DEUTSCHE BUNDESBANK
EUROSYSTEM

Discussion Paper

Deutsche Bundesbank
No 01/2018

An analysis of non-traditional activities at German savings banks – Does the type of fee and commission income matter?

Matthias Köhler

Deutsche Bundesbank, Wilhelm-Epstein-Straße 14, 60431 Frankfurt am Main,
Postfach 10 06 02, 60006 Frankfurt am Main

Tel +49 69 9566-0

Please address all orders in writing to: Deutsche Bundesbank,
Press and Public Relations Division, at the above address or via fax +49 69 9566-3077

Internet http://www.bundesbank.de

ISBN 978–3–95729–422–7 (Printversion)
ISBN 978–3–95729–423–4 (Internetversion)

Non-technical summary

Research question

Structural developments, together with the low interest rate environment, have put German savings banks' net interest income under increasing pressure. One possibility to stabilize their revenues is to increase net fee and commission income. In this context, we investigate the relationship between their net fee and commission income on the one hand and their profitability and stability on the other hand.

Contribution

For our analysis, we use a fully anonymized dataset provided by the *German Savings Banks Association* (DSGV) on the composition of fee and commission income of German savings banks. This dataset allows us to break fee and commission income down into income from payment services, income from securities business, commission income from insurance, building loan contracts and real-estate brokerage, income from foreign business, and other fee and commission income. Because the return and risk characteristics of these activities are different, we examine whether the effect of fee business on bank profitability and stability differs depending on the type of activity.

Results

Our results suggest that savings banks with a higher share of fee and commission income, in particular from payment services and securities business, have a higher (risk-adjusted) profitability. Bank stability also correlates positively with the share of securities business income, possibly because it responds to different shocks than net interest income and, therefore, offers the largest diversification potential. Taken together, our results suggest a positive relationship between the level of net fee and commission income and risk-adjusted returns.

Nichttechnische Zusammenfassung

Fragestellung

Strukturelle Entwicklungen setzen zusammen mit dem Niedrigzinsumfeld das Zinsergebnis der Sparkassen in Deutschland unter Druck. Eine Möglichkeit, ihre Erträge zu stabilisieren, besteht darin, das Provisionsergebnis zu erhöhen. Vor diesem Hintergrund untersuchen wir den Zusammenhang zwischen ihrem Provisionsergebnis auf der einen Seite und ihrer Profitabilität und Stabilität auf deren anderen Seite.

Beitrag

Zur Analyse der Fragestellung verwenden wir einen vollständig anonymisierten Datensatz des *Deutschen Sparkassen- und Giroverbands* (DSGV). Dieser Datensatz macht es möglich, die Provisionseinnahmen der Sparkassen in Einnahmen aus dem Zahlungsverkehr, Einnahmen aus dem Wertpapiergeschäft, Einnahmen aus der Vermittlung von Versicherungen, Bausparverträgen und Immobilien, Einnahmen aus dem Auslandsgeschäft und sonstige Provisionseinnahmen zu unterteilen. Da sich die Rentabilität und das Risikoprofil dieser Aktivitäten unterscheiden, untersuchen wir, ob der Einfluss des Provisionsgeschäfts auf die Profitabilität und Stabilität von der Art der Aktivität abhängig ist.

Ergebnisse

Unsere Ergebnisse lassen vermuten, dass Sparkassen mit einem höheren Anteil an Provisionseinkommen, insbesondere aus dem Zahlungsverkehrs- und Wertpapiergeschäft, eine höhere (risiko-adjustierte) Profitabilität haben. Die Stabilität einer Bank korreliert ebenfalls positiv mit dem Anteil des Einkommens aus dem Wertpapiergeschäft, möglicherweise weil es anderen Schocks ausgesetzt ist als das Zinseinkommen und daher ein größeres Diversifikationspotential bietet. Insgesamt ergibt die Studie, dass ein positiver Zusammenhang zwischen der Höhe des Provisionsergebnisses und den risiko-adjustierten Gewinnen besteht.

Deutsche Bundesbank Discussion Paper No 01/2018

An Analysis of Non-Traditional Activities at German Savings Banks – Does the Type of Fee and Commission Income Matter?

Matthias Köhler*
Deutsche Bundesbank

Summary

In this paper, we use a fully anonymized dataset provided by the *German Savings Banks Association* (DSGV) to analyse which savings banks have expanded into fee-producing activities more quickly. In addition, we investigate whether their profitability and stability is correlated with the share of their fee and commission income. Notably, we examine whether the effect on bank profitability differs depending on the type of fee and commission income. Our results support the view that savings banks with low net interest margins are under greater pressure to expand into fee-producing activities. They further suggest that savings banks with a higher share of fee and commission income, in particular from payment services and securities business, also have a higher profitability. The Z-score also correlates positively with the share of securities business income, possibly because it responds to different shocks than net interest income and, therefore, offers the largest diversification potential.

Keywords: Savings banks, fee and commission income, profitability

JEL-Classification: G 20, G 21, G 29

* Deutsche Bundesbank, Wilhelm-Epstein-Straße 14, 60431 Frankfurt am Main, Germany. Tel. +49 69 9566 4765, Fax +49 69 9566 4765 , E-Mail: matthias.koehler@bundesbank.de. The author thanks the *German Savings Banks Association* (DSGV) for providing the data on German savings banks. The author is also grateful for comments and suggestions received from the DGSV, Ulrich Krüger, Christoph Memmel, Dilek Bülbül, Felix Noth and the participants at the research seminar at the Bundesbank, the University of Paderborn and the 5th Conference of the Financial Engineering and Banking Society (FEBS).

1. Introduction

The net interest margin has significantly decreased over the past decades. Recently, the low interest rate environment has put additional pressure on this margin, since it usually narrow when interest rates decline. In Germany, for instance, the average net interest margin has dropped to its lowest level ever recently.[1] This primarily raises concerns about the profitability of savings banks and other institutions that traditionally focus on lending and deposits, since the bulk of their income is derived from net interest income. To reduce their dependence on net interest income, the vast majority of German savings banks plans to increase their fee and commission income over the next years. Against this backdrop, this paper makes two main contributions. First, we analyse which savings banks have expanded into fee-producing activities more quickly over the past decade. Second, we investigate whether their profitability is correlated with the share of their fee and commission income. Notably, we examine not only whether a higher share of fee and commission income is associated with increased profitability, but also whether the effect varies depending on the type of fee and commission income. This is an important point given that fee and commission income is diverse, ranging from fees for payment services and commission income from the sale of insurance products to fee and commission income from securities business. The return and risk characteristics of these activities differ fundamentally.

Our results indicate that savings banks that have a higher share of fee and commission income are more profitable. This result is mainly driven by payment service fees and income from securities business. The share of securities business income also correlates positively with the Z-score, possibly because it responds to different shocks than net interest income and, therefore, offers the largest diversification potential. Taken together, our results are consistent with the view that expanding into fee-producing activities allows German savings banks to increase their revenues and improve their risk/return trade-off. Our results further show that net fee and commission income increases when the net interest income decreases. This supports the view that banks with low net interest margins are under greater pressure to increase their fee and commissions income to offset the decline in net interest income.

We use a fully anonymized dataset provided by the *German Savings Banks Association* (DSGV) to examine the impact of fee and commission income on the profitability of savings

[1] For more information on the link between interest rates, net interest margins and their impact on financial stability in Germany see Deutsche Bundesbank (2015a).

banks. This dataset comprises data on 416 savings banks in the German banking sector between 2002 and 2013. Alongside standard balance sheet and income statement data, the dataset also provides detailed information on the composition of the savings banks' fee and commission income that is not available from other databases. The granularity of the dataset allows us to break it down into five main categories: (I) income from payment services, (II) income from securities business, (III) commission income from insurance, building loan contracts and real-estate brokerage, (IV) income from foreign business, and (V) other fee and commission income.

For banks, many researchers have explored the relationship between income diversification, profitability and risk-taking. Most of the earlier studies find that a higher share of non-interest income is associated with lower risk-adjusted returns and greater risks.[2] These studies usually explain the increase in bank risk by the higher volatility of non-interest income compared to interest income. Their findings contrast with the results of more recent studies which have found some risk diversification benefits from expanding into non-traditional activities.[3] Some of these studies suggest that the impact of the share of non-interest income on bank profitability differs depending on the type of the bank. Using data for the German and EU banking sector, respectively, Köhler (2014 and 2015), for example, shows that retail banks, i.e. banks with a focus on lending and deposits business for private households and small and medium enterprises, become significantly more stable, as measured by the Z-score, when they increase their share of non-interest income to total operating income, while investment banks doing the same become more risky. There are two main reasons why retail and investment banks are affected differently by an expansion into activities that generate non-interest income. First, investment banks have already a large share of non-interest income. This might limit the benefits to be gained from further expanding into non-interest income activities. This contrasts with retail banks. They are highly reliant on interest income and might benefit from diversifying into non-interest income due to the reduction of the net interest margin. Second, the composition of non-interest income differs significantly. For example, while retail banks usually collect payment service fees and earn commission income from securities business, insurance products and alike, investment banks derive most of their non-interest income from underwriting, securitisation and other market-related services as well as trading. The risk character-

2 Many studies focus on US banks (see, for example, DeYoung and Roland (2001), DeYoung and Rice (2004), Stiroh (2006) and Stiroh and Rumble (2006)). For Europe, the evidence is mixed. Lepetit et al. (2008), for example, show that banks that have expanded their non-interest income activities are more risky than banks that mainly supply loans. Mercieca et al. (2007) obtain similar findings for a sample of small European banks. Chiorazzo et al. (2008), in contrast, find that Italian banks will have significantly higher risk-adjusted returns.

3 Demirgüç-Kunt and Huizinga (2010), for a sample of international banks, and Altunbas et al. (2011), for banks from Europe, find some risk diversification benefits at very low levels of non-interest income. Saunders et al. (2014) find that a higher proportion of non-interest income is associated with a higher profitability and greater stability of US banks as well.

istics of these activities differ fundamentally. DeYoung and Torna (2013), for example, show that the probability that a distressed US bank failed during the financial crisis declined with pure fee-based non-traditional activities such as securities brokerage and insurance sales, but increased with asset-based non-traditional activities such as venture capital, investment banking and asset securitization. Stiroh and Rumble (2006) also find that the type of non-interest income matters. They show that a higher share of non-interest income makes US banks more risky (in the sense of having a lower Z-score). The negative impact is, however, entirely driven by trading and other non-interest income, a result confirmed by Stiroh (2006). A higher share of fiduciary income, by contrast, is found to have a positive effect on the profitability and stability of returns of US banks.

