substitute the funding gap through other liabilities, do they rely on asset securitization as an innovative funding mode? Banks may remain specialists in loan origination but suffer from funding problems. In that case, they can pool parts of their loan portfolio and sell them to the market as asset backed securities. Third, from a theoretical standpoint the economic function of deposits should matter. Customers hold bank deposits for payment purposes on the one hand and for saving purposes on the other hand. Does the specialness of banks relate more to the payment function than to the saving function? Fourth, what is the impact of bank mergers and acquisitions on deposit taking? Are larger banks less able to mobilize deposits than smaller banks? Fifth, is there a link between the size of a bank's branch network and its ability to mobilize deposits? Finally, if banks increasingly substitute deposits from customers by interbank liabilities, can we conclude that systemic risk in the banking sector increases?

In the light of these questions, we analyze the evolution of the funding structure of German banks and its consequences over the course of the decade 1992-2002. Germany, constituting the country with the world's second largest banking system in terms of total assets as of year-end 2001 (after the United States and slightly before Japan), represents an interesting object of investigation for the following reasons: it provides a typical example for a bank-based financial system and, more importantly, the banks heavily rely on deposits as a funding mode. In addition, due to the recently published FSAP report by the International Monetary Fund a new debate on the future of Germany's three-pillar banking system has started (see Brunner et al. (2004)). Note that the diversity due to the three-pillar system offers the opportunity to study funding modes of a wide range of different banks (large vs. small, privately-owned vs. publicly-owned etc.). To our knowledge, this is the first paper that analyzes deposit taking of banks not only with aggregate but also with bank-level data. Specifically, we address the following three issues:

- How can we characterize the evolution of deposits taken by German banks?

- What is the relationship between deposits from customers and other funding modes?

- What is the impact of potential changes of the liability structure on the asset structure and bank profitability?

Note that we do not attempt to test for factors that determine the evolution of deposits because these factors are predominantly macro-economic ones (see Deutsche Bundesbank (2003)). Instead, we take the evolution as given and examine its consequences at the bank-level.

The remainder of the paper is organized as follows. Section 2 provides a brief overview of related research on the role of deposits in banking. Section 3 summarizes institutional characteristics of the German banking sector and presents summary statistics. In section 4, we test a set of hypotheses on the relationship between the evolution of deposits and other funding modes, the lending business and bank performance using panel data from all German banks provided by the Deutsche Bundesbank. Section 5 concludes.

2.   Research on the role of deposits in banking

In this section, we consider two strands of literature that both deal with deposits in banking. Firstly, we review related research that examines banking systems from a macro perspective. Secondly, we turn to selected theoretical and empirical studies from the field of financial intermediation which usually take a micro perspective.

Merton (1995) proposes that the analysis of financial systems should distinguish between a functional and an institutional perspective.[1] Essentially, there are various functions that may be executed by different kind of institutions. While functions are independent from the institutional setting, the latter may evolve over time incorporating or abandoning various

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[1] See Schmidt and Tyrell (2004) with an overview of approaches to analyzing financial systems. They distinguish between the institutional, intermediation, functional and systemic approach.

functions. In the context of deposits, following Merton's approach means to examine the evolution of various kinds of deposits and depository institutions as well as the evolution of the underlying economic functions.

Moreover, research on financial systems distinguishes between market-based and bank-based financial systems. Whereas the United States and the United Kingdom are commonly considered as market-based systems, Japan and Germany are seen as examples for bank-based systems (see Allen and Gale (2000), Krahnen and Schmidt (2004)). In this context, "bank-based" means that universal and/or commercial banks play a dominant role in the intermediation process of an economy. Intermediaries in bank-based financial systems typically perform QAT by means of deposit taking and lending. Levine (2002) provides a large-scale cross-country analysis of financial systems. His main result is that the financial development is strongly linked with the economic growth of a country. However, this study finds no support for either the bank-based or capital-market based views of financial systems.

In some countries, especially in the United States, tendencies towards disintermediation and securitization seem to render QAT less important (see, for example, Edwards and Mishkin (1995), Miller (1998)). However, there has been doubt in reference to a general decline in commercial banking (see Boyd and Gertler (1995), Rajan (1996), Schmidt, Hackethal, and Tyrell (1999), Hackethal (2004)). The ongoing dynamics have been interpreted as a change in banking towards off-balance sheet and fee-income business rather than a decline. In other countries, for example United Kingdom and Germany, evidence is mixed. Domanski (1997) follows Merton (1995) and analyzes aggregate data for the German financial system during 1970-1995. He identifies a trend of disintermediation on the liability side of bank balance-sheets. The relative importance of deposits from customers declines while the lending business does not decrease in relative terms.

Schmidt, Hackethal, and Tyrell (1999) investigate whether there is a trend towards disintermediation and securitization in Germany, France and the United Kingdom during the

period 1982-1996. By measuring both effects by means of intermediation and securitization ratios between the economic sectors within a country they obtain the following results. First, by means of intermediation ratios they find a trend towards disintermediation in France but not in Germany and the UK. Second, in all three countries securitization increases. Third, consistent with Domanski (1997), they show that the ability of banks to mobilize deposits from customers declines because the intermediation chain has been lengthened by mutual funds. Interestingly, banks seem to specialize in lending while other non-bank financial intermediaries specialize in providing investment products.

Deutsche Bundesbank (2003) provides an overview of the aggregate development of bank deposits in Germany. In the 1990s, deposits have grown at a slower rate than in the 1980s. A cointegration analysis of quarterly data from the period 1980-2002 is carried out to test determinants of deposit growth. The analysis reveals that the level of deposits is positively associated with the level of the real GDP and negatively associated with the ten year-level of interest rates. During 2001 and 2002, however, deposit growth sharply increases and lies considerably above its long-term estimates. This finding is explained by portfolio effects that are a consequence of the ongoing stock market baisse and Germany's entry into stage three of the monetary union.

The second strand of related literature consists of theoretical and empirical studies from the field of financial intermediation where bank behavior is frequently analyzed at the individual level. Early theoretical work emphasizes the beneficial implications of banks being exposed to runs (see, for example, Diamond and Dybvig (1983), Calomiris and Kahn (1990)). More recently, Boot and Thakor (2000) develop a model about competition within the banking sector and competition between banks and capital markets in order to make predictions for different kinds of lending (relationship lending, transaction lending, and capital market lending). The following assumptions are made to characterize commercial banks: they provide QAT and benefit from deposit insurance, deposit supply depends on the

availability of deposits in its operating area, bank branches provide access to deposits, and expected costs of deposits are the riskless rate plus an add-on reflecting the cost of bank regulations.

Empirical work that analyzes the deposit taking role of banks is relatively scarce. Berlin and Mester (1999) examine the link between a special type of deposits, called "core deposits", and relationship lending. They find that access to core deposits with inelastic interest rates insulate a bank's cost of funds from exogenous shocks. This effect, in turn, can protect borrowers against unexpected increases in loan rates as a part of an implicit relationship. In their conclusion, they mention that the declining demand for deposits may not only raise banks' funding costs but also reduce the feasibility of relationship lending.

Another rationale that integrates the asset and liability side of banks goes back to Black (1975), Fama (1985), and Nakamura (1993). Small banks primarily lend money to small and medium firms and simultaneously offer checking accounts with payment services. Therefore, these banks permanently acquire information about incoming and outgoing payments of their borrowers. This information may be useful for monitoring these borrowers as it reveals a large part of their business (checking account hypothesis). An empirical investigation of Mester, Nakamura, and Renault (2003) provides support for this hypothesis.

Rajan (1996) and Kashyap, Rajan, and Stein (2002) offer an alternative explanation for the existence of banks. They interpret the deposit and the lending business as two sides of one function: the provision of liquidity on demand. Banks can benefit from synergies if deposit withdrawals and the usage of loan commitments are imperfectly correlated because both activities can share the costs of holding liquid assets.

Finally, taking an institutional view, Allen and Parwada (2002) ask whether bank deposits and managed funds (mutual funds, investment funds) are close substitutes. Analyzing data from Australian banks and bank-affiliated funds, they find that managed funds cannot be seen as substitutes for bank liabilities. In contrast, both instruments seem to complement rather

than substitute each other. This result indicates an underlying difference between bank deposits and capital-market investment products.

3.   Characteristics of the German banking system

3.1.   Institutional characteristics

The German banking system is an example of a universal banking system (for a detailed description see Hackethal (2004), Brunner et al. (2004) and Fitch Ratings (2005)). Accordingly, German banks provide commercial and investment banking services to their customers.

Historically, three major sectors (or "pillars") evolved in the German banking system: private commercial banks (including the four so-called big banks), public savings banks (including the Landesbanks), and credit cooperatives (including the cooperative central banks). Note that these three sectors consist of a large number of legally independent banking firms; they do not represent banking groups or bank holding companies (but may include some). The structure of the banking system mirrors the federalist-decentralized structure of politics and economics in Germany.

