The Impact of Economic Factors on Bank Profits

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This study examines the impact of macroeconomic changes on bank profits that Austrian banks have experienced over the past 15 years. We used several proxies based on balance sheet data at the individual bank level, as well as macroeconomic variables to capture these changes, and additionally controlled for a number of microeconomic factors. Our estimation is based on panel regression analysis using unconsolidated micro-level data reported by all Austrian banks from 1995 to 2009. While we found that disintermediation (fewer loans in total assets) and the degree of concentration in the banking sector had a positive effect on bank profitability, changes in the ownership structure (privatization and increased foreign ownership), as well as more foreign lending by Austrian banks, did not, on the basis of unconsolidated data, have a clear-cut or significant impact on bank profits. As in other countries, bank profits in Austria are contingent on the business cycle and are positively influenced by the spread between long-term and short-term interest rates.

In all economies, banks play a key role in transforming savings into investment. This holds especially true of a primarily bank-based financial system like that in Austria. Therefore, developments in the banking sector do not affect banks alone, but are highly relevant for the economy as a whole. Accordingly, the efficiency and profitability of the banking sector is of interest not just at the business level, i.e. at the individual bank level; rather, it is crucial at a broader macroeconomic level. Profits are a basic factor in the capital formation of enterprises, which include banks. Capital can be increased either by issuing equity or by retaining earnings (adjusted for payouts – dividend payments, share buybacks, etc. – to shareholders). Profits have an impact on a bank's cost of raising capital not only because of their direct contribution to equity financing, but also because profitability has an effect on external investors' assessment of the bank's financial strength. The better a bank's profit situation is, the better its prospects are for issuing new capital,

because investors have greater confidence in the bank's financial strength. This applies to the cost of both equity and debt financing. The yields of AAA-rated euro area bank bonds, for instance, averaged 2.9 percentage points less between the beginning of 2001 and September 2010 than those of BBB-rated banks.

The theory of the bank capital channel, which explores the link between equity ratios and the loan supply (Van den Heuvel, 2002, 2009) postulates that profits impact on bank lending through their effects on bank capital. International studies have shown that banks with sufficient capital resources are better equipped to absorb monetary policy and macroeconomic shocks (Altunbas et al., 2004; Gambacorta and Mistrulli, 2004). Conversely, banks with shrinking capital resources could be induced to cut back on lending on the asset side. The results of the Eurosystem's bank lending survey may also be interpreted in this fashion. The survey data show that, to some extent, banks' balance sheet constraints

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contributed to the tightening of lending standards in the course of the crisis. At the same time, well-capitalized banks are in a better position to attract deposits, and thus have more funds to lend.

The environment within which Austrian banks make profits has been influenced by a broad range of economic and economic policy developments over the past decades.[2] EU integration and the related liberalization of the regulatory framework for the Austrian financial market from the mid-1990s represented the catalyst for these developments. At the EU level, the increased competitive pressure became manifest in the establishment of Economic and Monetary Union, and then in the efforts to set up a single market for financial services by 2005. A key development for Austrian banks was the opening up of the Central, Eastern and Southeastern European (CESEE) markets. This integration of the financial markets led to a significantly more international orientation of the banking sector. Austrian banks accumulated significant positions, especially in CESEE.

In parallel, the comprehensive liberalization of the Austrian and international financial markets triggered a shift to capital market funding in Austria, a development observable in most countries with a bank-based financial system. Financial market deregulation spawned new financial instruments and transactions. Capital market instruments played an increasingly important role in corporate financing and in household investment. For banks, this translated into a drop in interest income, but also into additional income from other sources – as universal banks, Austrian banks also sell many of the financial instruments into which investors diversified.

More deregulation went hand in hand with comprehensive privatization of banks. Over the past 20 years, the public sector's holdings of Austrian banks' capital have gradually been scaled back, but were enlarged again in 2008 when recapitalization measures were taken under the bank support package. The changes in the ownership structure of banks appear to have brought about changes in the corporate governance structures of the banks involved, possibly also in the market as a whole. Moreover, the integration of the Austrian banking market into the EU was accompanied by a pronounced increase in the number of mergers. One of the express goals of mergers – especially in the 1990s – was to create larger units representing a critical mass powerful enough to cope with the challenges of EU integration.[3] Mergers and acquisitions led to substantial reductions in the number of market participants: Between 1995 and 2009, the number of independent banks declined from 1,041 to 855.

Against the background of the importance of bank profits for the economy, the object of this study is to quantify the impact of the economic and economic policy changes of the past 15 years on Austrian banks' profits. Thus far, the macroeconomic determinants of bank profits have been analyzed mainly in the context of cross-country comparative studies using aggregated data for the banking sector of each country. By contrast, panel analyses of individual bank data have usually focused on microeconomic

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[2] See also Glauninger et al. (2001), Mooslechner (2005) and Waschiczek (1999, 2005).

[3] In addition, there were a number of other reasons for mergers and acquisitions in banking, such as the exploitation of synergies.

influences. The impact of the economic and economic policy framework on bank profitability has to date not been systematically analyzed specifically for Austria. This study attempts to close that gap by analyzing the effects that such changes have had on the Austrian banking system over the past 15 years with the aid of microeconomic data on bank profits. Furthermore, microeconomic determinants are integrated into the study, making it a comprehensive examination of micro- and macroeconomic drivers of bank profits in Austria.

This study is structured as follows: Section 1 provides a brief overview of the literature on the determinants of bank profits. Section 2 contains a description of the data and variables on which the analysis is based. In section 3, we briefly review the econometric method used and analyze the estimation results. Section 4 summarizes the results and draws a number of relevant economic policy conclusions.