Our paper extends the literature in two ways. First, we analyse whether the overall impact of the share of fee and commission income on bank profitability is driven by the type of fee and commission income. Like other retail banks, most of a savings bank's fee and commission income comes from payment services, followed by securities and insurance business as well as real-estate brokerage. These activities differ significantly. Fee income from payment services, for instance, is usually less volatile than income from securities brokerage. However, fee income from payment services is also usually more strongly correlated with net interest income because payment services are closely related to the traditional deposit business of banks. Income from securities brokerage, by contrast, is more dependent on market fluctuations and, therefore, responds to different shocks than net interest income. This suggests that the potential to diversify earnings through the provision of fee- and commission-based services may vary according to the type of fee and commission income.

Second, we explore which savings banks have expanded into fee-producing activities more quickly. We investigate, for example, whether savings banks which have seen their net interest margin contracting more sharply have expanded into fee and commission income more quickly. Moreover, we analyse whether savings banks use their customer relationships from lending and deposit business to cross sell fee- and commission based products and services. Savings banks might be particularly adapted for cross-selling because they usually have a close relationship with their customers due to their large branch network and staff (Bülbül et al. 2014).

The paper is structured as follows. In the following section, we describe the shift from traditional intermediation business to fee-producing activities and outline the advantages and dis-

advantages that might be associated with an expansion into such activities. Section 3 presents the dataset and descriptive statistics on the relative importance and composition of fee and commission income of German savings banks between 2002 and 2013. Moreover, we examine which savings banks have expanded into fee-producing activities more quickly. In Section 4, we analyse the relationship between the share of fee and commission income and bank profitability and the Z-score empirically. Section 5 summarizes our main findings and concludes.

2. Striving for fee-producing activities

To recoup lower net interest margins, banks try to increase their non-traditional activities and complement interest income by non-interest income. In Germany, savings banks experienced a decline in their net interest margin and their net interest income share over the past decades (see Figure 1), while their net fee and commission margin and their net fee and commission income share increased (see Figure 2). Several savings banks have recently announced to raise their account management service fees to offset the decline in net interest income. However, greater competition from other (savings) banks and alternative payment service providers such as *Paypal* may limit the extent to which payment service fees can be increased. In line with that, fee income from payment services grew only slightly between 2002 and 2013 (see Table 1). Greater competition may also restrict the extent to which savings banks can levy commissions when signing a credit contract as a substitute for net interest income. Their focus on lending- and deposit-related fees might explain why savings banks still have a low share of fee and commission income compared to the German big banks, since most of the big banks' fee and commission income comes from corporate and investment banking services (Köhler 2014).[4]

Besides raising payment service fees, savings banks might also increase their cross-selling of securities, insurance products and the like, thereby raising the share of other types of fee and commission income. In the past, particularly income from securities and commission business increased, while payment service fees remained almost unchanged (see Table 1). Providing commission services might not only help savings banks to recoup lower margins in traditional intermediation business, but also to increase their market power, because private households might be willing to pay more for the convenience of one-stop-shopping or might not want to

[4] Similar to the savings banks, cooperative banks in Germany also have a low share of fee and commission income (Köhler 2014). They earn most of their fee and commission income by providing lending- and deposit-related services as well and, hence, face similar restrictions on the expansion of fee-based activities.

pay switching costs (Berger 2000). Private households also value person-to-person contact at branch offices similar to small enterprises, because they prefer to reveal their private information only to a single bank (DeYoung and Rice 2004).

By raising the share of fee and commission income savings banks may not only be able to increase their income, but also to reduce their risk level, because they are less exposed to the risks inherent in traditional intermediation activities (Allen and Santomero 2002). For example, to generate interest income from lending and deposits, savings banks have to expose themselves to the risk of loan default and maturity transformation.[5] This is not the case if banks are active in, for example, commission business, because they act as an intermediary between two parties and do not need to put the risks associated with the transaction on their balance sheet. Nevertheless, substantial legal risks may arise from the provision of fee-based services. Using data from the DSGV, Bülbül et al. (2014) provide evidence which is consistent with this hypothesis. They show that German savings banks become significantly more profitable by expanding into leasing services. Importantly, the beneficial effect of leasing activities stems from commission-based services in which banks are not affected by loan defaults.

Besides the advantages of having a higher share of fee and commission income, there may also be some disadvantages. First, banks might require a larger number of employees with different skills to increase their fee and commission business. This increase costs and raises the ratio of fixed-to-variable expenses, which makes banks more sensitive to fluctuations in bank revenues (DeYoung and Roland 2001). Moreover, while the revenue from traditional lending activities may be relatively stable over time because switching costs and information costs make it costly for either borrowers or lenders to walk away from a lending relationship, the revenue from some fee-based activities may be relatively unstable because banks face a high level of competitive rivalry, low information costs, and fluctuating demand in a number of these product markets, e.g. securities and insurance brokerage (DeYoung and Roland 2001). Consistent with that, the standard deviation of the growth rates of income from securities and commission business was significantly higher than the standard deviation of the other types of fee and commission income between 2002 and 2013 (see Table 1). However, the larger variability may imply that income from securities and commission business is also less correlated with net interest income than, for example, payment service fees which are more stable, but

5 Memmel (2011) shows that German savings and cooperative banks earn up to one quarter of the net interest income by maturity transformation.

also more closely related to a savings bank's traditional lending and deposit business.[6] This reduces the potential diversification benefits a higher share of payment services offers. Taken together, it is important not only to look at the overall impact of a higher share of fee and commission income, but to examine the impact of each of its components on bank profitability.

3. Data and descriptive statistics

Detailed data on the structure of fee and commission income is not available from commercial databases such as *Bankscope* and prudential databases such as the *Deutsche Bundesbank's* database BAKIS. We used the dataset of the *German Savings Banks Association* (DSGV).[7] The DSGV has a unique database that contains detailed information on the business of each savings bank in Germany. This dataset had already been employed by Puri et al. (2011) and Bülbül et al. (2014).

To ensure the anonymity of the savings banks, we did not receive any data on their names and location. We also obtained no data on their total assets because it would have been possible to merge the dataset with the Deutsche Bundesbank's database, which contains the name of each institution, by total assets. Instead, the DSGV has categorized the savings banks into three different size groups based on their total assets in 2014: (I) small savings banks with total assets of less than €1 billion, (II) medium savings banks with total assets between €1 billion and €2.5 billion and (III) large savings banks with total assets above €2.5 billion. Overall, we have 115 small, 165 medium and 136 large savings banks in our sample. Therefore, our dataset comprises a total of 416 savings banks and 4,988 bank-year observations for the period between 2002 and 2013.

It is important to note that we only have data for the banks that were operating in 2014. All banks that failed between 2002 and 2014 are, therefore, omitted. Because there were 519 banks in 2002, the number of missing banks in our sample is 103. If these banks were affected differently by fee and commission income, our results would be subject to survivorship bias. We believe that this bias is relatively small, because the missing banks did not fail and drop

6 We address this issue in greater detail in Section 4.2 of this paper.

7 The DSGV represents the interests of its members. It belongs to the *German Savings Banks Finance Group*. This group comprises the savings banks, the Landesbanken group, the DekaBank, regional building societies and various other institutions. It is characterised by a division of labor. While the Landesbanken are focused on wholesale banking and are active in issuance, underwriting and commission-based services for medium-sized and larger corporate customers in Germany and elsewhere, savings banks focus on deposits and lending for retail and small business customers in their region. Savings banks adhere to the so-called regional principle, which restricts the operations of a savings bank to the area for which the public body is responsible. Further information is available from the *German Savings Banks Association* (DSGV 2014). For detailed descriptions and analyses of the German banking sector, see Krahnen and Schmidt (2004).

out of the sample, but were merged with other institutions in our sample and are therefore covered by our data as of the year of the merger. This means that only observations up to the merger year are missing. Because most mergers took place at the beginning of the sample period, the number of missing observations is low compared to the total number of observations in our sample. A problem related to mergers is that they may change the way how fee and commission income affects bank profitability. We address this problem in the robustness section.

3.1 The relative importance and structure of non-interest income

In the first step, we analyse the relative importance of non-traditional activities for savings banks. In line with the literature, we measure the relative importance of traditional and non-traditional activities using the ratios of net interest and net non-interest income to total operating income. With an average of almost 80% of total income, net interest income is the dominant source of income for savings banks (Table 2). This is a reflection of their focus on lending and deposits. Non-interest income, by contrast, is much less important for savings banks and accounts for the remaining 20% of total operating income. Most non-interest income is fee and commission income. In general, trading income and other operating income are unimportant.[8]

Table 3 separates fee and commission income into its main components. The most important component is fee income from payment services which accounts, on average, for around half of the fee and commission income of savings banks. Banks charge payment services fees for providing services such as account management and payment transactions. The substantial amount of fees derived from payment services indicates that the production and distribution of these services constitutes one of the core business activities of savings banks. The variation, however, is large; with some savings banks earning more than 70% of their fee and commission income through the provision of payment services and others only 30%. There is also considerable variation in the relative importance of income from securities business, which is the second most important component of fee and commission income (19% on average) followed by commission income (15%). Most of the latter comes from insurance brokerage, but brokerage of building loan contracts and real estate is also important. Fee and commission income related to foreign business is the least important component with an average

8 Other operating income comprises all income and expenses that are incurred from operating activities, but not directly related to the actual business. It essentially comprises expenses and earnings from leasing business, the gross result for transactions in goods and subsidiary business as well as other operating income or charges.

share of 3%. It comprises fees for providing foreign exchange transactions and other services related to foreign investment financing. Fee and commission income from other activities combined accounts for 13%. It consists of fee income from financial guarantee business and fees for any other services that cannot be assigned to any of the other categories of fee and commission income.

