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The Effects of Size on Local Banks' Funding Costs ⋆

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Abstract

Motivated by the recent discussion of the declining importance of deposits as banks' major source of funding we investigate which factors determine funding costs at local banks. Using a panel data set of more than 800 German local savings and cooperative banks for the period from 1998 to 2004 we show that funding costs are not only driven by the relative share of comparatively cheap deposits of bank's liabilities but among other factors especially by the size of the bank. In our empirical analysis we find strong and robust evidence that, ceteris paribus, smaller banks exhibit lower funding costs than larger banks suggesting that small banks are able to attract deposits more cheaply than their larger counterparts. We argue that this is the case because smaller banks interact more personally with customers, operate in customers' geographic proximity and have longer and stronger relationships than larger banks and, hence, are able to charge higher prices for their services.

Our finding of a strong influence of bank size on funding costs is also in an international context of great interest as mergers among small local banks - the key driver of bank growth - are a recent phenomenon not only in European banking that is expected to continue in the future. At the same time, net interest income remains by far the most important source of revenue for most local banks, accounting for approximately 70% of total operating revenues in the case of German local banks. The influence of size on funding costs is of strong economic relevance: our results suggest that an increase in size by 50%, for example, from EUR 500 million in total assets to EUR 750 million (exemplary for M&A transactions among local banks) increases funding costs, ceteris paribus, by approximately 18 basis points which relates to approx. 7% of banks' average net interest margin.

Key words: Regional banks, bank funding, mergers & acquisitions

JEL: G21, G34, L25, C23

1 Introduction

The future role of deposits as banks' major and at the same time cheapest source of funding has recently attracted attention by both researchers and practitioners. Both alike argue that the importance of deposits has been diminished because more and more money traditionally held as deposits is today invested in alternative investment products offered by non-bank financial intermediaries, a trend typically referred to as disintermediation (see Edwards and Mishkin (1995) and Hackethal (2004)). Norden and Weber (2008) find that customer deposits lose ground in relative terms while inter-bank liabilities increase as a source of banks' funding. Furthermore, the emergence of securitization is regarded as another key trend responsible for the declining importance of deposits in bank funding as it provides banks with an alternative way of financing their lending activities and the opportunity to take their loans (partially) off balance sheet. Only the recent liquidity crisis in the second half of 2007 caused by the subprime mortgage crisis in the US has again highlighted the advantages of bank deposits providing banks with liquidity and flexibility when other sources of funding dry up.

Motivated by the recent discussion and market developments we examine the importance of customer deposits for banks' funding by investigating the determinants of funding costs. The role of deposits as part of banks' funding mix is especially important in view of the German market because access to customer deposits is regarded as key strength of local banks. In Germany, customer deposits account for 70 to 80% of local banks' total liabilities and in volume terms even outweigh banks' loan portfolios. Using a panel data set comprising bank level financials for over 800 German local savings and cooperative banks for the period from 1998 to 2004 we show that funding costs are not only driven by the relative share of relatively cheap deposits in banks' funding mix as suggested by Norden and Weber (2008) but among other factors especially by the size of the bank.[1] In our empirical analysis we find

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[1] We define funding costs as the average interest rate paid on liabilities calculated as a bank's interest expenses over average interest-bearing liabilities.

strong and robust evidence that, ceteris paribus, smaller banks exhibit lower funding costs than larger banks suggesting that small banks are able to attract deposits more cheaply than their larger counterparts. We propose that this is the case because smaller banks interact more personally with customers, operate in customers' geographic proximity and have longer and, thus, stronger relationships than larger banks and, hence, are able to charge higher prices for their services. In line with Berger et al. (2005) we argue that larger banks, in contrast, operate at a greater distance, interact more impersonally with their customers and have shorter and more transaction based relationships, i.e. they compete on terms and conditions rather than on customized services. Bank growth, especially in the course of mergers and acquisitions, is often accompanied by streamlining of bank networks, eliminating regional proximity to customers and therefore the basis for close customer relationships.

Our finding of a strong positive relation between bank size and funding costs is of great interest as mergers among small local banks are a recent phenomenon in European banking that is expected to continue in the future. At the same time, net interest income remains by far the most important source of revenue for most local banks, accounting for approximately 70% of total operating revenues. Furthermore, the size effect is of strong economic relevance: our results suggest that a 50% increase in size from EUR 500 million in total assets to EUR 750 million (exemplary for M&A transactions among local banks) increases the funding costs and therefore simultaneously decreases the net interest margin by approximately 18 basis points -this amounts to more than 7% of the average net interest margin of a German local bank in our sample, which is less than 300 basis points. Especially the comparison to banks' average net profit margin of 24 basis points in our sample highlights the economic significance of this effect.

While previous research has extensively investigated the determinants of banks' net interest margins based on work by Ho and Saunders (1981), there is no study that considers the determinants of interest income and interest expenses (funding costs) separately. With this paper we contribute to closing this gap and examine the determinants of banks' funding costs. We also go beyond the national view on bank profitability and consider differences in market concentration and the economic environment on the local market level.

The remaining paper is structured as follows: Section 2 provides a brief overview of the literature closely related to our work. Section 3 lays out the empirical framework for our analysis and derives key hypotheses. Section 4 discusses the panel data set, the different samples used for our analysis as well as empirical specifications of the model. Section 5 summarizes the empirical results and section 6 provides some robustness checks. Finally, Section 7 concludes.

2 Literature review

Although there is no particular literature on the impact of bank size on banks' funding costs a number of authors analyze the competitive advantages small banks have due to their decentralized set-up and their customer proximity compared to larger banks. For example, Berger et al. (2005) analyze how bank size affects the quality of bank-customer relationships. Based on empirical research in the US, they show that larger banks interact with their customers at greater distances, more impersonally and more often via phone or the internet, thereby reducing the personal interaction which is the basis for sound bank-customer relationships. In addition, they find that banking relationships with smaller banks tend to be longer and more often exclusive. With respect to the relationship strength of small banks Uchida et al. (2007) empirically confirm these findings using a unique Japanese data set. Stein (2002) builds a theoretical model to explain the relation between bank size and the use of information in customer relationships. He provides theoretical evidence that soft information - a key feature of small business lending but also a requirement to provide clients with suitable financial advice - can be better dealt with by decentralized organizations such as small banks while large organizations act better upon hard transferable information. The main reason is that soft information cannot be transported reliably between hierarchies. Although Stein (2002) uses small business lending as an example, the rationale can be applied to other products as well. Furthermore, Carter et al. (2004) argue that small banks that operate in less competitive markets as many of them do also have a greater incentive to invest in customer (loan) relationships because there is less chance that the customer will switch to a competing bank. A number of empirical studies provide evidence that small banks indeed leverage on their competitive advantages by showing that small banks are able to earn higher (risk-adjusted) returns on activities such as small business lending than large banks (e.g. Berger and Udell (1996), Sapienza (2002), Carter et al. (2004)). Although most research on the effects of bank size is related to relationship banking in lending, i.e. the bank's ability to facilitate monitoring and screening to overcome problems of asymmetric information in exclusive lending relationships, Boot (2000) explicitly suggests that phenomena from relationship banking are not limited to lending but may be observed for other financial services such as deposit taking, check clearing, cash management services etc. as well - an interpretation we offer for our empirical evidence of a strong relationship between bank size and banks' funding costs. [2]