1 Survey of the Literature

A large number of studies have already dealt with the determinants of bank profitability, both at the international and at the specifically Austrian level.[4] The analyses focus primarily on microeconomic or bank-specific drivers of profits, based on variables like size, capitalization, risk management and cost management. With respect to the impact of the bank's size on its profitability, the results are ambiguous, but newer studies generally find a negative correlation (e.g. Maudos and Fernández de Guevara, 2004; for Austria: Liebeg and Schwaiger, 2006). Many authors find a strong, positive correlation between a bank's capitalization and its profitability (Bikker and Hu, 2002; Demirgüç-Kunt and Huizinga, 2000; Maudos and Fernández de Guevara, 2004; Carbó Valverde and Rodríguez Fernández, 2007). Generally, the authors postulate a link between capitalization and risk aversion. According to this view, banks with a high level of capital are more risk averse and ignore potential diversification options or other methods to increase profitability (Goddard et al., 2004). Some studies look at the influence of the cost-to-income ratio as an indicator of the quality of management. Whereas it is no surprise that the cost-to-income ratio makes a positive contribution to overall profitability, it is notable that other authors (Maudos and Fernández de Guevara, 2004; Liebeg and Schwaiger, 2006) find a negative correlation with the interest spread.

Most of the studies focusing on macroeconomic influences are cross-country comparisons that use aggregated country data to compare the profitability of different countries' banking systems. At the international level, a number of studies (Albertazzi and Gambacorta, 2009; Bikker and Hu, 2002; Demirgüç-Kunt and Huizinga, 2000) find that the business cycle has a positive influence on the development of bank profits. Demirgüç-Kunt and Huizinga (2000) emphasize the importance of the difference between institutional factors, such as the structure of the financial sector, the legal system and taxation. Thus far, researchers have found almost no evidence that the ownership structure of banks had an impact on their profitability.

A number of studies examined the influence of the market structure (degree of competition, barriers to market

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[4] Given the pronounced changes in banking, both internationally and in Austria in recent years, this section concentrates on the literature of the past decade.

entry) on bank profitability. Most of them are based on the structure-conduct-performance (SCP) model that links market structure to the behavior of firms (in this case, that of banks) and postulates a positive correlation between market power and profit. Goddard et al. (2004), as well as Hahn (2008), find a negative influence of the degree of competition (positive influence of the degree of concentration) on bank profits. The efficient structure hypothesis, by contrast, assumes that banks with superior management have lower costs and therefore higher profits. These banks will be able to gain market share over time, leading to a higher market concentration (Berger, 1995, 2007).

In addition, interest rate levels and, above all, the possibility of generating income gains through maturity transformation, i.e. the slope of the yield curve, have an impact on bank profits (Albertazzi and Gambacorta, 2009). Demirgüç-Kunt and Huizinga (2000) also find a positive correlation between bank profits and inflation. Finally, corporate tax rates influence bank profits (Albertazzi and Gambacorta, 2009; Demirgüç-Kunt and Huizinga, 2000).

Some studies examined bank profits in Austria from various angles. Most of the analyses concentrated on either microeconomic factors and/or market structure, although all of the studies took into account at least a few macroeconomic variables, generally as control variables. The first comprehensive analysis of Austrian banks' profitability is Mooslechner (1995), who examined, above all, the influence of both microeconomic factors and the market structure. This study found a negative correlation between profitability and total assets, and only a weak correlation with balance sheet structure, where the share of lending was found to have a positive influence. Using regression analysis, Arpa et al. (2001) examined the impact of macroeconomic variables on Austrian banks' profits (and on their risk provisioning). Burgstaller (2006), too, took a predominantly macroeconomic perspective, whereas Hahn (2008) essentially analyzed the effects of the market structure of Austrian banking on banks' profits. Liebeg and Schwaiger (2006) focused not on total profit but rather on the determinants of Austrian banks' interest margins from a primarily microeconomic angle.

The last four of the studies listed above examined the effects of the business cycle on bank profits, but only Liebeg and Schwaiger (2006) found a significant contribution of the business cycle (to the interest margin). The three other studies, which used economic growth as a variable, did not ascertain any significant influence. Looking at the impact of interest rates on bank profits, Arpa et al. (2001) found a positive influence of the level of short- and long-term interest rates, while Liebeg and Schwaiger (2006) established that both the spread between short- and long-term interest rates and the volatility of interest rate levels had positive effects. By contrast, Burgstaller (2006) did not determine any significant correlation. Three of the studies analyzed the influence of market structure on bank profits, each using other variables to establish a positive correlation between a higher degree of market concentration and bank profitability.[5] At the micro level, efficiency indicators (with the exception of economies of scale, which Hahn, 2008, tested) and capitalization proved

[5] *Liebeg and Schwaiger (2006) used the Lerner index, Burgstaller (2006) the share of the ten largest banks in total assets, and Hahn (2008) the Herfindahl-Hirschman index.*

significant in all studies. Findings with respect to the market share of an institution were mixed: Liebeg and Schwaiger (2006) found a significant negative influence (on interest margins), whereas Hahn (2008) found no effect (on return on assets). Looking at the earnings structure, Liebeg and Schwaiger (2006) found a positive influence both of the share of interest income and of non-interest income in total assets. None of the studies included variables that capture the impact on Austrian banks' profitability of the changes in the economic fundamentals mentioned earlier.

2 Data and Variables

2.1 Panel Dataset Containing Individual Bank Data and Macro Data

Reports by all banks that did business in Austria in the period from 1995 to 2009 – a total of 1,042 banks – represent the basis for this study.[6] Data on balance sheet items and Austrian banks' profitability were taken from the quarterly reports of condition and income – the (unconsolidated) Asset, Income and Risk Statement – that are available as from the fourth quarter of 1995. Data on banks' core capital and risk-weighted assets up to 2007 were taken from the monthly reports (part C) by banks to the Oesterreichische Nationalbank (OeNB) and, from 2007, they were taken from the (unconsolidated) reports on compliance with regulatory standards.

As consolidated data for Austrian banks did not become available until 2006, the unconsolidated figures were used for this analysis, despite the fact that they do not capture key areas of Austrian banks' activities. These data do not include the business activities of foreign subsidiaries of Austrian banks, which have become increasingly important over the past decade. However, as this study reviews the development of the Austrian market, the use of unconsolidated data appears warranted, considering that while the unconsolidated data may not capture the full volume of foreign business, they provide an indication of the speed at which this foreign business has developed, although perhaps understating it.

