

## WORKING PAPER 180

# Have Changes in the Financial Structure Affected Bank Profitability? Evidence for Austria

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Imprint: Responsibility according to Austrian media law: Günther Thonabauer,  
Communications Division, Oesterreichische Nationalbank.

Published and printed by Oesterreichische Nationalbank, Wien.

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## **Editorial**

The authors examine the impact of changes in the financial structure of the Austrian banking sector over the past 15 years, such as disintermediation, internationalization and privatization, on the profitability of banks. Several proxies based on bank balance sheet data at the micro level as well as macroeconomic variables are used to capture these changes. The case of Austria is particularly interesting because country-specific developments, such as the opening-up of the banking sector due to EU accession, coincided with the global deregulation of banking activities. The authors' estimation results, which are based on dynamic panel regression methods, indicate that disintermediation (a lower percentage of loans over total assets) and higher market concentration in the banking sector had a positive effect on bank profitability, while, surprisingly, changes in the ownership structure (privatization and increased foreign ownership) as well as more foreign lending by Austrian banks did not have a clear-cut or significant impact on bank profits.

September 25, 2012



# Have Changes in the Financial Structure Affected Bank Profitability? Evidence for Austria\*

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September 2012

## Abstract

We examine the impact of changes in the financial structure of the Austrian banking sector over the past 15 years, such as disintermediation, internationalization and privatization, on the profitability of banks. Several proxies based on bank balance sheet data at the micro level as well as macroeconomic variables are used to capture these changes. The case of Austria is particularly interesting because country-specific developments, such as the opening-up of the banking sector due to EU accession, coincided with the global deregulation of banking activities. Our estimation results, which are based on dynamic panel regression methods, indicate that disintermediation (a lower percentage of loans over total assets) and higher market concentration in the banking sector had a positive effect on bank profitability, while, surprisingly, changes in the ownership structure (privatization and increased foreign ownership) as well as more foreign lending by Austrian banks did not have a clear-cut or significant impact on bank profits.

*JEL Classification:* G21, E44, D40, G32, C33

*Keywords:* Bank Profitability, Banking Market Structure, Dynamic Panel Estimation

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\*The authors want to thank Jürgen Eckhardt and Alfred Stiglbauer for their support in compiling the dataset and Johann Burgstaller, Pirmin Fessler, Markus Knell, Lukas Reiss, Johann Scharler, Martin Summer and an anonymous referee for valuable comments and discussions. The views expressed in this paper are those of the authors and do not necessarily reflect the position of the Oesterreichische Nationalbank. All errors are our own responsibility.

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# 1 Introduction

In response to the crisis a host of initiatives have been brought forward that aim at re-regulating the financial sector and strengthening the ‘traditional’ bank model with a strong emphasis on retail banking. In essence, these initiatives can be expected to reverse the trend towards deregulation observed in the decades before the crisis. At this point, it is still too early to assess the overall effect of these re-regulation measures on the profitability of banks. It is, however, possible to look at this question in the reverse direction and try to assess the effects of deregulation and liberalization on bank profits in the decades before the crisis. This is the strategy we pursue in this paper using the Austrian banking sector as an example.

The Austrian financial system constitutes a prime example of a bank-based financial system where credit institutions still play a central role, especially in corporate finance. However, the Austrian financial system underwent considerable changes in the period between Austria’s accession to the EU and the onset of the crisis. These changes were even more pronounced in Austria than in most other Western European economies given that deregulation and liberalization have started relatively late in Austria. Until the late 1970s, Austria’s financial markets ranked among the most regulated in Europe (Braumann, 2002) and the remaining financial restrictions were not removed until the accession to EU in 1995. Arguably even more relevant for the Austrian financial system was the opening up of the Central, Eastern and Southeastern European (CESEE) countries where Austrian banks accumulated significant market positions. This integration of financial markets led to a considerably more international orientation of the banking sector.<sup>1</sup>

The aim of this paper is to quantify the impact of the deregulation and liberalization process on bank profits since Austria’s entry into EU. We use a comprehensive micro-dataset on all banks operating in Austria. Thus far, the macroeconomic determinants of bank profits have been analyzed mainly in the context of cross-country studies using aggregate data for the banking sector of each country. By contrast, panel analyses based on individual bank data have usually focused on microeconomic determinants of bank

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<sup>1</sup>For an overview of the developments in the Austrian banking system see Glauning et al. (2001), Mooslechner (2005) and Waschiczek (1999, 2005).

profits. Furthermore, the impact of the financial structure as a whole on bank profitability has to date not been systematically analyzed for Austria. In this paper we try to close this gap and combine the two approaches in the literature by integrating macroeconomic drivers of bank profits into a microdata analysis, making it a comprehensive examination of micro- and macroeconomic determinants of bank profits in Austria.

We find that, overall, Austrian banks have weathered the changes in their structural environment of the recent years quite well. Disintermediation, as measured by a declining share of loans in total assets, actually had a positive effect on bank profits but privatization as well as the internationalization of the ownership structure and the lending business did not significantly affect the profitability of Austrian banks. However, the change in the ownership structure might have had an indirect impact on profits through competition, as the degree of competition in the market is found to affect the profitability of banks negatively. Furthermore, bank profits are found to be pro-cyclical and positively influenced by the spread between long-term and short-term interest rates and by inflation. Contrary to what is found in the international literature, the capitalization ratio of Austrian banks appears to have a negative influence on their profits, but this effect is significant only in some of our empirical specifications.

The remainder of the paper is structured as follows: The next section provides a brief overview of the literature on the macroeconomic determinants of bank profits. Section 3 describes the empirical design of our analysis, i.e. the measurement of bank profits, the estimation method as well as the data and variables on which the analysis is based. In section 4 we present and discuss our estimation results followed by an analysis of the robustness of our results in section 5. Section 6 summarizes the results and draws some conclusions.

## **2 Macroeconomic Determinants of Bank Profits**

Numerous empirical studies have addressed the relevance of macroeconomic factors for the development of bank profits. In Table 1 we summarize the findings of recent cross-country studies on the macroeconomic determinants of bank profitability where the signs represent significant positive (+) or negative (−) correlations and 0 indicates insignificant

results.<sup>2</sup> As the table illustrates, the literature so far has not found conclusive evidence on the effects of disintermediation on bank profits. Some authors designed specific indicators in order to capture whether a financial system is more bank-based or more market-based. For example, Carbó-Valverde and Rodríguez-Fernández (2007) use a dummy indicating if a bank operates in a bank-based or market-based system, and Demirgüç-Kunt and Huizinga (2000) construct an indicator consisting of the average of the ratios of stock market capitalization to total bank assets, stock market turnover to total bank credit to the private sector and stock market turnover to bank overhead costs. However, these summary indicators did not significantly explain bank profitability. Similarly, the ratio of stock market capitalization to the size of the banking sector did not yield significant results either.

[Insert Table 1 about here!]

Indicators concentrating on individual aspects of the disintermediation process performed somewhat better. For example, in some studies, notably Albertazzi and Gambacorta (2009) and Demirgüç-Kunt and Huizinga (2000), the stock market capitalization relative to GDP turned out to be strongly significant. The volatility of the share price index was found to affect bank profitability (measured by profit before taxes) negatively in Albertazzi and Gambacorta (2009), reflecting a possible inverse impact of increasing disintermediation on profits via higher risk associated with a larger exposure to stock markets, but positively for the return on equity. On the other hand, variables indicating the importance of bank finance in the economy, such as the ratio of total lending to GDP and the share of loans to non-banks, loan commitments (including credit lines) and off-balance sheet items in total assets, did not yield significant (or only weakly significant) results either, implying that banks could have compensated for shrinking profits from lending with increased non-interest income. Concerning the effect of market concentration, Goddard et al. (2004) find a positive correlation between the HHI and profits.