3.2 Correlates of fee and commission income

The first contribution of this paper is in determining which savings banks have expanded more quickly into fee-based activities. To this end, we estimate the following regression model:

$$y_{it} = \alpha_i + \beta_1 * X_{it-1} + \gamma_t + \epsilon_{it} \quad (1)$$

where y_{it} is the ratio of net non-interest income and net fee and commission income to total assets, respectively, of bank *i* in year *t*. In addition, we estimate separate models with the different types of fee and commission income relative to total assets as dependent variables. The explanatory variables are included in the vector *X*. Note that all bank variables are lagged by one year to mitigate potential endogeneity problems. We use lags, because it is hard to find instrumental variables that are correlated with the bank variables, but that are exogenous to bank profitability. Lagged variables are not fully exogenous, but they are predetermined which means that the lagged variables are set before the actual value is determined.[9] For a complete list of variables included in our analysis, see Table 4. Descriptive statistics for each variable are presented in Table 5.

The regression results are reported in Table 6. All models are estimated with bank-specific effects α_i and time-fixed effects γ_t. Our results indicate that net fee and commission income relative to total assets is higher if the net interest margin is lower. This is consistent with Rogers and Sinkey (1999) and suggests that banks with high levels of fee-producing activities tend to have smaller net interest margins. Since lending and deposit business is less profitable for these banks, they are under greater pressure to increase their net fee and commission income to offset the decline in net interest income (Rogers and Sinkey 1999). The coefficients for the different components of fee and commission income suggest that particularly payment service fees will rise relative to total assets if net interest margins decrease. Since payment service fees usually do not change much over time, we believe that their increase reflects by

9 Since the observations for one specific bank are not independent, we compute cluster-robust standard errors and treat each bank as a cluster.

and large a higher volume of and not a higher price for payment services. As argued above, several savings banks have started to raise their payment service fees in response to the low interest rate environment. Most of these price increases, however, have occurred recently and are not be covered by our dataset which ends in 2013.

Table 6 further shows that fee and commission income correlates positively with overhead costs. This corroborates the findings in DeYoung and Rice (2004). They argue that banks need to invest in more staff, branches and technology, and thus incur higher costs to conduct non-interest income business. Our results further show that banks with a higher ratio of private customer deposits have a significantly higher income from payment services (Column 3). This is not surprising as a large fraction of a savings bank's payment service fees derives from account management fees and other services that are directly linked to a bank's deposit business with private customers. However, our results also indicate that savings banks will be more successful in cross-selling insurances, building loan contracts and alike and, thus, generate more income from commission business if the share of retail deposits to total assets increases (Column 5). These results support the view that savings banks primarily use their customer relationship from traditional deposit-business to cross sell commission-based services and products.

Most differences of the fee and commission income shares are, however, explained by the fixed effects α_i which account, on average, for 80% of the variation of the fee and commission income share and its components. This indicates that the relative importance of non-interest income, in general, and fee and commission income, in particular, is mostly determined by bank-individual characteristics that are constant along time as, for example, management choice and risk preferences. Besides, the fixed effects also control for the region in which the savings bank is located, because the bank-specific fixed effects are inclusive of market fixed effects. This is due to the so-called regional principle which restricts the operations of a savings bank to an area for which their public owner is responsible and in which no other savings banks make business. In contrast to the bank-specific effects, the market fixed effects control for determinants of the net fee and commission income that are outside the control of the management such as the level of local market competition and other regional characteristics. Since we have no information on the location of the savings banks for anonymity reasons, it is not possible to disentangle bank- and market-specific fixed effects in our dataset.

To check whether the results are independent of bank size, we did separate regressions for small, medium and large banks.[10] The results are similar and are not reported for the sake of brevity.

4. Correlates of bank profitability

The second contribution of this paper is to determine whether the profitability of savings banks is correlated with their fee and commission income share. To this end, we follow the literature (e. g. Stiroh 2006, Demirgüç-Kunt and Huizinga 2010 and Köhler, 2014) and estimate the following model:

$$y_{it} = \alpha_i + \beta_1 * X_{it-1} + \beta_2 * B_{it-1} + \gamma_t + \epsilon_{it} \quad (2)$$

where y_{it} is either the ROA, ROE, RAROA, RAROE or Z-score of bank *i* in year *t*. These are defined as follows:

$$ROA_{it} = \frac{\text{Pre-tax Return}_{it}}{\text{Total Assets}_{it}} \quad (3)$$

$$ROE_{it} = \frac{\text{Pre-tax Return}_{it}}{\text{Equity}_{it}} \quad (4)$$

RAROA and RAROE can be interpreted as profits per unit of risk. They are calculated by dividing the ROA and ROE by the standard deviation of the ROA (SDROA) and ROE (SDROE) respectively. Since we only have 12 observations per bank, we calculate the standard deviation as a constant per bank.

$$RAROA_{it} = \frac{\text{ROA}_{it}}{\text{SDROA}_{i}} \quad (5)$$

$$RAROE_{it} = \frac{\text{ROE}_{it}}{\text{SDROE}_{i}} \quad (6)$$

In addition, we employ the Z-score. It has frequently been used in the literature (e. g. Stiroh 2006, Demirgüç-Kunt and Huizinga 2010 and Köhler 2014 and 2015) and is defined as follows:

10 Note that we do not have data on the total assets of each savings bank. Instead they are categorized into three groups based on their size. Due to the within transformation of the data, dummy variables for each size group will drop out of the regression if the model is estimated with fixed effects.

$$Z-Score_{it}=\frac{ROA_{it}+CAR_{it}}{SDROA_{i}} \tag{7}$$

where CAR is the ratio of equity over total assets. The Z-score is, thus, based purely on accounting data. This is important, since there is no market data available for savings banks. If profits are assumed to follow a normal distribution, it can be shown that the Z-score is the inverse of the probability of insolvency. More specifically, the Z-score indicates the number of standard deviations below the expected value of a bank's return on assets at which equity is depleted and the bank is insolvent (see Roy 1952 and Boyd et al. 1993).[11] Following Lepetit and Strobel (2015) the Z-score may be upwardly biased, i.e. the probability of bank insolvency may be overestimated for lower Z-score ratios. We, therefore, follow Bülbül et al. (2014) and use the natural log of the Z-score to account for the skewed distribution of the Z-score.[12]

The variables of interest on the right-hand side of the regression equation are included in the vector *X*. To measure the relative importance of net fee and commission income, we use the share of net fee and commission income in total operating income. In our extended model, we replace the net fee and commission income share by its five component shares. The coefficient of interest is β_1. If β_1 is positive, savings banks' profitability and the Z-score correlate positively with their fee income share. In this case, expanding into fee-producing activities allows savings banks to better diversify bank revenue and improve their risk/return trade-off. If β_1 is negative, however, it is better for savings banks to focus on lending and deposit business and to increase their net interest income. There is a potential bias in the construction of the non-interest income share, because the non-interest income share will increase (decrease) by construction if net interest income decreases (increases), even if non-interest income is constant. In this case, a higher (lower) share of non-interest income is associated with lower (higher) profits. The coefficient for β_1 is, hence, negatively biased. There may also be a positive bias, however, as positive (negative) shocks to non-interest income would raise (lower) the non-interest income share and also profits. Stiroh and Rumble (2006) argue that the positive bias dominates the negative bias, because non-interest income is more volatile than net interest income and, thus, more exposed to shocks than net interest income. The higher vola-

11 Finally, we examine whether a larger share of non-interest income increases the standard deviation of the ROA (SDROA) in order to find out whether savings banks will have more volatile returns if they become more active in areas that generate fee and commission income. Instead of the Z-score and the accounting ratios of bank profitability, one might prefer a measure of market risk and performance because this is ultimately what investors are interested in. However, for German savings banks, this is not a feasible strategy because they are not listed and, thus, there is no data available on stock returns. Moreover, from the perspective of bank owners and supervisors, accounting data provide an informative view on the ex-post outcomes (Stiroh 2004b).

12 Further studies that use the logarithm of the Z-score as dependent are Laeven and Levine (2009) and Houston et al. (2010).

tility is, however, mainly driven by trading income and other operating income. Fee and commission income, the most important source of savings banks' non-interest income, is much more stable, in particular payment service fees. Overall, therefore, it is not clear *a priori* which bias dominates. To reduce this bias, we lag the net fee and commission income share by one period as current shocks should be unrelated to past values of the net fee and commission income share. The results, however, still have to be interpreted with caution, since endogeneity problems are not fully eliminated.

In vector B, we include a number of additional control variables that are typically used in the literature. These include the capital ratio, the cost-income ratio and share of customer loans and deposits in total assets. To mitigate endogeneity problems, all of these variables are lagged by one period as well. Bank profitability and the Z-score may also be affected by unobserved variables such as management ability, risk preferences and location that affect both bank performance and diversification. For example, if better managers both diversify and generate a strong performance, then diversification itself may not be beneficial. Managers' risk preferences may also matter. For instance, the fact that the savings banks did not expand equally into non-traditional activities might indicate that savings banks that are more active in non-traditional activities are willing to take more risks. In this case, banks with a high share of non-interest income may be less stable, although non-interest income itself may not be more risky. In both cases, our results may, hence, suffer from an omitted variable bias. To reduce this bias, we exploit the panel structure of our dataset and estimate our model with fixed effects α_i to control for unobserved heterogeneity. As mentioned above, due to the regional principle the operations of a savings bank are restricted to the specific area for which their public owner is responsible. This implies that the bank-specific fixed effects are inclusive of market fixed effects. In addition, we include a set of year dummies γ_t to control for macroeconomic developments (e.g. GDP growth and the level of interest rates). As previously, to reduce the impact of outliers, all variables are winsorized at the 1% and 99% levels.

4.1 Baseline results

The results of our baseline model are presented in Tables 7 and 8, respectively. They show that savings banks that increase their share of non-interest income and fee and commission income, respectively, also have higher (risk-adjusted) returns (Columns 1 to 4). Interestingly, we find no evidence that savings banks have more volatile returns when the share of non-interest income increases (Columns 6 and 7). This supports our hypothesis that the non-interest income of savings banks is a relatively stable source of income. We also find that banks with a higher share of non-interest income and fee and commission income, respectively, also have a higher Z-score (Column 5). Taken together, our results are consistent with the view that expanding into fee-producing activities allows savings banks to increase their revenues and improve their risk/return trade-off.