General industrial economics provide an alternative explanation why strong customer relationships - a feature of small rather than large banks - positively

[2] See Ongena and Smith (1998) and Boot (2000) for a good overview on previous research relating to relationship banking.

impact banks' interest margins by investigating customer switching costs. For example, Tirole (1988) points out that long-term customers who appreciate the service provided by their bank tend to switch their bank only in case of significant price differences, hence, customers appreciating existing service levels provide banks with additional bargaining and pricing power. With regard to banks' funding costs or deposit taking, in particular, Klemperer (1987) develops a theoretical framework and also postulates that switching costs reduce competition over existing customers since they allow to differentiate otherwise equivalent products. Degryse and Ongena (2005) further show for Belgium banks that banks can gain market power also from geographical proximity to their customers. Customers are willing to pay higher prices (or accept lower deposit rates) if their bank is located closer to them, which can be explained by the lower transportation and transaction cost.

In addition to literature investigating the advantages of small banking organizations vis-à-vis large banks and their respective effect on banks' financial performance there is also a large strand of literature on the determinants of banks' net interest margins which from a methodological point of view we regard as closest to our own work. Most research on determinants of banks' net interest margins is based on the model developed by Ho and Saunders (1981). In their analysis of banks' interest margins Ho and Saunders (1981) extend a securities dealership model to banks. Thereby, they introduce banks as risk-averse dealers in deposit and loan markets that demand a positive interest spread for the provision of immediate liquidity, i.e. the banks' ability to take on deposits and provide loans under the uncertainty of the actual timing of deposit supply and loan demand. In their theoretical model Ho and Saunders (1981) show that this spread depends on the degree of bank management's risk aversion, the concentration of the market the bank is operating in, transaction size and interest rate risk. In their empirical application they evaluate the sensitivity of these determinants including further variables to control for institutional imperfections and regulatory constraints such as implicit interest payments (free bank services offered to customers), default risk and opportunity cost for holding required reserves.

Several researchers have extended this model and have verified its findings empirically. For example, Allen (1988) introduces loan heterogeneity and thus cross-elasticities of demand between bank products and proposes a reduction of banks' interest margins as a result of diversification. McShane and Sharpe (1986) empirically test the model using panel data for Australian banks verifying the inverse relationship between net interest margins and measures of market power and the degree of absolute risk aversion. Angbazo (1997) explores the function of credit risk, interest rate risk (esp. its interaction with default risk) and off-balance sheet banking assets on banks' net interest margins. He finds that risk effects are heterogeneous across bank size classes with smaller (local) banks' margins being more sensitive to interest rate and default risk than those of their larger peers. Saunders and Schumacher (2000) find that net interest margins are higher for banks located in more segmented markets, both geographically and by business activity. Maudos and de Guevara (2004) measure competition in different markets and demonstrate that the fall of banks' net interest margins in Europe is compatible with an increase in market power and concentration that was (partly) offset by the reduction of interest rate risk, credit risk and operating costs. Valverde and Fernández (2007) consider the ability of diversified banks to cross-subsidize costs of price competition by incurring non-interest income. They expand the analysis by including the impact of non-interest income on interest margins and market power of banks. Their results support Maudos and de Guevara (2004) at least partly explaining the remarkable coexistence of decreasing interest margins and increasing market concentration in European banking. Most recently, Norden and Weber (2008) examine the shift in German banks' funding mix from customer deposits to inter-bank lending and observe a positive relationship between the share of deposits of banks' funding mix and net interest margins.

Another related strand of literature takes a direct view on loan and deposit prices as opposed to overall net interest margins, eliminating bank-level product portfolio effects but also inter-industry differences resulting from widely differing local market conditions. Most papers examine the relationship between market concentration/competition and bank product prices while controlling for other macroeconomic factors. For example, Berger and Hannan (1989) show that US banks in the most concentrated local markets are found to pay 25-100 basis points less on money market deposit accounts than banks in the least concentrated markets. Fischer (2005) offers an extensive analysis of the relationship of prices and market concentration for the German market. Applying the price-concentration relationship to deposit rates Hannan and Berger (1991) and Neumark and Sharpe (1992) also find evidence that deposit rates are significantly more rigid in concentrated markets than in less concentrated markets, i.e. banks in concentrated markets respond slower to market interest rate changes. Although we focus our research on the impact of bank size rather than market concentration it needs to be highlighted that in Germany small banks such as public savings and cooperative banks typically operate in regional and, hence, more concentrated markets than large banks - a factor we later explicitly control for.

3 Theoretical framework and hypotheses

In the following, we explore the role of bank size for banks' funding costs and derive hypotheses for our empirical analyses in the following section.

According to Allen and Gale (2000) bank-based markets such as Germany's are characterized by strong bank-customer relationships. This finding especially holds for small local banks, which in the case of Germany account for approximately 50% of the total deposit and loan markets. The small local banks' immediate proximity to their customers as well as their decentralized organizational set-up are regarded as their main competitive advantages vis-à-vis larger banks. According to anecdotal evidence the regional proximity is often also accompanied by close personal ties outside the formal bank-customer relationship creating strong loyalty with the bank. Conducting lending activities on the basis of such close bank-customer relationships is generally referred to as relationship banking. It is characterized by banks' access to customer-specific, often proprietary information and the ability to evaluate customer profitability based on multiple interactions with the customer (see Boot (2000)).

While previous research focuses on the competitive advantages of small banks mainly in the context of relationship banking we extend this view to banks' other activities. We argue that customers generally value small banks' proximity and their superior utilization of soft information resulting in more personalized service offerings and advice and are therefore willing to pay higher prices or accept lower interests on their deposits in return. In line with Boot (2000) we propose that banks may be in a position to leverage the bargaining power stemming from their strong customer relationships in lending by charging higher prices not only for loans but also for other banking products. For example, banks might cross-subsidize their lending business through bundled product offerings or exploit the customers' bank dependency resulting from the hold-up problem.

Furthermore, larger banks tend to have fewer branches, especially in rural and less populated areas. Thereby, the average distance between a customer and the nearest branch is bigger than for smaller local banks. As Degryse and Ongena (2005) point out, this is not only inconvenient for customers but also increases transportation costs and thus decreases switching costs. In the same vain, the customers' true appreciation of the bank's services that are superior to those of other banks as described above does also not only increase customers' preparedness to pay higher prices but also increases switching costs (Tirole (1988)). Furthermore, as service levels at other banks are ex ante not observable for customer their switching costs increase further. That is, by changing to a new bank with unknown service standards customers run the risk to loose the benefits of individual services designed to their individual financial requirements.