With respect to the performance indicators, the banks' data on their operating income and operating expenditure (and, therefore, also those on their operating profit) are based on the total for the respective business year. For instance, third-quarter values are the sum total of the values of the first three quarters of the year in question. In addition, banks report quarterly updates of the outlook for the respective business year for the operating profit, loan loss provisions, profit from ordinary activities, tax payments and the net profit or loss for the year. In other words, most of the performance indicators are expected rather than actual figures – only the financial statements for the year contain the actual figures. For operating profit, both quarterly and outlook values for the respective business year are available. As there is only a negligible difference between the two values for the fourth quarter in each year, the outlook values are suitable as a proxy for the annual figures. However, this also means that performance indicators are available solely on an annual basis. Therefore, annual values for 1995 through 2009 were used for this analysis. The data were evaluated in anonymized form for all

[6] With the exception of those of branches of credit institutions subject to the provisions of Article 9 Banking Act (governs the activities of branches of credit institutions under the freedom of establishment within the EU).

banks that existed between 1995 and 2009.

Data on GDP growth and inflation come from Statistics Austria, with inflation being calculated on the basis of the HICP. The data on long-term and short-term interest rates were taken from Thomson Reuters.

2.2 Banks' Profit Rates Tended to Fall

As dependent variables two profit indicators were analyzed, namely earnings before tax and operating profit. Earnings before tax is the sum of operating profit, provisions[7] and extraordinary income, and is thus banks' profit before taxes. The use of earnings before tax as an indicator eliminates the impact of changes in taxation. The use of the variable earnings before tax as one of the two profitability measures makes it possible to take into account the impact of value adjustments, which rose markedly in 2008 and 2009. In line with usual practice, both profit variables are expressed as a ratio to core capital, so that the return on equity (ROE) is our profitability measure. The ROE is the rate of return on equity investors' capital during a given period. As this measure is expressed in terms of core capital, it allows a comparison of individual banks' data over time.[8]

Chart 1 shows the development of the unweighted averages of the profit-

ability variables covered in this study for all banks in the sample for the entire observation period.[9] Chart 1, panel (a), demonstrates that the unweighted average of all observed banks' earnings before tax, which take into account depreciation and extraordinary income, rose marginally when expressed as a percentage of core capital (ROE I) in the late 1990s and tended to decline from 2000 to 2007, when the financial and economic crisis started and slashed banks' profits. The other profitability measure – the operating profit expressed as a percentage of core capital (ROE II) – has, on average, also declined since 2000, as indicated in chart 1, panel (b). Consequently, bank profitability exhibited a falling trend, on average, in the past decade.

2.3 Determinants of Bank Profits

This study uses a variety of microeconomic indicators stemming from bank data, including balance sheet and income statement figures, as well as macroeconomic indicators, to capture changes in the economic and economic policy framework.

2.3.1 Disintermediation

This study uses the share of loans extended to domestic non-banks in total assets as a measure of the magnitude of disintermediation tendencies.[10] This share diminishes the more bor-

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[7] Here, the allocation and dissolution of provisions for lending to banks and customers, on securities as well as on participations and shares in affiliated enterprises have been aggregated. The item includes already executed direct write-offs of claims and expected value adjustments.

[8] Some studies also use a ratio dividing earnings before tax and/or the operating profit by total assets, namely the return on assets (ROA). However, use of the ROE is preferred in this study for econometric reasons, as many of the explanatory variables are also expressed in terms of total assets. Consequently, if the ROA were used, there would automatically be a correlation between the ROA and some of the explanatory variables, which could have a negative effect on the reliability of the estimation results. Most of the studies available, however, do not take into account this issue (e.g. Maudos and Fernández de Guevara, 2004).

[9] The figures in this study differ from those published in the OeNB's regular statistics and analyses because this study uses the unweighted averages of all banks covered.

[10] Disintermediation is also visible on the liability side of banks' balance sheets, where investing households substitute capital market products for bank deposits. Results for the deposit ratio may differ from those of the credit ratio if the ratios are subject to different influences.

Chart 1

Unweighted Annual Averages of Selected Variables from 1995 to 2009

(a) ROE I

(b) ROE II
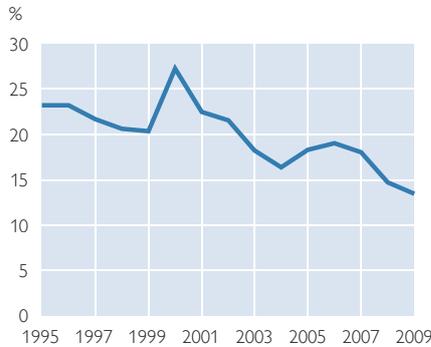
(c) Loans

(d) Share of publicly owned banks (dummy)
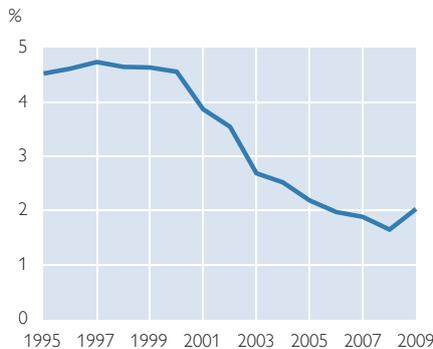
(e) Share of foreign-owned banks (dummy)
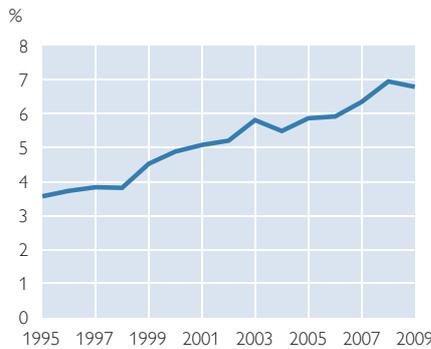
(f) Foreign lending