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<sup>2</sup>We include only papers that analyze broad profitability measures, i.e. profit before taxes in per cent of total equity (ROE) or of total assets (ROA). If more results are reported in a paper, the table presents the respective ‘baseline result’, i.e. the estimation with the broadest geographical and/or the longest sample.



Using a number of different macroeconomic variables, such as GDP, GDP growth and unemployment, all studies mentioned in the table find strong cyclicalities of bank profits. The results for the effects of interest rates are mixed: Somewhat surprisingly, in Bikker and Hu (2002) and Carbó-Valverde and Rodríguez-Fernández (2007) movements in interest rates do not significantly influence bank profitability, whereas Albertazzi and Gambacorta (2009) do find a significant correlation between interest rates and profits.

### 3 Empirical Setup

While the studies mentioned above analyze some structural aspects of the banking sectors in the countries under consideration, this paper provides a comprehensive analysis of various structural changes that Austrian banks faced in the past 15 years. Specifically, we investigate the effects of disintermediation, changes in ownership, internationalization and competition on the profitability of Austrian banks using bank-specific as well as macroeconomic data. Additionally, we include a number of bank-specific variables that are relevant for profitability in the existing literature as control variables.

#### 3.1 Panel Dataset of Individual Bank Data

Our empirical analysis is based on the quarterly reports on balance sheet items and profitability measures of all Austrian banks which operated from 1995 to 2009 to the Oesterreichische Nationalbank (OeNB).<sup>3</sup> Most balance sheet data stem from the Asset, Income and Risk Statement of the banks and are available from 1995 onwards. As these are unconsolidated data, they do not fully capture the business activities of foreign subsidiaries of Austrian banks but they nevertheless provide an indication of the dynamics of the international business, e.g. when looking at cross-border loans to foreign counterparties.

Since most performance indicators of the banks are available only as (quarterly updated) expected rather than actual values for the whole year, we use the expected values for the fourth quarter as our annual observation. Given that there is usually only a negligible difference between outlook and actual values for the fourth quarter, we conclude that the outlook values are suitable proxies for the annual figures.

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<sup>3</sup>We exclude (the few) branches of foreign credit institutions operating in Austria from our analysis because they are not subject to capital requirements, so no data on their capital is available.

[Insert Table 2 about here!]

Table 2 shows the characteristics of the banks included in our sample. The number of legally independent banks in Austria has declined from 1039 in 1995 to 840 in 2009. The table also shows that the number of banks owned by the government has decreased considerably whereas the number of banks owned by foreign groups has increased over the last 15 years. The sectoral composition in the right part of the table reveals that a majority of banks belongs to the Raiffeisen sector. In total, our micro dataset includes 1,042 individual banks that have existed (at some point) between 1995 and 2009, so the panel's dimensions are  $N = 1,042$  and  $T = 15$ . Table 3 contains the definitions and descriptive statistics of all bank-specific variables used in our analysis.

[Insert Table 3 about here!]

### 3.2 Measuring Bank Profitability

The profitability measures we employ in our analysis are earnings before tax (EBT), operating profit and – as an alternative measure – also net interest earnings. EBT is the sum of operating profit and extraordinary income minus loss provisions.<sup>4</sup> The main difference between operating profit and EBT is the treatment of the risk incurred by the banks.<sup>5</sup> EBT does not take into account the losses of banks due to the risk associated with their lending and investment decisions. The risk of default on a loan (credit risk) should be covered by a risk premium that is implicitly included in the interest rate charged for the loan. If there is a positive relationship between risk taken and profits – as standard theory predicts – then profits (measured both by EBT and operating profit) should be positively correlated with provisions, across banks as well as over time. Moreover, as credit risk can be expected to follow the business cycle, operating profit – which does not include risk provisions – should be more cyclical than earnings before tax.<sup>6</sup>

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<sup>4</sup>This item includes the allocation and dissolution of provisions for loans to other banks and customers, for securities and for shares in affiliated enterprises. The item comprises already realized write-offs as well as expected value adjustments.

<sup>5</sup>Another difference is that EBT eliminates the impact of changes in taxation.

<sup>6</sup>However, while the credit quality of loans has a strong cyclical component, Bikker and Hu (2002) as well as Arpa et al. (2001) amongst others, find that risk provisions of banks increase not only in economic downturns, but also when banks' operating income increases. They suppose that banks raise provisions with the aim of smoothing their operating results over time, perhaps due to credibility and/or tax considerations.

In line with usual practice, both profit measures are expressed as ratios to core capital and to total assets resulting in two measures of return on equity (ROE) and return on assets (ROA), respectively: We denote EBT in percent of core capital as ROE I and operating profit in percent of core capital as ROE II; ROA I and II are defined equivalently.

ROE is the most popular measure of performance for analysts, as it is easily available, only relying upon public information. It is primarily a profitability measure of shareholder value. Thus, it has to be interpreted with caution, since a high value may indicate high profitability, but also low capitalization. A rise in ROE may simply be the result of the use of more debt and thus of a higher leverage of banks. The use of ROE would therefore require accounting for the risk in the bank's equity. By using the core capital ratio – which is a measure of capital at risk – in our regressions we are, at least partly, accounting for this effect. Moreover, the fact that due to regulatory requirements capital is not allowed to fall below a certain threshold puts a constraint on the variation of bank capital.<sup>7</sup>

Net interest earnings (NIE) are defined as interest income generated by interest-bearing assets minus interest payments on liabilities and are also expressed as a percentage of total assets. They essentially represent the portion of bank income which the intermediation business contributes to the total income of banks. Although diminishing over time, NIE still represent roughly half of Austrian banks' total profits.

ROA is a broad profitability measure as it indicates how efficiently a bank uses its (financial and real) resources by specifying the profit generated per unit of assets. ROE may be decomposed into ROA multiplied by the leverage (total assets/total equity) of the bank. Therefore, ROA captures profitability before leverage, and as we use core capital, this measure also has a risk-adjustment factor. However, the use of ROA is impaired by the increasing importance of derivatives and other off-balance-sheet items which have reduced the relevance of total assets as a yardstick. Another reason why ROA could be problematic has to do with the econometric specification of our model. As many of the explanatory variables are also normalized by total assets, a correlation exists between the

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<sup>7</sup>Yet it might still be desirable to adjust the return on capital for the risk incurred and to use some variant of risk-adjusted return on capital (RAROC), for example by adjusting the profit measure for expected losses. However, this would require data on the loss distribution of banks' activities, something that we – as all other studies in the field – do not observe. Moreover, it might be argued that RAROC – which is mostly derived from capital market models – represents the optimal risk-return trade-off of individual capital market investors rather than that of banks.

dependent variable – the ROA – and some explanatory variables which as a consequence could lead to biased estimates and spurious regression results (see Kronmal, 1993). For these reasons we prefer to use the ROE in our standard specification and include the ROA and the NIE (which is also expressed in relation to total assets) in our robustness analysis.

[Insert Figure 1 about here!]

Graphs (1) to (5) in Figure 1 show the unweighted averages of all profitability measures over the observation period. EBT expressed as a percentage of core capital (ROE I) rose somewhat in the late 1990s after which it remained broadly stable until 2007. In the last two years of our observation period, ROE I plummeted as a result of the financial crisis. Operating profit expressed as a percentage of core capital (ROE II) on average also increased in 2000 but followed a declining path since then. Thus, the financial crisis influenced bank profits in 2008 and 2009 mainly through loss provisions which explains why ROE I declined much more than ROE II during this period. Average EBT in percent of total assets (ROA I) shows a marked downturn in 1999 after which it recovered and remained broadly stable until the beginning of the crisis. In contrast, average ROA II shows some variation at the beginning of the sample period but then follows a steady downward trend from 2000 on. The same is true for net interest earnings in percent of total assets (NIE).