The results for the remaining control variables are also of interest. As expected, we find that savings banks that are more cost-efficient in terms of their cost-income ratio are more profitable and stable as well, while better capitalized banks are found to be less profitable, but also have higher Z-scores. Due to their risk aversion better capitalized banks might be less profitable, but also more stable than low-capitalized banks. Banks with a higher ratio of loans to corporate customers relative to their assets have significantly lower (risk-adjusted) returns and are less stable as well. This corroborates the findings in Bülbül et al. (2014) that corporate loan business is less profitable and more risky. Finally, there is evidence that savings banks are more profitable and stable if the share of retail and corporate customer deposits relative to their total assets is high. Both provide a relatively cheap and stable source of funding (Huang and Ratnosvki 2011).

4.2 Components of fee and commission income

In this section, we examine whether our results of our baseline model are driven by the type of fee and commission income. This is important, since our finding that savings banks with a higher share of fee and commission income are more profitable and stable does not necessarily imply that banks should expand into each type of fee-based activity equally. Fee income from securities and commission business, for example, is more volatile than fees from payment services (see Table 1). Because of this, it might be better for savings banks to increase the share of payment service fees and to reduce the share of income from securities and commission business. However, fee income from payment services should also be more strongly correlated with net interest income than fee income from securities business because payment

services are closely related to the traditional deposit business of banks. Securities business income, by contrast, should be more dependent on market fluctuations and, therefore, responds to different shocks. This suggests that the diversification opportunities of income from payment and securities business differ.

To assess the potential diversification opportunities of the different types of fee and commission income, we calculate bank-specific correlations between net interest income and fee and commission income. The correlations are estimated based on annual growth rates because we are interested in the correlation between different sources of income across time. They have direct implications for the diversification question because they measure whether a given bank's shocks to one type of income are typically accompanied by similar shocks to the second. The results of the correlation analysis are reported in Table 9. The average correlation between net interest income and net fee and commission income is 0.05 with a standard deviation of 0.32. The high standard deviation suggests that the diversification potential considerably differs across banks. This is also illustrated in Figure 3 which shows the distribution of bank-specific correlation coefficients. The tails of this distribution are particularly important because large negative correlations imply the biggest potential diversification benefits and large positive correlations the least.

The correlation analysis further suggests that income from securities business offers the largest potential diversification benefits, because it is negatively correlated with net interest income (see Table 9). This supports our view that securities business is more dependent on market fluctuations and, hence, responds to different shocks than net interest income. The correlation between all other types of fee and commission income, by contrast, is positive, but close to zero. If fee and commission income and net interest income are negatively or only weakly correlated, i.e. positive shocks to one revenue source are offset by negative shocks to the other one, fee and commission income may diversify bank revenue and improve the risk/return trade-off.

To examine whether these potential diversification benefits translate into higher profits and lead to more stable institutions, we replace the share of fee and commission income in our baseline model by its five components shares. As previously, all variables are again lagged by one period to mitigate endogeneity concerns. The results of our extended baseline model are reported in Table 10. They show that savings banks with a higher share of fee income from

payment services and securities business also have a higher (risk-adjusted) profitability (Columns 1 to 4). The Z-score will also rise, but only if the share of securities business increases (Column 5). This suggests that the diversification potential that fee income from securities business offers more than offsets its higher volatility. The share of income from payment services, by contrast, is insignificant in the regression with the log Z-score as dependent variable. Overall, the results from our extended regression model suggest that the results from the baseline model are mainly driven by the share of fee income from payment services and securities business.

4.3 Robustness Tests

One concern is that we could not control for bank size in our previous regressions, because the DSGV provided no data on total assets to ensure the anonymity of the savings banks. Hence, as a robustness check and to examine whether the impact of the share of fee and commission income and its five components shares on the profitability and the Z-score of savings banks depends on bank size, we now re-estimate models for small, medium and large savings banks. The results are reported in Table 11. For brevity, we only report the results of the main variables of interest.

The results confirm most of our previous findings. For all groups, we find banks that have a high share of fee and commission income also have a higher (risk-adjusted) profitability (Columns 1 to 4). Interestingly, however the fee and commission income share is only significant for small and large banks in the regression with the log of the Z-score as dependent variable. This suggests that the findings for the full sample are mainly driven by these banks. The impact of the five component shares of fee and commission income on bank profitability and the Z-score also differs across bank groups. Our results suggest that small savings banks mainly benefit from a higher share of payment service fees, while medium-sized banks also benefit from a higher share of income from commission business. Large banks, by contrast, only benefit from a higher share of securities business income, while the other bank groups do not. Overall, these findings suggest that the potential to generate diversification gains from expanding into fee-producing activities strongly depends on bank size.

Our second robustness test is designed to check whether mergers among savings banks affect our results. Because we received no data form the DSGV on mergers, we tried to identify mergers by means of our data. To this end, we exploit the fact that administrative costs in-

crease in the merger year due to merger-related expenses. In detail, we identified those observations as merger years in which the growth rate of total administrative expenses (scaled by total assets) was larger than two standard deviations.[13] This corresponds to an increase of administrative costs of, on average, 10% relative to the previous year. Based on this definition of a merger year, we identified 109 mergers and generated a dummy variable that has a value of one in the merger year and zero otherwise. In addition, we create a dummy that is one in the merger year and all years thereafter. This dummy controls for the fact that mergers might affect banks not only in the year in which the merger took place, but also in the years after the merger. The results with both dummies support our main findings. They are not reported for the sake of brevity. We are aware that this test does not fully rule out the possibility that our results are biased by mergers.

A third concern is that the results may be driven by outliers, e.g. there are a few savings banks that have a very high profitability and large Z-scores even after winsorizing. As a final robustness test we, therefore, drop outliers, defined as values of the dependent variables below the 5^{th} and above the 95^{th} percentile. The results are qualitatively similar. Overall, these results suggest that mergers and outliers are not driving our results. The results are not reported for the sake of brevity.

5. Conclusions

Structural developments, together with the low interest rate environment, have put German savings banks' net interest income under increasing pressure. As a result, concerns about the profitability of savings banks have emerged. To reduce their dependence on net interest income and to stabilize profits, German banks plan to increase their fee and commission income over the next years. In this context, this paper makes two main contributions. First, we analyse which German savings banks have expanded into fee-producing activities more quickly. Second, we investigate whether their profitability is correlated with a higher share of their fee and commission income.

Using a fully anonymized data set from the *German Savings Banks Association* (DSGV) we find that fee and commission income, in particular from payment services, relative to total assets correlates positively with a lower net interest margin. This supports the view that banks with decreasing net interest margins are under greater pressure to increase their fees and

13 To separate bank- from industry-specific changes in administrative costs over time, standard deviations were calculated over all banks and for each year separately.

commission income to offset the decline in net interest income. Our results further shows that a higher share of fee and commission income correlates with a higher (risk-adjusted) profitability. This result is mainly driven by payment service fees and income from securities business. The share of securities business income also correlates positively with the Z-score, possibly because securities income responds to different shocks than net interest income and, therefore, offers the largest diversification potential. Taken together, our results are consistent with the view that expanding into fee-producing activities allows savings banks to increase their revenues and improve their risk/return trade-off without losing their main focus on lending and deposit business.

A few caveats must be taken into account when interpreting our results. First of all, our empirical approach does not fully eliminate endogeneity problems. Our results may, therefore, reflect correlation rather than causation. Moreover, given the fact that we only have data for the 416 savings banks that were operating in 2014 and the lack of data on bank mergers, we cannot rule out that our results are subject to a survivorship and merger bias. Second, our results may hold only for the Z-score and not for alternative indicators of bank stability. Finally, our results are based on a sample of German savings banks; in this respect, our findings hold true primarily for this group of credit institutions. However, our results may, with some caution, be applied generally to other banks that predominantly provide lending and deposit services, since these banks share similar characteristics and are confronted with similar issues to the banks in our sample.

Literature

Allen F., Santomero A. M. (2001), What Do Financial Intermediaries Do?, Journal of Banking and Finance 25:271-294.

Altunbas Y., Manganelli S., Marques-Ibáñez D. (2011), Bank Risk During the Financial Crisis – Do Business Models Matter?, ECB Working Paper Series, No. 1394.

Berger A. (2000), The Integration of the Financial Services Industry: Where are the Efficiencies, North American Actuarial Journal 4(3): 25-45.

Boyd J. H., Graham S. L., Hewitt S. R. (1993), Bank Holding Company Mergers with Nonbank Financial Firms: Effects on the Risk of Failure, Journal of Banking and Finance 17: 43-63.

Bülbül D., Noth F., Tyrell M. (2014), Why Do Banks Provide Leasing?, Journal of Financial Services Research 46: 137-175.

Chiorazzo V., Milani C., Salvini F. (2008), Income Diversification and Bank Performance: Evidence from Italian Banks, Journal of Financial Services Research 33:181-203.

Demirgüç-Kunt A., Huizinga H. (2010), Bank Activity and Funding Strategies: The Impact on Risk and Returns, Journal of Financial Economics 98: 626-650.

DeYoung R., Rice T. (2004), Noninterest Income and Financial Performance at US Commercial Banks, The Financial Review 39: 101-127.

DeYoung R., Roland K. P. (2001), Product Mix and Earnings Volatility at Commercial Banks: Evidence from a Degree of Total Leverage Model, Journal of Financial Intermediation 10: 54-84.

DeYoung R., Torna G. (2013), Non-traditional Banking Activities and Bank Failures During the Financial Crisis, Journal of Financial Intermediation 22: 397-421.

Deutsche Bundesbank (2015a) Financial Stability Review 2015.

Deutsche Bundesbank (2015b) Structural developments in the German banking sector, Monthly Report April: 35-60.

DSGV (2014) Inside the Savings Banks Finance Group Published by German Savings Banks Association http://www.dsgv.de.

Hakenes H., Hasan I., Molyneux P., Xie R. (2015), Small Banks and Local Economic Development, Review of Finance 19: 653-683.