Whereas private commercial banks are relatively heterogeneous in terms of size, geographic coverage and activity, the savings banks and credit cooperatives sector are more homogenous. These institution are typically relatively small banks that operate regionally and focus on deposit taking and lending to SME. In addition, there is a number of private and public banks with special functions (mortgage banks, building and loan associations, SME finance, development finance etc.). All banks are subject to federal banking regulation and supervision. Moreover, deposits at almost all German banks are either directly insured to a fixed amount (commercial banks) or indirectly insured by the sector-specific regional and federal associations (savings banks, credit cooperatives). Another distinguishing feature is that less than 1% of all banks are publicly listed.

The banking system is characterized by a large number of banks as well as bank branches, and a small number of inhabitants per bank branch (in 2001: 1,880 inhabitants per branch, in 2003: 2,113 inhabitants per branch).[2] The Herfindahl-Hirshman Index (HHI) for the German banking market is relatively small indicating a low degree of concentration (see Hempell (2002), p. 34-35). However, market concentration statistics have to be interpreted carefully: the degree of concentration is clearly higher at regional or local levels because most of the savings banks and credit cooperatives operate exclusively locally or regionally while some, but not all, of the private commercial banks operate in all regions of Germany (for example, the four big banks).

Finally, two major issues concerning the German banking system are noteworthy. First, Germany faces an increasing intra-sector consolidation in the cooperative and savings bank sector (see, for example, Elsas (2004)). Table 1 shows characteristics of the German banking sector over the period 1992-2003. It reveals that the absolute number of independent banking firms has decreased by roughly 43%. This development is mainly due to the growing number of mergers in the cooperative sector and, to a smaller degree, in the savings banks sector. In addition, the absolute number of domestic bank branches has declined by 25%. Overall, the average German bank in 2003 is considerably larger in terms of total assets and number of branches than in 1992.

(insert Table 1 here)

Second, the savings banks sector is in a period of transition because all kinds of public guarantees for savings banks and Landesbanks (guarantee obligation, maintenance obligation) will be abolished by mid-July 2005 as these guarantees are considered illegal state aids

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[2] Therefore, Germany has often been called "overbanked" and "overbranched", see Deutsche Bundesbank (2002), Deutsche Bundesbank (2004), and Fitch Ratings (2005).

according to European Union law. This development could unfavorably affect the credit ratings of the Landesbanks and, as a consequence, raise their funding costs. In contrast, the removal of the state guarantees will not have a big impact on savings banks since most of their funding consists of (fully-insured) deposits. However, it may influence ownership and governance structures towards privatizations as well as cross-sector or cross-border mergers and acquisitions (see Hackethal (2004), Brunner et al. (2004)).

3.2.   Summary statistics

To investigate the evolution of German banks' funding modes, we analyze data for all German banks from the Deutsche Bundesbank. Major data sources are:

- Bank balance sheet statistics (publicly available aggregate data, 1970-2002, monthly)

- Bank balance sheet statistics (not publicly available anonymous bank-level data, 1992-2002, monthly)

- Bank income statement statistics (not publicly available anonymous bank-level data, 1992-2002, yearly)

Balance sheet statistics include assets and liabilities items that are disaggregated into maturities and creditor/debtor types by economic sectors. In addition, we consider performance variables from the yearly income statement statistics. Note that since both balance sheet and income statement statistics reflect the entire German banking system, we do not have to deal with selection problems and sampling errors. Furthermore, since monthly time series are more detailed but simultaneously more noisy (due to seasonal components in December and January), monthly observations are only considered for data description in this section while section 4 is based on yearly data. Finally, the remaining part of this section is based on both aggregate data from the period 1970-2002 and bank-level data from the period 1992-2002 while the panel analysis in section 4 is carried out with bank-level data from the most recent decade.

Subsequently, we will summarize the relative evolution of major assets and funding items of German banks. Figure 1 displays the development of various asset items of German banks over the past 30 years.

(insert Figure 1 here)

The ratio of loans to customers to total assets has decreased from above 60% in the mid-1980s to below 50% in 2001. Furthermore, interbank lending has slightly increased to 25% and security holdings have grown considerably from roughly 10% at the beginning of the 1980s to more than 20% in 2001. Liquid assets have steadily declined reflecting the continuously rising spread of non-cash payment instruments.

How do German banks fund their investments? Figure 2 presents the evolution of main funding items relative to total assets (see also Deutsche Bundesbank (2003), European Central Bank (2002)):

(insert Figure 2 here)

It can be seen that the ratio of deposits from customers to total assets has continuously declined from 50% to below 40% over the past 15 years. Note that in 1990 the spike in some curves is due to the effects of the German unification. During the same period deposits from banks (interbank liabilities) have risen from 20% to almost 30% of total assets (see Ehrmann and Worms (2001)). In addition, the share of bonds relative to total assets has increased. The mean equity ratio of German banks has been quite stable over the last 30 years (see Kleff and Weber (2003), and Heid, Porath, and Stolz (2003) for recent research on determinants of German banks' capital).

The evolution of the ratio deposits from customers to total assets is plotted in Figure 3 by major bank categories (big banks, savings banks, credit cooperatives). During the 1990s, we detect a clear decrease in deposits from customers relative to total assets for all three bank categories (big banks: from 55% in 1990 down to 33% in 2000, savings banks: from 75% down to 64%, and cooperatives: from 81% down to 71%). While this decline is dramatic for the big banks, it is less pronounced but still remarkable for savings banks and cooperatives. Note that this evolution does not necessarily imply that banks' absolute stock of deposits from customers is declining but, at least, that it is growing at a slower rate than other funding items. In other words, assets of some banks are increasingly funded by other means than deposits from customers.

(insert Figure 3 here)

Additional information on the evolution of deposits from customers is given in Table 2. For savings banks (credit cooperatives), the first row indicates an almost monotonous reduction in the mean deposit growth rates ΔDEP from 7.3% (9.4%) in 1993 to -0.1% (1.5%) in 2000. Deposits rise considerably in 2001 because of reallocations of savings that were invested in stocks and mutual funds beforehand (see Deutsche Bundesbank (2003)) but, important to note, growth slows down again in 2002. Comparing the growth rates of deposits with those of other liabilities which are shown in the second row, it demonstrates that deposits at savings banks and cooperatives grow at a slower rate than other liability items in all years except 2001 and 2002. The third row displays the first difference of the ratio deposits from customers to total assets in percentage points. We find a decline in the relative importance of deposits at savings banks and cooperatives in each of the years from 1993 to 2000, except 2001 and 2002. The fourth row includes the sector-specific share of banks with negative growth of the absolute level of deposits. Consistent with the decrease of mean growth rates,

the percentage of banks who lose deposits in absolute terms appears to increase over the period 1993-2000. For example, 62% of all savings banks and 70% of all cooperatives face a net outflow of deposits from customers in the year 2000. In contrast, only a very small fraction of savings banks and credit cooperatives exhibit negative deposit growth in 2001. Interestingly, the percentage of banks with negative deposit growth has increased strongly again in 2002 which is consistent with the above mentioned slackening of average growth rates. Finally, we do not see any clear trend for funding modes of "other banks". There are several reasons for this observation. First, since this group is very heterogeneous (including the four big banks, the Landesbanks, mortgage banks as well as direct banks or auto banks), funding modes differ considerably. Second, deposits are, on average, a less important source of funding in this group which is reflected by considerable lower mean deposit ratios than for savings banks and credit cooperatives. Nonetheless, it is remarkable that the mean fraction of banks with negative absolute deposit growth amounts to 32.4% which is the highest mean of all groups.

(insert Table 2 here)

This descriptive analysis provides evidence for a substantial change in the funding structure of German banks, especially for savings banks and credit cooperatives. In particular, it is noteworthy that deposits from customers are no longer as important for funding as in former times. As mentioned introduction, this development is not only observed for Germany but for other large countries as well. In the next section, a set of hypotheses on the evolution of deposits and its consequences is tested by means of micro-data from all German banks over the period 1992-2002.

4. Analyzing the impact of declining deposit growth

4.1. Hypotheses

Subsequently, we propose three hypotheses that relate to the impact of declining deposit growth at German banks. As mentioned in the introduction, note that we take the evolution of deposits as reflected in the bank balance sheet statistics as given and analyze its consequences.

First, in contrast to former banking practice, interbank liabilities might not only serve as a *temporary* buffer for lending-refinancing imbalances but might replace *structural* funding gaps. In Germany, permanent funding with interbank liabilities seems particularly attractive for savings banks who can rely on borrowing from their regional Landesbanks while the latter refinance themselves by means of bond issuances. Overall, this development implies that some banks increasingly become net interbank creditors while others increasingly get net interbank debtors. In other words: deposits from customers are gradually substituted by borrowed money from other banks. Accordingly, we expect a significantly negative relationship between deposits from customers and interbank liabilities.

H1 (Substitution hypothesis): The declining growth of deposits from customers is compensated by an increasing growth of interbank liabilities.