### 3.3 Model Specification and Variables

We estimate a panel regression model including some variables that are observed at the micro level and others at the macro level:

$$y_{it} = \alpha + \beta' X_{it} + \gamma' Z_t + \mu_i + \varepsilon_{it}, \quad (1)$$

where  $y_{it}$  contains an indicator of bank profitability, the vector  $X_{it}$  includes all explanatory variables which are observed at the micro level,  $Z_t$  includes the variables which vary only over time,  $\mu_i$  denotes the panel individual effects and  $\varepsilon_{it}$  represent individual *iid* error terms.

### 3.3.1 Determinants of Bank Profits at the Micro Level

*Disintermediation:* Our measure for disintermediation in Austria is the share of loans extended to domestic non-banks in total assets. This share diminishes the more borrowers choose market-based debt financing rather than bank-based financing. Graph (6) in Figure 1 shows that on average loans expressed as a percentage of total assets have fallen since 2000. The literature doesn't give a clear account of the impact of disintermediation on bank profits. While some studies conclude that a higher share of non-interest income increases the volatility of bank profits (Stiroh, 2004, Carbó-Valverde and Rodríguez-Fernández, 2007), other authors find that the diversification resulting from disintermediation strengthens banks' profits (Lown et al., 2000, Rossi et al., 2009).

*Privatization:* We use the share of government-owned banks in total banks as an indicator of the extent of privatization of the Austrian banking sector. Our data allow to identify only those banks which are majority government owned, i.e. if the share of the central, state or local government exceeds 50%, so that our privatization variable is a dummy. Apart from data availability, the rationale for the use of a dummy variable is that changes in bank behavior induced by privatization can best be represented by focusing on the majority shareholder. Graph (7) in Figure 1 indicates that the share of government-owned banks in all Austrian banks has dropped from 5% to below 2% since 2000. The impact of privatization on bank profits is not clear-cut in the literature. On the one hand, public ownership may put restrictions on banks' business opportunities, thus limiting their options for raising capital so that privatization could be expected to have a positive effect on profits. On the other hand, in the process of a government bail-out the public sector typically acquires banks with low profitability which was especially the case during the financial crisis.

*Internationalization:* We consider two different aspects of the internationalization process in the Austrian banking sector – the internationalization of the ownership structure and of banking activities. The internationalization of the ownership structure is captured in a similar way as privatization, i.e. a bank is classified as foreign-owned if the share of foreign ownership exceeds 50%. Much of the increase in the share of foreign ownership was due to privatizations but in a number of cases also private banks were sold to shareholders

outside of Austria. Graph (8) in Figure 1 shows a steady growth of the share of majority foreign-owned banks since 1995 to nearly 7% at the end of the observation period. Like for privatization, the effect of foreign ownership on bank profits is ambiguous in the literature. If a bank acquired by a foreign owner is integrated into a multinational group, we would expect efficiency gains and a positive effect on profitability. On the other hand, information asymmetries between (foreign) shareholders and (domestic) management could play a greater role, thus affecting profitability negatively. Regulatory, language-related and cultural differences may also have a negative impact on profits (Buch, 2005). The empirical evidence on this question is also mixed: For the US, the correlation between foreign ownership and bank profitability is found to be positive while for other countries it is negative or not significant (Berger, 2007).

The degree of internationalization of banks' activities is measured by the share of foreign lending in total assets. Although our data does not include the portion of the international business of Austrian banks which is generated by foreign subsidiaries, this variable nevertheless reflects the dynamics of the internationalization of Austrian banks after the opening up of the CESEE countries quite well. As indicated in Graph (9) of Figure 1, since 1995 the average share of cross-border loans in total assets has expanded from below 4% to over 10% in the last two years of the observation period. Because interest rate margins have usually been higher in CESEE countries than in Austria, we expect the share of cross-border lending to have a positive effect on banks' profits.

*Degree of Competition:* We use the Herfindahl-Hirschman Index (HHI) to measure the intensity of competition in the Austrian banking sector. The HHI is a measure of market concentration that takes account of differences in the size as well as the number of market participants. It is calculated as the sum of the squared market shares (in our case the share of claims on domestic non-banks) of all firms in the market.<sup>8</sup> This measure has often been used to capture the competitive features of an industry, based on the structure-conduct-performance (SCP) paradigm which postulates that higher concentration reduces

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<sup>8</sup>Though individual banks in the Raiffeisen sector, the savings banks sector and Volksbanken sector are legally independent and figure as separate entities in our dataset, they are nevertheless tightly interlinked with each other. In the calculation of the HHI we take this into account by treating each of the three sectors as a hypothetical single group. This alternative calculation, however, has no noteworthy impact on the regression results presented later.

competition by fostering collusive behavior among firms. Hence, we expect higher market concentration to have a positive effect on bank profits.

However, the theory of industrial organization has shown that the competitiveness of an industry should not be measured by market structure indicators alone but other factors, such as entry/exit barriers and the general contestability of the market, may also affect competitive behavior. In this vein, in a comprehensive study on the relationship between bank competition and concentration covering 50 developed and developing countries, Claessens and Laeven (2004) find no empirical evidence of a negative correlation between the degree of competition and concentration in the banking system. Rather, they find that countries with more foreign banks and fewer restrictions on entry and activity have a higher competitiveness score. In this context, one of the variables we consider is the internationalization of the ownership which should capture foreign bank entry into the Austrian market quite well. Moreover, during our whole sample period Austria was a member of the EU, so that all legal entry barriers were inexistent. This is confirmed by Hahn (2008) who finds a fairly high level of contestability in the Austrian banking sector implying small entry and exit barriers. Finally, the metric used in Claessens and Laeven (2004) and similar studies, the so-called ‘H-statistic’, is not without flaws either, as it relies on the assumption that the industry in question is in equilibrium and, in addition, it does not take into account differences between banks such as size, product- or geographic differentiation.<sup>9</sup>

Graph (10) in Figure 1 shows that the HHI in the Austrian banking sector increased only moderately from 1995 to 2001, jumped up in 2002 due to the merger of Bank Austria and Creditanstalt after which it fell again until the end of the observation period.

### 3.3.2 Macroeconomic Factors

*GDP Growth:* A number of studies have shown that the business cycle may significantly influence bank profits (e.g. Albertazzi and Gambacorta, 2009). GDP growth is the most comprehensive measure of macroeconomic developments and is also an indicator of both,

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<sup>9</sup>The definition of the relevant market may pose some problems in this context. While using the HHI based on the claims on domestic non-banks can cope with the cross-country dimension of defining the market, it cannot do so with its intra-country dimension, i.e. different degrees of competition in regional sub-markets or different degrees of competition for different products (such as loans to enterprises and households or differences between loans and deposits).

demand for bank services and credit risk. Thus, we use real GDP growth as an explanatory variable and expect a positive influence on bank profits.

*Interest Rate Spread:* Additionally, interest rates – more specifically the spread between short-term and long-term interest rates – are an important macroeconomic determinant of bank profitability. As the maturities of banks’ assets and liabilities frequently differ (their investment has a longer maturity than their funding), changes in the interest rate spread can have a noticeable impact on the profitability of maturity transformation. Thus, we expect a positive effect of the interest rate spread on bank profitability.