Houston J. F., Lin C., Lin P., Ma Y. (2010), Creditor Rights, Information Sharing, and Bank Risk-Taking, Journal of Financial Economics 96:485-512.

Huang R., Ratnovski L. (2011), The Dark Side of Bank Wholesale Funding, Journal of Financial Intermediation 20:248-263.

Koetter M., Bos J. W. B. , Heid F., Kolari J. W., Kool C. J. M., Porath D. (2007), Accounting For Distress Bank Mergers, Journal of Banking and Finance 31: 3200-3217.

Köhler M. (2014), Does Non-Interest Income Make Banks More Risky? Retail- Versus Investment-Oriented Banks, Review of Financial Economics 23:182-193.

Köhler M. (2015), Which Banks are More Risky? The Impact of Business Models on Bank Stability, Journal of Financial Stability 16:195-212.

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

Laeven L., Levine R. (2009), Bank Governance, Regulation and Risk Taking, Journal of Financial Economics 93:259–275.

Lepetit L., Nys E., Rous P., Tarazi A. (2008), Bank Income Structure and Risk: An Empirical Analysis of European Banks, Journal of Banking and Finance 32:1452-1467.

Lepetit L., Strobel F. (2014), Bank Insolvency Risk and Z-score Measures: A Refinement, Finance Research Letters 13:214-224.

Memmel C. (2011), Banks' exposure to interest rate risk, their earnings from term transformation, and the dynamics of the term structure, Journal of Banking and Finance 35:282–289.

Mercieca S., Schaeck K., Wolfe S., (2007), Small European Banks: Benefits from Diversification?, Journal of Banking and Finance 31:1975-1998.

Puri M., Rocholl J., Steffen S. (2011), Global Retail Lending in the Aftermath of the US Financial Crisis: Distinguishing Between Supply and Demand Effects, Journal of Financial Economics 100:556-578.

Rogers K., Sinkey J. F. (1999), An Analysis of Nontraditional Activities at U.S. Commercial Banks, Review of Financial Economics 8:25-39.

Roy A. D. (1952), Safety First and the Holding of Assets, Econometrica 20: 431-449.

Saunders A., Schmid M., Walter I. (2014), Non-Interest Income and Bank Performance: Is Banks' Increased Reliance on Non-Interest Income Bad?, University of St. Gallen School of Finance Research Paper 2014/17.

Stiroh K. J. (2004a), Diversification in Banking: Is Non-interest Income the Answer?, Journal of Money, Credit, and Banking 36:853-882.

Stiroh K. J. (2004b), Do Community Banks Benefit from Diversification?, Journal of Financial Services Research 25:135-160.

Stiroh K. J. (2006), New Evidence on the Determinants of Bank Risk, Journal of Financial Services Research 30: 237-263.

Siroh K.J., Rumble A. (2006), The Dark Side of Diversification: The Case of US Financial Holding Companies, Journal of Banking and Finance 30:2131-2161.

Tables

Table 1: Growth and Variability of Net Interest Income and Fee and Commission Income

Table 1 shows descriptive statistics for the annual growth rate of aggregated net interest income and aggregated net fee and commission income and its components for the period between 2002 and 2013. All variables are scaled by total assets.

	Mean	Median	Std. Dev.
Net Interest Income	-0.93	-1.09	3.96
Net Fee and Commission Income	1.36	1.64	3.59
of which:			
Payment Services Fees	0.56	0.27	2.28
Fees from Securities Business	2.10	5.70	10.57
Fees from Commission Business	5.08	3.43	11.36
Fees from Foreign Business	-4.37	-4.71	4.38
Fees from Other Fee Business	2.10	1.48	2.97

Table 2: Relative Importance of Net Interest and Net Non-Interest Income

Table 2 shows descriptive statistics for the share of net interest income and net non-interest income as a percentage of total operating income for all savings banks and for small, medium-sized and large savings banks separately. Small savings banks have total assets of less than €1 billion. Savings banks with total assets between €1 billion and €2.5 billion are considered as medium and savings banks with total assets above €2.5 billion as large. To reduce the impact of outliers, all variables are winsorized at the 1% and 99% levels.

	All Savings Banks			
	Obs.	**Mean**	**Median**	**Std.dev.**
Net Interest Income	4,988	78.62	78.67	3.22
Net Non-Interest Income	4,988	21.38	21.33	3.22
of which:				
Net Fee and Commission Income	4,988	97.90	97.79	9.51
Net Trading Income	4,988	0.25	0.00	7.83
Net Other Operating Income	4,988	1.85	1.84	5.54

	Small Savings Banks			
	Obs.	**Mean**	**Median**	**Std.dev.**
Net Interest Income	1,377	79.27	79.17	3.46
Net Non-Interest Income	1,377	20.73	20.83	3.46
of which:				
Net Fee and Commission Income	1,377	98.24	98.46	11.40
Net Trading Income	1,377	0.35	0.00	11.00
Net Other Operating Income	1,377	1.41	1.41	4.12

	Medium-Sized Savings Banks			
	Obs.	**Mean**	**Median**	**Std.dev.**
Net Interest Income	1,980	79.03	79.07	2.93
Net Non-Interest Income	1,980	20.97	20.93	2.93
of which:				
Net Fee and Commission Income	1,980	98.21	98.01	7.31
Net Trading Income	1,980	0.08	0.00	5.56
Net Other Operating Income	1,980	1.72	1.65	4.49

	Large Savings Banks			
	Obs.	**Mean**	**Median**	**Std.dev.**
Net Interest Income	1,631	78.97	79.01	3.52
Net Non-Interest Income	1,631	21.03	20.99	3.52
of which:				
Net Fee and Commission Income	1,631	97.23	96.91	10.07
Net Trading Income	1,631	0.38	0.19	6.91
Net Other Operating Income	1,631	2.39	2.50	7.40

Table 3: Composition of Fee and Commission Income

Table 3 shows descriptive statistics on the share of fee and commission income from payment services, securities business, commission-based services, foreign business and other activities as a percentage of total operating income for all savings banks and for small, medium-sized and large savings banks separately. Small savings banks have total assets of less than €1 billion. Savings banks with total assets between €1 billion and €2.5 billion are considered as medium and savings banks with total assets above €2.5 billion as large. To reduce the impact of outliers, all variables are winsorized at the 1% and 99% levels.

			All Savings Banks	
	Obs.	**Mean**	**Median**	**Std.dev.**
Payment Services	4,988	49.88	48.70	9.68
Securities Business	4,988	18.64	18.50	6.04
Commission Business	4,988	14.90	14.40	6.57
of which:				
Building loan contracts	4,988	4.31	4.02	2.10
Real Estate	4,988	3.53	3.30	2.67
Insurance contracts	4,988	7.01	6.51	3.87
Foreign Business	4,988	3.23	2.40	3.12
Other Business	4,988	13.24	12.61	4.27

			Small Savings Banks	
	Obs.	**Mean**	**Median**	**Std.dev.**
Payment Services	1,377	52.05	50.67	10.26
Securities Business	1,377	16.64	16.28	5.96
Commission Business	1,377	15.29	14.41	6.91
of which:				
Building loan contracts	1,377	4.18	3.83	2.09
Real Estate	1,377	3.63	3.18	3.06
Insurance contracts	1,377	7.38	6.8	4.02
Foreign Business	1,377	2.69	1.64	3.52
Other Business	1,377	13.09	12.21	4.7

			Medium-Sized Savings Banks	
	Obs.	**Mean**	**Median**	**Std.dev.**
Payment Services	1,980	49.7	48.5	9.55
Securities Business	1,980	18.42	18.37	5.84
Commission Business	1,980	15.87	15.23	6.55
of which:				
Building loan contracts	1,980	4.66	4.31	2.25
Real Estate	1,980	3.5	3.28	2.42
Insurance contracts	1,980	7.66	7.26	3.95
Foreign Business	1,980	2.85	2.18	2.57
Other Business	1,980	13.12	12.59	3.8

			Large Savings Banks	
	Obs.	**Mean**	**Median**	**Std.dev.**
Payment Services	1,631	48.25	47.35	8.99
Securities Business	1,631	20.59	20.38	5.76
Commission Business	1,631	13.37	13.25	5.99
of which:				
Building loan contracts	1,631	3.99	3.89	1.87
Real Estate	1,631	3.48	3.37	2.61
Insurance contracts	1,631	5.89	5.55	3.37
Foreign Business	1,631	4.16	3.47	3.15
Other Business	1,631	13.5	12.92	4.4

Table 4: List of Variables

Table 4 shows the variables used in the regression analysis. To reduce the impact of outliers, all variables are winsorized at the 1%- and 99%-levels.

Variable	Description
Capital Ratio	Equity divided by total assets (in %)
Cost-Income Ratio	Operating income divided by overhead costs (in %)
Deposits from Corporate Customers	Total deposits from corporate customers divided by total assets (in %)
Deposits from Retail Customers	Total deposits from retail customers divided by total assets (in %)
Loans to Corporate Customers	Total loans to corporate customers divided by total assets (in %)
Loans to Retail Customers	Total loans to retail customers divided by total assets (in %)
Net Interest Margin	Net interest income divided by total assets (in %)
RAROA	ROA divided by the standard deviation of the ROA (SDROA)
RAROE	ROE divided by the standard deviation of the ROE (SDROE)
ROA	Pre-tax return divided by total assets (in %)
ROE	Pre-tax return divided by total equity (in %)
SDROA	Standard deviation of the ROA. Calculated over the whole sample period
SDROE	Standard deviation of the ROE. Calculated over the whole sample period
Share of income from payment services	Share of net fee and commission income from payment services divided by total operating income (in %)
Share of fee and commission income	Share of net fee and commission income divided by total operating income (in %)
Share of income from commission-based services	Share of fee and commission income from commission-based services divided by total operating income (in %)
Share of income from foreign business	Share of fee and commission income from foreign business divided by total operating income (in %)
Share of income from other activities	Share of fee and commission income from other activities divided by total operating income (in %)
Share of income from securities business	Share of fee and commission income from securities business divided by total operating income (in %)
Share of net non-interest income	Sum of net fee and commission income, net trading income and net other operating income divided by total operating income (in %)
Z-score	Z-score is the sum of the ROA and the capital ratio divided by the standard deviation of the ROA (SDROA). Since the Z-score is highly skewed, we use the log in our empirical analysis.