Second, under the condition that the declining growth of deposits cannot be compensated by an increase of alternative funding modes, a bank may be forced to reconfigure its asset structure (divest from securities or interbank loans to maintain the same lending capacity) and/or to reduce growth of lending to customers.[3] Hence, we expect a significantly positive relationship between deposits from and loans to customers.

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[3] We cannot follow Berlin and Mester (1999) in analyzing the impact of declining deposit growth on relationship lending because our data does not include information on individual bank-borrower relationships.

H2 (Bottleneck hypothesis): The declining growth of deposits from customers negatively

affects the growth of lending to customers.

Third, the declining growth of deposits may deteriorate a bank's performance. Note that in

Germany, deposits from customers tend to be less expensive than interbank liabilities in terms

of interest expenses (in particular demand deposits which usually do not pay any or very low

interest). Therefore, decreasing growth of deposits from customers may reduce the net interest

income because the new funding mix of a given asset structure will cause higher interest

expenses. This reasoning only holds if the deposits that are declining in importance bear

lower interest rates than interbank liabilities. In contrast, if higher interest bearing deposits

(for example, time deposits or particular savings products) grow at a slower rate, performance

may be unchanged or even improved. Overall, we expect a significantly positive relationship

between the relative fraction of deposits from customers to other funding modes and the net

interest income.

H3 (Performance impact): The declining growth of deposits will unfavorably affect the

net interest income of banks.

4.2. Variables and model specifications

The variables of our analysis can be categorized as funding items, asset items,

performance measures as well as bank characteristics and are defined as shown in Table 3.

Bank characteristics are captured by the variables SIZE (log. of total assets), GROWTH

(growth rate of total assets), GROUP (categorical variable which is 1 for other banks[4], 2 for

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[4] The group "other banks" includes all private commercial banks as well as Landesbanks (savings bank sector) and cooperative central banks (cooperative sector). Although this classification deviates from the three sectors mentioned above it seems reasonable as Landesbanks and cooperative central banks are more similar to private commercial banks in terms of their business activities and size than to savings banks and credit cooperatives.

savings banks, and 3 for credit cooperatives), LOC (indicator variable: 17 regions[5]), URBAN (a dummy variable that takes the value one if a bank stems from the city states of Berlin, Hamburg or Bremen[6]), EAST (a dummy variable that takes the value one if a bank comes from Eastern Germany), and MERGE (a dummy variable that is one if a bank acquires another bank in a particular year).

(insert Table 3 here)

Table 4 reports the cross-sectional means of these variables by year as well as the time-series means for all banks.[7] While Panel A includes variable levels as ratios in percent of total assets, Panel B presents growth rates of the absolute balance sheet item levels. It can been seen from Panel B that the mean of ΔDEP is lower than the one of ΔIBL in each of the years except 2001 and 2002. Consequently, the overall mean of ΔDEP amounts to 5.4 % per year while it is 13.8 % per year for ΔIBL. A differentiation by deposit types (ΔDEM, ΔSAV, ΔTIME) reveals that the evolution of ΔDEP is quite heterogeneous. While time deposits exhibit considerable decreases over 1993-1999, savings deposits increase in the first half of the sampling period and decrease in the second half. Demand deposits exhibit on average higher growth rates (9.4 %) than savings deposits (7.6 %) and time deposits (-0.4 %).

On the asset side, we observe a relatively even increase in lending with ΔLOAN ranging between 6% and 11% in most years. The evolution of ΔIBR tends to be irregular: in some

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[5] Regions are Baden-Württemberg, Bayern, West Berlin, Bremen, Hamburg, Hessen, Niedersachsen, Nordrhein-Westfalen, Rheinland-Pfalz, Saarland, Schleswig-Holstein, Mecklenburg-Vorpommern, Brandenburg, Sachsen-Anhalt, Thüringen, Sachsen, and East Berlin. Except the split up of Berlin in East and West, the regions correspond to the German federal states (Bundesländer).

[6] We are aware of the fact the many large cities (for example Munich, Frankfurt, and Cologne) are not covered by the variable URBAN. As we do not know the domicile of each bank inside a region, we unfortunately cannot mark large cities that are not states. However, differentiating regions by the average number of inhabitants per square kilometer over the sampling period leads to a similar classification as by city-states (2,592 inhabitants/square kilometer) vs. non-city states (225 inhabitants/square kilometer).

[7] See Appendix A for a decomposition by groups and years.

years there are increases in interbank receivables while other years exhibit decreases. In terms of performance, ΔNIR exhibits a negative mean over the sampling period indicating a general deterioration of German banks' net interest income (see Organisation for Economic Co-Operation and Development (2001)).

(insert Table 4 here)

We now turn to the specification of regression models to test the three hypotheses proposed above. As stated in H1, we examine if and how strong the growth of deposits from customers is related to the evolution of other funding modes. The model presented below aims to explain the growth rate of interbank liabilities by growth rates of various other funding modes. We include slope and intercept dummy variables to identify group-specific effects ($GROUP_j$ with j=2, 3).[8] Additionally, we control for individual bank characteristics ($MERGE_t$, $EAST_t$, $URBAN_t$, $SIZE_t$, and $GROWTH_t$) and year-specific effects with dummy variables (year 1993 as reference category)[9]. According to H1, the growth of interbank liabilities should be inversely related to the growth of deposits from customers, that is $\beta_1 < 0$. In all models, we will substitute ΔDEP with ΔDEM, ΔSAV, and ΔTIME to test whether the hypothesis holds for different kinds of deposits and bank groups.

$$\Delta IBL_{it} = \alpha + \beta_1 \left(\Delta DEP \cdot GROUP_j \right)_{it} + \beta_2 \left(\Delta BOND \cdot GROUP_j \right)_{it} + \delta Bank\_characteristics_{it} + \mu Year\_dummies_t + \varepsilon_{it}$$

(1)

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[8] Technically, the categorical variable GROUP is decomposed into two dummy variables ($GROUP_j$ with j=2: 1 for savings banks, zero otherwise; $GROUP_j$ with j=3: 1 for credit cooperatives, zero otherwise). Hence, other banks (j=1) serve as reference category.

[9] Year dummies are included to control for macro-economic effects. We cannot include bank-individual loan and deposit interest rates because there is no such micro-data base for German banks. The alternative, i.e. calculating average interest rates from interest expenses/income and loan/deposit volume, would be very imprecise because it would presume the same level of interest rates for all kinds of deposits.

For a test of H2, we analyze the impact of changes in interbank receivables, security holdings and various funding modes (in particular interbank liabilities and deposits from customers) on changes in lending to customers by means of the following regression model. If H2 holds, we would expect a significantly positive coefficient β_3 and no significant coefficients β_4 and β_5.

$$
\begin{aligned}
\Delta LOAN_{it} = {} & \alpha + \beta_1 \left(\Delta IBR \cdot GROUP_j \right)_{it} + \beta_2 \left(\Delta SEC \cdot GROUP_j \right)_{it} + \beta_3 \left(\Delta DEP \cdot GROUP_j \right)_{it} + \\
& \beta_4 \left(\Delta IBL \cdot GROUP_j \right)_{it} + \beta_5 \left(\Delta BOND \cdot GROUP_j \right)_{it} + \beta_6 \left(\Delta EQ \cdot GROUP_j \right)_{it} + \\
& \delta Bank\_characteristics_{it} + \mu Year\_dummies_t + \varepsilon_{it}
\end{aligned}
\tag{2}
$$

Finally, H3 suggests that the relative decline of deposits unfavorably affects a bank's interest income. Consequently, we test whether changes of the funding structure (change rate of the ratio of deposits to interbank liabilities, ΔDEP_IBL) influence the net interest income, controlling for simultaneous changes of the asset structure ($\Delta LOAN\_IBR$). Empirical results would corroborate H3 if the estimation yields a significantly positive coefficient β_1. In addition, the coefficients β_2 and β_3 are also expected to be significantly positive. Note that the explanatory variables in this model indicate structural changes on the liability and asset side because they measure the change in the reciprocal importance of two variables.

$$
\begin{aligned}
\Delta NIR_{it} = {} & \alpha + \beta_1 \left(\Delta DEP\_IBL \cdot GROUP \right)_{it} + \beta_2 \left(\Delta DEP\_BOND \cdot GROUP \right)_{it} + \\
& \beta_3 \left(\Delta LOAN\_IBR \cdot GROUP \right)_{it} + \delta Bank\_characteristics_{it} + \mu Year\_dummies_t + \varepsilon_{it}
\end{aligned}
\tag{3}
$$

with $\qquad \Delta DEP\_IBL_t = (DEP_t/IBL_t) - (DEP_{t-1}/IBL_{t-1})$

$\qquad\qquad\quad \Delta DEP\_BOND_t = (DEP_t/BOND_t) - (DEP_{t-1}/BOND_{t-1})$

$\qquad\qquad\quad \Delta LOAN\_IBR_t = (LOAN_t/IBR_t) - (LOAN_{t-1}/IBR_{t-1})$.