*Inflation:* As in other studies, we also include the inflation rate as a macroeconomic explanatory variable in our analysis. Arpa et al. (2001), Bikker and Hu (2002) and Demirgüç-Kunt and Huizinga (2000) all find a positive correlation between bank profits and inflation. However, the literature hardly elaborates on this correlation. Possible explanations are, for example, that income from fees and commissions rises because the nominal value of the underlying assets rises or that interest rates on loans are adjusted for inflation more quickly than those on deposits.

Data on GDP growth and inflation stem from Statistics Austria; inflation is calculated on the basis of the HICP. The data on long-term and short-term interest rates are from Thomson Reuters.

### **3.3.3 Control Variables**

Furthermore, we include a number of control variables, both at the microeconomic and macroeconomic level, that were found to be relevant for explaining bank profits in other studies.

*Core Capital Ratio:* Many studies, such as Maudos and Fernández de Guevara (2004), use the capital ratio as an indicator for risk aversion. Since the core capital ratio is not available from the beginning of our dataset, we proxy this indicator by the ratio of core capital to risk-weighted assets. In 2008 this ratio surged as banks stepped up their core capital considerably on account of the financial crisis – see Graph (14) in Figure 1. Given the positive correlation between a bank’s capitalization and its profitability found in other studies, we also expect a positive effect of this variable on bank profits.

*Bank Size:* The relationship between bank size and profitability is controversial in



the literature. Economies of scale are often cited as the reason why bank size may have a positive effect on bank profits (e.g. Diamond, 1984) but empirical research on the existence of economies of scale in banking does not come to a clear conclusion. In the 1990s, Mooslechner (1995) found diseconomies of scale for Austrian banks. However, technological progress and regulatory changes since then are likely to have increased the optimum size of banks. Given that economies of scale are most pronounced in lending, the bank size is measured in terms of each individual bank's share in total lending.

*Foreign Currency Lending:* The expansion of foreign currency lending mainly to households from the mid-1990s on was a striking feature of the Austrian banking sector. This share more than quadrupled between 1995 and 2005 and, even though it declined in the meantime, came to roughly 12% at the end of the observation period. Thus, we include the share of foreign currency loans in total lending as an additional control variable in our analysis. Liebeg and Schwaiger (2006) find a negative correlation of foreign currency loans with interest rate margins for Austria.

*Sector-Specific Dummies:* To control for possible heterogeneity as a result of banks belonging to different sectors, sectoral dummies for the sectors (1) Raiffeisen banks, (2) savings banks, (3) Volksbank credit cooperatives, (4) joint stock banks, (5) state mortgage banks, (6) building and loan associations and (7) special purpose banks are included in the estimation (see also Table 2).<sup>10</sup> As the sectoral classification of banks can change as a result of mergers and acquisitions or other reclassifications, these dummies are not necessarily constant over time.

### 3.4 Estimation Method

As bank balance sheet data are correlated over time<sup>11</sup> and/or profit indicators may evolve endogenously with other balance sheet items, we apply an estimation method that can control for these sources of potential endogeneity. Thus, we use the dynamic panel data estimator proposed by Blundell and Bond (1998) which allows to include lags of the dependent variable as explanatory variables and also takes into account that some right-hand-side variables may be endogenous (or predetermined). The Blundell-Bond estimator

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<sup>10</sup>The Raiffeisen sector serves as the reference group in our estimations.

<sup>11</sup>The correlation of the ROE I with its first lag is roughly 58%, for the ROE II this autocorrelation even amounts to 86%.

was further developed from the original dynamic panel estimator by Arellano and Bond (1991) in order to improve the latter's efficiency. It was designed for panels with large  $N$  and small  $T$  and is based on system GMM estimation of the testable equation in levels and first differences. In the level equation, the lag(s) of the dependent variable and other possibly endogenous variables are instrumented by all further available lags of these variables in first differences and in the difference equation by their available lags in levels. Additionally, the levels of the exogenous variables are used as instruments in the level equation and their first differences in the difference equation. For more details see Roodman (2006).

As only the first lag of the dependent variable proved to be significant in our estimations, we are presenting all results for the specification with a lag structure of one. Taking all variables together, the particular model we estimate for the respective dependent variable (ROE I, ROE II, ROA I, ROA II, NIE) is:

$$\begin{aligned}
 DV_{it} = & \alpha + \beta_0 DV_{i,t-1} + \beta_1 loans_{it} + \beta_2 gov. \text{ owned}_{it} + \beta_3 foreign \text{ owned}_{it} + \\
 & \beta_4 foreign \text{ lending}_{it} + \gamma_1 HHI_t + \gamma_2 growth_t + \gamma_3 spread_t + \gamma_4 inflation_t + \\
 & \beta_5 core \text{ capital}_{it} + \beta_6 bank \text{ size}_{it} + \beta_7 FX \text{ loans}_{it} + \sum_{j=2}^{J=7} \theta_j sector_{j,it} + \mu_i + \varepsilon_{it}
 \end{aligned} \tag{2}$$

To assess the robustness of our results with respect to the estimation method, we also estimate the model with panel least squares with fixed-effects which also allows for individual heterogeneity.<sup>12</sup> In this case, the model is estimated without lags of the dependent variable on the right-hand-side because this would entail an endogeneity bias.

Throughout the paper we calculate standard errors which are robust with respect to heteroskedasticity and which allow for correlation within but not across groups (clustering at the group level).

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<sup>12</sup>We chose the fixed-effects rather than the random-effects specification because, first, our sample is not randomly selected but contains the total population of all Austrian banks and, second, correlation between the individual-specific effects and other explanatory variables (which is assumed to be absent in the random-effects model) cannot generally be ruled out.

## 4 Results

Table 4 shows the results of the Blundell-Bond estimation for our preferred profitability measures ROE I and ROE II. In general, the results differ somewhat whether earnings before taxes or operating profit are considered. Since the ROE I is adjusted for loan loss provisions which can be considerable at times, it represents a more complete measure of bank profitability. But also the ROE II deserves attention as it may give a better account of profit developments in the current period because loss provisions often originate from previous periods.

[Insert Table 4 about here!]

As already suggested by the autocorrelation of the dependent variables, the respective first lags are highly significant in explaining bank profits and the effect is stronger for the ROE II than for the ROE I.

Our results show a significantly negative effect of the share of loans in total assets on bank profits as measured by the ROE I. This implies that banks with a lower share of loans in their portfolio compared to other assets, such as equity and debt securities, have earned higher profits in the observation period. Put differently, the disintermediation process may well have increased the profits of Austrian banks. A coefficient of -0.049 can be interpreted as the effect of a 1 percentage point increase in the share of loans in total assets on an average bank's ROE I – *ceteris paribus*. For the ROE II, which is not adjusted for loss provisions, we find a positive relationship between the share of lending and profits. A possible explanation for the changing sign is that for most banks loss provisions have probably been higher for loans than for equity and debt securities. Moreover, extraordinary income may also drive a wedge between EBT and operating profit, thus, also affecting the sign of the coefficient.

Privatization in the Austrian banking sector does not appear to have had a positive impact on bank profits throughout the observation period. For the ROE I, we even get a positive coefficient of the dummy variable for majority government-owned banks, but it is only marginally significant. For the ROE II, the effect of privatization on bank profits is not significant. Similarly, the change in the ownership structure from domestic

to foreign owners does not show the expected positive effect on profitability: coefficients of the dummy for foreign-owned banks are even negative, however not significant. This indicates that information asymmetries (as discussed in section 3.3.1) probably outweigh the economies of scale that result from integration in a larger international banking group.