This leads to our first hypothesis H1:

> **Hypothesis H1:** *Small banks are better able to build strong customer relationships than large banks due to information advances, more customized*

services, more convenient locations and personal ties. Consequently, they benefit from the ability to charge higher fees and margins for their services such as offering lower interest rates on deposits. Thus, bank size is positively related to banks' funding costs.

Size effects are most pronounced in the course of mergers and acquisitions, which should have an immediate adverse effect on banks' funding costs. In the process of mergers and acquisitions banks often need to adjust their organizational structure and business processes to adapt to increased size. This leads to branch network consolidation, centralization of processes and staff redundancies, consequently jeopardizing or even eliminating the basis for strong customer relationships and customer proximity and, hence, the competitive advantages of small banks (Berger et al. (2005)). Furthermore, with increasing size and organizational complexity management's abilities to monitor the bank's day-to-day business may also become less effective (Caves (1989)).

This leads to our second hypothesis:

Hypothesis H2: *Merger-induced changes in bank size and organizational complexity jeopardize small banks' competitive advantages and make effective control more difficult. Hence, merger induced increases in bank size have a positive effect on merging banks' funding costs.*

However, merger related negative effects on banks' funding costs do not only result from increased size and organizational complexity but also from temporary distortions of merging bank's day-to-day business: Merger execution and post-merger integration may (temporarily) distract managers from effectively managing bank's day-to-day operations, which would adversely affect banks' productivity and, hence, sales performance. Berger et al. (1999) suggest downsizing and culture clashes as potential triggers for business disruptions and, thus, reasons for inferior operating performance. Furthermore, customers are more likely to switch banks following a merger because often mergers are accompanied by potential inconveniences for customers such as the uncertainty of future service levels, the reduction of the number of (local) branches and the requirement for customers to change their account details. In the case of mergers associated inconveniences can pose substantial costs for the customer that may at least partially offset the benefits from the existing bank-customer relationship and decrease switching costs. The loss of customers would directly translate in the loss of deposits that are required to be replaced by alternative means of funding such as interbank loans typically resulting in higher funding costs. Alternatively, banks might be forced to offer their customers higher deposit rates to prevent them from switching.

This results in our third hypothesis:

Hypothesis H3: *Mergers positively affect merging banks' funding costs be-*

cause of temporary disruptions of day-to-day operations and merger related loss of customers. Hence, we expect an additional increase in funding costs beyond the normal size effect. However, as some of the effects are temporary in nature we expect merger related negative effects to decrease in the post-merger years.

In addition to the ongoing merger activity, the German banking market is also characterized by intensifying competition partly caused by the market entry of foreign banks but also by accelerating technological developments such as the increasing acceptance of phone and online banking.[3] Phone and online banking decrease transportation costs and, hence, customers are unlikely to be prepared to continue to pay a premium for those services that can be conveniently accessed over the internet.

This leads us to our fourth hypothesis:

Hypothesis H4: *Technological advances and increasing competition in recent years have rendered some advantages of smaller, rather local banks for which the customer had traditionally been prepared to pay a premium void. Hence, we expect the magnitude of the positive relationship between bank size and funding costs to persist but to decrease over time.*

4 Empirical specifications

4.1 Description of sample

For our analysis we merged three data sets containing detailed financial information on over 800 local banks in Germany, regional economic data as well as data on local market concentration for the period from 1998 to 2004. Per the end of 2004, there were 477 savings banks and 1,290 cooperative banks operating in Germany, of which approximately 400 and 440, respectively, are included in our sample. In terms of total assets savings and cooperative banks included in our sample correspond to approx. 80% and 55%, respectively, of the total population. The economic data and the concentration measures are reported on the level of the respective administrative district (counties and cities) the respective bank is located in. In total, Germany comprises of 440 of such administrative districts.

For several reasons local banks in Germany pose a very interesting subject for economic research. Firstly, with a market share in lending and deposit

[3] The competitive pressure resulting from online banking is not captured by our market concentration variable which is based on bank branch statistics.

taking of approximately 50%, they are still the dominant provider of credit and banking services to individuals and SMEs in Germany. Secondly, both banking groups follow what is known as the "regional principle", i.e. in its respective sector each institution exclusively serves well defined and separated regional business areas that often correspond to the 440 districts in Germany. This allows us to account for local rather than national market concentration and economic characteristics. Thirdly, all banks use the same accounting and reporting principles and operate on the basis of the same legal foundation. Fourthly, all savings and cooperative banks are independent institutions with their own business strategy and operational setup. In sum, these banks form a large group of highly comparable but independent entities - an ideal setup to analyze the implications of different bank and market characteristics with econometric models.

Our merged data set is an unbalanced panel data set comprising bank financials as they were reported by the respective banks. In case one bank merged with another bank during the observation period, its financials are reported until the year before the merger took place and the bank drops out of the sample thereafter. Consequently, the data does not only reflect size changes due to organic growth or differences between small and large banks but also accounts for size changes due to mergers. For example, if one bank merges with another bank of equal size, the absorbing institute doubles in size from one year to the next. In total, this sample contains 5,686 observations for the period from 1998 to 2004.

The merged data set includes local economic data as well as information on the local market concentration in each bank's respective administrative district, i.e. city our county, and for each year of the observation period.

The balance-sheet and income-statement data is taken from BvD's Bankscope database. The merger information was derived manually from the bank history provided in Bankscope and validated with LexisNexis as well as a proprietary list of savings banks mergers provided by the German Savings Banks Association.[4] Information on market concentration is based on regional branch statistics provided by the German Central Bank. Macroeconomic data was provided by the Statistical State Offices and is available for each of the 440 administrative districts in Germany.

[4] We thank the German Savings Banks Association ("Deutscher Sparkassen und Giroverband (DSGV)") for the provision of this data.

4.2 Empirical model and variables

In order to investigate the relationship between bank size and banks' funding costs and to test the hypotheses established above we define a multivariate regression model with *Interest Expenses / Total Liabilities* as measure for banks' funding costs as dependent variable and *Ln(Total Assets)* as measure for bank size as our key explanatory variable. For the correct specification of our regression model, we build on the insights gained from the theoretical framework developed by Ho and Saunders (1981) on the determinants of banks' net interest margins. As the net interest margin is calculated as interest income net of interest expense - the latter of which we refer to as funding costs in our analysis - their model is highly relevant for our research as all determinants of banks' funding costs simultaneously pose determinants for banks' net interest margin. The work by Ho and Sounder (1981) has been extended significantly in subsequent years. Among others Allen (1988), McShane and Sharpe (1985), Angbazo (1997), Saunders and Schumacher (2000), Maudos and de Guevara (2004) as well as Valverde and Fernández (2007) adjust and adapt the model to increase its general applicability. Ho and Saunders (1981) and subsequent literature suggest that factors influencing the interest margin can be classified into four categories. Besides the size of the bank's operations, these are: bank specific effects (BS), market concentration (MC), economic environment (CT) and individual bank characteristics: [5]

$$FC_{it} = f(Size_{it}, BS_{it}, MC_{it}, CT_{it}, \epsilon_{it})$$

In our empirical model we control for all four categories with the following variables. A detailed description of each variable including the calculation is provided in Table 1.