As indicated, the three models are estimated in first differences because most of the variable levels (i.e. the ratio relative to total assets as well as the absolute balance sheet items) exhibit high serial correlation.

4.3. Results

In this section, we report and discuss main findings for the regression models 1-3. For each model, we present estimation results for cross-sectional time-series pooled data with robust standard errors. Note that the corresponding fixed and random effects panel models produce very similar outcomes.

Table 5 includes results from the estimation of model 1. First of all, keep in mind that ΔDEM_t, ΔSAV_t, $\Delta BOND_t$, and $\Delta TIME_t$ reflect the impact of these variables on ΔIBL_t for banks from the category "other banks" while interaction terms indicate the additional slope coefficients for savings banks (GROUP2 = 1) and credit cooperatives (GROUP3 = 1) respectively.[10] It can be seen that for other banks ΔDEM_t, ΔSAV_t, and $\Delta BOND_t$ are not significantly associated with ΔIBL_t whereas $\Delta TIME_t$ exhibits a significantly negative coefficient (-0.20). Interestingly, all interaction terms of ΔDEM_t, ΔSAV_t, and $\Delta TIME_t$ for savings banks and credit cooperatives are significantly negative at the 0.01-level. For example, a 1%-decline of savings deposits at savings banks (credit cooperatives) translates into an overall increase of interbank liabilities by 0.03 + 1.12 = 1.15% (1.04%). In addition, results show that the inverse relationship between time deposits and interbank liabilities is stronger at cooperatives than at savings banks while the opposite is found for the relationship between demand deposits and interbank liabilities. The coefficient of $\Delta BOND_t$ is only significantly negative, but economically weak, when it is interacted with a dummy variable for cooperatives. In a modified specification, we also included lag 1 of ΔDEM_t, ΔSAV_t,

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[10] The same interpretation applies to models 2 and 3.

$\Delta TIME_t$, and $\Delta BOND_t$ and find that none of the coefficients is significantly different from zero. Moreover, the dummy variable $MERGE_t$ is significantly negative which may be due to the fact that interbank liabilities of the (usually bigger) acquirer may be diluted due to a smaller interbank liabilities of the (usually smaller) target. The indicator variable $EAST_t$ has a significantly negative impact on ΔIBL_t but its magnitude is much smaller than the that of $MERGE_t$. $GROWTH_t$ and the corresponding interaction terms are significantly positive indicating that an increase in total assets is, at least, partially funded by an increase in interbank liabilities. The additive group dummy variables are highly significant and positive reflecting the higher growth of interbank liabilities at savings banks and cooperatives compared to other banks. Finally, the model explains roughly one third of the variation of changes in interbank liabilities which is relatively high for a regression in first-differences. In summary, a significant negative relationship between all kinds of deposits from customers and interbank liabilities has been detected for savings banks, credit cooperatives, and partly for other banks which provides support for hypothesis H1.

(insert Table 5 here)

We now turn to the test of H2 by means of regression model 2. Table 6 summarizes the estimation results. First, we find that changes of interbank receivables (ΔIBR_t) exhibit a significantly negative coefficient indicating substitution relationships between different types of bank assets. Although the influence is less pronounced for savings banks and cooperatives due to significantly positive interaction terms, the overall effect remains significant and negative for all bank groups. Changes in security holdings (ΔSEC_t) have a significantly negative impact on loan growth at all banks. The interaction terms for savings banks and cooperatives are not significant indicating that there is no difference in the slope coefficients in comparison to the reference group.

Second, changes of interbank liabilities (ΔIBL_t) exhibit no significant impact on the growth rate of loans to customers at either bank group. Similarly, demand deposits have no significant impact while savings deposits at other banks and savings banks (but not at cooperatives) are significantly positively related to the growth of loans. However, in terms of economic significance, the relationship is quite weak with coefficients between 0.0271 and 0.0722 (= 0.0271 + 0.0451). For time deposits, we obtain a significantly positive coefficient for other banks, no significant additional slope for savings banks but a significantly negative coefficient for cooperatives. $\Delta BOND_t$ exhibits overall coefficients that are significant at the 0.10-level but their magnitude is even lower than those of most kinds of deposits. Changes of a bank's equity ratio have a significantly positive influence on $\Delta LOAN_t$ at all bank groups, especially at savings banks. Moreover, $MERGE_t$ and in particular $EAST_t$ exert a strong positive impact on loan growth. The significantly negative coefficient of $SIZE_t$ indicates that larger banks exhibit a slower growth of loans to customers. Finally, $GROWTH_t$ is highly significant and positively associated with $\Delta LOAN_t$ with an economically meaningful coefficient of 0.9691.

(insert Table 6 here)

Although we have detected a positive impact of ΔSAV_t and $\Delta TIME_t$ as well as no significant influence of ΔIBL_t on $\Delta LOAN_t$, we refrain from concluding that these empirical findings provide clear-cut support for H2. Such a conclusion would ignore that there is simultaneously a significantly positive impact of $\Delta BOND_t$ and a negative link between asset items (loans to customers, interbank receivables, security holdings). Consequently, even if deposits are declining in relative importance, a reconfiguration on the asset side or other funding modes could substitute this funding gap enabling a bank to maintain or even increase

its capacity of lending to customers. Overall, we have to reject hypothesis H2: apparently, there is no "bottleneck" or negative effect on lending due to a relative decline in deposits from customers.

Finally, we investigate if and how structural changes in banks' funding modes affect bank profitability measured by changes of the ratio net interest income to total assets (ΔNIR_t). Table 7 reveals that the ratio of deposits from customers to interbank liabilities (ΔDEP_IBL_t) has no significant influence in the case of other banks and credit cooperatives while its coefficient is significantly positive at the 0.01-level for savings banks. In other words: the higher the share of deposits from customers relative to interbank liabilities the more profitable a savings bank.[11] Moreover, changes of the ratio of loans to customers to interbank receivables ($\Delta LOAN\_IBR_t$) exhibit a significantly positive impact on ΔNIR_t for all bank groups. Note that the effect is less marked for savings banks (credit cooperatives) which is reflected by a significantly negative interaction term of -0.07 (-0.05). The overall coefficient of $\Delta LOAN\_IBR_t$ is highest for other banks (0.0918) and lowest for savings banks (0.0217). One explanation could be that other banks benefit from higher margins in loan rates than savings banks due to a more risk-sensitive loan pricing behavior. Furthermore, there is no significant interest income impact of structural shifts between deposits and bonds (ΔDEP_BOND_t) in either bank group. In addition, the coefficient of $MERGE_t$ is highly significant and amounts to 0.17 which can be directly interpreted as an additional net interest income (in percentage points) for the acquirer in the year of a bank merger/acquisition. The

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[11] We admit that this finding only holds for the net interest result of savings banks but not for overall profitability. In general, there may be two contrarian effects. On the one hand, it is not implausible to assume that a savings bank pushes its customers to invest, for example, in mutual funds to generate provision income which may reduce growth of deposits. On the other hand, if the same bank faces a steady growth in loan demand, it has to find alternative funding modes which might be more expensive than previous ones. It is left to future research whether additional provision income exceeds increased funding costs caused by an altered funding structure. The data analyzed here does not allow to study this issue as we cannot isolate provision income that is due to the sale of investment funds. In addition, note that the average net interest result of savings banks is five times larger than the net non-interest result during the sampling period.

variables $EAST_t$, $SIZE_t$, and $GROWTH_t$ display significantly negative coefficients while $URBAN_t$ has no significant influence.

(insert Table 7 here)

To summarize, consistent with the prediction of Hackethal (2004), we find evidence in favor of H3 for German savings banks: a decrease in deposits from customers, which is compensated by an increase in interbank borrowing, unfavorably affects the net interest result. Note that our regression results are based on years with relatively high interest rates (and an inverse term structure that is shifting to a normal one) during 1992-1993 and years with relatively low interest rates (and a normal term structure) during the last years. While year dummies (not shown in Table 7) are not significant in each of the years for other banks except 1994, they exhibit significantly positive coefficients for savings banks during most of the years, and significantly negative coefficients for credit cooperatives in all years. The significance and the magnitude of the year dummies reflect the different impact of the level and term structure of interest rates on each group which is caused by different asset and funding structures.

5.   Conclusions

In this analysis, we examine structural changes of funding modes and its implications for lending to customers and bank profitability. Empirical evidence is based on individual data from all German banks for the period 1992-2002 provided by the Deutsche Bundesbank.

First, we find that deposits from customers decline and interbank liabilities increase in relative importance as a source of funding. Thus, we provide evidence for a kind of "creeping disintermediation" (or, at least, lengthening of the intermediation chain) on the liability side of bank balance sheets. Second, we cannot detect a negative impact of the relative decline in deposits on lending to customers. Instead, lending is even slightly gaining in relative importance over time. Third, the decreasing ability of banks to mobilize deposits from customers and the substitution of deposits by interbank liabilities unfavorably affects the net interest results of German savings banks.