The second measure capturing Austrian banks' internationalization, the rise in lending to foreign debtors, had a positive but not statistically significant impact on both profitability measures. This is somewhat surprising given the fact that Austrian banks often motivate their foreign activities with profitability considerations. However, this result may reflect the problem mentioned earlier that unconsolidated data do not take into account the profits of foreign subsidiaries which may lead to an underestimation of the effect of internationalization.

Furthermore, we find a positive and highly significant effect of the degree of competition as measured by the HHI on both profitability measures. Average ROE I, for instance, increased by 1.27 percentage points in years when market concentration increased by 1 percentage point – *ceteris paribus*.

All three macroeconomic variables included in the analysis have a positive and significant effect on bank profits. As expected, we find that profits are positively affected by GDP growth. The coefficient implies that ROE I, for example, increases by 0.73 percentage points when GDP growth increases by 1 percentage point, which is a fairly small effect in economic terms. This effect was especially apparent in 2009 when the financial crisis hit the banking sector and at the same time caused GDP to shrink. However, this relationship is not exclusively driven by the crisis as the growth variable remains significant after including a dummy variable for the financial crisis and, in addition, it remains also significant in an estimation using data only up to 2007 (see robustness analysis in section 5).

Changes in the interest rate spread (between three-month market rates and ten-year government bond yields) are also found to have a significant positive effect on both profitability measures. The spread affects the profitability of maturity transformation as it determines the difference between interest rates on (mostly short-term) deposits and (longer-term) loans.

As in Demirgüç-Kunt and Huizinga (2000), we also find a positive correlation between bank profits and inflation which indicates that banks obviously benefit from higher inflation.

Of our control variables, only the core capital ratio has a significant influence on bank profits. Banks with a higher ratio of core capital to risk-weighted assets are found to have been less profitable than banks with a lower core capital ratio, but at an average -0.001 percentage points the effect is tiny. In contrast, bank size and foreign currency lending had no significant influence on neither of the two profitability indicators.

The usual specification tests conducted with the Blundell-Bond estimation indicate a slight specification problem in the estimation of the ROE II. The tests are shown in the last two rows of Table 4. While the test for first- and second-order autocorrelation of the residuals does not reveal any specification problem in the regression with the ROE I, we find some second-order autocorrelation in the residuals of the ROE II estimation.<sup>13</sup> The Hansen test for validity of the instruments indicates that the overidentifying restrictions imposed by the instruments are valid.

## 5 Robustness Analysis

To assess whether our results so far are robust with respect to the econometric specification, the estimation method and the measure of bank profits, we now discuss the results obtained from alternative estimations. Tables 5 and 6 show the results obtained from different econometric specifications of the empirical model or different estimation methods for the ROE I and ROE II, respectively.

[Insert Table 5 about here!]

Column (I) in Table 5 contains our baseline specification which is reproduced here for comparison. Column (II) shows the estimation with a linear trend additionally included in the model. As can be seen from Figure 1, both the ROE I and ROE II exhibit a slight negative trend for which we want to control in this estimation. The results of this estimation are to be interpreted as the effects on profitability in deviation from the

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<sup>13</sup>This autocorrelation drops but does not go away when we include further lags of the ROE II in the estimation.

trend. In column (III) we control for the effects of the crisis by estimating the model with data up to 2007 only. If our main results still hold in this estimation, we may conclude that they are not sensitive to the inclusion of the crisis.<sup>14</sup> In the estimation shown in column (IV) we allow the share of loans in total assets, the share of cross-border lending and the core capital ratio all appearing on the right-hand-side to be endogenous with respect to profitability. This means that we have to instrument them – like the lagged dependent variable – with all their available lags which increases the number of instruments dramatically.

In column (V) we present the results of a weighted regression. Although our primary focus in this paper is a micro analysis of all banks operating in Austria, it is a matter of fact that the Austrian banking sector is dominated by a few large banks. In 2009, the 10 largest Austrian banks accounted for 52% of the cumulated sum of total assets of the whole banking sector. In order to render our results more representative for the large banks, we run a weighted regression where each bank's share in the cumulated sum of total assets (averaged over the observation period) are used as weights. Finally, in column (VI) we present the results of the panel least squares estimation with bank fixed effects.

According to Table 5, the results for the lagged ROE I and for the macroeconomic variables (growth, interest rate spread and inflation) are completely robust across all specifications. The results for our disintermediation and competition measures are still quite robust, although not for every single specification: the share of loans in total assets does not come out significant when it is assumed to be endogenous (column IV) and for large banks (column V). Obviously, the results for this variable depend on the decision if it is treated exogenous or endogenous in the estimation. The HHI loses its significance when the years of the financial crisis are left out (column III) and in the fixed-effects specification (column VI).

The result for the government ownership dummy, which was marginally significant in our baseline specification, is not significant in any other specification. The effect of the core capital ratio is not significant anymore in the estimation where it is assumed

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<sup>14</sup>An alternative way of accounting for the effect of the crisis would be to add a time dummy for the years of the crisis (2008 and 2009) in our baseline specification. This dummy turns out to be highly significant for both dependent variables, but the remaining results are qualitatively unaffected (results are available upon request).

endogenous, in the weighted regression and in the fixed-effects estimation (columns IV to VI). The negative trend is found to be significant in column (II) while all other variables are virtually unaffected by its inclusion.

[Insert Table 6 about here!]

The results for the ROE II shown in Table 6 also confirm that our key variables – the macroeconomic variables and our measure for competition – are largely robust across specifications. For disintermediation, however, results are a bit less robust than in the case of the ROE I as the share of loans in total assets is found significant in only three out of six specifications which weakens our finding of opposite signs of this variable for ROE I and ROE II. Further observations from Table 6 are that the share of cross-border lending turns out significant only when it is assumed to be endogenous and that the market share of a bank has a significantly negative impact on its profitability in the pre-crisis estimation and in the weighted regression. The latter can be interpreted as evidence that the relatively smaller among the large banks obviously made higher profits in our sample period.

[Insert Table 7 about here!]

Finally, Table 7 summarizes the estimation results for the alternative measures of bank profits (the baseline results for the ROE I and ROE II are again reproduced for comparison). The results for the ROA I and ROA II in the third and fifth column of the table resemble very much those of their ROE counterparts. The only difference is that inflation and the core capital ratio do not appear to significantly affect the ROA. The estimation with the NIE as dependent variable delivers somewhat different results for a number of variables. The dummy for government ownership is positively significant now – as in the case of the ROE I – and also foreign lending appears to affect the NIE positively. Interestingly and in contrast to the baseline results, a higher core capital ratio has a positive and significant effect on bank profits and foreign currency lending seems to have dampened the interest earnings of Austrian banks. Apart from these latter two findings, the rest of the results, in particular for the macro variables, are in line with those for the ROE and the ROA.

Overall, the results in Tables 5, 6 and 7 largely confirm the results of our baseline estimation in Table 4 – at least for the key variables. Consequently, we regard our main findings as robust with respect to different econometric specifications and different measures of bank profitability.

## 6 Concluding Remarks

In this paper we investigate if and how the structural changes of the Austrian banking sector over the past 15 years have affected the profitability of banks using a variety of microeconomic indicators derived from individual bank data including balance sheet and income statements as well as macroeconomic indicators.

Our results suggest that bank profits in Austria are significantly influenced by macroeconomic factors such as GDP growth, the interest rate spread and inflation and, albeit to a lesser extent, also by changes in the financial structure. We find only little evidence that a change in the ownership structure of Austrian banks had a significant impact on their profitability; the estimated coefficients even point in a different direction than expected. For both, privatization and foreign ownership we find a negative effect on bank profits, but the effect is significant only in one out of six specifications. What comes as a surprise is that the internationalization of banks' lending activities is not found to have significantly increased their profits.