(g) Herfindahl-Hirschman index

(h) GDP growth
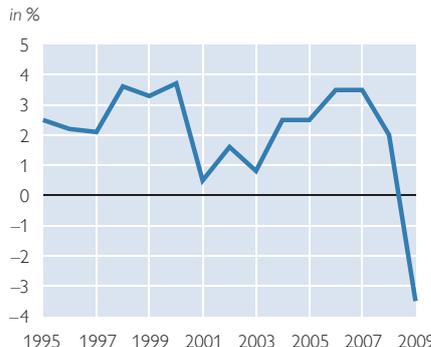
(i) Yield curve (ten years minus three months)
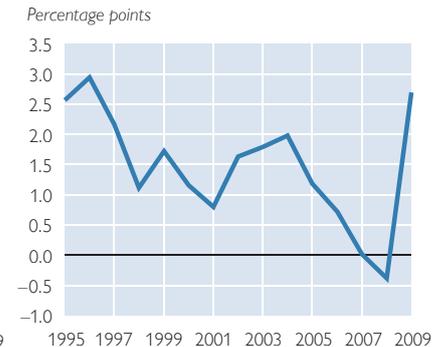
(j) Inflation rate (HICP)

(k) Core capital

(l) Foreign currency loans
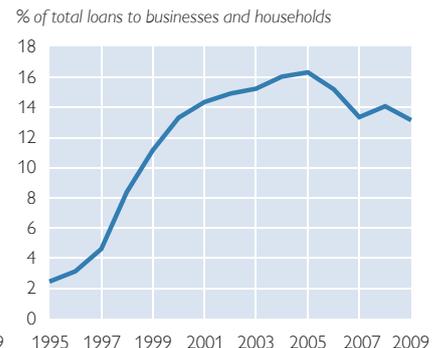
Source: OeNB.

rowers opt for market-based debt financing rather than for bank-based financing. Chart 1, panel (c), shows that, on average, loans expressed as a percentage of total assets have fallen since 2000. The literature does not give a clear account of the impact of such disintermediation tendencies on bank profits. Whereas some studies come to the conclusion 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 the banks' profit base (Lown et al., 2000; Rossi et al., 2009). We expect that, on balance, disintermediation tendencies have a positive impact on banks' earnings – the lower the share of loans is in total assets, the higher profits are.

2.3.2 Privatization

The share of public holdings in Austrian banks is an indicator of the level of privatization (or the remaining share of public ownership) in Austria. A bank is considered to be publicly owned if the public (central, state and local government) share exceeds 50%. Minority public interests (up to 50%) are not taken into account. We use a dummy variable (0 or 1) to represent the banks' ownership structure. The economic rationale for the use of a dummy is that the issue at stake is essentially the impact of changes in behavior rooted in the ownership structure, which can best be represented by focusing on the majority shareholder. Chart 1, panel (d), establishes that the share of publicly owned banks has dropped from 5% to below 2% since 2000. The impact of privatization on bank profits is not clear-cut. On the one hand, public ownership frequently put restrictions on banks' business opportunities, with some banks' options for raising capital (and, hence, for expanding their business activities) also being limited, so that privatization could be expected to have a positive effect on bank profits. On the other hand, however, the profitability of the banks that the public sector has acquired in the wake of the crisis in recent years was low.

2.3.3 Internationalization of the Ownership Structure

The procedure for capturing the internationalization of the ownership structure is the same as that used to determine the volume of privatization in the Austrian banking sector. A bank is classified as foreign-owned if the share of foreign ownership exceeds 50% (again, using a dummy). Much of the increase in the share of foreign ownership in Austrian banks was due to privatization, but in a number of cases, banks not owned by the public sector were also sold to investors outside of Austria. Chart 1, panel (e), records a steady growth of the share of foreign-owned Austrian banks (again as a percentage of all banks) over the entire observation period, to nearly 7% at present. The expected effect of foreign ownership on bank profits is ambiguous, as was the case for the impact of privatization on bank profits. If foreign owners expect higher returns on their interests than Austrian owners, one would expect these banks to make higher profits. Moreover, if a bank is integrated into a multinational group, one could expect this to entail efficiency gains, provided that the group proves capable of following international customers to their respective markets. Conversely, information asymmetries between shareholders and management could play a greater role at foreign-owned banks. Regulatory, language-related and cultural differences may also have a

negative impact on profits (Buch, 2005). Overall, the empirical evidence on the issue of whether predominantly foreign-owned banks are more profitable is mixed. For the U.S.A., the correlation between foreign ownership and bank profitability tends to be positive, while other countries tend to exhibit a negative or no correlation (Berger, 2007).

2.3.4 Internationalization of Banking Activity

The degree of internationalization in banks' activities is measured as the share of foreign lending in total assets.[11] The unconsolidated data used in this study reflect Austrian banks' international business only incompletely, so that the estimate falls considerably short of the absolute volume. The reason for this is that while the large Austrian commercial banks have built up extensive subsidiary networks in the CESEE region, the CESEE business volume is not included in the Austrian banking sector's total assets. Nevertheless, the internationalization indicator reflects the speed of internationalization in Austrian banking in the wake of the opening up of the CESEE region fairly well. Since 1995, the average share of cross-border loans in total assets has expanded to over 10% in the last two years of the sample (chart 1, panel (f)). In the consolidated figures, CESEE business made an important contribution to Austrian banks' profits

(for more information, see the regular analyses of Austrian and international developments in the OeNB's Financial Stability Report). But even in the incomplete coverage based on unconsolidated data, the share of foreign business should correlate positively with banks' income.

2.3.5 Degree of Competition

The literature frequently uses market structure indicators to assess the degree of competition in the banking system, based on the line of reasoning that a larger market share implies greater market power, which in turn restricts competition. This argumentation is rooted in the structure-conduct-performance (SCP) paradigm, which postulates a positive correlation between market power and profit.[12] In practice, such considerations also play a role in banking. Frequently, one of the reasons explicitly cited as a motive for mergers and acquisitions in banking is that of strengthening a bank's market position and reducing the degree of competition on regional and national markets. Hence, higher market concentration should entail greater bank profitability. One of the most widespread measures of the degree of competition on a market is the Herfindahl-Hirschman index (HHI). The HHI is defined as the total of the squared market shares (in percent) of the individual firms.[13] As the HHI squares the banks' market shares, larger banks are represented dispropor-

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[11] As in the case of the assessment of disintermediation, the share of foreign business is depicted in terms of the asset side. It would also be possible, however, to depict it in terms of the liability side.