What are the implications of our analysis for Germany and other countries which exhibit a similar evolution of bank funding modes? First, the data from German banks shows that the function of deposits matters. On the one hand, following demand-side arguments, we conclude that demand deposits are and will not be affected by disintermediation because they provide liquidity and serve as means of payment (see Kashyap, Rajan, and Stein (2002) and Bossone (2001)). Demand deposits are exclusively provided by banks and represent a significant feature of banks' specialness. Additionally, supply-side arguments suggest that demand deposits provide the bank with information that can be used for monitoring purposes (see Black (1975), Fama (1985), Nakamura (1993), and Mester, Nakamura, and Renault (2003)). Accordingly, there may be an informational synergy between deposit taking (and payment services) and lending. On the other hand, financial products fullfill an investment and/or saving function. These products are offered by banks (savings deposits, time deposits), non-bank financial intermediaries (e.g. insurance companies, mutual funds) and financial markets (stocks, bonds). Our data indicates that savings deposits steadily decrease in relative

importance which leads to structural changes in bank funding modes and to a lengthening of the intermediation chain for investment products. Second, given the relative change of funding structures and the simultaneous growth in lending there is a strategic need for alternative funding modes. It is obvious that long-term funding by demand deposits will by far not be sufficient and interbank funding will reach its limits. We think that true sale asset securitization, which still is in its infancy in Germany, is not only useful for risk management purposes but can also represent one possible instrument to deal with strategic imbalances between the lending and deposit business of banks. Finally, central banks and banking supervisors should monitor the long-run evolution of national and cross-border interbank relationships and its impact on systemic liquidity and credit risk.

Appendix A: Descriptive statistics by group and year

Other banks

Panel A: Mean variable levels (in %)

Variable	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	Mean
IBL	33.1	31.1	30.2	28.9	28.8	29.7	27.2	29.2	29.2	26.9	25.9	29.4
DEP	44.7	46.8	46.8	47.1	48.1	48.0	50.8	49.1	48.3	51.8	52.2	48.2
DEM	8.5	8.8	9.4	10.2	12.7	12.3	14.6	14.1	13.9	16.8	17.9	12.3
SAV	8.6	9.4	10.0	10.2	10.8	11.4	11.2	10.8	9.4	9.4	9.5	10.0
TIME	27.56	28.6	27.4	26.7	24.5	24.2	25.1	24.2	25.0	25.6	24.7	25.9
BOND	7.1	7.4	8.1	8.8	8.3	7.7	7.4	7.0	7.3	6.7	6.7	7.5
EQRAT	6.9	6.1	6.2	6.3	6.2	6.0	6.4	6.6	6.8	7.0	7.6	6.5
IBR	30.6	31.0	28.6	29.5	29.8	30.5	31.3	29.8	26.3	27.4	27.4	29.4
LOAN	48.8	47.9	49.3	49.0	48.7	48.6	47.86	47.5	50.6	50.2	50.0	48.9
SEC	10.9	12.6	13.7	13.0	13.4	13.4	13.4	15.0	15.1	15.3	15.5	13.6
NIR	2.3	2.3	2.4	2.3	2.2	2.1	2.0	2.0	1.9	1.9	1.9	2.1
SIZE	13.5	13.7	13.8	13.8	13.9	13.9	13.9	14.0	14.0	14.1	14.2	13.9
GROWTH	---	15.3	4.9	8.0	9.1	9.9	8.7	99.5	6.6	12.2	7.6	17.6
EAST	0.0	0.0	0.5	0.0	0.0	0.6	1.3	0.7	0.7	0.8	0.0	0.4
MERGE	0.0	2.7	1.1	0.6	2.4	1.8	2.6	2.1	1.4	3.0	---	1.7

Panel B: Mean variable change rates (in %)

Variable	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	Mean
ΔIBL	---	6.5	2.4	2.2	8.8	12.8	-2.5	21.4	-2.2	3.9	-0.6	5.4
ΔDEP	---	13.6	4.4	7.7	7.5	5.5	8.7	9.4	-1.1	10.8	2.1	6.9
ΔDEM	---	11.3	5.1	11.9	22.4	1.0	15.9	14.4	-2.8	31.4	8.4	11.7
ΔSAV	---	3.9	1.0	9.9	2.6	-2.1	4.8	4.2	-24.9	-2.0	-9.5	0.8
ΔTIME	---	9.4	-0.1	3.7	3.8	6.4	5.5	10.1	5.4	5.5	-1.7	4.8
ΔBOND	---	14.2	21.2	13.3	13.9	-7.43	2.2	-6.4	-9.5	5.3	-24.2	4.6
ΔEQ	---	9.9	8.1	5.1	6.2	5.9	7.1	9.4	5.4	9.1	8.5	7.5
ΔIBR	---	19.2	-7.4	18.7	9.0	12.9	13.7	-9.0	-10.3	9.1	1.4	6.1
ΔLOAN	---	10.9	4.9	7.4	7.8	6.1	5.1	9.5	7.8	4.5	-0.2	6.5
ΔSEC	---	17.7	14.8	-0.2	2.3	7.4	2.0	24.0	4.5	9.8	-4.6	8.1
ΔNIR	---	0.1	0.1	-0.1	-0.1	-0.1	-0.2	0.0	-0.0	-0.1	0.1	-0.0

Appendix A (continued): Descriptive statistics by group and year

Savings banks

Panel C: Mean variable levels (in %)

Variable	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	Mean
IBL	12.4	13.5	15.6	16.4	17.4	18.7	19.9	22.1	23.8	22.5	21.9	18.4
DEP	74.0	74.1	71.2	69.5	68.3	67.1	66.2	64.4	62.4	63.8	64.1	68.0
DEM	11.8	15.1	14.5	13.9	13.9	13.5	14.0	14.4	14.7	16.9	17.7	14.6
SAV	34.2	34.5	36.0	37.7	38.8	38.5	37.6	36.4	34.0	33.2	33.0	35.9
TIME	28.0	24.4	20.8	17.9	15.6	15.0	14.6	13.6	13.7	13.7	13.4	17.5
BOND	4.9	3.5	3.9	4.3	4.3	4.1	3.9	3.5	3.5	3.2	3.2	3.8
EQRAT	3.8	3.5	3.6	3.7	3.8	3.9	3.9	4.0	4.1	4.2	4.3	3.9
IBR	8.3	11.1	7.4	8.2	7.8	7.4	7.4	7.0	6.5	7.1	8.1	7.9
LOAN	62.0	53.8	56.4	58.3	59.0	59.5	59.5	59.9	60.6	60.1	60.1	58.8
SEC	21.8	25.4	27.8	25.7	25.9	26.1	26.4	26.2	26.1	26.1	25.1	25.7
NIR	2.8	2.9	3.0	2.8	2.7	2.6	2.3	2.2	2.1	2.0	2.1	2.5
SIZE	13.3	13.3	13.4	13.6	13.7	13.7	13.8	13.8	13.9	14.0	14.0	13.7
GROWTH	---	11.0	11.8	10.1	8.2	5.9	5.8	5.7	3.9	5.7	2.0	7.2
EAST	0.0	24.2	21.1	17.3	6.0	15.7	15.8	15.6	16.0	16.8	17.3	16.3
MERGE	0.0	2.6	5.6	3.8	2.3	1.2	0.7	2.1	2.3	3.7	---	2.5

Panel D: Mean variable change rates (in %)

Variable	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	Mean
ΔIBL	---	20.9	25.7	14.3	13.9	13.0	12.8	15.5	11.1	-1.0	-0.9	12.9
ΔDEP	---	7.5	6.5	6.4	5.6	3.6	4.2	2.2	-0.0	6.9	2.1	4.6
ΔDEM	---	9.6	8.5	7.9	9.2	3.6	9.6	8.2	4.8	18.0	5.6	8.5
ΔSAV	---	10.7	14.2	13.6	10.1	4.6	3.0	1.5	-3.7	2.1	0.8	5.9
ΔTIME	---	2.3	-6.9	-8.6	-7.7	1.4	2.1	-2.1	3.6	4.2	-1.4	-1.5
ΔBOND	---	5.5	12.0	12.7	2.7	1.2	-9.4	-12.9	-4.4	-3.8	-4.0	0.1
ΔEQ	---	8.9	10.6	9.9	9.1	8.0	6.6	7.1	6.8	6.8	5.0	8.0
ΔIBR	---	22.5	-39.1	24.6	1.5	2.1	5.9	-0.4	-13.8	24.2	11.7	3.2
ΔLOAN	---	8.3	14.2	10.5	7.8	6.4	5.8	5.8	4.7	4.4	2.1	7.2
ΔSEC	---	14.6	21.4	1.1	8.5	5.7	5.1	4.8	1.7	2.2	-5.7	6.2
ΔNIR	---	0.0	0.1	-0.1	-0.1	-0.1	-0.2	-0.1	-0.2	-0.1	0.1	-0.1

Appendix A (continued): Descriptive statistics by group and year

Credit cooperatives

Panel E: Mean variable levels (in %)