The logarithm of total assets *Ln(Total Assets)* is the explanatory variable of interest in our analysis. To control for general bank heterogeneity we add further bank specific variables. In the vain of Maudos and de Guevara (2004) we use *Operating expenses / Total Assets* to reflect the bank's overall cost structure and implicitly as a proxy for management's (in)efficiency. We assume the more efficient the management overall, i.e. the lower the relative operating cost of the bank, the lower the funding cost, implying a more efficient management of the bank's funding activities. *Implicit Interest Payments* controls for the fact that many banks provide additional free services in combination with deposit accounts, e.g. free usage of ATM network, account statements or comprehensive advice. These extra services are regarded as implicit interest payments as deposit rates might be lower than market rates to remunerate banks not only for their service of immediate liquidity provision but also for

[5] Individual bank characteristics are accounted for as bank fixed effects in our panel regression analysis.

free services provided together with deposit accounts. In line with Ho and Saunders (1981) and Angbazo (1997), we calculate *Implicit Interest Payments* as the amount of operating expenses that cannot be covered by non-interest income. Furthermore, some banks might focus more on provision income as it offers potentially higher margins. Consequently, they might cross-subsidize anchor products such as loans and deposits with revenues from other services. We include *Non-Interest Income / Total Assets* to control for these differences. Following McShane and Sharpe (1985) and Maudos and de Guevara (2004) we use *Equity / Total Assets* as proxy for the degree of bank management's risk aversion. [6] In line with Angbazo (1997) one could alternatively interpret a bank's capitalization as a proxy for the bank's risk of financial distress. Since a bank with a strong capital base has many different sources of financing available, it is less dependent on customer deposits and, thus, might be offering lower deposit rates compared to a bank that is more depending on customer deposits. The *Deposits / Loans ratio* is used to control for the overall funding structure of the bank. It reflects to what extend the bank is able to finance its lending activities using customer deposits. A bank with more deposits at hand is expected to offer on average lower deposit interest rates than a bank with a scarce supply of deposits. In a further robustness check we explicitly include three variables reflecting the funding structure of the bank: *Demand Deposits / Total Assets*, *Savings Deposits / Total Assets* and *Deposits from Banks / Total Assets* denote the share of total assets that is financed with the respective source of capital. This allows us to capture the impact of different sources of funding on the funding cost in more detail (Norden and Weber (2008)). Most pronounced effects on bank size originate from mergers and acquisitions. In order to control for other or additional effects from M&A activity we introduce a dummy variable that takes the value 1 if the respective bank is involved in a merger or an acquisition in the respective year. As we argue that bank size has a positive impact on the bank's funding cost amidst other temporary negative merger related effects we expect a positive sign for *M&A activity*. We also include an interaction term *M&A activity*Ln(Total Assets)* to capture any changes in magnitude of the coefficient of the size effect in the context of mergers.

In addition to bank characteristics, we use the local market concentration (*Local HHI*) to control for the competitive structure in the respective local markets. Berger (1995) or Gilbert (1984), for example, show that such concentration measures may be used as a proxy for market power. As data for total assets, loan and deposit volumes is not available on the level of administrative districts for all (esp. private) banking groups, we determine the market concentration as the Hirschmann-Herfindahl-Index on the basis of the num-

[6] We emphasize the point also made by Maudos and de Guevara (2004) that equity over average total assets measures capitalisation and is restricted from presenting the true risk aversion due to imposed bank capital requirements.

ber of branches of any one banking institution in each district over the total number of bank branches in the respective area. We assume that funding costs decrease with market concentration and therefore expect a negative sign.

Furthermore, we control extensively for the local economic environment. First of all, we control for the current *interest rate* level as this is arguably one of the main drivers behind banks' funding costs. Although many studies show that banks normally do not pass on full market interest rate adjustments (or at least not in a timely manner) to their customers (for example see Hannan and Berger (1991) and Neumark and Sharpe (1992)) it can be assumed that the interest rate level is closely correlated with rates paid on new deposits. Hence, higher market rates increase the average funding cost and vice versa. As risk free rate we apply the 1-year Euribor. This is in line with common practice, e.g. for transfer rate calculation or bank valuation. Using only one standard reference rate for all banks in the same year, does not reflect the term structure of deposits of an individual bank. However, we do not adjust the reference rate to the individual term structures because, firstly, the term structure of local banks does not differ significantly between banks. Secondly, the yield curve is relatively flat during the observation period, thus, slight differences in the term structure do not yield meaningful differences in funding cost. We include the *Yield Curve Slope* in our analysis as one might argue that it is the slope of the yield curve that determines the bank's ability to generate earnings by allowing a maturity mismatch between the lending and the deposit taking side (term transformation). Consequently, banks might be willing to pay higher deposit rates in a market environment with steeper yield curves. At the same time the slope of the yield curve might affect the investment decision of customers. They can be expected to invest into longer term maturities if the spread between short and long-term interest rates is bigger. The regional economic strength measured as GDP per inhabitant (*Local GDP*) influences the availability of deposits and, therefore, is expected to have a negative sign. The Savings Rate of local private households directly influences the supply of deposits to banks. A negative sign is expected as well.

In addition to the aforementioned variables, we include dummy variables for each bank to control for time-invariant individual characteristics of each bank and dummy variables for each year to capture specific time effects.

Tables 2, 3 and 4 in the appendix provide descriptive statistics for the unbalanced dataset employed.

Average bank specific characteristics are shown in Table 2 for the total sample as well as bank size classes dividing the total sample into four groups. In line with our hypothesis H1 the descriptive analysis already shows that funding costs increase with increasing bank size. Further findings include a decline in operating expenses with increasing bank size indicating the existence of scale economies. *Implicit Interest Payments* decrease with size due to economies of scale in providing branch and ATM networks or online banking to customers. Finally, the equity ratio decreases with size, potentially indicating that bank managers feel more secure the larger and thus more diversified their business model is.

Table 3 provides descriptive statistics for the local economic environment and contrasts rural and urban areas as well as East and West German municipalities, where - even after more than 15 years post reunification - one can see significant differences. Worth mentioning is the significant difference in GDP per inhabitant. Urban areas compared to rural areas as well as Western compared to Eastern areas tend to be notably wealthier on average, respectively. With regard to the market concentration, urban areas are less concentrated than rural areas in which often only regional savings and cooperative banks are present. Considering that foreign competitors and specialized retail institutions, e.g. Citibank, are only present in bigger cities, this is in line with our expectations.

Finally, Table 4 reveals time trends within our observation period from 1998 to 2004. Most visible is the decrease in funding cost since 2001, which merely reflects the concurrent decline in interest rate levels. In the same period, the average size of banks has grown constantly. The majority of this growth can be attributed to the ongoing merger wave among both savings banks as well as cooperative banks. It is also worth mentioning that cooperative banks are still significantly bigger in number but smaller in size than savings banks. That is, on average there is only approximately one savings bank per district but more than two cooperative banks.