[12] However, the assumptions underlying the SCP model are the subject of some controversy in the literature. The causality might in fact be reversed, as the efficient structure hypothesis postulates. This hypothesis assumes that costs are lower and profits higher in well-managed banks, so that such banks can gain market share over time, leading to higher market concentration.

[13] However, Austrian banks are interlinked in many ways as a result of their organization in sectors. For much of the banking system — the decentralized sectors, i.e. Raiffeisen banks, savings banks and Volksbank credit cooperatives — the local markets are clearly separate. An alternative calculation of the HHI that takes this into account by treating each of the three decentralized sectors as a hypothetical single group has no noteworthy impact on the regression results presented later in the study.

tionately. Chart 1, panel (g), shows that the HHI rose slightly until 2001, increased sharply in 2002 and tended to fall again thereafter.[14] This indicator thus allows the conclusion to be drawn that the overall degree of concentration in Austrian banking has not risen since 1995.[15]

2.3.6 Cyclical Factors

Cyclical aspects must also be taken into account in macroeconomic analyses of bank profits. A number of studies have shown that the position in the economic cycle may influence bank profits significantly (Albertazzi and Gambacorta, 2009). Economic growth is the most comprehensive measure of macroeconomic developments, and is thus an indicator of both demand for bank services and credit risk (loan loss provisions). Therefore, real GDP growth is used as an explanatory variable, and it is expected that economic growth and bank profit are positively correlated.

In addition, the general level of interest rates – above all, the spread between short-term and long-term interest rates – is key to explaining bank profitability. As the maturities of banks' assets and liabilities frequently differ – usually, their investment has a longer maturity than their funding – changes in the yield curve have a noticeable impact on the profitability of maturity transformation. A positive correlation between the spreads and bank profitability is expected.

Like other studies on this topic, this study also uses the inflation rate as an additional economic variable in the analysis. Arpa et al. (2001), Bikker and Hu (2002), and Demirgüç-Kunt and Huizinga (2000) all find a positive correlation between bank profit and inflation. However, the literature hardly substantiates this correlation. It is conceivable, for example, that fees and commissions rise simply 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, which may temporarily lead to higher profits in periods of higher inflation.

2.3.7 Control Variables

This study also takes into consideration some microeconomic control variables that have proved to be particularly significant for the development of bank profits in other studies, especially in those on Austrian bank profits.

– *Bank size:* The correlation between bank size and profitability is controversial in the literature. In addition to the market power argument already discussed in connection with the degree of competition, economies of scale are also cited as a factor behind a positive correlation between bank size and bank profits. Delegated monitoring as described by Diamond (1984), above all in lending, should create economies of scale by lowering transaction costs, but empirical research on the existence of economies of scale and economies of scope in banking does not come to unambiguous conclusions. In fact, in the 1990s, negative economies

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[14] *The marked increase in 2002 reflects the merger of Bank Austria AG and Creditanstalt-Bankverein AG. Given the use of unconsolidated data, the merger can only be considered as of that point in time.*

[15] *The development of another common structural measure of the degree of competition, namely the concentration ratio, presents a similar picture. The concentration ratio depicts the cumulative market share of the x largest banks. The share of the five largest banks in the total volume of credit diminished from 41% in 2005 to 35% in 2009. Prior to this period, the ratio fluctuated fairly strongly without following a clear trend. Finally, the development of banks' total assets has not indicated a rise in the concentration ratio in recent years.*

of scale were measured for Austrian banks (Mooslechner, 1995). Since then, however, technical progress and regulatory changes are likely to have increased the optimum size for European banks. Given that economies of scale will probably be highest in lending, the bank size is measured in terms of each individual institution's share in total domestic lending by the banking sector.

— *Risk aversion:* A bank's risk behavior is another fairly important determinant of its profitability. Many studies, such as that by Maudos and Fernández de Guevara (2004), use the capital ratio (core capital ratio) as an indicator – the higher the capital ratio, the greater the risk aversion. As the core capital ratio first became available in 1998, this study uses the ratio of core capital to risk-weighted assets (until 2007) and the risk-weighted exposure amount of on-balance-sheet business (from 2008).[16] In 2008 and 2009, this ratio surged, as banks boosted their capital considerably during the crisis; moreover, the ratio of core capital to risk-weighted assets declined marginally in 2009 (chart 1, panel (k)). Considering the strong positive correlation between a bank's capitalization and its profitability in many other studies, the correlation in this study is also expected to be positive.

— *Share of foreign currency lending:* The proliferation of foreign currency lending to households and, albeit to a lesser degree, enterprises became typical of the development of Austrian banking from the mid-1990s. Therefore, the share of foreign currency loans in total lending to businesses and households was considered as an additional control variable for the analysis. The (unweighted average) share of foreign currency loans in total lending to domestic nonfinancial corporations and households more than quadrupled between 1995 and 2005 and, even though it declined in the meantime, came to roughly 12% at the end of 2009 (chart 1, panel (l)). As the sharp increase in foreign currency lending is an Austrian phenomenon, it has been analyzed in only one study so far, namely by Liebeg and Schwaiger (2006), who find a negative correlation with the interest rate spread.

— *Sector-specific dummies:* To control for possible heterogeneity in profits that stem from the classification of a bank as belonging to a specific sector, dummy variables are used in the estimation for each sector represented in the sample (Raiffeisen banks, savings banks, Volksbank credit cooperatives, joint stock banks, state mortgage banks, building and loan associations and special purpose banks). Since the sectoral classification of banks can change on account of mergers and acquisitions or other reclassifications, these dummy variables are not necessarily constant over time.