Furthermore, we find that the disintermediation process of the past 15 years had a positive effect on bank profitability. On average, those banks which focused to a greater degree on business activities other than conventional lending generated higher earnings before tax than banks with a stronger focus on lending. If banking regulation is about to reverse this disintermediation process, it is conceivable that this could have adverse effects on bank profits. The same could be expected for another factor that is one of the prime targets of current banking regulation, the capital ratio. The fact that the core capital ratio has a significant negative influence on bank profits implies that higher capitalization is likely to come at the cost of somewhat lower profits. But this has to be seen in the context of the higher stability of bank profits which is entailed by the new regulatory environment.



The financial crisis resulted in a dramatic decline in profits in the last two years of our observation period which puts the profitability implications of the changes in the financial structure and capital requirements somewhat into perspective. At the same time, the crisis makes it difficult to assess the long-term perspectives of the Austrian banking sector. It remains for future research to investigate whether our results will hold up also in the post-crisis period.

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# Appendix

Table 1: Macroeconomic Determinants of Bank Profitability in the Literature

	Albertazzi and Gambacorta (2009)		Bikker and Hu (2002)	Carbó-Valverde and Rodríguez-Fernández (2007)	Demirgüç-Kunt and Huizinga (2000)	Goddard et al. (2004)
	PBT	ROE	ROA	ROA	PBT	ROE
<b>Financial Structure</b>						
Indicator: bank-based or market-based system				0	0	
Stock market capitalisation (% tot. bank assets)				0	0	
Stock market capitalisation (% of GDP)	+	+++			+++	
Stock market turnover					0	
Share price index (volatility)	--	+++				
Share price index (% change)			0			
Total assets of banks (% of GDP)	0				---	
Bank loans (% of GDP)	0	0				
Loans (% of total assets)			-	0	0	
Loan commitments (% of total assets)				0		
Earning assets except loans (% of total assets)				++		
Non-interest earning assets (% of total assets)					-	
Fee-based activities (relative to total assets)				+		
Off-balance sheet items (% of total assets)				0		0
Market concentration (HHI)				0		+++
<b>Macroeconomic variables</b>						
Real GDP (per capita, level)	++			0	+++	
Real GDP (% change)		+++	++		++	+++
Unemployment			-			
Inflation	0	0	+		+++	
Housing prices (% change)			0			
Taxes paid by banks (% profit before taxes)					++	
Total assets of the central bank (% of GDP)					+++	
Short-term interest rate	---	-	0			
Long-term interest rate	+++	0	0			
Spread: lending rate – deposit rate		+++				
Spread: short-term rate – deposit rate				0		
Spread: long-term rate – short-term rate			0			
Real M3 (% change)			0			
<b>Bank specific factors</b>						
Deposits (% of total assets)			0	0	--	
Capital and reserves/equity (% of total assets)			+	0	+++	0
Bank size (market share)						---
Loan defaults (% of total loans)				0		
Liquid assets (% of total assets/funding)				0		0
Cost factors <sup>1)</sup>				+	0	
Number of ATMs/branches				+		
Cross section	countries		panel of individual banks and countries			
Included countries	AT, BE, FR DE, IT, NL PT, ES, UK US		DE, ES, FR FR, NL, IT UK, SE	DE, ES, FR NL, IT, UK SE	OECD and developing countries	DK, FR, DE IT, ES, UK
Sample Period	1981-2003		1994-2001	1994-2001	1990-1997	1992-1998

Notes: 1) Operating costs in % of gross income (B&H), personnel expenses and other non-interest expenses in % of total assets (DK&H);

+++/- -- denotes significance at the 1%, ++/- - at the 5% and +/- at the 10% level. The signs indicate the direction of the correlation and 0 indicates insignificant estimates.

PBT: profit before taxes, ROE: return on equity, ROA: return on assets.

Table 2: Bank Characteristics

Year	Number of banks	of which:		belonging to sector:							
		government- owned	foreign- owned	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
1995	1039	47	37	718	78	80	54	8	5	96	0
1996	1019	47	38	700	77	78	54	8	5	97	0
1997	994	47	38	683	73	74	63	8	5	88	0
1998	970	45	37	666	72	72	62	8	5	85	0
1999	950	44	43	648	71	70	64	8	5	84	0
2000	922	42	45	626	70	71	61	8	5	81	0
2001	906	35	46	617	67	70	61	8	5	78	0
2002	904	32	47	609	64	70	59	8	5	89	0
2003	896	24	52	596	64	69	63	8	5	91	0
2004	876	22	48	581	59	68	47	9	4	87	21
2005	870	19	51	576	57	68	44	9	4	87	25
2006	862	17	51	567	56	70	48	9	4	83	25
2007	852	16	54	558	56	70	51	10	4	77	26
2008	850	14	59	551	55	68	51	10	4	80	31
2009	840	17	57	545	55	68	51	10	4	78	29

Notes: Sectors: (1) Raiffeisen banks, (2) savings banks, (3) Volksbank credit cooperatives, (4) joint stock banks, (5) state mortgage banks, (6) building and loan associations, (7) special purpose banks, (8) banks subject to Article 9 of the Austrian Banking Act (branches of foreign credit institutions). Article 9 banks have been excluded from our analysis because no data on their capital is available.

Table 3: Descriptive Statistics of Bank-Specific Variables

Variable	Definition	Obs	Mean	Std.Dev.	25th- perc.	Median	75th- perc.
ROE I	Earnings before tax over core capital	13,485	13.4	39.7	5.5	9.9	15.6
ROE II	Operating profit over core capital	13,485	20.1	35.8	10.9	16.4	22.7
ROA I	Earnings before tax over total assets	13,746	2.2	79.0	0.4	0.7	1.1
ROA II	Operating profit over total assets	13,746	5.9	76.4	0.8	1.1	1.5
NIE	Net interest earnings over total assets	13,746	12.1	162.2	1.8	2.4	3.0
Loans ratio	Loans to domestic non-banks over total assets	13,748	51.8	21.4	42.6	55.0	66.0
Foreign lending	Loans to foreign non-banks over total assets	13,748	7.1	15.6	0.3	1.4	5.5
Core capital ratio	Core capital over risk-weighted assets	13,364	40.6	334.2	9.2	11.8	16.9
Bank size	Indiv. bank's loans over total loans of all banks	13,748	0.11	0.71	0.01	0.01	0.04
FX lending	FX loans over total loans	12,924	11.4	13.8	0.3	7.0	16.9

Notes: All ratios are expressed in percent.

Table 4: System-GMM Estimation of Bank Profits

Dependent variable	ROE I	ROE II
ROE I <sub>t-1</sub>	0.155*** (4.53)	
ROE II <sub>t-1</sub>		0.595*** (10.35)
Loans in total assets	-0.049*** (-1.98)	0.030** (2.11)
Government ownership (dummy)	1.181* (1.75)	-0.807 (-1.34)
Foreign ownership (dummy)	-6.740 (-1.22)	-2.004 (-0.85)
Foreign lending in total assets	0.015 (0.43)	0.018 (0.95)
HHI	1.273*** (5.62)	0.256*** (4.19)
GDP growth	0.732*** (8.47)	0.668*** (14.62)
Interest rate spread	2.301*** (10.95)	1.024*** (7.92)
Inflation	1.047*** (4.49)	0.739*** (5.28)
Core capital ratio	-0.001* (-1.82)	-0.001* (-1.95)
Bank size (market share)	-0.140 (-0.61)	-0.023 (-0.20)
Foreign currency lending	0.029 (1.49)	0.005 (0.51)
Number of observations	11,669	11,669
Number of groups	1,014	1,014
Number of instruments	122	122
Arellano-Bond test for AR(2)	-0.84	2.27**
Hansen test of overid. restrictions	39.80	45.00

Notes:  $t$ -statistics in parenthesis. \* denotes significance at the 10%, \*\* at the 5% and \*\*\* at the 1% level. In addition to the variables displayed in the table, the estimation also contains sector-specific dummies and a constant. The standard errors are robust with respect to heteroskedasticity and involve clustering at the group level.