Variable	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	Mean
IBL	7.5	8.5	9.8	10.8	11.3	12.0	12.9	14.3	14.8	13.8	13.1	11.3
DEP	83.1	81.7	79.7	78.3	77.5	76.6	75.8	74.3	73.1	74.2	74.3	77.7
DEM	13.0	13.8	13.7	13.4	13.9	13.9	14.6	15.4	15.7	17.7	18.5	14.6
SAV	32.8	31.6	34.1	37.1	40.0	40.8	40.2	39.1	36.7	35.1	34.7	36.5
TIME	37.3	36.3	32.0	27.7	23.7	22.0	21.0	19.8	20.7	21.4	21.1	26.6
BOND	1.4	1.6	1.9	2.2	2.3	2.3	2.3	2.3	2.5	2.5	2.7	2.1
EQRAT	4.2	4.2	4.3	4.5	4.6	4.8	4.8	4.9	5.2	5.2	5.3	4.7
IBR	15.0	16.0	12.6	13.5	12.7	12.7	12.9	12.8	11.3	12.8	13.3	13.3
LOAN	58.2	55.4	57.2	58.5	59.0	59.9	60.3	60.6	62.9	61.1	60.6	59.1
SEC	19.2	20.7	23.0	21.1	21.7	21.2	20.8	20.3	19.3	19.2	19.4	20.7
NIR	3.1	3.1	3.2	3.1	3.0	2.9	2.7	2.6	2.6	2.5	2.6	2.9
SIZE	11.1	11.3	11.4	11.5	11.5	11.6	11.7	11.8	11.9	12.1	12.2	11.6
GROWTH	---	12.1	9.7	8.4	7.0	5.5	8.0	6.8	4.5	9.1	5.1	7.8
EAST	0.0	7.7	7.3	7.0	7.0	6.9	6.6	6.7	6.6	6.5	6.7	6.2
MERGE	0.0	3.7	3.6	2.4	2.6	3.0	5.3	7.6	9.9	7.8	---	4.2

Panel F: Mean variable change rates (in %)

Variable	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	Mean
ΔIBL	---	21.6	25.6	18.9	13.5	12.7	16.1	17.9	7.7	0.9	-1.7	14.7
ΔDEP	---	9.4	6.4	5.8	5.4	3.6	5.8	3.7	1.5	8.6	4.2	5.6
ΔDEM	---	9.6	8.9	6.0	9.5	4.9	13.4	11.4	5.8	19.3	8.3	9.4
ΔSAV	---	10.4	16.6	16.5	14.6	7.2	5.4	3.3	-2.9	2.4	3.0	8.6
ΔTIME	---	8.4	-4.5	-7.9	-10.5	-3.2	2.5	-0.9	6.4	10.6	1.4	-0.5
ΔBOND	---	27.7	24.1	22.2	5.8	7.1	1.1	0.3	7.2	1.7	8.8	11.5
ΔEQ	---	12.5	12.5	10.4	10.2	8.1	8.0	7.8	9.2	6.2	5.7	9.4
ΔIBR	---	17.6	-21.5	19.4	-1.0	6.1	11.4	4.2	-10.9	24.9	8.4	5.4
ΔLOAN	---	9.1	11.7	9.9	7.2	6.3	7.4	6.1	6.7	4.2	3.0	7.6
ΔSEC	---	15.1	21.2	-2.6	7.4	1.6	4.6	2.4	-2.0	3.6	1.5	5.9
ΔNIR	---	0.0	0.1	-0.1	-0.1	-0.1	-0.2	-0.0	-0.0	-0.1	0.1	-0.1

References

Allen, F., Santomero, A. (2001). What do financial intermediaries do?, Journal of Banking and Finance, 25, 271-294.

Allen, F., Gale, D. (2000). Comparing Financial Systems, Cambridge, MA.: MIT Press.

Allen, F., Santomero, A. (1998). The theory of financial intermediation, Journal of Banking and Finance, 21, 1461-1485.

Allen, D., Parwada, J. (2002). Are bank deposits and bank-affiliated managed funds close substitutes?, Working Paper, Edith Cowan University, Western Australia.

Benston, G., Smith, C. (1976). A transactions cost approach to the theory of financial intermediation, Journal of Finance, Vol. 31, S. 215-231.

Berlin, M., Mester, L. (1999). Deposits and Relationship Lending, Review of Financial Studies, 12, 579-607.

Bhattacharya, S., Thakor, A. (1993). Contemporary Banking Theory, Journal of Financial Intermediation, 3, 2-50.

Black, F. (1975). Bank Funds Management in a efficient market, Journal of Financial Economics, 2, 323-339.

Boot, A., Thakor, A. (2000). Can Relationship Banking Survive Competition ?, Journal of Finance, 55, 679-713.

Bossone, B. (2001). Do banks have a future? A study on banking and finance as we move into the third millenium, Journal of Banking and Finance, 25, 2239-2276.

Boyd, J., Gertler, M. (1995). Are banks dead? Or are the reports greatly exaggerated?, NBER Working Paper No. 5045, National Bureau of Economic Research.

Brunner, A., Decressin, J., Hardy, D., and Kudela, B. (2004). Germany's three-pillar banking system – cross-country perspectives in Europe, Occasional Paper No. 233, International Monetary Fund, Washington DC.

Calomiris, C., Kahn, C. (1991). The Role of Demandable Debt in Structuring Optimal Banking Arrangements, American Economic Review, 81, 497-513.

Deutsche Bundesbank (2004). Entwicklung des Bankstellennetzes im Jahr 2003, July 8, 2004.

Deutsche Bundesbank (2003). The development of bank deposits in Germany, Monthly Report April, 35-48.

Deutsche Bundesbank (2002). Entwicklung des Bankstellennetzes im Jahr 2001, August 12, 2002.

Diamond, D. (1984). Financial Intermediation and Delegated Monitoring, Review of Economic Studies, 51 , 393-414.

Diamond, D., Dybvig, P. (1983). Bank Runs, Deposit Insurance, and Liquidity, Journal of Political Economy, 91, 401-419.

Domanski, D. (1997). Disintermediationstendenzen im deutschen Finanzsystems und ihre Auswirkungen auf die Rolle der Kreditinstitute, in: Gahlen, B., Hesse, H., and Ramser, H.J. (eds.): Finanzmärkte, 26, 271-290.

Edwards, F., Mishkin, F. (1995). The Decline of Traditional Banking: Implications for Financial Stability and Regulatory Policy, Federal Reserve Bank New York, Economic Policy Review, July 1995, 27-45.

Ehrmann, M., Worms, A. (2001). Interbank Lending and Monetary Transmission: Evidence for Germany, European Central Bank, Working Paper No. 73, July 2001.

Elsas, R. (2004). Preemptive distress resolution through bank mergers, Working Paper, Goethe-University Frankfurt, Germany, March 29, 2004.

European Central Bank (2002). Report on financial structures, 67-89.

Fama, E. (1985). What's different about banks?, Journal of Monetary Economics, 15, 29-39.

Fitch Ratings (2005). The German Banking System, Country Report, 23 February 2005.

Gurley, J., Shaw, E. (1960). Money in a Theory of Finance, The Brookings Institution, Washington, D.C.

Hackethal, A. (2004). German banks and Banking Structure, in: Krahnen, J., Schmidt, R., eds., (2004). The German Financial System, Oxford University Press, 71-105.

Heid, F., Porath, D., Stolz, S. (2003). Does Capital Regulation Matter for Bank Behavior? Evidence for German savings banks, Working Paper, December 2003.

Hempell, H. (2002). Testing for competition among German banks, Discussion Paper 04/02, Economic Research Centre of the Deutsche Bundesbank.

Kashyap, A., Rajan, R., Stein, J. (2002). Banks as Liquidity Providers: An Explanation for the Coexistence of Lending and Deposit-Taking, Journal of Finance, 57, 33-73.

Kleff, V., Weber, M. (2003). How do banks determine capital? – Empirical evidence for Germany, Working Paper, September 30, 2003.

Krahnen, J., Schmidt, R., eds., (2004). The German Financial System, Oxford University Press.

Levine, R. (2002). Bank-Based or Market-Based Financial Systems: Which is better?, Journal of Financial Intermediation, 11, 398-428

Merton, R. (1995). A Functional Perspective of Financial Intermediation, Financial Management, 24, summer, 23-41.

Mester, L., Nakamura, L., Renault, M. (2003). Checking accounts and bank monitoring, Working Paper No. 01-3/R, Federal Reserve Bank of Philadelphia.

Miller, G.P. (1998). On the Obsolescence of Commercial Banking, Journal of Institutional and Theoretical Economics, 154, 61-73.

Nakamura, L. (1993). Commercial Bank Information: Implications for the Structure of Banking, in: Klausner, M., White, L. (eds.): Structural Change in Banking, 131-160.

Organisation for Economic Co-Operation and Development (2001). Bank Profitability: Financial Statements of Banks, Paris.