4.3 Econometric methodology

As Maudos and de Guevara (2004) point out, it is reasonable to assume that characteristics that are individual for each bank in the sample influence the interest margin and, thus, also the funding costs. The clear advantage of using panel data is that it allows to capture these time invariant fixed effects. Time invariant effects differ in the cross section, but do not change over time. Thus, to exploit this additional information we use a fixed effect OLS regression model. Specifically, we use a so-called Least Square Dummy Variables model where we include additional dummy variables for each bank into the regression and estimate the resulting model with ordinary least square (see Baltagi (2001)). The fact that the sample of banks used in our analysis is not a random draw but rather represents almost all existing banks (esp. in the case of savings banks) does not suggest the application of random effects regression (see Wooldridge (2002)). A Hausman test confirms that for our purposes random effects would lead to inconsistent estimators. We control for time trends by including time-period dummy variables in our regression analysis.

We did not follow a two-step approach as suggested by Ho and Saunders (1981) for three major reasons. In line with the argument made by Maudos and de Guevara (2004), too many observations would be dropped in a two-stage approach. Furthermore, we deliberately do not split the observed funding costs into a pure spread and market imperfections as Ho and Saunders (2004) propose. This work rather follows a similar approach like McShane and Sharpe (1985) and Angbazo (1997) and treats all explanatory variables as equal determinants of the funding costs. Last but not least, a two step approach poses some difficulties in verifying the significance of the coefficients of the second step for the overall model/relationship as standard errors of the second step regression are econometrically difficult to adjust for standard errors from the first step.

5 Empirical results

Table 5 provides a summary of our regression results. Results of our base model are depicted in column (1). In Hypothesis H1 we postulate that bigger banks are less able to build strong customer relationships compared to their smaller peers. As a result we expect larger banks, ceteris paribus, to show higher funding costs. The models in Table 5 strongly support this hypothesis: bank size (*Ln(Total Assets)*) shows a positive sign, suggesting a positive relationship between bank size and the bank's interest expense. This effect is significant at the 1% level. However, the estimate for the impact of size on funding costs could be distorted by banks that follow an aggressive growth strategy based on lucrative rates on deposits, i.e. competitively high rates to attract additional deposits. The model in column (2) uses the year-to-year growth of deposit volume to control for this effect. As expected the growth variable shows a significant and positive sign. In column (3) the base model is amended to include dummy variables for *M&A activity* in order to ensure that our results are not driven by mergers. We also include an interaction term of size and M&A activity (*M&A activity * Ln(Total Assets)*) to understand whether the size effect is of a different magnitude in the case of merger related growth. Confirming hypothesis H2 the relatively small coefficient of the interaction term indicates that there is a positive relation between size and funding cost with regard to merger activities. However, as the negative sign indicates the effect is slightly smaller than for the whole sample. In line with our hypothesis H3, which suggests an even more pronounced effect in the year of the merger due to integration efforts, we observe an additional positive effect from M&A activity on funding cost in the same year in which a bank is involved in a merger as indicated by the significant positive sign of the coefficient of the M&A dummy variable However, as per our prediction the two lagged M&A activity dummy variables show that the additional positive effect vanishes after one year and is not present in the two years following the merger. The influence of bank size on the funding costs remains significant and positive when controlling for mergers. In the model in Column (4) we control for the influence of non-interest income on the funding costs which is significantly positive, suggesting that banks use fees and commission income to cross-subsidize deposit taking activities. Furthermore, in Column (5) we check for the influence of the slope of the yield curve and find contrary to our expectations a significant negative influence on funding cost. Column (6) presents our base model excluding the variable that controls for implicit interest payments in order to show that results remain the same despite the fact that operating expenses and implicit interest are both calculated based on operating expenditure and therefore are correlated. We also introduced the development of the stock market as an additional control variable since one could argue that to a certain extent the availability of deposits is driven by the availability of alternative investment opportunities. Again, we find our main results confirmed but do not report these findings for conciseness reasons.

In order to account for potential differences in the funding structure between banks we add three control variables indicating the shares of the different sources of funding. The results are shown in column (7). The share of demand deposits shows a negative relationship with the funding costs, i.e. the higher the portion of assets financed with demand deposits the lower the funding costs. Given that demand deposits are normally non-interest bearing the result is expected. Savings and deposits from banks in contrast are on average more expensive than the average funding (deposit interest) rate, resulting in a positive sign. The effect of size on the funding costs remains unchanged in direction and magnitude in all cases. To test our fourth hypothesis and in order to ensure the robustness of our findings we re-run our base regression model using varying observation periods. Table 6 shows that the size effect remains the same in direction but slightly decreases in magnitude over time which confirms hypothesis H4, which postulates that the relationship aspect has become less important over time due to technological advances such as phone and online banking as well as intensified competition in German retail banking. Most of our control variables remain unchanged. Some turn insignificant when using shorter observation periods.

By large, all the remaining control variables are highly significant in all analyses and show signs as predicted. For example, the higher the bank's operating expenses, the higher the funding costs. Hence, if management is less able to run the whole banking operations efficiently, it is on average also less able to manage the funding activities properly. Highly significant in all regressions is also the negative relation between implicit interest payments and funding costs. That is, the more free services a bank offers to its customers the more customers are willing to accept lower interest rates for their deposits. Of interest in this context is also the impact of market concentration. One would expect that higher market concentration leads to lower funding cost. However, all market concentration estimates are insignificant throughout our regression analyses. This might be due to a rather technical issue. Since concentration measures in single regional markets do not change significantly year-by-year, the concentration measure constitutes almost a time invariant fixed effect that is already absorbed in the fixed effect dummies. Using a different methodology, e.g. pooled OLS regression, reveals the significant influence of market concentration on funding cost. Finally, we control for the local economic environment a bank operates in. As predicted, coefficients for general regional financial strength (*Local GDP*) and the *Savings Rate* are significantly negative as these are two main factors driving the overall supply of deposits in a region. The coefficient for the general interest rate level is also significantly positive in all regressions.

6 Robustness

We perform several further analyses to confirm the robustness of our results. Overall, our main findings remain unchanged regardless of the following variations to the original setup.

As mentioned in section 4, our sample includes more than 170 mergers during the observation period. As mergers go along with a significant change in size of the remaining bank, the relationship between size and funding costs may be driven or at least distorted by these mergers. In our main analysis we already control for mergers by including several (lagged) dummy variables into the regression. To further dispel any concerns in this respect, we generate a second data set where we consolidate financial statements of merging institutions backwards for the whole period before the merger. To do so, we simply add-up the respective positions in the balance sheets and profit and loss accounts for those banks involved in a particular merger for the years prior to the merger and keep only the surviving bank in the sample, thereby eliminating any direct merger related size effects. The resulting sample contains only those banks that were active throughout the entire period from 1998 until 2004. In order to obtain a balanced panel data set we further eliminate all banks for which we do not have complete information on all required variables for the period from 1998 to 2004. In total, this sample contains 5,105 observations. Our main finding, the positive relationship between size and funding costs, remains highly significant and does not change in direction or magnitude. The coefficients of the control variables also stay by large unchanged.[7]

[7] Results are not reported for conciseness reasons but available on request.