— *Introduction of the euro:* In the run-up to Stage Three of EMU, some banks voiced concerns that the introduction of the euro could affect their profits because they would no longer have income from

[16] *In 2007, the year of transition from the Basel I to the Basel II regime, reporting requirements were changed. The proxy for banks that no longer reported under the old requirements in 2007 was the assessment base for credit risk pursuant to Articles 22a – 22h Austrian Banking Act multiplied by the factor 12.5 (the inverse of the regulatory minimum capital ratio of 8%).*

currency exchange fees or other earnings generated through e.g. hedging business with other European currencies. To test this hypothesis, a dummy variable was included that takes the value of 1 as from the date on which the euro was introduced as a noncash currency in 1999.

— *Financial crisis:* Finally, as the single most important macroeconomic occurrence in the past 15 years, the financial crisis had a material impact on the data of all variables used. In order to explicitly take into account this effect, which is visible in macroeconomic variables such as economic growth and the yield curve, we use a dummy variable that takes a value of 1 for 2008 and 2009.

— *Trend:* As indicated in chart 1, panels (a) and (b), ROE I and – even more so – ROE II are likely to show a negative trend over time. To take this circumstance into account, the estimation equation also includes a time trend.

3 Estimation Method and Results

The two indicators of bank profits – earnings before tax as a percentage of core capital (ROE I) and operating profit as a percentage of core capital (ROE II) – are available at the individual bank level $i = 1, ..., M$ for the years 1995 through 2008, $t = 1, ..., 15$. Hence, a panel regression is the natural estimation technique for our analysis. To allow for individual heterogeneity in the estimation, i.e. the heterogeneity among bank profits, which is not explained by any of the independent variables, the model is estimated using a fixed-effects specification:[17]

$$y_{it} = \alpha + X'_{it}\beta + Z'_t\gamma + \mu_i + \varepsilon_{it} \qquad (1)$$

where y_{it} is the dependent variable (ROE I and ROE II, respectively), α is the constant and β as well as γ are the coefficient vectors to be estimated. X_{it} is the vector of all explanatory variables available at the micro-level: lending as a percentage of total assets, foreign lending and foreign currency lending as a percentage of total assets, the bank's market share in total lending, core capital as a percentage of risk-weighted assets, and dummy variables for publicly owned and foreign-owned banks and for sector classification. Vector Z_t contains variables that vary only over time: the HHI, the macro variables economic growth, the slope of the yield curve and inflation, and the dummies for the introduction of the euro as well as the financial crisis and the time trend. μ_i denotes the individual fixed-effects, ε_{it} the individual error terms, which are assumed to be independently and normally distributed.

3.1 Disintermediation and Foreign Ownership Dampen Bank Profits

Table 1 shows the results of the fixed-effects estimation for ROE I and ROE II.[18] Principally, the results differ

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[17] *In panel regression econometrics, this estimation method is called fixed-effects least squares, in which the "within" transformation of the estimation equation (Baltagi, 2008, chapter 2) is used. The random-effects generalized least squares (GLS) estimation method would be an alternative to the fixed-effects estimation. The GLS method assumes that individual-specific effects are not fixed (deterministic) but random (normally distributed). We chose the fixed-effects method for this study because first, our sample is not randomly selected but rather contains the total population of Austrian banks and second, a correlation between the individual-specific effects and other explanatory variables cannot be ruled out. The latter represents a basic assumption of the random-effects GLS method (for more details, see also Baltagi, 2008, chapter 2).*

[18] *To test whether the estimation results are robust with respect to the estimation method, the same model is also estimated with the method introduced by Arellano and Bond (1991). The corresponding estimation results are presented in the annex to this study and largely confirm the fixed-effects estimation results shown in table 1.*

somewhat for the dependent variable being earnings before tax (ROE I) and operating profits (ROE II). As ROE I is already adjusted for loan loss provisions and thus represents a more complete picture of bank profitability, the regression using ROE I is considered our standard specification. However, ROE II, which is not adjusted for loan loss provisions, deserves to be taken into account as well as it may well provide a more accurate picture of profit developments in the current period because these provisions frequently originate in previous periods. Overall, however, we consider ROE I as the more relevant profitability measure; therefore, results for ROE II are highlighted only where they diverge.

The results show a significantly negative correlation between the share of loans in total assets and bank profits. Banks with a lower proportion of their business in classical lending operations and hence a higher proportion in other types of investment, such as equity and debt securities, appear to make higher profits. In other words, the disintermediation tendencies in Austrian banking may well have boosted profits. The coefficient of −0.08 means that: If the share of lending in total assets declines by 1 percentage point for the average bank, its ROE I rises by 0.08 percentage points under *ceteris paribus* conditions. We find an inverse relationship for ROE II, which is not adjusted for loan loss provisions. Obviously, loss provisions are on average lower for equity and debt securities than for loans.

Continued privatization in the Austrian banking sector throughout the observation period is likely to have

Table 1

Fixed-Effects Panel Regression Analysis of Bank Profits

Dependent variable	ROE I	ROE II
Loans in % of total assets	−0.079***	0.106***
Public ownership (dummy)	0.291	−1.403
Foreign ownership (dummy)	−7.854**	−4.761
Foreign lending in % of total assets	0.052	0.119**
HHI	0.481*	−0.530***
GDP growth	0.331**	−0.168*
Yield curve (ten years minus three months)	1.234***	0.040
Inflation rate (HICP)	3.165***	1.858***
Market share in total lending	0.650	1.051
Core capital in % of risk-weighted assets	0.002**	−0.001
Share of foreign currency lending	0.085	−0.017
Euro introduction (dummy from 1999 on)	−1.608	0.948
Financial crisis (dummy for 2008 and 2009)	−9.232***	−2.505***
Trend	−0.165**	−0.871***
Number of observations	12,694	12,694
Number of banks	1,042	1,042
R^2 (within R^2)	0.27	0.13

Source: Authors' calculations.