Table 5: Explaining Earnings before Tax (ROE I) of Austrian Banks

	(I)	(II)	(III)	(IV)	(V)	(VI)
ROE $I_{t-1}$	0.155*** (4.53)	0.155*** (4.66)	0.141*** (3.49)	0.152*** (4.67)	0.406*** (3.41)	
Loans in total assets	-0.049** (-1.98)	-0.051** (-2.01)	-0.076*** (-3.05)	-0.017 (0.47)	-0.028 (-0.97)	-0.056** (-1.99)
Government ownership (dummy)	1.181* (1.75)	1.061 (1.58)	0.969 (1.11)	1.052 (1.52)	1.973 (1.09)	0.840 (0.52)
Foreign ownership (dummy)	-6.740 (-1.22)	-6.918 (-1.25)	-8.490 (-1.40)	-6.862 (-1.64)	-1.479 (-0.55)	-7.444** (-2.14)
Foreign lending in total assets	0.015 (0.43)	0.019 (0.53)	0.037 (0.93)	0.052 (0.75)	-0.033 (-0.77)	0.021 (0.22)
HHI	1.273*** (5.62)	1.717*** (7.65)	0.149 (0.67)	1.196*** (5.46)	1.239*** (2.69)	0.625 (1.18)
GDP growth	0.732*** (8.47)	0.417*** (2.82)	0.288** (1.98)	0.703*** (7.37)	0.723*** (2.70)	1.033*** (8.29)
Interest rate spread	2.301*** (10.95)	1.676*** (6.24)	1.070*** (5.33)	2.298*** (10.05)	1.082** (1.92)	3.136*** (5.77)
Inflation	1.047*** (4.49)	1.020*** (4.39)	2.412*** (7.52)	1.180*** (3.39)	-0.159 (-0.21)	1.869*** (4.35)
Core capital ratio	-0.001* (-1.82)	-0.001* (-1.67)	-0.033*** (-2.85)	-0.001 (-0.62)	-0.000 (-0.10)	0.001 (1.26)
Bank size (market share)	-0.140 (-0.61)	-0.147 (-0.64)	-0.196 (-0.79)	-0.270 (-0.74)	-0.049 (-0.33)	0.718 (0.54)
Foreign currency lending	0.029 (1.49)	0.030 (1.51)	0.030 (1.41)	0.017 (0.76)	0.031 (1.16)	0.072 (1.03)
Trend		-0.174** (-2.28)				
Number of observations	11,669	11,669	10,157	11,669	11,669	12,694
Number of groups	1,014	1,014	1,001	1,014	1,014	1,042
Number of instruments	122	123	95	431	122	
$R^2$ (Within)						0.182

Notes:  $t$ -statistics in parenthesis. \* denotes significance at the 10%, \*\* at the 5% and \*\*\* at the 1% level. In addition to the variables displayed in the table, the estimation also contains sector-specific dummies and a constant. The standard errors are robust with respect to heteroskedasticity and involve clustering at the group level. Columns are defined as follows: (I) is our standard specification, (II) is the estimation with trend, (III) is the estimation with data up to 2007, (IV) is the estimation where the share of loans, foreign lending and core capital are assumed to be endogenous, (V) is the weighted regression and (VI) is the fixed-effects estimation.



Table 6: Explaining Operating Profit (ROE II) of Austrian Banks

	(I)	(II)	(III)	(IV)	(V)	(VI)
ROE II <sub>t-1</sub>	0.595*** (10.35)	0.581*** (8.81)	0.646*** (9.87)	0.570*** (14.53)	0.647*** (5.97)	
Loans in total assets	0.030** (2.11)	0.029** (2.05)	0.007 (0.47)	0.021 (0.65)	0.003 (0.09)	0.145*** (5.19)
Government ownership (dummy)	-0.807 (-1.34)	-0.879 (-1.46)	-0.128 (-0.33)	-0.586 (-0.96)	-2.341 (-1.04)	-0.026 (-0.02)
Foreign ownership (dummy)	-2.004 (-0.85)	-2.212 (-0.93)	-3.184 (-1.50)	-3.561 (-1.27)	-0.491 (-0.44)	-3.671 (-0.90)
Foreign lending in total assets	0.018 (0.95)	0.022 (1.12)	0.020 (1.08)	0.081* (1.94)	-0.010 (-0.32)	0.038 (0.81)
HHI	0.256*** (4.19)	0.207*** (5.11)	0.629*** (12.55)	0.255*** (5.18)	0.460 (1.51)	0.595*** (11.65)
GDP growth	0.668*** (14.62)	0.531*** (5.26)	1.915*** (14.15)	0.740*** (16.74)	0.420* (1.87)	0.929*** (16.38)
Interest rate spread	1.024*** (7.92)	0.776*** (3.75)	0.935*** (6.24)	1.192*** (8.05)	0.088 (0.20)	2.276*** (10.38)
Inflation	0.739*** (5.28)	0.751*** (5.39)	2.510*** (10.86)	0.709*** (5.09)	2.671*** (3.09)	1.658*** (9.21)
Core capital ratio	-0.001* (-1.95)	-0.002* (-1.95)	-0.045*** (-3.71)	-0.002 (-1.32)	-0.000 (-0.28)	-0.001 (-0.82)
Bank size (market share)	-0.023 (-0.20)	-0.032 (-0.28)	-0.166* (-1.80)	-0.174 (-1.49)	-0.218** (-2.54)	0.781 (0.73)
Foreign currency lending	0.005 (0.51)	0.010 (1.01)	-0.001 (-0.09)	0.003 (0.24)	-0.009 (-0.41)	-0.104*** (-4.40)
Trend		-0.118 (-1.48)				
Number of observations	11,669	11,669	10,157	11,669	11,669	12,694
Number of groups	1,014	1,014	1,001	1,014	1,014	1,042
Number of instruments	122	123	95	431	122	
R <sup>2</sup> (Within)						0.101