To further confirm the size and other related effects from merger activities, we construct a third data set including M&A transactions only. It includes only banks that emerged as acquirers in mergers or acquisitions during the period from 1998 until 2004. The dependent and explaining variables are first differences of respective financials and ratios in the year prior to the merger and of those in the merger year or one or two years following the merger, respectively. This allows a direct view on the impact from a merger driven change in size on the corresponding change in funding costs. In total, this sample contains 439 observations from approximately 170 mergers. Table 7 outlines the empirical results for this robustness check. In line with our findings in our primary analysis, all size coefficients are highly significant and positive, thus, again confirming hypothesis H2 that the size effect also holds if it is related to a merger. Furthermore, we find that the coefficient of bank size is stronger in magnitude than in our primary analysis when comparing the change in funding between the year before the merger and the actual merger year (column (1)). This indicates that funding costs on average increase above the expected size effect during the year of the merger again confirming hypothesis H3. Columns (2) and (3) reveal that the merger related size effect decreases in the years following the merger towards the expected size effect (hypothesis H3). Several control variables become insignificant. We suggest that this is due to the considerably lower number of observations compared to our previous regressions. To dispel any concerns that our findings are driven by either savings banks or cooperative banks in our sample, we run the analyses separately for these two sub-samples. The positive relationship between bank size and funding costs turns out to be highly significant for both sub-samples and also coefficients are of similar magnitude.

7 Conclusion

In this paper we investigate how banks' average funding costs are influenced by bank size. We provide strong and robust empirical evidence that bank size is a key determinant of banks' funding costs and that funding costs generally increase in line with bank size suggesting that small banks are able to attract deposits more cheaply than their larger counterparts. In line with Berger et al. (2005) we argue that this is the case because smaller banks interact more personally with customers, operate in customers' geographic proximity and have longer and more exclusive relationships than larger banks and, hence, are able to charge higher prices for their services, i.e. offer lower deposit rates. In previous literature the competitive advantages of small banks from their proximity to customers and their decentralized organizational set-up have been frequently discussed with regard to relationship banking, i.e. the bank's ability to facilitate monitoring and screening to overcome problems of asymmetric information in exclusive lending relationships. Analogous to Boot (2000) we argue that the advantages found for small banks in facilitating relationship banking also apply for banking products other than lending and especially for deposit taking.

Our empirical finding of a strong positive relationship between bank size and banks' funding costs is robust across model specifications. In particular, our results hold when we explicitly control for the bank's funding mix highlighting that funding costs at small banks are not only driven by the typically higher relative share of deposits of bank's liabilities at small banks. The application of a particular large data set comprising 80% of local banks in Germany also gives support to the general validity of our results. As part of our analysis we emphasize that the positive relationship between bank size and funding costs does not only hold for organic growth or cross-sectional size differences but also for non-organic growth. Although slightly smaller in magnitude, funding cost increase following a merger due to the merger-induced growth in size as well as increased organizational complexity of the enlarged institution. Other than the merger-related size effects we find an additional significant positive impact on funding costs in the year of the merger itself on top of the size effect. We suggest that this is a consequence of management distraction from day-to-day operations due to integration tasks and the need to offer some customers more competitive deposit rates to prevent them from switching to another bank as their switching costs are lowered due to the merger. This effect, however, vanishes in subsequent years suggesting that some of the causes are temporary in nature and can be offset over time. Although there are good reasons for mergers and acquisitions among banks and the desire to grow in size (e.g. economies of scale or improved diversification), our findings highlight some potential drawbacks of acquisitive growth - namely, the potential loss of customer proximity and thus the basis of strong bank-customer-relationships. When evaluating external growth opportunities banks should consider the implications of increasing funding costs and whether targeted synergies make up for the short-fall in income contribution from deposit taking and funding. Finally, our analyses indicate that the competitive advantages of small banks leading to comparatively lower average funding costs decrease in magnitude (not significance) over time. We argue that technological advances and fiercer competition for deposits in the German market as well as customers' increasing preparedness to switch banks to benefit from superior conditions are the reason for this trend.

Our finding of a strong influence of bank size on banks' funding costs is of great interest also in an international context as mergers among small local banks - the key driver of bank growth - are a recent phenomenon not only in European banking that is expected to continue in the future. At the same time, net interest income remains by far the most important source of revenue for most local banks, accounting for approximately 70% of total operating revenues in the case of German local banks. The influence of size on funding costs is of strong economic relevance: our results suggest that an increase in size by 50%, for example, from EUR 500 million in total assets to EUR 750 million (exemplary for M&A transactions among local banks) increases funding costs, ceteris paribus, by approximately 18 basis points which relates to approx. 7% of banks' average net interest margin.

In sum, our research shows that building and maintaining strong customer relationships remains a key strength for small banks. This strength does not only grant small banks an advantage in facilitating monitoring in lending relationships but also yields significant advantages for their funding activities as they can afford to pay less interest on their deposits without loosing customers or deposits. This paper is the first to shed more light on banks' benefits of customer relationships on products other than lending, especially deposit taking. Furthermore, this paper is the first to go beyond the national view of economic influences on bank performance by considering economic factors as well as market concentration on a local market level. We suggest further research in this area to investigate how phenomena known from relationship banking also impact other bank products using both product- and bank-level data.

Appendix

Table 1: Description of variables

Variable	Unit	Description
Interest Expenses / Total Liabilities	%	Interest expenses divided total liabilities *Calculation*: total interest expense / total liabilities
Bank specific variables		
Ln(Total Assets)	logarithm of EUR million	Natural logarithm of total assets in million Euros. *Calculation*: ln(total assets)
Demand Deposits / Total Liabilities	%	Share of funding through customer demand deposits of total liabilities. *Calculation*: demand deposits / total liabilities
Savings Deposits / Total Liabilities	%	Share of funding through customer savings deposits of total liabilities. *Calculation*: savings deposits / total liabilities
Deposits from Banks / Total Liabilities	%	Share of funding through deposits from other banks of total liabilities. *Calculation*: deposits with banks / total liabilities
Operating Expenses / Total Assets	%	Quality of management is expected to have a direct impact on the funding mix. It is approximated by the operating expenses relative to total assets, which can be interpreted as the overall (in)efficiency with which the bank is run. *Calculation*: total operating expenses / total assets
Implicit Interest Payments	%	Customers often except lower interest rates on deposits in exchange for additional bank services free of charge, e.g. free account handling. These services produce additional operating cost, which can be seen as implicit interest payments to the customer to compete for her deposits. *Calculation*: (operating expenses Ű loan loss provisions-(net commission revenue + other operating revenues)) / total assets
Non-Interest Income / Operating Revenues	%	Non-interest income is included to evaluate the potential cross-subsidization impact of non-interest income on the funding costs. *Calculation*: net provision income/ (net interest income + net provision income)
Deposits / Loans	%	Measured as deposit overhang customer deposits in relation to customer loans reflect the bankŠs ability to fund its lending business through deposits rather than through capital markets.