Note: The regressions also contain sector-specific dummies and a constant in addition to the stated variables. *** denotes significance at the 1% level, ** at the 5% level, and * at the 10% level. The standard errors are robust with respect to heteroscedasticity and control for clusters in the 1,042 banks.

The coefficients of the variables defined as ratios and of the macrovariables are to be interpreted as semi-elasticities: If the respective explanatory variable rises by 1 percentage point, the ROE rises (falls) by x percentage points (e.g. 0.3-percentage-point higher ROE I as a result of 1-percentage-point higher GDP growth). For the dummy variables, the change from 0 to 1 translates into an increase (decrease) of the ROE by x percentage points (e.g. ROE I decreases by an average of 7.9 percentage points if the bank becomes majority foreign owned).

had a neutral impact on bank profits, as the results available do not indicate a significant correlation between the profits of, and the dummy variables for, majority publicly owned banks. The profitability of majority publicly owned banks turns out to be no higher on average than that of majority privately owned banks.

Conversely, the internationalization of the Austrian banking landscape apparently did have an impact on profits. We find a significantly negative influence on ROE I in the case of the dummy variables for majority foreign-owned banks – these banks made lower profits in the review period. The negative effects of foreign ownership on the bank profits mentioned in section 2.3.3 appear to outweigh the positive factors. While this impact is also negative for ROE II, it is no longer statistically significant.

The other factor capturing Austrian banks' internationalization, namely the rise in lending abroad, had a positive but not statistically significant impact on ROE I. But this variable may reflect the problem mentioned in section 2.3.4 that a review of bank profits on an unconsolidated basis does not take into account the profits of subsidiaries abroad, so that the impact of internationalization on bank profits may be underestimated. However, foreign lending is found to have a significant positive effect on profitability in the case of ROE II, however. Thus, the higher profit is likely to have been canceled out by higher loan loss provisions.

The fixed-effects estimation shows the degree of competition in Austrian banking measured with the HHI to have a significantly positive effect on ROE I, which means that average profits were higher (lower) in years in which, *ceteris paribus,* market concentration in the Austrian banking sector rose (fell). By contrast, the degree of competition as shown by the HHI has a negative effect on profits in the case of ROE II.

3.2 Bank Profits Are Procyclical and Depend on the Slope of the Yield Curve

All three macroeconomic variables included in the analysis have a positive and significant effect on bank profits. Economic growth measured as the annual percentage change in real GDP has a positive impact on ROE I: Bank profits are higher in years with stronger economic growth. However, at an average 0.3 percentage points, the effect is fairly small. It was certainly especially apparent in 2009, the year in which the financial crisis hit the banking sector hard and in which it also caused GDP to shrink. This correlation was not driven exclusively by the events during 2008 and 2009, as shown by the fact that the variable is significant despite the inclusion of a dummy for the financial crisis (see the last paragraph in this section) and that it remains significant in an estimation of the same model using data only up to 2007.[19] But looking at ROE II, the fixed-effects estimate produces a negative correlation between economic growth and bank profits.

The steepening in the yield curve – measured in terms of the differential between three-month rates and the ten-year government bond yields – also has a significant positive effect on

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[19] *To assess whether the results are robust with respect to the unprecedented financial crisis, which is likely to have influenced all data of the past two years, we performed an alternative estimation using only data from 1995 to 2007. The results of this estimation confirm the results shown in table 1 at the qualitative level for every variable.*

ROE I. This differential has an impact on the interest rate spread between deposits (assumed to be shorter-term) and loans (assumed to be longer-term) and thus determines banks' profitability. As in Demirgüç-Kunt and Huizinga (2000), we also find a positive correlation between bank profits and inflation. Obviously, banks benefit from higher inflation.

Of the microeconomic control variables, only the ratio of core capital to risk weighted assets was found to have a significant and positive influence on bank profits. More risk-averse banks identified in terms of a higher ratio of core capital to risk-weighted assets made higher profits in Austria in the review period than less risk-averse banks. Bank size – measured in terms of the individual institution's share in total domestic lending – and foreign currency lending had no significant influence on the two profitability indicators analyzed in this study.

The findings of this study show that the introduction of the euro represented by a dummy from 1999 on had no sustained influence on bank profits, whereas the financial crisis had a clearly negative influence on both profit variables. In addition, a mild, but still significantly negative trend over the observation period was found for both profit variables.

4 Conclusions

Overall, the findings suggest that Austrian banks have coped well with the major challenges of financial market restructuring. Contrary to widespread expectations prior to the liberalization and integration of the Austrian banking market, the economic policy adjustments did not reduce profits. Despite a slight tendency to decline, profits have remained robust, except during the current crisis.

The regression results show that banks in fact benefited from the disintermediation tendencies of the past 15 years. On average, those banks which engaged to a greater degree in business activities outside of conventional lending made higher profits than banks with a larger share of their business in lending. The positive correlation may also be interpreted as disintermediation resulting in a broader diversification of bank assets – and thus of bank profits. These results are also noteworthy because they show that the Austrian banks' business model is based on a strong position in deposits and lending, which to some degree represented a stabilizing factor in the current financial crisis.

Only few indications were found that a change in ownership structure had an impact on bank profits. While foreign ownership seems to have had a negative impact on bank profitability, this result is not robust with respect to the second profitability measure or to alternative estimation methods. By contrast, the results show that privatization did not have a significant influence on bank profits. Nor did the introduction of the euro have a sustained effect on bank profits.

What came as a surprise was that the internationalization of banks' asset-side business (as shown by foreign lending) did not lead to significantly higher profits, possibly because the data cover only unconsolidated profit measures that reflect the banks' CESEE business incompletely. Even if a portion of lending to foreign customers is handled through the parent bank, the subsidiaries do play an important role, above all for large banks. But large banks are not as dominant in a panel data analysis as in an analysis of aggregated data, so that medium-sized and small banks have a greater weight in the panel data

analysis result than they do in the public perception of Austrian banks.

As in other countries, bank profits are strongly influenced by cyclical developments. Moreover, the estimation results show a significant positive influence of the spread between short- and long-term rates as well as of the inflation rate on bank profits.