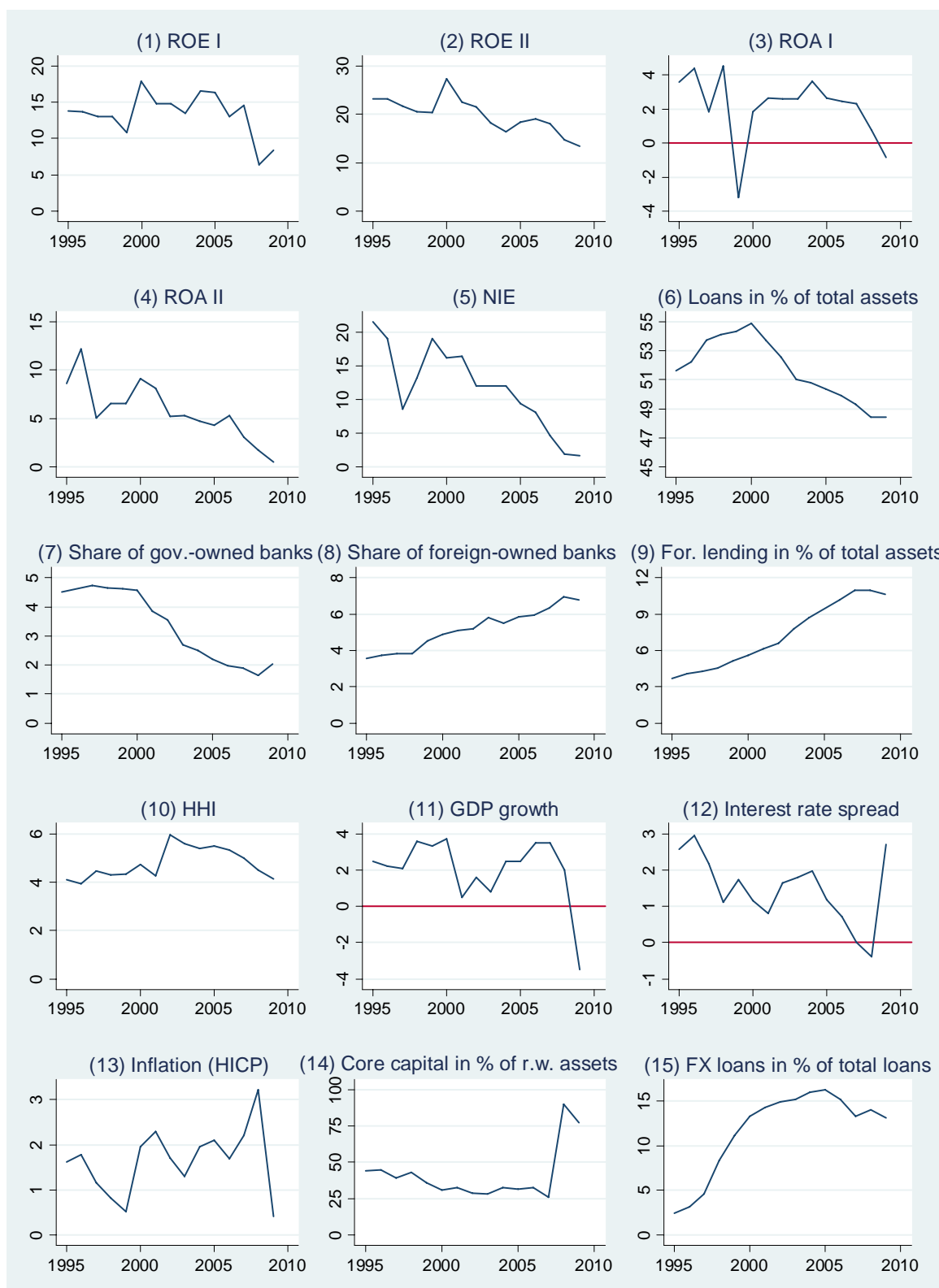
Notes: *t*-statistics in parenthesis. \* denotes significance at the 10%, \*\* at the 5% and \*\*\* at the 1% level. In addition to the variables displayed in the table, the estimation also contains sector-specific dummies and a constant. The standard errors are robust with respect to heteroskedasticity and involve clustering at the group level. Columns are defined as follows: (I) is our standard specification, (II) is the estimation with trend, (III) is the estimation with data up to 2007, (IV) is the estimation where the share of loans, foreign lending and core capital are assumed to be endogenous, (V) is the weighted regression and (VI) is the fixed-effects estimation.

Table 7: Explaining Alternative Measures of Bank Profits

Dependent variable	ROE I	ROA I	ROE II	ROA II	NIE
Dep. variable $_{t-1}$	0.155*** (4.53)	0.409*** (4.05)	0.595*** (10.35)	0.520*** (4.05)	-0.012 (-1.14)
Loans in total assets	-0.049*** (-1.98)	-0.059** (-2.19)	0.030** (2.11)	0.081** (2.21)	0.375*** (8.39)
Government ownership (dummy)	1.181* (1.75)	-1.529 (-0.68)	-0.807 (-1.34)	-3.567 (-0.51)	4.708*** (2.97)
Foreign ownership (dummy)	-6.740 (-1.22)	-8.290 (-1.07)	-2.004 (-0.85)	-3.792 (-1.13)	-3.430 (-0.65)
Foreign lending in total assets	0.015 (0.43)	-0.066 (-0.54)	0.018 (0.95)	-0.025 (-0.17)	0.106* (1.74)
HHI	1.273*** (5.62)	0.615** (1.99)	0.256*** (4.19)	0.388* (1.65)	0.274*** (5.49)
GDP growth	0.732*** (8.47)	0.588*** (2.62)	0.668*** (14.62)	1.070*** (3.23)	0.456*** (5.94)
Interest rate spread	2.301*** (10.95)	1.102** (2.32)	1.024*** (7.92)	2.808** (2.24)	2.087*** (11.33)
Inflation	1.047*** (4.49)	-0.083 (-0.14)	0.739*** (5.28)	1.202 (1.15)	0.892*** (5.75)
Core capital ratio	-0.001* (-1.82)	0.001 (1.48)	-0.001* (-1.95)	0.001 (1.26)	0.003** (2.39)
Bank size (market share)	-0.140 (-0.61)	-1.007 (-0.41)	-0.023 (-0.20)	0.098 (0.03)	-0.555 (-1.02)
Foreign currency lending	0.029 (1.49)	0.048 (1.13)	0.005 (0.51)	0.086 (1.07)	-0.228*** (-8.02)
Number of observations	11,669	11,669	11,669	11,669	11,669
Number of groups	1,014	1,014	1,014	1,014	1,014
Number of instruments	122	122	122	122	122
Arellano-Bond test for AR(2)	-0.84	-0.72	2.27**	-0.86	-1.15
Hansen test of overid. restrictions	39.80	84.73	45.00	85.14	38.30

Notes:  $t$ -statistics in parenthesis. \* denotes significance at the 10%, \*\* at the 5% and \*\*\* at the 1% level. In addition to the variables displayed in the table, the estimation also contains sector-specific dummies and a constant. The standard errors are robust with respect to heteroskedasticity and involve clustering at the group level.

Figure 1: Bank-Specific and Macro Variables over Time



Notes: The figures show unweighted annual averages across all banks (except for the macro variables). The numbers and dynamics may differ from those of aggregate data on the Austrian banking sector. All numbers are in percent.



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## Call for Applications: Visiting Research Program

The Oesterreichische Nationalbank (OeNB) invites applications from external researchers for participation in a Visiting Research Program established by the OeNB's Economic Analysis and Research Department. The purpose of this program is to enhance cooperation with members of academic and research institutions (preferably post-doc) who work in the fields of macroeconomics, international economics or financial economics and/or with a regional focus on Central, Eastern and Southeastern Europe.

The OeNB offers a stimulating and professional research environment in close proximity to the policymaking process. Visiting researchers are expected to collaborate with the OeNB's research staff on a prespecified topic and to participate actively in the department's internal seminars and other research activities. They will be provided with accommodation on demand and will, as a rule, have access to the department's computer resources. Their research output may be published in one of the department's publication outlets or as an OeNB Working Paper. Research visits should ideally last between 3 and 6 months, but timing is flexible.

Applications (in English) should include

- a curriculum vitae,
- a research proposal that motivates and clearly describes the envisaged research project,
- an indication of the period envisaged for the research visit, and
- information on previous scientific work.

Applications for 2013 should be e-mailed to [eva.gehringer-wasserbauer@oenb.at](mailto:eva.gehringer-wasserbauer@oenb.at) by November 1, 2012.

Applicants will be notified of the jury's decision by mid-December. The following round of applications will close on May 1, 2013.