Rajan, R. (1996). Why banks have a future: Toward a new theory of commercial banking, in: Journal of Applied Corporate Finance, vol. 9, S. 114-128.

Schmidt, R., Hackethal, A., Tyrell, M. (1999). Disintermediation and the Role of Banks in Europe: An International Comparison, Journal of Financial Intermediation, 8, 36-67.

Schmidt, R., Tyrell, M. (2004). What constitutes a financial system in general and the German financial system in particular?, in: Krahnen, J., Schmidt, R., eds., (2004). The German Financial System, Oxford University Press, 19-67.

Table 1: Characteristics of the German banking sector

Year	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003
Total assets (mill. EUR)	3,141	3,476	3,684	3,977	4,366	4,789	5,294	5,678	6,084	6,303	6,394	6,432
Nb. of banks	4,030	3,866	3,701	3,616	3,508	3,415	3,232	2,993	2,733	2,518	2,419	2,294
Nb. of savings banks	723	704	657	626	607	598	594	578	562	534	519	489
Nb. of credit cooperatives	2,916	2,774	2,664	2,589	2,508	2,419	2,249	2,035	1,795	1,621	1,490	1,394
Nb. of all bank branches*	49,186	49,118	48,721	48,224	47,741	47,086	45,227	44,443	43,307	41,297	38,201	36,599

* This number does not include branches of the Postbank AG, see Deutsche Bundesbank (2004).

Table 2: Evolution of deposits from customers and other liabilities

This table reports the mean annual growth rates of deposits from customers ΔDEP in %, the mean annual growth rate of other liabilities Δ(other liab.) in %, the mean change of relative levels Δ(DEP/TA) in percentage points, and the percentage of banks with negative growth rates of deposits from customers by groups and years. The last column shows the mean of each variable over the period 1993-2002.

Group	Variable	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	Mean
Savings banks	ΔDEP	7.3	6.5	6.4	5.6	3.6	4.2	2.3	-0.1	6.9	2.1	4.6
	Δ(other liab.)	15.8	22.5	14.2	11.2	10.2	9.6	11.9	9.5	-0.7	-0.7	10.7
	Δ(DEP/TA)	-1.8	-2.6	-1.5	-1.1	-1.2	-0.9	-1.8	-2.0	1.2	0.2	-1.2
	percentage with ΔDEP < 0	0.3	11.9	8.4	5.4	13.4	6.1	31.5	62.4	3.2	29.6	16.9
Credit cooperatives	ΔDEP	9.4	6.4	5.8	5.4	3.6	5.8	3.7	1.5	8.7	4.2	5.5
	Δ(other liab.)	21.1	23.9	18.8	11.7	11.5	13.1	14.8	7.6	1.1	0.2	13.6
	Δ(DEP/TA)	-1.2	-1.8	-1.4	-0.7	-1.0	-0.7	-1.4	-1.2	1.2	0.2	-0.9
	percentage with ΔDEP < 0	2.4	10.2	8.2	9.4	23.1	15.0	42.3	70.1	6.4	32.2	19.9
Other banks	ΔDEP	14.6	2.9	7.3	9.2	5.9	10.0	6.5	-0.6	9.5	1.9	6.9
	Δ(other liab.)	2.2	3.1	4.7	5.1	6.6	2.2	17.2	5.8	-0.9	-4.4	4.3
	Δ(DEP/TA)	0.6	-0.4	0.1	-0.1	-0.4	1.3	-0.9	-1.5	1.4	0.4	0.1
	percentage with ΔDEP < 0	18.7	45.5	29.7	26.3	35.2	27.2	32.6	43.3	22.7	45.2	32.4

Table 3: Variable categories and definitions

Variable category	Variable	Definition
Funding items	IBL	interbank liabilities
	DEP	deposits from customers
	DEM	demand deposits from customers
	SAV	savings deposits from customers
	TIME	time deposits from customers
	BOND	bonds
	EQ	equity
	EQRAT	equity / (total assets)
Asset items	IBR	interbank receivables
	LOAN	loans to customers
	SEC	securities holdings
Bank performance	NIR	(net interest income) / (total assets)
Bank characteristics	SIZE	log (total assets)
	GROWTH	log [(total assets in t) / (total assets in t-1)]
	GROUP	sector (other banks, savings banks, and credit cooperatives)
	LOC	location (16 regions in Germany)
	URBAN	city region (dummy, 1 if bank stems from Berlin, Hamburg, and Bremen)
	EAST	Eastern Germany (dummy, 1 if bank stems from Eastern Germany)
	MERGE	bank is involved in a merger as an acquirer (dummy)

Table 4: Descriptive statistics by year

Panel A: Mean variables relative to total assets (in %) and bank characteristics

Variable	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	Mean
IBL	9.7	10.6	11.9	12.7	13.3	14.2	14.9	16.7	17.7	16.6	16.0	13.7
DEP	79.4	78.4	76.4	75.1	74.3	73.3	72.6	70.9	69.2	70.4	70.5	74.2
DEM	12.6	13.8	13.6	13.4	13.8	13.7	14.5	15.1	15.4	17.4	18.2	14.4
SAV	31.6	31.0	33.1	35.8	38.3	38.8	38.2	37.0	34.5	33.1	32.8	34.9
TIME	35.2	33.6	29.6	25.8	22.2	20.7	19.9	18.7	19.3	19.8	19.4	24.8
BOND	2.3	2.2	2.6	2.9	2.9	2.9	2.8	2.7	3.0	2.9	3.1	2.7
EQRAT	4.3	4.1	4.3	4.5	4.7	4.7	4.8	5.1	5.1	5.0	5.2	4.6
IBR	14.8	15.9	12.4	13.3	12.7	12.6	12.7	12.5	11.10	12.3	12.9	13.1
LOAN	58.2	54.7	56.6	57.9	58.5	59.2	59.5	59.8	61.7	60.3	59.8	58.5
SEC	19.1	21.2	23.4	21.6	22.1	21.7	21.6	21.3	20.6	20.6	20.6	21.3
NIR	3.0	3.1	3.1	3.0	2.9	2.8	2.6	2.5	2.4	2.3	2.4	2.8
SIZE	11.6	11.8	11.9	12.0	12.1	12.1	12.2	12.4	12.5	12.6	12.7	12.1
GROWTH	---	12.1	9.8	8.7	7.3	5.8	7.6	11.4	4.5	8.5	4.5	8.2
EAST	10.9	10.5	9.5	8.6	8.3	8.2	8.2	8.2	8.4	8.6	8.8	8.9
MERGE	0.0	3.3	3.8	2.5	2.6	2.6	4.3	6.2	7.7	6.6	---	3.7

Panel B: Mean variable changes (in %)

Variable	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	Mean
ΔIBL	---	20.7	24.3	17.1	13.4	12.7	14.3	17.5	7.9	0.6	-1.5	13.8
ΔDEP	---	9.3	6.2	5.9	5.6	3.7	5.7	3.5	1.0	8.3	3.5	5.4
ΔDEM	---	9.7	8.6	6.6	10.0	4.5	12.7	10.8	5.4	19.6	7.5	9.4
ΔSAV	---	9.9	15.4	15.5	13.1	6.2	4.9	2.8	-4.2	2.1	1.8	7.6
ΔTIME	---	7.5	-4.8	-7.5	-9.1	-1.8	2.6	-0.8	5.6	8.7	0.6	-0.4
ΔBOND	---	20.3	20.7	19.1	5.3	4.5	-2.3	-4.5	2.1	-0.1	2.4	7.6
ΔEQRAT	---	11.7	11.7	10.1	9.5	7.9	7.8	7.7	8.4	6.5	5.7	8.9
ΔIBR	---	18.4	-24.1	20.1	-0.1	5.7	10.2	2.6	-11.5	23.8	8.7	4.9
ΔLOAN	---	9.1	11.7	9.7	7.4	6.3	7.0	6.2	6.3	4.2	2.4	7.4
ΔSEC	---	15.1	20.7	-1.7	7.4	2.5	4.5	3.8	-0.9	3.5	-0.5	6.1
ΔNIR	---	0.0.	0.1	-0.1	-0.0	-0.1	-0.2	-0.0	-0.0	-0.1	0.1	-0.1

Table 5: Regression results for ΔIBL

Results are based on a cross-sectional time-series pooled estimation with data from all banks for the period 1993-2001. Dummy variables GROUP2 (1 for savings banks, 0 otherwise) and GROUP3 (1 for credit cooperatives, 0 otherwise) are added and interacted with ΔDEM, ΔSAV, ΔTIME, ΔBOND, and GROWTH. Additionally, the regression includes year dummies (1993 as reference category) that are not shown here. ***, **, * indicate coefficients that are significantly different from zero at the 0.01, 0.05, and 0.10 level. P-values are calculated from robust standard errors.