Of the microeconomic control variables, only the core capital ratio was found to have a significant positive influence on bank profits. The finding that a higher core capital ratio on average during the past 15 years did not prevent higher profits is also relevant for the current economic policy debate about future regulatory requirements for the banking sector. Furthermore, the findings indicate that foreign currency loans, which stopped expanding as the crisis unfolded, did not positively contribute to banks' profitability.

However, in discussing the findings, it must be taken into account that the regression is based on unconsolidated data, so that important developments in the banking sector were captured only incompletely. The current crisis, which has resulted in massive reductions in profits as well as of some explanatory variables, makes it difficult to assess the long-term development of profits. At the current juncture, it is still impossible to determine whether and, if so, how much the financial crisis has changed the operational environment for Austrian banks, and it remains to be seen to what extent the results of this study will remain valid in the post-crisis period.

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Annex

Robustness Analysis: Estimation Using the Arellano-Bond Method

The standard method in panel data analysis is the fixed-effects estimation, which assumes that all explanatory variables are exogenous with respect to the dependent variable and that the variables are not correlated over time. To allow for the possible correlation of dependent variables with their own past values and thus to allow for a dynamic panel structure,[20] or for endogeneity of individual variables with respect to the profit measures, we additionally use the dynamic panel data estimation method introduced by Arellano and Bond (1991) (which was designed for panels with large M and small T). The Arellano-Bond method is no longer based on least squares, but on the Generalized Method of Moments (GMM), with the first lag of the respective dependent variable ($y_{i,t-1}$) additionally used as an explanatory variable:[21]

$$y_{it} = \alpha + \delta y_{i,t-1} + X'_{it}\beta + Z'_t\gamma + \mu_i + \varepsilon_{it} \quad (2)$$

The Arellano-Bond Results Largely Confirm the Fixed-Effects Results

Table 2 summarizes the estimation results obtained on the basis of the Arellano-Bond method.[22] As the autocorrelation of the dependent variables already suggested, the respective first lags of ROE I and ROE II are significant in explaining bank profits.[23] As for autocorrelation, the effect of the first lag in the Arellano-Bond estimation is more pronounced for ROE II than for ROE I. The Arellano-Bond estimation confirms the results of the fixed-effects estimation with reference to disintermediation and the degree of competition. However, the alternative estimation method does not show a significant influence of either of the internationalization measures (ownership structure and lending abroad) on bank profits.

The macroeconomic variables economic growth, slope of the yield curve and inflation do not have different effects on ROE I in the Arellano-Bond and the fixed-effects estimations. However, economic growth and the slope of the yield curve now also have a significant positive effect on ROE II in the Arellano-Bond estimation. Hence, the results for the macroeconomic variables are no longer different for ROE I and ROE II under the Arellano-Bond method, and above all, the unexpected

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[20] The autocorrelation of ROE I with its own first lag is roughly 58%, and in the case of ROE II this autocorrelation even comes to 86%.

[21] Arellano and Bond (1991) developed an estimation method that takes account of endogeneity resulting from the inclusion of lags of the dependent variable that arise between these variables and the panel individual effects. GMM, an instrumental variables estimation method, is used, with the lags of the dependent variable instrumented by all of their available further lags and other possibly endogenous variables also instrumented by all of their available lags. Moreover, the first differences of all exogenous variables are used as instruments (for a detailed explanation, see Arellano and Bond, 1991). In the textbook literature, this estimation method is also referred to as "difference GMM," as the moment conditions are formed with the first-differenced residuals (Baltagi, 2008). The assumption whether the individual effects are fixed or random has now become irrelevant for the estimation, as these effects drop out of the equation when the first differences are considered.

[22] The usual specification tests of the Arellano-Bond method reveal a certain specification problem, above all in the estimations with ROE II. Whereas the test for first- and second-order autocorrelation of the residuals does not reveal any specification error in the regression with ROE I, the presence of second-order autocorrelation in the residuals indicates a problem in the estimation with ROE II. Moreover, the test for validity of the instruments (Hansen test) shows that some of the instruments are not strictly exogenous. However, this test is weakened by the use of many instruments.

[23] In an additional estimation, a second lag of the respective dependent variable was included as an additional explanatory variable. However, this lag proved not to be significant in both cases. We may thus conclude that one lag of the dependent variables is sufficient to capture the dynamic structure of our panel.

negative effect of economic growth on ROE II has reversed.

Overall, the results obtained with the Arellano-Bond estimation confirm the earlier estimation results, although the Arellano-Bond estimation uses roughly one-sixth fewer observations as a result of the included lag of the dependent variables and the lagged instruments. Consequently, the available estimation results may be considered largely robust for both estimation methods.

Table 2

Arellano-Bond "Difference" General Method of Moments (GMM) Estimation of Bank Profits

Dependent variable	ROE I	ROE II
ROE I (t–1)	0.070**	
ROE II (t–1)		0.481***
Loans in % of total assets	−0.167***	0.151***
Public ownership (dummy)	−2.708	−2.870
Foreign ownership (dummy)	−2.095	7.225
Foreign lending in % of total assets	0.245	0.059
HHI	0.135	−0.651**
GDP growth	0.341**	0.417***
Yield curve (ten years minus three months)	1.062***	0.656**
Inflation rate (HICP)	2.432***	1.045***
Market share in total lending	−0.046	0.522
Core capital in % of risk-weighted assets	0.002**	−0.001
Share of foreign currency lending	0.246	0.012
Euro introduction (dummy from 1999 on)	−2.355	1.105
Financial crisis (dummy for 2008 and 2009)	−8.789***	−1.495***
Trend	−0.419**	−0.366***
Number of observations	10,649	10,649
Number of banks	975	975
Number of instruments	110	110

Source: Authors' calculations.

Note: The regressions also contain sector-specific dummies and a constant in addition to the stated variables. *** denotes significance at the 1% level, ** at the 5% level, and * at the 10% level. The standard errors are robust with relation to heteroscedasticity and control for clusters in the 975 banks.