Table 5: Descriptive Statistics

Table 5 shows descriptive statistics for the variables used in the regression analysis. To reduce the impact of outliers, all variables are winsorized at the 1%- and 99%-levels.

Variable	Obs.	Mean	Median	Std. Dev.
Capital Ratio	4,988	5.5	5.2	1.5
Cost-Income Ratio	4,988	64.1	64.1	6.8
Deposits from corporate customers	4,988	12.9	12.0	4.8
Deposits from retail customers	4,988	55.6	55.8	9.2
Loans to corporate customers	4,988	23.9	23.7	7.2
Loans to retail customers	4,988	27.1	27.4	7.4
Log(Z-score)	4,988	3.0	3.0	0.5
Net interest margin	4,988	2.4	2.4	0.3
Share of net non-interest income	4,988	21.4	21.3	3.2
RAROA	4,988	2.3	2.2	1.5
RAROE	4,988	2.1	2.0	1.4
ROA	4,988	0.6	0.7	0.4
ROE	4,988	12.1	11.8	7.9
Share of fee and commission income	4,988	20.3	20.3	3.1
Share of income from payment services	4,988	10.8	10.5	2.5
Share of income from commission-based services	4,988	3.2	3.1	1.5
Share of income from foreign business	4,988	0.7	0.5	0.7
Share of income from other activities	4,988	2.9	2.7	1.0
Share of income from securities business	4,988	4.1	3.9	1.6

Table 6: Determinants of Net Fee and Commission Income

Table 6 shows the results of regressions with net fee and commission income to total assets as dependent variable. Each model is estimated with bank- and time-specific dummy variables. All variables in these models are lagged by one period to mitigate endogeneity concerns. Since the observations for one specific bank are not independent, we compute cluster-robust standard errors and treat each bank as a cluster. To reduce the impact of outliers, all variables are winsorized at the 1% and 99% levels. ***/**/* indicate significance at the 1%/5%/10% level.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	Net Non-Interest Income / Total Assets	Net Fee and Commission Income / Total Assets	Income from Payment Services / Total Assets	Income from Securities Business / Total Assets	Income from Commission Business / Total Assets	Income from Foreign Business / Total Assets	Income from Other Activites / Total Assets
L.Net Interest Margin	-0.0231	-0.0188	-0.0121	-0.0021	0.0034	-0.0006	-0.0039
	(0.0089)	(0.0087)	(0.0051)	(0.0042)	(0.0032)	(0.0012)	(0.0033)
	***	**	**				
L.Overhead Costs	0.1604	0.1508	0.0711	0.0389	0.0203	0.0107	0.0201
	(0.0151)	(0.0137)	(0.0086)	(0.0065)	(0.0051)	(0.0029)	(0.0072)
	***	***	***	***	***	***	***
L.Loans Private Retail Customers	0.0011	0.0011	0.0003	0.0007	-0.0001	0.0003	0.0005
	(0.0007)	(0.0007)	(0.0004)	(0.0003)	(0.0003)	(0.0001)	(0.0003)
				**		**	*
L.Loans Corporate Customers	0.0008	0.0006	-0.0006	-0.0003	0.0002	0.0001	0.0010
	(0.0006)	(0.0006)	(0.0004)	(0.0003)	(0.0002)	(0.0001)	(0.0003)
							***
L.Deposits from Private Retail Customers	0.0006	0.0006	0.0011	-0.0005	0.0006	-0.0002	-0.0001
	(0.0006)	(0.0006)	(0.0003)	(0.0002)	(0.0002)	(0.0001)	(0.0002)
			***	*	**	*	
L.Deposits from Corporate Customers	0.0008	0.0009	0.0006	-0.0004	0.0002	-0.0000	0.0007
	(0.0007)	(0.0007)	(0.0004)	(0.0004)	(0.0003)	(0.0001)	(0.0002)
							***
Obs.	4569	4569	4569	4569	4182	4569	4569
Adj. R^2	0.22	0.24	0.20	0.44	0.37	0.12	0.19
Bank Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Time Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Level of Clustering	Bank	Bank	Bank	Bank	Bank	Bank	Bank

Table 7: Baseline Results, Share of Non-Interest Income

Table 7 shows the results of regressions with the share of net non-interest income to total operating income as the main variable of interest. Columns (1) to (5) report the results of fixed effects panel estimations with robust standard errors clustered at the bank level. Each model is estimated with year dummies. All variables in these models are lagged by one period to mitigate endogeneity concerns. Columns (6) and (7) show the results of cross-sectional regressions with the standard deviation of the ROA (SDROA) and ROE (SDROE), respectively, as dependent variables. These models are estimated with dummies for medium and large savings banks. The dummies are not reported for the sake of brevity. To reduce the impact of outliers, all variables are winsorized at the 1% and 99% levels. ***/**/* indicate significance at the 1%/5%/10% level.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	Net Non-Interest Income / Total Assets	Net Fee and Commission Income / Total Assets	Income from Payment Services / Total Assets	Income from Securities Business / Total Assets	Income from Commission Business / Total Assets	Income from Foreign Business / Total Assets	Income from Other Activites / Total Assets
L.Net Interest Margin	-0.0231	-0.0188	-0.0121	-0.0021	0.0034	-0.0006	-0.0039
	(0.0089)	(0.0087)	(0.0051)	(0.0042)	(0.0032)	(0.0012)	(0.0033)
	***	**	**				
L.Overhead Costs	0.1604	0.1508	0.0711	0.0389	0.0203	0.0107	0.0201
	(0.0151)	(0.0137)	(0.0086)	(0.0065)	(0.0051)	(0.0029)	(0.0072)
	***	***	***	***	***	***	***
L.Loans Private Retail Customers	0.0011	0.0011	0.0003	0.0007	-0.0001	0.0003	0.0005
	(0.0007)	(0.0007)	(0.0004)	(0.0003)	(0.0003)	(0.0001)	(0.0003)
				**		**	*
L.Loans Corporate Customers	0.0008	0.0006	-0.0006	-0.0003	0.0002	0.0001	0.0010
	(0.0006)	(0.0006)	(0.0004)	(0.0003)	(0.0002)	(0.0001)	(0.0003)
							***
L.Deposits from Private Retail Customers	0.0006	0.0006	0.0011	-0.0005	0.0006	-0.0002	-0.0001
	(0.0006)	(0.0006)	(0.0003)	(0.0002)	(0.0002)	(0.0001)	(0.0002)
			***	*	**	*	
L.Deposits from Corporate Customers	0.0008	0.0009	0.0006	-0.0004	0.0002	-0.0000	0.0007
	(0.0007)	(0.0007)	(0.0004)	(0.0004)	(0.0003)	(0.0001)	(0.0002)
							***
Obs.	4569	4569	4569	4569	4182	4569	4569
Adj. R^2	0.22	0.24	0.20	0.44	0.37	0.12	0.19
Bank Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Time Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Level of Clustering	Bank	Bank	Bank	Bank	Bank	Bank	Bank

Table 8: Baseline Results, Share of Fee and Commission Income

Table 8 shows the results of regressions with the share of net fee and commission income to total operating income as the main variable of interest. Columns (1) to (5) report the results of fixed effects panel estimations with robust standard errors clustered at the bank level. Each model is estimated with year dummies. All variables in these models are lagged by one period to mitigate endogeneity concerns. Columns (6) and (7) show the results of cross-sectional regressions with the standard deviation of the ROA (SDROA) and ROE (SDROE), respectively, as dependent variables. These models are estimated with dummies for medium and large savings banks. The dummies are not reported for the sake of brevity. To reduce the impact of outliers, all variables are winsorized at the 1% and 99% levels. ***/**/* indicate significance at the 1%/5%/10% level.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	ROA	ROE	RAROA	RAROE	log(Z-Score)	SDROA	SDROE
L.Fee and Commission Income Share	0.010	0.281	0.027	0.037	0.004	0.004	0.086
	(0.004)	(0.079)	(0.011)	(0.010)	(0.001)	(0.003)	(0.062)
	***	***	**	***	***		
L.Loans to Private Customers	0.005	0.069	0.013	0.009	0.003	-0.004	-0.086
	(0.003)	(0.064)	(0.008)	(0.008)	(0.001)	(0.001)	(0.021)
					***	***	***
L.Loans to Corporate Customers	-0.008	-0.194	-0.026	-0.032	-0.001	0.000	-0.040
	(0.003)	(0.057)	(0.008)	(0.008)	(0.001)	(0.001)	(0.026)
	***	***	***	***			
L.Deposits of Private Customers	0.017	0.402	0.047	0.050	0.004	-0.001	-0.050
	(0.002)	(0.042)	(0.006)	(0.006)	(0.001)	(0.001)	(0.022)
	***	***	***	***	***		**
L.Deposits of Corporate Customers	0.011	0.281	0.030	0.033	0.000	-0.004	-0.112
	(0.003)	(0.059)	(0.008)	(0.008)	(0.001)	(0.002)	(0.033)
	***	***	***	***		**	***
L.Cost-Income Ratio	-0.016	-0.281	-0.043	-0.037	-0.003	-0.001	-0.044
	(0.002)	(0.036)	(0.004)	(0.004)	(0.001)	(0.001)	(0.026)
	***	***	***	***	***		*
L.Capital Ratio	-0.044	-2.748	-0.129	-0.358	0.098	-0.002	-0.853
	(0.009)	(0.177)	(0.027)	(0.024)	(0.004)	(0.007)	(0.142)
	***	***	***	***	***		***
Obs.	4,569	4,569	4,569	4,569	4,569	416	416
Adj. R^2	0.31	0.33	0.32	0.35	0.80	0.04	0.20
Bank Fixed Effects	Yes	Yes	Yes	Yes	Yes	No	No
Time-Fixed Years	Yes	Yes	Yes	Yes	Yes	No	No

Table 9: Correlation analysis

Table 9 shows descriptive statistics for bank-specific correlations between the annual growth rate of aggregate net interest income and the annual growth rate of aggregate fee and commission income and its components. All variables are scaled by total assets. Correlations are calculated for all banks and for small, medium-sized and large banks separately over the period between 2003 and 2013.