ΔIBL_t	Coeff.	p-val.	
ΔDEM_t	-0.0897	0.142	
$(\Delta DEM_t*GROUP2)$	-0.5341	0.000	***
$(\Delta DEM_t*GROUP3)$	-0.2776	0.002	***
ΔSAV_t	-0.0381	0.141	
$(\Delta SAV_t*GROUP2)$	-1.1224	0.000	***
$(\Delta SAV_t*GROUP3)$	-1.0009	0.000	***
$\Delta TIME_t$	-0.2020	0.001	***
$(\Delta TIME_t*GROUP2)$	-0.3169	0.000	***
$(\Delta TIME_t*GROUP3)$	-0.6209	0.000	***
$\Delta BOND_t$	-0.0005	0.987	
$(\Delta BOND_t*GROUP2)$	-0.0353	0.300	
$(\Delta BOND_t*GROUP3)$	-0.0627	0.064	*
$MERGE_t$	-12.0282	0.000	***
EAST	-5.8477	0.000	***
URBAN	1.6493	0.638	
$SIZE_t$	0.5874	0.056	*
$GROWTH_t$	1.3376	0.000	***
$(GROWTH_t*GROUP2)$	2.3647	0.000	***
$(GROWTH_t*GROUP3)$	2.3294	0.000	***
GROUP2	5.6267	0.001	***
GROUP3	6.6746	0.000	***
Constant	-13.3423	0.012	**
Obs.	15,094		
R^2 overall	0.2895		

Table 6: Regression results for ΔLOAN

Results are based on a cross-sectional time-series pooled estimation with data from all banks for the period 1993-2001. Dummy variables GROUP2 (1 for savings banks, 0 otherwise) and GROUP3 (1 for credit cooperatives, 0 otherwise) are added and interacted with ΔIBR, ΔSEC, ΔDEM, ΔSAV, ΔTIME, ΔBOND, and GROWTH. Additionally, the regression includes year dummies (1993 as reference category) that are not shown here. [***], [**], [*] indicate coefficients that are significantly different from zero at the 0.01, 0.05, and 0.10 level. P-values are calculated from robust standard errors.

$\Delta LOAN_t$	Coeff.	p-val.	
ΔIBR_t	-0.1318	0.000	***
$(\Delta IBR_t*GROUP2)$	0.1110	0.000	***
$(\Delta IBR_t*GROUP3)$	0.0901	0.002	***
ΔSEC_t	-0.0781	0.001	***
$(\Delta SEC_t*GROUP2)$	0.0044	0.876	
$(\Delta SEC_t*GROUP3)$	0.0179	0.489	
ΔIBL_t	-0.0053	0.691	
$(\Delta IBL_t*GROUP2)$	-0.0124	0.410	
$(\Delta IBL_t*GROUP3)$	0.0141	0.298	
ΔDEM_t	0.0068	0.759	
$(\Delta DEM_t*GROUP2)$	-0.0090	0.697	
$(\Delta DEM_t*GROUP3)$	-0.0105	0.640	
ΔSAV_t	0.0271	0.057	*
$(\Delta SAV_t*GROUP2)$	0.0451	0.031	**
$(\Delta SAV_t*GROUP3)$	-0.0166	0.318	
$\Delta TIME_t$	0.0587	0.076	*
$(\Delta TIME_t*GROUP2)$	-0.0490	0.145	
$(\Delta TIME_t*GROUP3)$	-0.0679	0.043	**
$\Delta BOND_t$	0.0405	0.069	*
$(\Delta BOND_t*GROUP2)$	-0.0377	0.090	*
$(\Delta BOND_t*GROUP3)$	-0.0372	0.094	*
$\Delta EQRAT_t$	1.6172	0.012	**
$(\Delta EQRAT_t*GROUP2)$	1.6306	0.059	*
$(\Delta EQRAT_t*GROUP3)$	0.0678	0.930	
$MERGE_t$	1.6852	0.000	***
EAST	2.6511	0.000	***
URBAN	1.4137	0.009	***
$SIZE_t$	-0.2386	0.000	***
$GROWTH_t$	0.9691	0.000	***
$(GROWTH_t*GROUP2)$	0.0633	0.683	
$(GROWTH_t*GROUP3)$	0.0765	0.615	
GROUP2	0.0798	0.921	
GROUP3	-0.4173	0.588	
Constant	2.1260	0.043	**
Obs.	15,077		
R^2 overall	0.7915		

Table 7: Regression results for ΔNIR (all banks)

Results are based on a cross-sectional time-series pooled estimation with data from all banks for the period 1993-2001. Dummy variables GROUP2 (1 for savings banks, 0 otherwise) and GROUP3 (1 for credit cooperatives, 0 otherwise) are added and interacted with ΔDEP_IBL, ΔDEP_BOND, and ΔLOAN_IBR. Additionally, the regression includes year dummies (1993 as reference category) that are not shown here. ***, **, * indicate coefficients that are significantly different from zero at the 0.01, 0.05, and 0.10 level. P-values are calculated from robust standard errors.

ΔNIR_t	Coeff.	p-val.		Coeff.	p-val.
ΔDEP_IBL_t	0.0108	0.734		0.0097	
$(\Delta DEP\_IBL_t*GROUP2)$	0.0932	0.008	***	0.0961	
$(\Delta DEP\_IBL_t*GROUP3)$	0.0194	0.583		0.0216	
ΔDEP_BOND_t	-0.0102	0.459		-0.0120	
$(\Delta DEP\_BOND_t*GROUP2)$	0.0026	0.863		0.0044	
$(\Delta DEP\_BOND_t*GROUP3)$	0.0205	0.153		0.0224	
$\Delta LOAN\_IBR_t$	0.0918	0.002	***	0.0829	
$(\Delta LOAN\_IBR_t*GROUP2)$	-0.0701	0.019	**	-0.0609	
$(\Delta LOAN\_IBR_t*GROUP3)$	-0.0524	0.080	*	-0.0432	
$MERGE_t$	0.1789	0.000	***	0.1695	
EAST	-0.0361	0.000	***	-0.0360	
URBAN	-0.0054	0.694		-0.0064	
$SIZE_t$	-0.0053	0.002	***	-0.0049	
$GROWTH_t$	-0.0053	0.000	***	-0.0064	
GROUP2	-0.0326	0.002	***	-0.0421	
GROUP3	-0.0317	0.006	***	-0.0416	
Constant	0.0162	0.571		0.0204	
Obs.	15,085				
R^2 overall	0.2105				

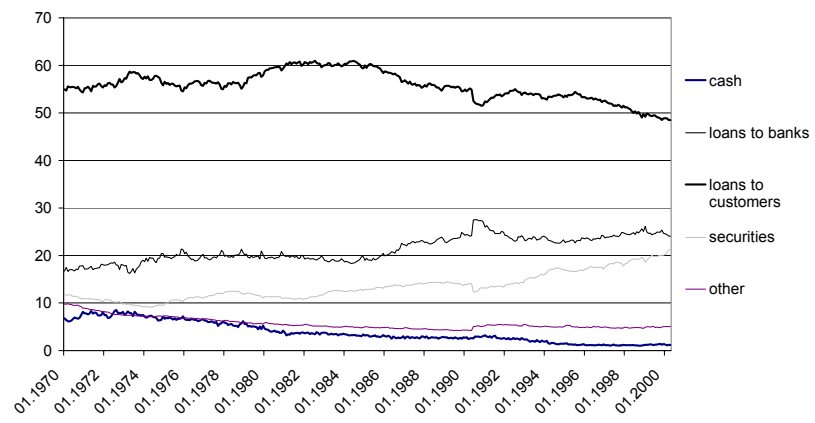Figure 1: Asset items to total assets of all German banks (in %)

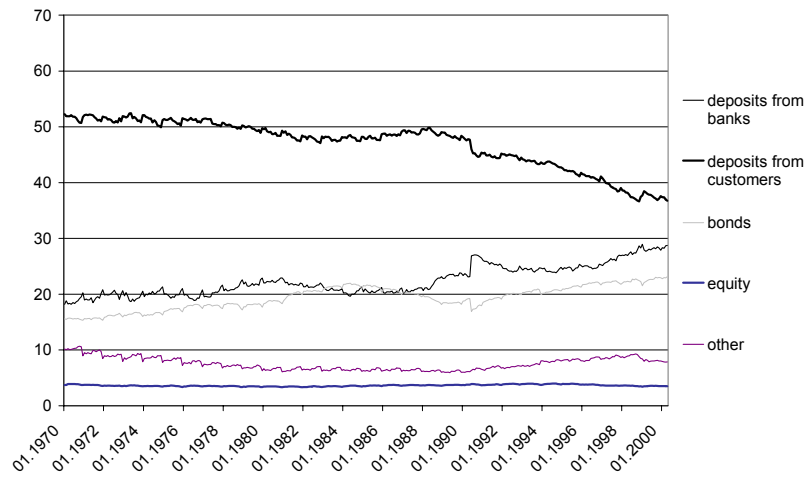Figure 2: Funding items to total assets of all German banks (in %)

Figure 3: Deposits from customers to total assets by bank categories (in %)

Legend:
- ·········· big banks
- ▬▬ savings banks
- ——— cooperatives