Table 1: Description of variables

Variable	Unit	Description
		Calculation: total customer deposits / total customer loans
Equity / Total Assets	%	The capitalization of the bank in terms of the amount of equity relative to the size of the total assets is used as a proxy for the general risk aversion of the bank's management (compare also Maudos and de Guevara (2004) as well as McShane and Sharpe (1985)). *Calculation*: equity / total assets
M&A activity	dummy variable	Dummy variable that takes the value 1 if the respective bank has been involved in a merger or an acquisition in the respective year.
Market concentration		
Local HHI	#	Hirschmann-Herfindahl-Index of market shares used to estimate market concentration and competition. Since total assets for all banks are not available on a district level, we approximate the market share with the share of branches (compare Fischer and Hempell (2006)). *Calculation*: $\sum_{j=1}^{n}(ms_j)^2$ *n=number of banks in local market, msj=market share (in terms of branches) of jth bank*
Macroeconomic variables		
Interest Rate	%	The risk free interest rate for one month (EURIBOR) is used to control for the general interest rate level. It is an annual value calculated based on monthly averages.
Yield Curve Slope	%	The yield curve slope is used to control for the yield differences between short- and long-term maturities. *Calculation*: 10-year government bond rate - 1-month Euribor rate
Local GDP	EUR	The economical strength of a region is measured by its average gross domestic product (GDP) per inhabitant. It is calculated on administrative district level. *Calculation*: GDP in district / number of residents in district
Savings Rate	%	The savings rate of the household controls for the savings activity in a region, which determines the general availability of deposits. It is available only on the state-level.

Table 2
Descriptive statistics for bank specific characteristics by size class (mean)

This table presents the means of the bank specific variables for the unbalanced sample of public savings and cooperative banks in Germany for the period 1994-2004. While the column "Complete sample" presents means of the bank specific variables of all banks the columns to its right present means for different size classes with size measured as Total Assets in EUR million.

Variables	**Unit**	**Complete Sample**	**<200**	**>=200 <400**	**>=400 <800**	**>=800**
Interest Expenses / Total Liabilities	%	3.22	3.20	3.21	3.17	3.27
Ln(Total Assets)	EUR million	1,205.30	136.43	294.29	572.26	2,333.88
Operating Expenses / Total Assets	%	2.42	2.57	2.68	2.50	2.20
Implicit Interest Payments	%	1.64	1.81	1.78	1.69	1.49
Equity / Total Assets	%	4.88	5.68	5.18	4.91	4.58
Deposits / Loans	%	121.61	115.22	118.92	123.79	122.60

Note: All differences are significant at the 1% level (t-test).

Table 3
Descriptive statistics for the local market environment (mean)

This table presents the means of the market concentration variable Local HHI and local economic variables for the unbalanced sample of public savings and cooperative banks in Germany for the period 1994-2004. Means are presented for the complete sample as well as for banks in urban, rural, West German and East Germany, respectively.

Variables	**Unit**	**Complete Sample**	**City**	**Rural area**	**West Germany**	**East Germany**
Local HHI	#	1,638.53	1,411.34	1,719.96	1,577.34	2,164.56
Interest Rate	%	3.25	3.25	3.25	3.25	3.25
Local GDP per inhabitant	EUR	25.93	36.87	22.02	26.92	17.88
Savings Rate	%	10.06	9.90	10.11	10.21	8.84

Note: All differences are significant at the 1% level (t-test).

Table 4
Descriptive statistics for bank specific and local market characteristics over time (mean)

This table presents the means of bank specific and local market characteristics for the unbalanced sample of public savings and cooperative banks in Germany for each year for the period 1994-2004.

Variables	**Unit**	**1998**	**1999**	**2000**	**2001**	**2002**	**2003**	**2004**
Bank specific characteristics								
Interest Expenses / Total Liabilities	%	3.67	3.35	3.44	3.53	3.18	2.82	2.57
Ln(Total Assets)	EUR million	1,074.78	1,082.65	1,172.34	1,228.46	1,264.72	1,290.53	1,299.14
Operating Expenses / Total Assets	%	2.44	2.40	2.49	2.41	2.39	2.45	2.40
Implicit Interest Payments	%	1.69	1.59	1.67	1.67	1.66	1.63	1.56
Equity / Total Assets	%	4.47	4.59	4.78	4.81	4.97	5.15	5.32
Deposits / Loans	%	125.65	121.36	115.48	120.10	121.57	122.74	124.73
Local market environment								
Local HHI	#	1,649.08	1,642.17	1,642.73	1,634.83	1,637.36	1,640.34	1,624.69
Interest Rate	%	3.52	2.87	4.18	4.39	3.33	2.38	2.08
Local GDP per inhabitant	EUR	24.14	24.78	25.61	26.19	26.51	26.70	27.33
Savings Rate	%	10.23	9.59	9.42	9.65	10.19	10.56	10.74

Table 5

The effects of size on bank's funding costs - full sample

This table presents coefficient estimates from regressions relating funding costs to bank size. As dependent variable we use Interest Expenses / Total Liabilities as measure of Banks' Funding Costs. All regressions are applied to the full sample comprising 5,686 observations from approximately 800 public savings and cooperative banks. Regression analyses include observations from years 1998 to 2004, however, the dataset does not comprise observations for every bank for every year due to the unbalanced nature of the dataset. All regressions include bank fixed effects dummy variables and year dummy variables (not reported). As estimation technique, we use fixed effects regression models (Least Square Dummy Variable Approach) with heteroskedasticity-robust standard errors. P-values are reported in brackets.