All Banks

Correlation of Net Interest Income with:	Mean	Median	Std.Dev.
Net Non-Interest Income	0.05	0.05	0.31
Net Fee and Commission Income	0.05	0.06	0.32
Income from Payment Services	0.12	0.14	0.3
Income from Securities Business	-0.11	-0.12	0.31
Income from Commission Business	0.08	0.08	0.33
Income from Foreign Business	0.04	0.05	0.33
Income from other Business	0.11	0.12	0.32

Small Banks

Correlation of Net Interest Income with:	Mean	Median	Std.Dev.
Net Non-Interest Income	0.04	0.03	0.33
Net Fee and Commission Income	0.02	0.02	0.32
Income from Payment Services	0.14	0.17	0.29
Income from Securities Business	-0.12	-0.12	0.3
Income from Commission Business	0.03	0.06	0.35
Income from Foreign Business	0.03	0.02	0.32
Income from other Business	0.05	0.04	0.33

Medium-Sized Banks

Correlation of Net Interest Income with:	Mean	Median	Std.Dev.
Net Non-Interest Income	0.04	0.05	0.29
Net Fee and Commission Income	0.06	0.05	0.3
Income from Payment Services	0.12	0.15	0.31
Income from Securities Business	-0.09	-0.12	0.31
Income from Commission Business	0.09	0.11	0.32
Income from Foreign Business	0.02	0.03	0.32
Income from other Business	0.11	0.13	0.31

Large Banks

Correlation of Net Interest Income with:	Mean	Median	Std.Dev.
Net Non-Interest Income	0.07	0.09	0.33
Net Fee and Commission Income	0.08	0.08	0.33
Income from Payment Services	0.11	0.11	0.29
Income from Securities Business	-0.12	-0.12	0.31
Income from Commission Business	0.1	0.09	0.32
Income from Foreign Business	0.08	0.08	0.33
Income from other Business	0.16	0.16	0.33

Table 10: Results, Fee and Commission Income Components

Table 10 shows the results of fixed effects regressions with the shares of each component of net fee and commission income to total operating income as the main variables of interest. Columns (1) to (5) report the results of fixed effects panel estimations with robust standard errors clustered at the bank level. Each model is estimated with year dummies. All variables in these models are lagged by one period to mitigate endogeneity concerns. Columns (6) and (7) show the results of cross-sectional regressions with the standard deviation of the ROA (SDROA) and ROE (SDROE), respectively, as dependent variables. Each of these models is estimated with dummies for medium and large savings banks. To reduce the impact of outliers, all variables are winsorized at the 1% and 99% levels. ***/**/* indicate significance at the 1%/5%/10% level.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	ROA	ROE	RAROA	RAROE	log(Z-Score)	SDROA	SDROE
L.Payment Service Income Share	0.015	0.408	0.038	0.042	0.004	0.003	0.106
	(0.007)	(0.153)	(0.020)	(0.019)	(0.003)	(0.003)	(0.073)
	**	***	*	**			
L.Securities Business Income Share	0.015	0.432	0.034	0.051	0.007	0.000	0.038
	(0.008)	(0.168)	(0.022)	(0.021)	(0.003)	(0.006)	(0.118)
	*	**		**	***		
L.Commission Business Income Share	-0.006	-0.037	-0.019	0.009	-0.002	0.012	0.201
	(0.009)	(0.186)	(0.025)	(0.026)	(0.003)	(0.006)	(0.121)
						**	*
L.Foreign Business Income Share	0.028	0.629	0.080	0.070	0.011	-0.014	-0.177
	(0.018)	(0.424)	(0.059)	(0.057)	(0.006)	(0.008)	(0.189)
					*	*	
L.Other Business Income Share	0.005	0.061	0.030	0.045	0.004	0.009	0.157
	(0.009)	(0.197)	(0.025)	(0.024)	(0.003)	(0.010)	(0.210)
				*			
L.Loans to Private Customers	0.005	0.061	0.012	0.008	0.003	-0.004	-0.086
	(0.003)	(0.065)	(0.008)	(0.008)	(0.001)	(0.001)	(0.021)
					**	***	***
L.Loans to Corporate Customers	-0.008	-0.179	-0.026	-0.032	-0.001	0.001	-0.035
	(0.003)	(0.057)	(0.008)	(0.008)	(0.001)	(0.001)	(0.029)
	***	***	***	***			
L.Deposits of Private Customers	0.017	0.410	0.049	0.051	0.004	-0.001	-0.057
	(0.002)	(0.043)	(0.006)	(0.006)	(0.001)	(0.001)	(0.023)
	***	***	***	***	***		**
L.Deposits of Corporate Customers	0.011	0.288	0.030	0.033	0.000	-0.003	-0.109
	(0.003)	(0.059)	(0.008)	(0.008)	(0.001)	(0.002)	(0.033)
	***	***	***	***		**	***
L.Cost-Income Ratio	-0.017	-0.296	-0.045	-0.038	-0.003	-0.001	-0.056
	(0.002)	(0.037)	(0.005)	(0.004)	(0.001)	(0.001)	(0.026)
	***	***	***	***	***		**
L.Capital Ratio	-0.045	-2.785	-0.133	-0.361	0.098	-0.004	-0.873
	(0.009)	(0.179)	(0.027)	(0.024)	(0.004)	(0.007)	(0.152)
	***	***	***	***	***		***
Obs.	4,569	4,569	4,569	4,569	4,569	416	416
Adj. R^2	0.31	0.33	0.32	0.35	0.80	0.04	0.20
Bank Fixed Effects	Yes	Yes	Yes	Yes	Yes	No	No
Time Fixed Effects	Yes	Yes	Yes	Yes	Yes	No	No

Table 11: Results for Small, Medium and Large Banks

Table 11 shows our regressions results for small, medium and large savings banks. Savings banks with total assets between €1 billion and €2.5 billion are considered as medium and savings banks with total assets above €2.5 billion as large. Columns (1) to (5) report the results of fixed effects panel estimations with robust standard errors clustered at the bank level. Each model is estimated with year dummies. All variables in these models are lagged by one period to mitigate endogeneity concerns. Columns (6) and (7) show the results of cross-sectional regressions with the standard deviation of the ROA (SDROA) and ROE (SDROE), respectively, as dependent variables. To reduce the impact of outliers, all variables are winsorized at the 1% and 99% levels. ***/**/* indicate significance at the 1%/5%/10% level.

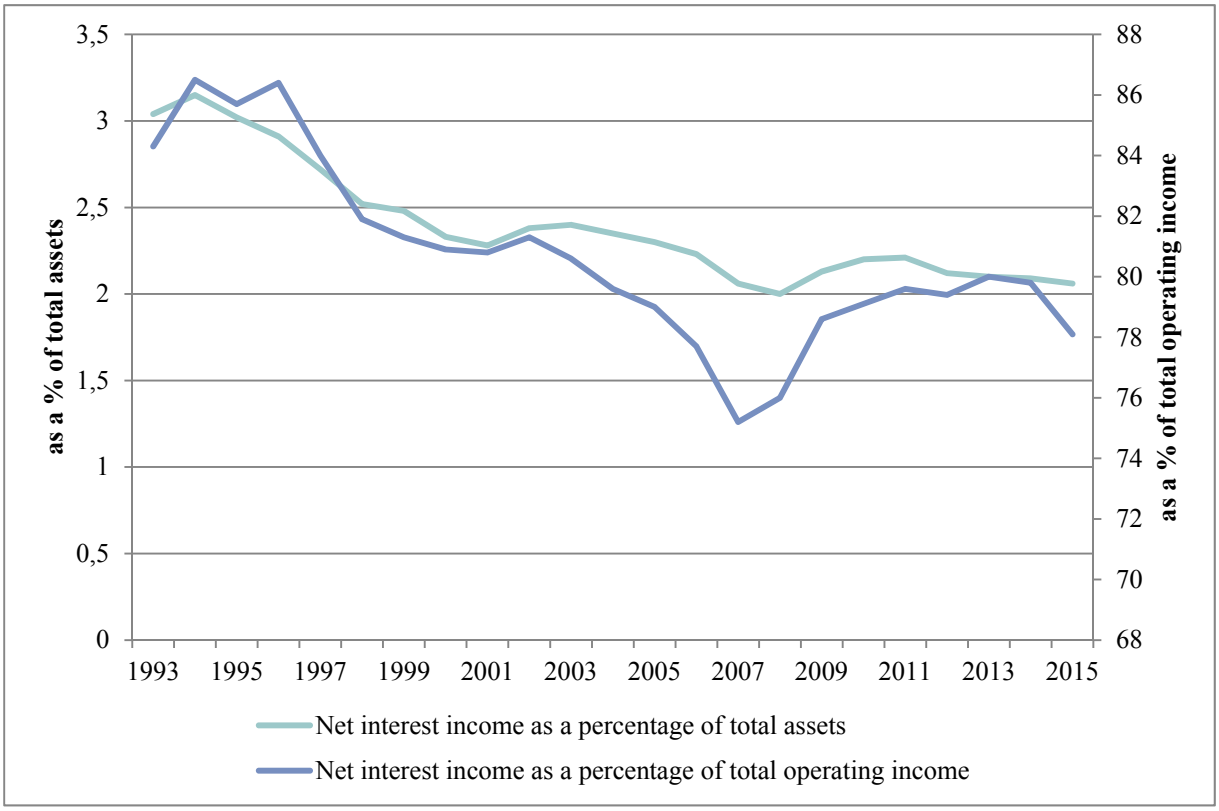
		(1)	(2)	(3)	(4)	(5)	(6)	(7)
		ROA	ROE	RAROA	RAROE	log(Z-Score)	SDROA	SDROE
L.Non-Interest Income Share	All Banks	0.008	0.220	0.020	0.026	0.003	0.005	0.101
		(0.003)	(0.068)	(0.009)	(0.009)	(0.001)	(0.003)	(0.059)
		***	***	**	***	***		*
	Small Banks	0.011	0.246	0.017	0.027	0.005	0.001	-0.024
		(0.006)	(0.128)	(0.017)	(0.017)	(0.002)	(0.005)	(0.096)
		*	*			**		
	Medium-Sized Banks	0.007	0.241	0.021	0.032	0.002	0.011	0.247
		(0.005)	(0.107)	(0.014)	(0.015)	(0.002)	(0.005)	(0.096)
			**		**		**	**
	Large Banks	0.009	0.198	0.022	0.023	0.004	0.003	0.101
		(0.005)	(0.117)	(0.016)	(0.015)	(0.002)	(0.004)	(0.090)
			*			**		
L.Fee and Commission Income Share	All Banks	0.010	0.281	0.027	0.037	0.004	0.004	0.086
		(0.004)	(0.079)	(0.011)	(0.010)	(0.001)	(0.003)	(0.062)
		***	***	**	***	***		
	Small Banks	0.014	0.291	0.025	0.037	0.005	-0.002	-0.064
		(0.008)	(0.160)	(0.019)	(0.018)	(0.002)	(0.005)	(0.101)
		*	*		**	**		
	Medium-Sized Banks	0.007	0.289	0.026	0.041	0.001	0.009	0.232
		(0.006)	(0.119)	(0.018)	(0.018)	(0.002)	(0.006)	(0.117)
			**		**			**
	Large Banks	0.011	0.294	0.029	0.038	0.005	0.006	0.132
		(0.006)	(0.128)	(0.018)	(0.018)	(0.002)	(0.005)	(0.092)
		*	**		**	**		
L.Payment Service Income Share	All Banks	0.015	0.408	0.038	0.042	0.004	0.003	0.106
		(0.007)	(0.153)	(0.020)	(0.019)	(0.003)	(0.003)	(0.073)
		**	***	*	**			
	Small Banks	0.030	0.495	0.055	0.046	0.013	-0.000	-0.050
		(0.014)	(0.306)	(0.042)	(0.038)	(0.005)	(0.006)	(0.132)
		**				**		
	Medium-Sized Banks	0.017	0.542	0.050	0.056	0.000	0.004	0.202
		(0.010)	(0.233)	(0.030)	(0.031)	(0.005)	(0.006)	(0.113)
		*	**	*	*			*
	Large Banks	0.002	0.251	-0.000	0.022	0.000	0.011	0.238
		(0.011)	(0.246)	(0.032)	(0.033)	(0.004)	(0.006)	(0.116)
							**	**
L.Securities Business Income Share	All Banks	0.015	0.432	0.034	0.051	0.007	0.000	0.038
		(0.008)	(0.168)	(0.022)	(0.021)	(0.003)	(0.006)	(0.118)
		*	**		**	***		
	Small Banks	-0.015	-0.128	-0.043	-0.012	-0.000	0.012	0.395
		(0.020)	(0.402)	(0.048)	(0.047)	(0.005)	(0.010)	(0.211)
								*
	Medium-Sized Banks	0.011	0.422	0.039	0.067	0.002	0.006	0.079
		(0.013)	(0.270)	(0.036)	(0.037)	(0.004)	(0.011)	(0.193)

	Large Banks	0.036	0.747	0.074	0.078 *	0.016	-0.006	-0.037
		(0.013) ***	(0.262) ***	(0.034) **	(0.033) **	(0.004) ***	(0.010)	(0.193)
L.Commission Business Income Share	All Banks	-0.006	-0.037	-0.019	0.009	-0.002	0.012	0.201
		(0.009)	(0.186)	(0.025)	(0.026)	(0.003)	(0.006) **	(0.121) *
	Small Banks	0.027	0.660	0.079	0.105	0.002	-0.004	-0.286
		(0.017)	(0.349) *	(0.042) *	(0.040) ***	(0.004)	(0.009)	(0.189)
	Medium-Sized Banks	-0.036	-0.632	-0.109	-0.080	-0.010	0.023	0.538
		(0.013) ***	(0.275) **	(0.040) ***	(0.041) *	(0.005) **	(0.011) **	(0.228) **
	Large Banks	0.006	0.172	0.020	0.042	0.003	0.007	0.157
		(0.014)	(0.309)	(0.047)	(0.051)	(0.006)	(0.011)	(0.213)
L.Foreign Business Income Share	All Banks	0.028	0.629	0.080	0.070	0.011	-0.014	-0.177
		(0.018)	(0.424)	(0.059)	(0.057)	(0.006) *	(0.008) *	(0.189)
	Small Banks	0.024	0.292	0.111	0.060	0.022	-0.034	-0.644
		(0.058)	(1.149)	(0.187)	(0.165)	(0.015)	(0.013) ***	(0.376) *
	Medium-Sized Banks	0.062	0.811	0.190	0.143	0.036	-0.015	-0.261
		(0.025) **	(0.518)	(0.086) **	(0.091)	(0.011) ***	(0.015)	(0.351)
	Large Banks	0.020	0.797	0.042	0.058	-0.001	0.015	0.389
		(0.024)	(0.589)	(0.081)	(0.076)	(0.008)	(0.011)	(0.234) *
L.Other Business Income Share	All Banks	0.005	0.061	0.030	0.045	0.004	0.009	0.157
		(0.009)	(0.197)	(0.025)	(0.024) *	(0.003)	(0.010)	(0.210)
	Small Banks	-0.010	-0.225	-0.020	0.005	-0.003	-0.002	-0.069
		(0.018)	(0.396)	(0.045)	(0.043)	(0.005)	(0.019)	(0.411)
	Medium-Sized Banks	0.007	0.169	0.035	0.049	0.006	0.012	0.218
		(0.013)	(0.277)	(0.038)	(0.038)	(0.006)	(0.016)	(0.321)
	Large Banks	0.016	0.189	0.067	0.073	0.009	0.005	0.168
		(0.015)	(0.330)	(0.044)	(0.045)	(0.006)	(0.015)	(0.299)

Figures

Figure 1: Net Interest Margin and the Share of Net Interest Income of German Savings Banks

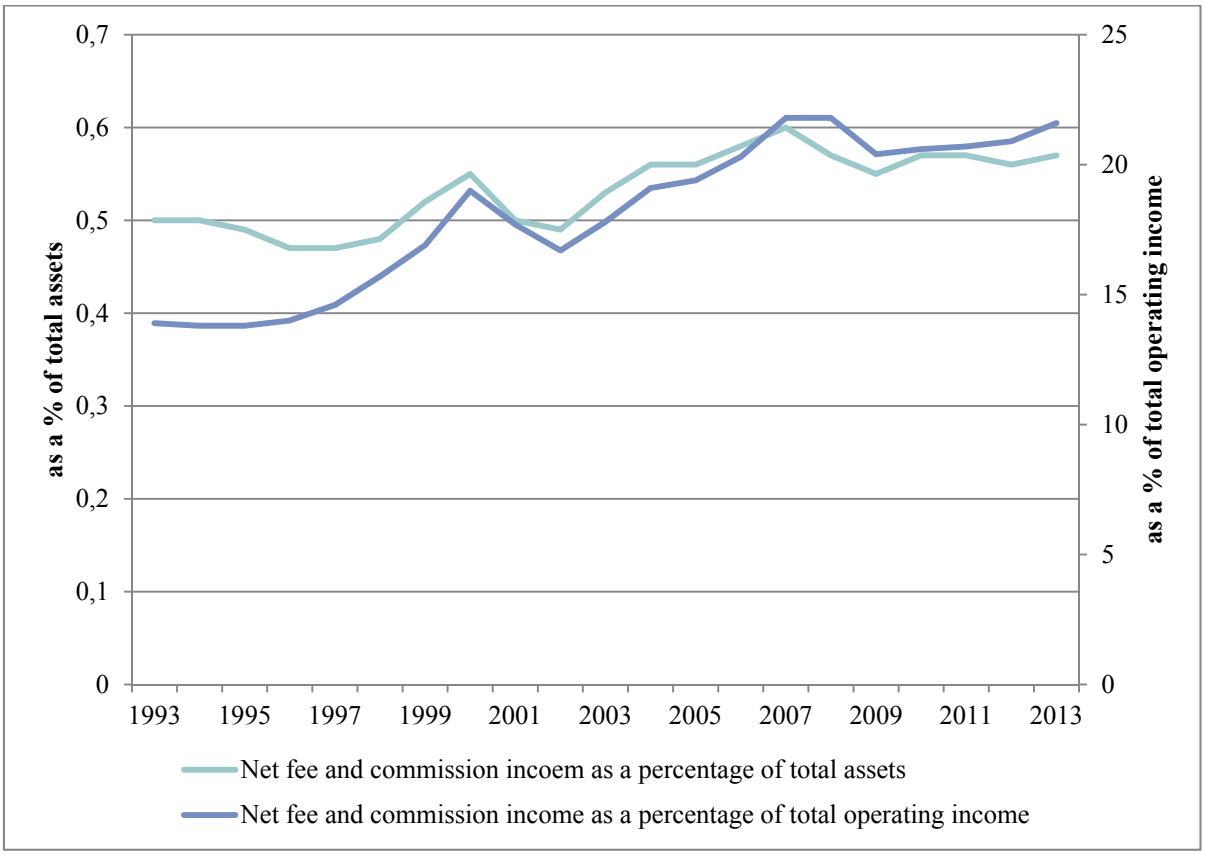
Figure 1 shows the development of the net interest margin and the share of net interest income in total operating income of German savings banks between 1993 and 2013. The net interest margin is equal to the ratio of net interest income over total average assets (in %).



Source: Own calculations based on data from the Deutsche Bundesbank

Figure 2: Net Fee and Commission Margin and the Share of Fee and Commission Income of German Savings Banks

Figure 2 shows the development of the net fee and commission margin and the share of net interest income as a percentage of total operating income of German savings banks between 1993 and 2013. The net fee and commission margin is equal to the ratio of net fee and commission income over total average assets (in %).



Source: Own calculations based on data from the Deutsche Bundesbank

Figure 3: Bank-Specific Correlations

Figure 3 shows the distribution of bank-specific estimated correlation coefficients between the annual growth rate of net interest income and the annual growth rate of net fee and commission income. All variables are scaled by total assets. Correlations are calculated between 2003 and 2013.