	Interest Expenses / Total Liabilities						
Variables	**(1)**	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**	**(7)**
Bank specific characteristics							
Ln(Total Assets)	0.452***	0.377***	0.445***	0.478***	0.452***	0.450***	0.435***
	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]
Demand Deposits / Total Liabilities							-0.010***
							[0.000]
Savings Deposits / Total Liabilities							0.004***
							[0.000]
Deposits from Banks / Total Liabilities							0.008***
							[0.000]
Operating Expenses / Total Assets	0.394***	0.416***	0.420***	0.314***	0.394***	0.309***	0.421***
	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]
Implicit Interest Payments	-0.110***	-0.139***	-0.168***	-0.022	-0.110***		-0.114***
	[0.001]	[0.000]	[0.000]	[0.499]	[0.001]		[0.000]
Non-Interest Income / Operating Revenues				0.018***			
				[0.000]			
Equity / Total Assets	-0.048***	-0.025**	-0.023*	-0.042***	-0.048***	-0.047***	-0.034***
	[0.000]	[0.026]	[0.069]	[0.000]	[0.000]	[0.000]	[0.001]
Deposits / Loans	-0.002***	-0.002***	-0.001*	-0.002***	-0.002***	-0.002***	-0.001***
	[0.000]	[0.000]	[0.078]	[0.000]	[0.000]	[0.000]	[0.005]
Growth Rate Deposits (%)		0.006***					
		[0.000]					
M&A activity			0.315***				
			[0.000]				
M&A activity (lagged t-1)			-0.051**				
			[0.019]				
M&A activity (lagged t-2)			-0.063***				
			[0.007]				
M&A activity * Ln(Total Assets)			-0.077**				
			[0.018]				
Local market environment							
Local HHI	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	[0.929]	[0.275]	[0.935]	[0.963]	[0.929]	[0.989]	[0.625]
Interest Rate	0.299***	0.315***	0.371***	0.310***		0.293***	0.306***
	[0.000]	[0.000]	[0.000]	[0.000]		[0.000]	[0.000]
Yield Curve Slope					-0.430***		
					[0.000]		
Local GDP	-0.010***	-0.007**	-0.010***	-0.009***	-0.010***	-0.010***	-0.007**
	[0.001]	[0.026]	[0.006]	[0.001]	[0.001]	[0.001]	[0.011]
Savings Rate	-0.240***	-0.191***	-0.104***	-0.237***	-0.240***	-0.244***	-0.200***
	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]
Constant	2.635***	2.180***	0.746	1.993***	4.122***	2.694***	1.777***
	[0.000]	[0.000]	[0.235]	[0.000]	[0.000]	[0.000]	[0.000]
Observations	5,832	5,007	4,174	5,832	5,832	5,832	5,832
R-squared	0.882	0.892	0.919	0.884	0.882	0.881	0.887

***significant at 0 to 1 percent level, **significant at 1 to 5 percent level, *significant at 5 to 10 percent level, others: significant at above 10 percent level

Table 6

The effects of size on bank's funding costs - different time periods

This table presents coefficient estimates from regressions relating funding costs to bank size. As dependent variable we use Interest Expenses / Total Liabilities as measure of Banks' Funding Costs. Regression analyses include observations from different time periods: 1998-2000 (Column 1), 2001-2004 (Column 2), 1998-1999 (Column 3), 2000-2001 (Column 4) and 2002-2004 (Column 5). Analyses for different time periods do not include the same number of banks and observations due to the unbalanced nature of the dataset. All regressions include bank fixed effects dummy variables and year dummy variables (not reported). As estimation technique, we use fixed effects regression models (Least Square Dummy Variable Approach) with heteroskedasticity-robust standard errors. P-values are reported in brackets.

	Interest Expenses / Total Liabilities				
	1998-2000	**2001-2004**	**1998-1999**	**2000-2001**	**2002-2004**
Variables	**(1)**	**(2)**	**(3)**	**(4)**	**(5)**
Bank specific characteristics					
Ln(Total Assets)	0.910***	0.623***	1.367***	0.894***	0.781***
	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]
Operating Expenses / Total Assets	0.389***	0.499***	0.298***	0.666***	0.496***
	[0.000]	[0.000]	[0.002]	[0.000]	[0.000]
Implicit Interest Payments	-0.084	-0.137***	-0.054	-0.237***	-0.169***
	[0.160]	[0.000]	[0.397]	[0.001]	[0.000]
Equity / Total Assets	-0.098***	-0.017	0.043	0.033	-0.002
	[0.001]	[0.212]	[0.309]	[0.435]	[0.878]
Deposits / Loans	-0.002***	-0.001	-0.002	-0.002	0.000
	[0.005]	[0.402]	[0.111]	[0.204]	[0.687]
Local market environment					
Local HHI	0.000	0.000	0.000	0.000	0.000
	[0.691]	[0.639]	[0.468]	[0.194]	[0.275]
Interest Rate	0.01	0.411***			0.575***
	[0.447]	[0.000]			[0.000]
Local GDP	-0.008	-0.007	-0.021**	-0.01	-0.009
	[0.226]	[0.140]	[0.014]	[0.243]	[0.101]
Savings Rate	-0.125***	-0.038	-0.006	-0.121*	0.109***
	[0.006]	[0.308]	[0.943]	[0.083]	[0.006]
Constant	-3.068**	-4.225***	-4.007***	-3.551**	-4.598***
	[0.022]	[0.000]	[0.004]	[0.049]	[0.000]
Observations	2,491	3,341	1,657	1,668	2,507
R-squared	0.885	0.929	0.941	0.933	0.933

***significant at 0 to 1 percent level, **significant at 1 to 5 percent level, *significant at 5 to 10 percent level, others: significant at above 10 percent level; Note: Note: Interest rate variable has been dropped from regressions (3) and (4) due to collinearity.

Table 7
The effects of size on bank's funding costs - the effects of M&A

This table presents coefficient estimates from regressions relating changes in funding costs to changes in bank size at merging banks. As dependent variable we use the first difference of our funding costs variable Interest Expenses / Total Liabilities. As explanatory variables we include the first differences of our bank size variable Total Assets and control variables. First differences for the respective variables are calculated between the pre-merger year (t-1) and the merger year (Column 1), the first post-merger year (Column 2) and the second merger year (Column 3). Regression analyses include observations of all banks that have been involved in merger between 1998 and 2004 for the years before and after their respective mergers. All regressions include bank fixed effects dummy variables and year dummy variables (not reported). As estimation technique, we use Ordinary Least Square (OLS) regression models with heteroskedasticity-robust standard errors. P-values are reported in brackets.

	Δ Interest Expenses / Total Liabilities		
	(1)	**(2)**	**(3)**
Variables	**Δ(t-1;t)**	**Δ(t-1;t+1)**	**Δ(t-1;t+2)**
Bank specific characteristics			
Δ Total Assets	0.656***	0.327***	0.378***
	[0.000]	[0.000]	[0.003]
Δ Operating Expenses / Total Assets	0.495**	0.380**	-0.084
	[0.047]	[0.028]	[0.647]
Δ Implicit Interest Payments	0.088	-0.194	0.472*
	[0.601]	[0.275]	[0.099]
Δ Equity / Total Assets	0.032	-0.061	-0.077
	[0.557]	[0.211]	[0.111]
Δ Deposits / Loans	-0.009***	-0.007***	-0.003
	[0.004]	[0.000]	[0.109]
Local market environment			
Δ Local HHI	-3.786**	-0.125	-1281
	[0.042]	[0.815]	[0.136]
Δ Interest Rate	-0.625**	0.114	0.253**
	[0.017]	[0.139]	[0.042]
Δ Local GDP	-0.044***	-0.017*	-0.033***
	[0.000]	[0.053]	[0.003]
Δ Savings Rate	0.257***	0.172***	0.170**
	[0.007]	[0.001]	[0.012]
Constant	-1.059***	-0.053	-0.436
	[0.000]	[0.703]	[0.180]
Observations	176	161	134
R-squared	0.892	0.925	0.900

***significant at 0 to 1 percent level, **significant at 1 to 5 percent level, *significant at 5 to 10 percent level, others: significant at above 10 percent level; Note: Note: Interest rate variable has been dropped from regressions (3) and (4) due to collinearity.

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